2016 Traffic Improvement Study

Presented to:
Town of Sussex, NB

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Project # 151-07231

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1.0 Introduction

Background

The Town of Sussex is built around a road network that has remained largely intact since it was constructed many years ago. The Town has been able to maintain efficiency on its roadways and at its intersections; however they are interested in determining the viability of the necessary strategic traffic improvement initiatives to direct and focus the improvements of its core intersections to continue to provide a safe and efficient transportation network to its residents and visitors.

WSP Canada Inc. has been retained to complete a Traffic Study to further develop these improvement options and determine phasing of the upgrades with respect to short, medium, and longer term modifications that will improve traffic flow and traffic safety throughout the Town.

Study Objectives

1. Estimate 2015 Annual Average Weekday Traffic Volumes at thirteen intersections and project traffic volumes to the 2020 horizon year.
2. Consider development of a roundabout near the CNR Railway crossing at Eveleigh Street and Rosemount Street, with conversion of both Eveleigh and Rosemount Streets to two-way traffic flows. Provide order of magnitude costs for such improvements.
3. Review and develop a functional layout of Rosemount Street and Leonard Drive intersection if two-way traffic is recommended.
4. Conduct a functional review of the intersection of Main Street and Leonard Drive with a focus on the westbound turn lanes and to redevelop lane configurations at the intersection.
5. Conduct a functional review of the intersection of Main Street and Queen Street. Recommend improvements to pedestrian safety as well as safety for maintenance.
6. Review one-way traffic on Broad Street and review potential modifications, if any, to improve traffic movements while not interfering with needed traffic in the downtown core.
7. Assess potential realignment of the intersection of Main Street at Sunnyside Drive / Albert Street.
8. Recommend cost-effective solutions for improving pedestrian safety at the Town's four signalized intersections. The recommended upgrades should include provisions to assist visual and hearing impaired persons.
9. Maintain and enhance the unique heritage character of Downtown Sussex.
10. Develop a critical path to assist in capital planning that would implement the recommended improvements.

2.0 Study Area Streets

Site Description

The Town of Sussex is situated in south-central New Brunswick. With tree-lined streets and small town charm, Sussex offers a thriving business culture and recreational opportunities to residents and visitors alike.

The Town of Sussex is interested in determining what cost effective traffic modifications can be made to improve traffic flow and continue to deliver safe and efficient operation of its roadway network. The Study Streets are summarized in Table 2-1 and are shown in Figure 2-1

Table 2-1 – Study Area Streets

Street Name	Limits		Street Class	Speed Limit (km/h)	Approximate Length (m)
	From	To			
Route 121	McGregor Brook Road	Main Street	Collector Highway	50	1200
Lower Cove Road	Southern Terminus	Route 121	Local	50	1600
Moffett Avenue	Gateway Street	Main Street	Local	50	280
Main Street	Western Terminus	Sussex Corner	Collector Highway	50	4500
Albert Street	Main Street	Court Street	Local	50	400
Sunnyside Drive	Hillside Crescent	Main Street	Local	50	300
Queen Street	Main Street	Broad Street	Collector	50	600
St George Street	Lower Cove Road	Queen Street	Local	50	1600
Broad Street	Queen Street	Main Street	Collector	50	250
Maple Avenue	Main Street	Marble Street	Local	50	1100
Church Avenue	Magnolia Avenue	Main Street	Local	40	1500
Summer Street	Winter Street	Main Street	Local	50	75
Magnolia Avenue	Church Avenue	Main Street	Local	50	1600
Leonard Drive	Main Street	Cougle Road	Collector	50	2300
Eveleigh Street	Perry Street	Leonard Drive	Local	50	350
Rosemount Avenue	Leonard Drive	Marble Street	Local	50	400

Turning Movement Counts

Turning movement counts were obtained by WSP on Tuesdays, Wednesdays, and Thursdays between July 22 and July 30, 2015 at the Study Area intersections shown in Figure 2-1 and described in Section 3.0 of this report. Turning movement counts are tabulated in Tables A-1 to A-13, Appendix A, with peak hour volumes indicated by shaded areas.

Figure 2-1: Study Location and Subject Intersections

Annual Traffic Volume Data

Machine counts on Route 121 between Landsdowne Avenue and Main Street were obtained by the New Brunswick Department of Transportation and Infrastructure (NBDTI) between 2007 and 2013. A graph of these volumes and the calculated trend line are indicated in Figure 2-2 below. The historical AADT volumes on Route 121 indicate an annual growth rate of 1.5%. For the purposes of this study, counted traffic volumes were grown at an annual rate of 1.5%.

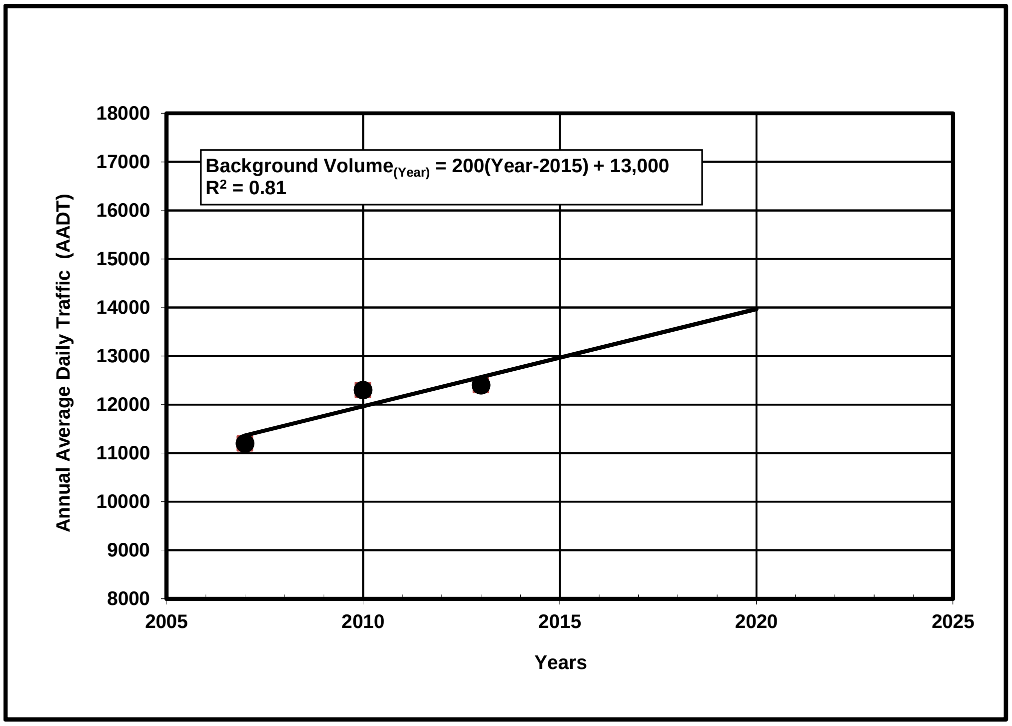


Figure 2-2 - Historical AADT Growth Rate Route 121 - Landsdowne Avenue to Main Street

Seasonal Traffic Volume Data

NBDTI obtained machine counts on Route 121 between Landsdowne Avenue and Main Street in May, July, and November of 2013. From these data, hourly adjustment factors and seasonal adjustment factors were developed and applied to the forecast traffic volumes to obtain Annual Average Weekday Traffic Volumes (AAWT). 2013 Hourly and Seasonal traffic volume data are summarized in Table 2-2.

Table 2-2 – 2013 Seasonal Counted hourly volumes – Route 121 between Landsdowne Avenue and Main Street

Hour	Seasonal Counted Hourly Volumes - Dates - Days of the Week - Days of the Year										
	Spring			Summer Weekday			Summer Weekend		Late Fall		
	Tue 30-Apr 120	Wed 1-May 121	Average Hourly Volume	Wed 10-Jul 191	Thu 11-Jul 192	Average Hourly Volume	Sat 13-Jul 194	Sun 14-Jul 195	Wed 13-Nov 317	Thu 14-Nov 318	Average Hourly Volume
0											
1	36	57	47	61	34	48	86	94	32	32	32
2	27	38	33	41	45	43	58	62	27	20	24
3	16	25	21	34	41	38	35	43	16	22	19
4	19	22	21	17	37	27	36	27	18	26	22
5	31	40	36	38	57	48	31	19	32	45	39
6	137	146	142	173	167	170	92	39	179	150	165
7	374	323	349	377	421	399	203	132	378	333	356
8	713	640	677	590	612	601	365	160	629	617	623
9	784	777	781	644	689	667	552	217	679	658	669
10	799	805	802	729	729	729	800	475	658	642	650
11	833	810	822	887	775	831	1035	536	702	659	681
12	920	931	926	932	927	930	1203	698	752	740	746
13	996	1141	1069	1094	1056	1075	1145	1123	835	795	815
14	1036	1092	1064	1031	997	1014	1119	1019	853	795	824
15	932	1061	997	993	981	987	977	906	791	835	813
16	1020	1033	1027	949	1008	979	964	891	833	853	843
17	1038	1276	1157	1117	1124	1121	868	845	884	912	898
18	1047	1155	1101	1119	1059	1089	845	660	892	952	922
19	732	796	764	736	797	767	755	568	616	666	641
20	636	720	678	663	712	688	670	556	450	504	477
21	571	577	574	620	636	628	631	528	381	386	384
22	352	400	376	427	377	402	476	386	247	291	269
23	176	161	169	215	224	220	272	235	115	162	139
24	89	122	106	98	100	99	144	114	81	75	78
TOTALS	13,314	14,148	13,739	13,585	13,605	13,600	13,362	10,333	11,080	11,170	11,129
% AADT	107.4	114.1	110.8	109.6	109.7	109.7	107.8	83.3	89.4	90.1	89.8
Factor	0.93	0.88	0.90	0.91	0.91	0.91	0.93	1.20	1.12	1.11	1.11

Source: Volume data obtained by NBDTI; estimated 2013 AADT is 12,400 vehicles per day.

Estimated 2015 and Projected 2020 Peak Hour Traffic Volumes

Estimated 2015 weekday AM and PM peak hour volumes are illustrated diagrammatically in Figures A-1, A-2, and A-3, Appendix A.

Projected 2020 weekday AM and PM peak hour volumes, calculated using an annual traffic volume growth rate of 1.5%, are illustrated diagrammatically in Figures A-4, A-5, and A-6, Appendix A.

Calculation of Annual Average Weekday Traffic (AAWT)

Using the turning movement counts, historical volume data from NBDTI, and an annual 1.5% growth rate, the 2015 and 2020 AAWT volumes were estimated for the Study Area roadways and intersections. These AAWT are summarized in Table 2-3 and illustrated diagrammatically in Figures A-7, A-8, and A-9, Appendix A.

Table 2-3 – Estimated 2015 and 2020 (two-way) AAWT[1] for study area roadways

Intersection	Street	Estimated 2015 AAWT[1]	Estimated 2020 AAWT[1]
Route 121 @ Lower Cove Road	Route 121 West	15300	16400
	Route 121 East	14600	15600
	Lower Cove Road	4400	4700
Main Street @ Route 121 / Moffett Avenue	Main Street West	12200	13100
	Main Street East	15300	16500
	Route 121	14600	15600
	Moffett Avenue	3600	3900
Main Street @ Albert Street / Sunnyside Drive	Main Street West	15100	16300
	Main Street East	15600	16800
	Albert Street	700	800
	Sunnyside Drive	1200	1300
Main Street @ Albert Street / Sunnyside Drive	Main Street West	15300	16400
	Main Street East	10500	11300
	Queen Street South	10000	10800
	Queen Street North	1400	1500
Queen Street @ St George Street	St George Street	3200	3400
	Queen Street South	10700	11500
	Queen Street North	10000	10800
Main Street @ Broad Street / Maple Avenue	Main Street West	10500	11300
	Main Street East	15400	16600
	Broad Street	10700	11500
	Maple Avenue	7100	7700
Main Street @ Church Street	Main Street West	15800	16900
	Main Street East	15100	16300
	Church Street	1500	1600
Main Street @ Summer Street	Main Street West	13700	14800
	Main Street East	13800	14800
	Summer Street South	2700	2900
	Summer Street North	6200	6700
Main Street @ Magnolia Avenue	Main Street West	14300	15400
	Main Street East	15100	16300
	Magnolia Avenue	2400	2600
Main Street @ Leonard Drive / O'Connell Park	Main Street West	14700	15800
	Main Street East	10000	10800
	O'Connell Park	200	300
	Leonard Drive	9700	10400
Leonard Drive @ 8th Hussars Park	Leonard Drive West	9700	10400
	Leonard Drive East	9500	10200
	8th Hussars Park	500	600
Leonard Drive @ Eveleigh Street	Leonard Drive West	9500	10200
	Leonard Drive East	9800	10500
	Eveleigh Street	3400	3700
Leonard Drive @ Rosemount Avenue	Leonard Drive West	9800	10500
	Leonard Drive East	9600	10300
	Rosemount Avenue	3000	3300

1. AAWT is Annual Average Weekday Traffic Volume showing two-way weekday traffic volumes on the indicated roadway section

3.0 Study Area Intersections

Intersection Levels of Service

Synchro 9.0 intersection analysis software was used to model the intersection operations for the 13 study intersections in the AM and PM peak hours of the 2020 horizon year. LOS criteria (Table 3-1) are stated in terms of average control delay per vehicle which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Table 3-1 – Level of Service (LOS) Criteria for Intersections

LOS	Signalized Intersections Control Delay (Seconds per Vehicle)	LOS Description	Two Way Stop Controlled (TWSC) Intersections Control Delay (Seconds per Vehicle)
A	Less than 10.0	Very low delay; most vehicles do not stop **(Excellent)**	Less than 10.0
B	Between 10.0 and 20.0	Higher delay; most vehicles stop **(Very Good)**	Between 10.0 and 15.0
C	Between 20.0 and 35.0	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping **(Good)**	Between 15.0 and 25.0
D	Between 35.0 and 55.0	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop **(Satisfactory)**	Between 25.0 and 35.0
E	Between 55.0 and 80.0	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of **acceptable** delay	Between 35.0 and 50.0
F	Greater than 80.0	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection **(Unacceptable)**	Greater than 50.0

Intersection Volume to Capacity (v/c) ratios and 95th Percentile Queue lengths

A ***v/c ratio*** is a measure of how the peak hour volume on an approach to an intersection compared to the capacity of that intersection approach. While the capacity of an intersection approach at a signalized intersection depends on the number of lanes and the amount of green time, the capacity of a Stop controlled approach is determined by the volume on the through street. Approaches with volumes less than 50% of capacity (v/c ratios less than 0.50) usually have low or no congestion, and a v/c ratio up to 0.75 is usually associated with moderate congestion. While a v/c ratio of 0.85 suggests that the approach has 15% residual capacity available, it is also an indication that mitigative measures must be considered if higher volumes are to be accommodated in future years.

The ***95th% queue*** is the estimated length in meters of a line of vehicles stopped on an intersection approach that is only exceeded 5% of the time. Since a stopped vehicle occupies about six meters of queue length, a 95th% queue of 12 meters indicates that less than 5 times out of 100 the queue may exceed two vehicles stopped on the approach.

Summary of Intersection Analysis Results

Level of service (LOS) analysis results for the projected AM and PM peak hours in the 2020 horizon year are summarized in Tables 3-2 to 3-13 with detailed analysis included in Appendix B. A review of the intersection summary tables finds that overall levels of service at the study intersections are very good during all scenarios. Although there are individual movements at some of the stop controlled intersection with poor levels of service, a review of these intersections finds that these movements experience low volume to capacity ratios (under 0.5) and queue lengths that exceed three vehicles only 5% of the time during the peak hour.

Intersection Descriptions

1-Route 121 – Lower Cove Road intersection is signalized. Each of the three approaches to the intersection have two lanes, one for each movement.

Table 3-2 - LOS Route 121 @ Lower Cove Road with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement						Overall Intersection	
	EB-T	EB-R	WB-L	WB-T	NB-L	NB-R	Delay	LOS
Weekday AM Peak Hour (Page B-1)								
Delay LOS v/c Queue	5.9 A 0.34 35.2	2.2 A 0.04 3.0	5.3 A 0.10 6.4	5.0 A 0.19 18.1	16.0 B 0.17 9.4	7.2 A 0.12 4.9	6.0	A
Weekday PM Peak Hour (Page B-14)								
Delay LOS v/c Queue	9.6 A 0.45 45.8	2.1 A 0.12 5.3	9.0 A 0.27 15.7	12.8 B 0.65 75.3	22.2 C 0.49 38.5	6.4 A 0.22 9.7	11.7	B

2-Main Street – Route 121 / Moffett Avenue intersection is signalized. The Main Street approaches each have left/through and through/right shared lanes while the Route 121 and Moffett Avenue approaches both have a left turn lane and a through / right shared lane.

Table 3-3 - LOS Main Street @ Route 121 / Moffett Avenue with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement						Overall Intersection	
	EB-LTR	WB-LTR	NB-L	NB-TR	SB-L	SB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-2)								
Delay LOS v/c Queue	12.7 B 0.35 18.1	29.5 C 0.66 39.8	6.6 A 0.19 19.1	3.8 A 0.32 18.8	6.3 A 0.04 4.5	12.4 B 0.05 9.3	14.9	B
Weekday PM Peak Hour (Page B-15)								
Delay LOS v/c Queue	5.0 A 0.36 18.8	17.1 B 0.87 57.7	19.9 B 0.48 44.5	12.2 B 0.60 28.7	18.3 B 0.32 25.6	30.0 C 0.30 23.2	13.7	B

Intersection Descriptions (Continued)

3-Main Street – Queen Street intersection (see Photos 1, 2, and 3) is signalized. The westbound approach is one way with three lanes (one for each movement), the eastbound approach has two approach lanes (one left turn lane and one right turn lane), and the southbound approach is a single through/right shared lane.

Photo 1: Looking east on Main Street at Queen Street

Photo 2: Looking south on Queen Street at Main Street

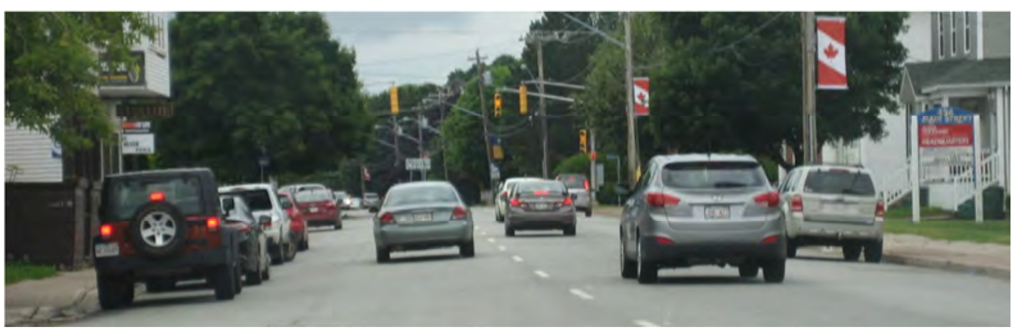


Photo 3: Looking west on Main Street at Queen Street

Table 3-4 - LOS Main Street @ Queen Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement						Overall Intersection	
	EB-L	EB-R	WB-L	WB-T	WB-R	SB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-3)								
Delay	3.1	1.3	2.3	7.2	0.0	14	4.7	A
LOS	A	A	A	A	A	B		
v/c	0.02	0.27	0.11	0.3	0.01	0.20		
Queue	1.7	6.9	7.4	47.4	0.0	11.6		
Weekday PM Peak Hour (Page B-16)								
Delay	2.5	1.5	1.8	8.9	0.3	20.8	5.5	A
LOS	A	A	A	A	A	C		
v/c	0.03	0.44	0.17	0.54	0.03	0.29		
Queue	1.6	8.0	10.5	138.4	0.7	13.6		

Intersection Descriptions (Continued)

4-Main Street – Summer Street intersection (See Photo 4) is signalized. All approaches have a left turn lane and a through/right shared lane.

Photo 4: Looking east on Main Street at Summer Street

Table 3-5 - LOS Main Street @ Summer Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement								Overall Intersection	
	EB-L	EB-TR	WB-L	WB-TR	NB-L	NB-TR	SB-L	SB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-5)										
Delay	6.1	10.5	5.7	14.0	14.4	18.9	15.0	10.7	12.5	B
LOS	A	B	A	B	B	B	B	B		
v/c	0.12	0.32	0.02	0.45	0.16	0.18	0.23	0.28		
Queue	7.5	47.0	2.6	59.0	12.6	12.4	16.5	11.9		
Weekday PM Peak Hour (Page B-18)										
Delay	5.6	12.7	5.4	15.7	21.7	20.6	20.9	15.2	15.1	B
LOS	A	B	A	B	C	C	C	B		
v/c	0.11	0.45	0.03	0.55	0.29	0.24	0.22	0.25		
Queue	6.8	80.9	3.3	99.2	26.8	14.3	21.5	12.3		

Intersection Descriptions (Continued)

5-Main Street – Leonard Drive / O'Connell Park intersection (See Photos 5, 6, and 7) is signalized. The two approaches on Main Street both have a left turn lane and a through / right shared lane, the Leonard Drive approach has a left/through shared lane and a short right turn lane, while the approach from O'Connell Park is a single lane.

Photo 5: Looking northeast (toward Leonard Drive) at the intersection of Main Street / Leonard Drive

Photo 6: Looking southeast (Leonard Drive is on the left) at the intersection of Main Street / Leonard Drive

Photo 7: Looking northwest (Leonard Drive is on the right) at the intersection of Main Street / Leonard Drive

Table 3-6 - LOS Main Street @ Leonard Drive with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement							Overall Intersection	
	EB-L	EB-TR	WB-L	WB-TR	NB-LTR	SB-LT	SB-R	Delay	LOS
Weekday AM Peak Hour (Page B-6)									
Delay LOS v/c Queue	5.1 A 0.35 16.1	5.3 A 0.19 15.8	14.1 B 0.03 3.7	22.3 C 0.67 53.6	0.2 A 0.03 0.0	24.6 C 0.31 17.1	8.3 A 0.48 15.1	12.5	B
Weekday PM Peak Hour (Page B-19)									
Delay LOS v/c Queue	6.8 A 0.37 20.4	8.2 A 0.38 43.4	0.0 A 0.00 0.0	24.1 C 0.71 70.8	20.2 C 0.01 3	26.2 C 0.43 28.6	7.9 A 0.59 19.9	13.8	B

Intersection Descriptions (Continued)

6-Main Street – Sunnyside Drive / Albert Street intersection is unsignalized, with stop control on Sunnyside Drive and Albert Street. There is a slight offset (approximately 12 metres) between Sunnyside Drive and Albert Street. There are existing left turn lanes on Sunnyside Drive and both Main Street approaches.

Table 3-7 - LOS Main Street @ Sunnyside Drive / Albert Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement							Overall Intersection	
	EB-L	EB-TR	WB-L	WB-TR	NB-LTR	SB-L	SB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-7)									
Delay LOS v/c Queue	8.2 A 0.01 0.2	0.0 A 0.26 0.0	8.2 A 0.01 0.2	0.0 A 0.25 0.0	15.6 C 0.06 1.5	21.2 C 0.13 3.3	13.2 B 0.04 0.8	1.5	A
Weekday PM Peak Hour (Page B-20)									
Delay LOS v/c Queue	9.3 A 0.03 0.6	0.0 A 0.36 0.0	8.8 A 0.01 0.3	0.0 A 0.44 0.0	29.0 D 0.13 3.3	45.5 E 0.20 5.3	18.1 C 0.09 2.2	1.7	A

7-Queen Street – St George Street intersection is unsignalized with yield control on St George Street. Queen Street is one way southbound with a two lane approach (a through lane and a through / right shared lane) while the St George Street approach is a single right turn only lane.

Table 3-8 - LOS Queen Street @ St George Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement		Overall Intersection	
	EB-R	SB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-8)				
Delay LOS v/c Queue	10.8 B 0.16 4.2	0.0 A 0.18 0.0	1.9	A
Weekday PM Peak Hour (Page B-21)				
Delay LOS v/c Queue	15.0 C 0.35 12.1	0.0 A 0.30 0.0	2.7	A

Intersection Descriptions (Continued)

8-Main Street – Broad Street / Maple Avenue intersection (See Photos 8, 9, and 10) is unsignalized with yield control on Broad Street. There is an at-grade railroad crossing of Main Street immediately to the east of the intersection (Seen in Photo 8).

Photo 8: Looking east (Maple Avenue is straight ahead) at the intersection of Main Street / Broad Street/Maple Avenue

Photo 9: Looking west (toward Broad Street) at the intersection of Main Street / Broad Street/Maple Avenue

Photo 10: Looking north on Maple Avenue; the intersection with Main Street is behind the photo and to the right

Intersection Descriptions (Continued)

9-Main Street – Church Avenue intersection is unsignalized with stop control on Church Avenue. All approaches are a single lane.

Table 3-9 - LOS Main Street @ Church Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement			Overall Intersection	
	EB-TR	WB-LT	NB-LR	Delay	LOS
Weekday AM Peak Hour (Page B-9)					
Delay LOS v/c Queue	0.0 A 0.25 0.0	0.3 A 0.10 0.2	16.9 C 0.15 4.0	1.1	A
Weekday PM Peak Hour (Page B-22)					
Delay LOS v/c Queue	0.0 A 0.42 0.0	0.6 A 0.80 0.6	52.9 F 0.49 17.7	2.8	A

10-Main Street – Magnolia Avenue intersection (See Photos 11 and 12) is unsignalized with stop control on Magnolia Avenue. The eastbound approach has a left turn lane for the RBC driveway that terminates in advance of the intersection. At the intersection itself, there is a through lane and a right turn lane at the eastbound approach, a left turn lane and a through lane for the westbound approach, and a left turn lane and a right turn lane for the northbound approach.

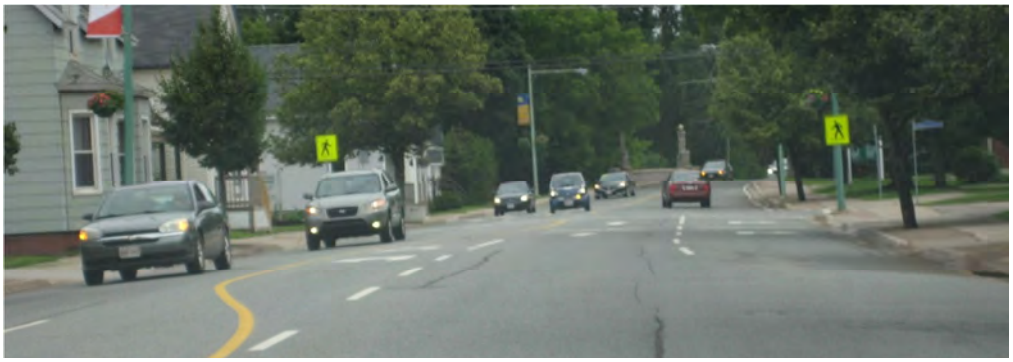


Photo 11: Looking east on Main Street at Magnolia Avenue

Photo 12: Looking west on Main Street at Magnolia Avenue

Table 3-10 - LOS Main Street @ Magnolia Avenue with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement					Overall Intersection	
	EB-T	EB-R	WB-L	WB-T	NB-LR	Delay	LOS
Weekday AM Peak Hour - Projected 2020 Volumes (Page B-10)							
Delay LOS v/c Queue	0.0 A 0.24 0.0	0.0 A 0.02 0.0	8.4 A 0.05 1.2	0.0 A 0.25 0.0	12.7 B 0.08 2.0	1.4	A
Weekday PM Peak Hour - Projected 2020 Volumes (Page B-23)							
Delay LOS v/c Queue	0.0 A 0.32 0.0	0.0 A 0.04 0.0	9.3 A 0.11 2.8	0.0 A 0.35 0.0	15.9 C 0.14 3.8	1.9	A

Intersection Descriptions (Continued)

11-Leonard Drive – 8th Hussars Park intersection is unsignalized with stop control on the 8th Hussars Park driveway. All approaches are a single lane.

Table 3-11 - LOS Main Street @ 8th Hussars Sports Centre with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement			Overall Intersection	
	EB-LT	WB-TR	SB-LR	Delay	LOS
Weekday AM Peak Hour (Page B-11)					
Delay LOS v/c Queue	0.7 A 0.26 0.4	0.0 A 0.16 0.0	11.4 B 0.05 1.1	0.8	A
Weekday PM Peak Hour (Page B-24)					
Delay LOS v/c Queue	0.2 A 0.28 0.1	0.0 A 0.28 0.0	13.4 B 0.05 1.2	0.4	A

Intersection Descriptions (Continued)

12-Leonard Drive – Eveleigh Street intersection is unsignalized with stop control on Eveleigh Street. The approaches on Leonard Drive are a single lane with a left turn lane and right turn lane on Eveleigh Street.

Table 3-12 - LOS Main Street @ Eveleigh Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement				Overall Intersection	
	EB-T	WB-T	SB-L	SB-R	Delay	LOS
Weekday AM Peak Hour (Page B-12)						
Delay LOS v/c Queue	0.0 A 0.19 0.0	0.0 A 0.11 0.0	14.6 B 0.29 9.0	9.7 A 0.11 2.7	4.1	A
Weekday PM Peak Hour (Page B-25)						
Delay LOS v/c Queue	0.0 A 0.18 0.0	0.0 A 0.20 0.0	15.6 C 0.22 6.4	11.4 B 0.21 5.9	3.6	A

13-Leonard Drive – Rosemount Avenue intersection is unsignalized. The Leonard Drive approaches are both single lane and because Rosemount Avenue is one way away from the intersection, there are no stop control or approach lanes on Rosemount Avenue. A one-way driveway toward Sussex Regional High School is the intersection's fourth leg.

Table 3-13 - LOS Main Street @ Rosemount Avenue with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement		Overall Intersection	
	EB-LT	WB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-13)				
Delay LOS v/c Queue	2.1 A 0.36 1.7	0.0 A 0.14 0.0	1.4	A
Weekday PM Peak Hour (Page B-26)				
Delay LOS v/c Queue	3.7 A 0.38 3.2	0.0 A 0.30 0.0	1.7	A

4.0 Review of Areas of Identified Concern

Background

In addition to the estimation of AAWT developed for the subject roadways in Section 2 of this report, there were several locations identified by the Town that were reviewed for potential network modifications.

4.1 Eveleigh Street and Rosemount Avenue One-way Operation

Background

Eveleigh Street and Rosemount Avenue are currently parallel one-way roadways with a total length of the one-way loop of approximately 800 metres. Rosemount Avenue serves as a main access for businesses on Rosemount Avenue and Industrial Drive. Eveleigh Street serves as a main access to businesses near its intersection with Leonard Drive.

Traffic flow rationalization

Typically, one-way road networks function well when traffic volumes are high by reducing the number of vehicle conflicts at intersections. One-way streets also work better in areas where intersection spacing is short, thus reducing the additional distance a driver is potentially required to backtrack to reach their intended destination. One-way streets can offer improved functionality with respect to safety and additional opportunity for onstreet parking and active transportation facilities (ie, bicycle lanes and sidewalks) that otherwise could not be accommodated on a two way street of equal width and traffic volume. Eveleigh Street and Rosemount Avenue both experience low traffic volumes, as well as low demand for onstreet parking and active transportation. The current configuration requires a circuitous route for traffic to flow through the area. The conversion of Rosemount Avenue to a two-way street would improve traffic flow through the area provide for an improved layout of the intersection between Rosemount Avenue and Eveleigh Street.

Recommendation

Rosemount Avenue should be converted to two-way traffic flow with Eveleigh Street kept as a one-way street (southbound). Eveleigh Street between Perry Street and Marble Street could become two-way to improve access to Marble Street and Rosemount Avenue.

4.1.1 Marble Street / Rosemount Avenue / Eveleigh Street

Background

The intersection of Marble Street / Rosemount Avenue / Eveleigh Street is unsignalized. Eveleigh Street and Rosemount Avenue are one-way streets, while Marble Street is a two-way street. There is an at-grade CN railway crossing of Marble Street approximately 25 metres north of this intersection and the stop-controlled intersection of Marble Street at Maple Avenue is approximately 15 metres north of the railway crossing.

Stop Controlled Intersection reconfiguration with Two-way flow

The reconfiguration of the Marble Street / Rosemount Avenue / Eveleigh Street intersection with two-way traffic flow on Rosemount Avenue and on Eveleigh Street between Perry Street and Marble Street is shown in Figure 4-1. Two-way traffic on Eveleigh Street (Perry Street to Marble Street) improves access and vehicle circulation through the area. Eveleigh Street south of Perry Street remains a one-way street (southbound). The concept shown in Figure 4-1 provides for improved pedestrian safety by reducing the requirement for pedestrian crossings for Rosemount Avenue.

It is estimated that the cost of these modifications will total $200,000, excluding HST.

Consideration as a Roundabout intersection

The intersection of Marble Street / Rosemount Avenue / Eveleigh Street was considered for reconstruction as a roundabout.

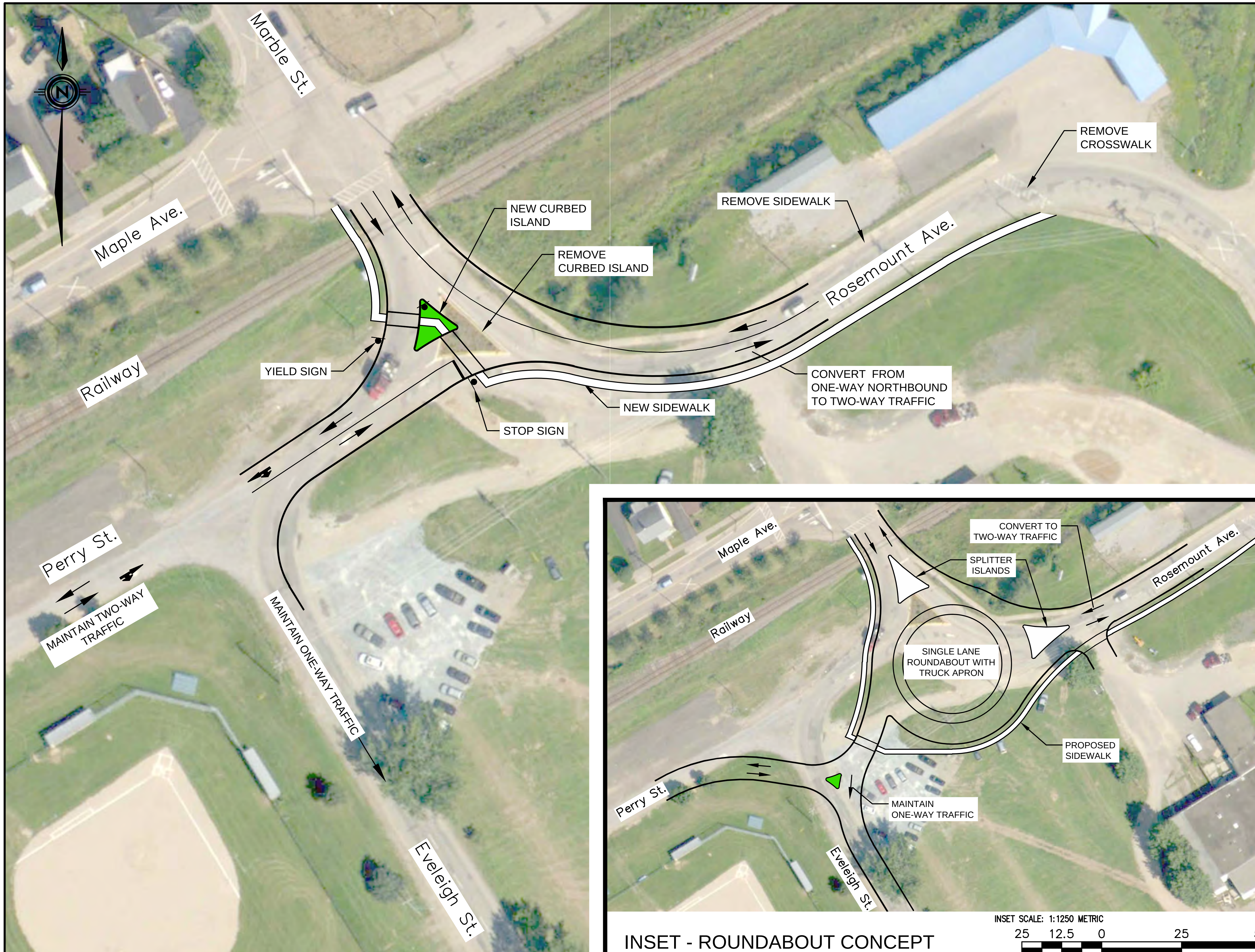
A functional sketch of the intersection as a roundabout is shown as an inset in Figure 4-1. Due to the design constraints and the proximity of the intersection of Perry Street and Eveleigh Street to the roundabout circle, Eveleigh Street between Marble Street and Perry Street remained one-way with this concept.

It is estimated that the cost of these modifications will total $1,500,000 excluding HST.

Recommendation

Due to the lower traffic volumes at this location, and reduced turning volumes due to the network configuration, full benefits typically realized by a roundabout are not available at this location. The high estimated cost of modifications and the design constraints at the location including the CN Railway Crossing, mean this intersection is not recommended for construction of a roundabout.

The intersection of Marble Street / Rosemount Avenue / Eveleigh Street should be reconfigured as a stop controlled intersection with functional alignment shown in Figure 4-1.



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CHECKED BY: G. O'BRIEN	

PROJECT:

2016 TRAFFIC IMPROVEMENT STUDY

TITLE:

ROSEMOUNT AVE. TWO-WAY CONCEPT AT EVELEIGH ST.

FIGURE 4-1	DATE: (YYYY/MM/DD) 2015/11/20	REV # 0

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4.1.2 Leonard Drive at Rosemount Avenue

Background

Leonard Drive at Rosemount Avenue intersection is unsignalized. The Leonard Drive approaches are both single lane and because Rosemount Avenue is currently one-way northbound, there is no stop control or approach lanes on Rosemount Avenue. A one-way driveway toward Sussex Regional High School forms the intersection's fourth leg of the intersection.

Left-turn lane warrant

Left-turn movements on a two lane street may cause both operational and safety problems. Operational problems result as a vehicle stopped waiting for an opportunity to turn across 'heavy' opposing traffic causes a queue of stopped vehicles to form. Safety problems result from rear end collisions when a stopped left-turning vehicle is struck by an advancing vehicle, or from head-on or right angle collisions when a left-turning vehicle is struck by an opposing vehicle.

The Geometric Design Standards for Ontario Highways Manual contains nomographs for left-turn lane analysis for two lane streets at unsignalized intersections. The analysis method, which is normally used by WSP Atlantic to evaluate the need for left-turn lanes, uses a series of nomographs that consider speed, advancing volumes, left-turns as a percentage of advancing volumes, and opposing volumes. A point, based on 'opposing' and 'advancing' volumes, plotted to the right of the 'warrant line' of the appropriate '% left-turns' and 'approach speed' nomograph, indicates that a left-turn lane is warranted for the conditions used in the analysis. Similarly, a point that is plotted to the left of the warrant line indicates that a left-turn lane is not warranted.

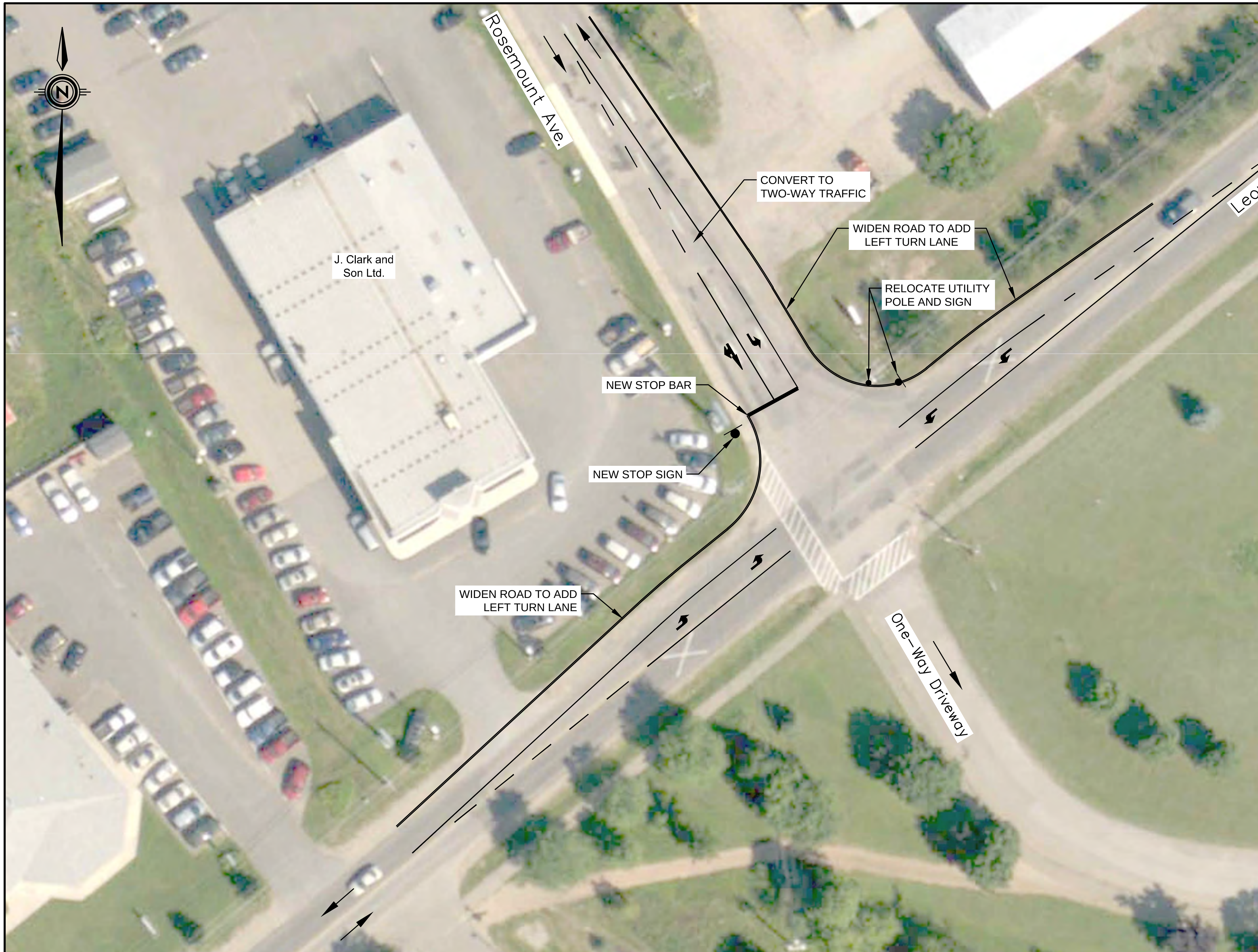
Analysis of a left-turn lane warrant for the intersection of Leonard Drive at Rosemount Avenue with existing 2015 PM peak hour traffic volume was completed (Figure A-10, Appendix A). The analysis shows that the left turn lane is currently warranted with existing traffic volumes. With road widening required east of the intersection to accommodate the alignment of the installation of an eastbound left-turn lane, a westbound left-turn lane (into the school driveway) can also be accommodated. The existing restriction on westbound left turns could be removed with the provision of this lane.

Intersection approach on Rosemount Avenue

With the existing flow directions of Eveleigh Street and Rosemount Avenue, traffic at Eveleigh Street turns left or right from a two lane approach. It is anticipated that once Rosemount Avenue is converted to two-way traffic flow, it will become the primary route for north-south traffic in this area, and Rosemount Avenue with two-way traffic should have two approach lanes (left turn lane and through/right lane) at the intersection with Leonard Drive as shown in (Figure 4-2). It is estimated that the cost of these modifications will total $100,000 excluding HST.

Recommendation

The intersection of Leonard Drive at Rosemount Avenue should be reconfigured with stop control on Rosemount Avenue and left turning lanes on Leonard Drive and Rosemount Avenue.



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CHECKED BY: G. O'BRIEN	25mm

PROJECT:
2016 TRAFFIC IMPROVEMENT STUDY

TITLE:
LEONARD DR. AT ROSEMOUNT AVE.
TWO-WAY STREET CONCEPT

FIGURE 4-2	DATE: (YYYY/MM/DD) 2016/02/09	REV # 0

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4.2 Main Street at Leonard Drive

Background

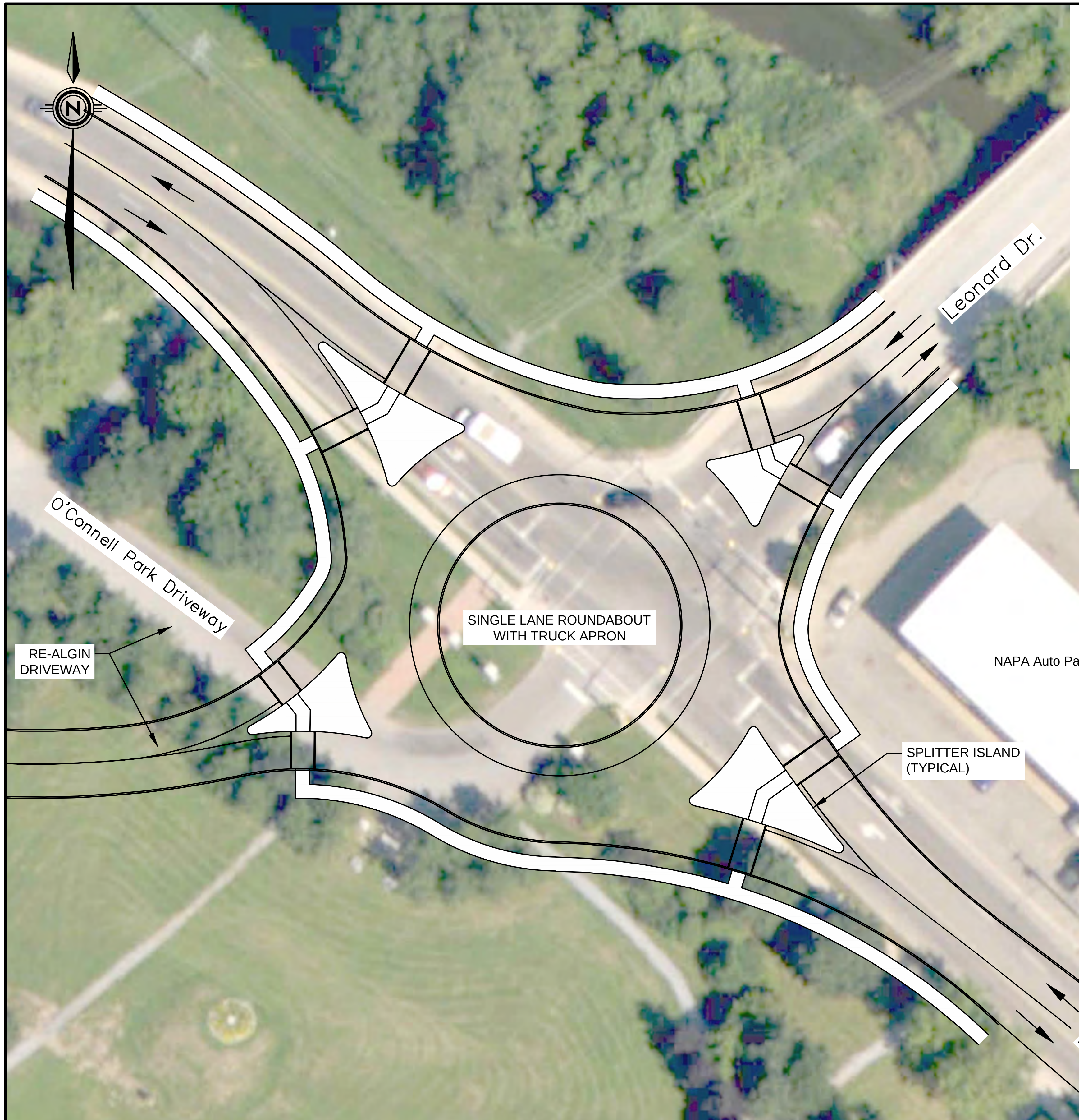
Traffic operational review at this intersection identified the southbound approach could operate in a more efficient manner with additional storage length for the right turn movement. The proximity of the two lane bridge crossing at Trout Creek limits the ability to provide additional storage to the right turning lane at the Leonard Drive approach to the intersection.

Intersection Level of Service Assessment

Synchro 9.0 traffic analysis software was used to analyze the projected 2020 traffic volumes and intersection operations under the existing lane configuration. A review of intersection operations finds that the queues for right turning traffic from Leonard Drive extend into the through/left shared lane. With the existing signalized intersection layout, additional lane lengths to accommodate southbound queues would require the bridge to be widened. Alternatives were considered to review possibilities for improved intersection performance without impacting the bridge structure. The intersection was analyzed as a roundabout using SIDRA traffic analysis software and the intersection is shown to function well as a single lane roundabout with projected 2020 traffic volumes. The 2020 analysis results with the existing configuration and with the intersection reconstructed as a roundabout are summarized in Table 4-1 and are included in Appendix B.

Table 4-1 - LOS Main Street @ Leonard Drive with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement							Overall Intersection	
	EB-L	EB-TR	WB-L(T)	WB-(T)R	NB-LTR	SB-LT	SB-R	Delay	LOS
Weekday AM Peak Hour - Signalized, existing lane configuration (Page B-6)									
Delay	5.1	5.3	14.1	22.3	0.2	24.6	8.3	12.5	B
LOS	A	A	B	C	A	C	A		
v/c	0.35	0.19	0.03	0.67	0.03	0.31	0.48		
Queue	16.1	15.8	3.7	53.6	0.0	17.1	15.1		
Weekday AM Peak Hour - Signalized, modified lane configuration (Concept in Figure 4-4, Analysis Page B-30)									
Delay	4.9	5.4	21.6	5.4	0.2	23.0	7.9	10.9	B
LOS	A	A	C	A	A	C	A		
v/c	0.32	0.19	0.58	0.18	0.03	0.30	0.48		
Queue	15.9	15.6	43.2	7.8	0.0	16.1	14.4		
Weekday AM Peak Hour - Roundabout (Concept in Figure 4-3, Analysis Page B-27)									
Delay	7.2		6.4		9.3	7.3		7.0	A
LOS	A		A		A	A			
v/c	0.37		0.39		0.02	0.32			
Queue	19.0		17.0		1.0	14.0			
Weekday PM Peak Hour - Signalized, existing lane configuration (Page B-19)									
Delay	6.8	8.2	0.0	24.1	20.2	26.2	7.9	13.8	B
LOS	A	A	A	C	C	C	A		
v/c	0.37	0.38	0.00	0.71	0.01	0.43	0.59		
Queue	20.4	43.4	0.0	70.8	3	28.6	19.9		
Weekday PM Peak Hour - Signalized, modified lane configuration (Concept in Figure 4-4, Analysis Page B-31)									
Delay	6.6	8.5	22.8	5.5	18.4	24.1	7.6	12.4	B
LOS	A	A	C	A	B	C	A		
v/c	0.34	0.4	0.64	0.15	0.01	0.42	0.58		
Queue	19.9	42.6	57	7.7	2.8	56.2	18.9		
Weekday PM Peak Hour - Roundabout (Concept in Figure 4-3, Analysis Page B-27)									
Delay	6.9		6.1		9.9	9.4		7.5	A
LOS	A		A		A	A			
v/c	0.55		0.43		0.01	0.57			
Queue	35.0		21.0		1.0	34.0			



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PROJECT: 2016 TRAFFIC IMPROVEMENT STUDY

TITLE: MAIN ST. AT LEONARD DR. ROUNDABOUT CONCEPT

FIGURE 4-3	DATE: (YYYY/MM/DD) 2015/11/20	REV # 0

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Intersection Improvement Options

A functional sketch showing the conversion of the intersection of Main Street / Leonard Drive to a roundabout is included on Figure 4-3. The O'Connell Park driveway could be realigned to the west and this has also been shown on Figure 4-3 as an inset.

The roundabout conversion is expected to require a budget in the $1,500,000 range.

While not providing the operational improvements that a roundabout would offer, there are benefits for queuing on the westbound approach with addition of a right turn channel while maintaining the existing Leonard Drive street width at the bridge. Additional benefits to intersection operations (See Table 4-1) are obtained with modifying the lane configuration of the westbound approach. A functional sketch of the addition of a right turn channel to the Leonard Drive approach and modification to the lane configuration of the westbound approach is shown on Figure 4-4. The addition of a right turn channel extends the available storage and allows the right turn movement to be performed at higher speed, increasing the movement capacity. Improvements to better accommodate pedestrian accessibility at the intersection are also shown.

It is estimated that the cost of these modifications will total $225,000 excluding HST.

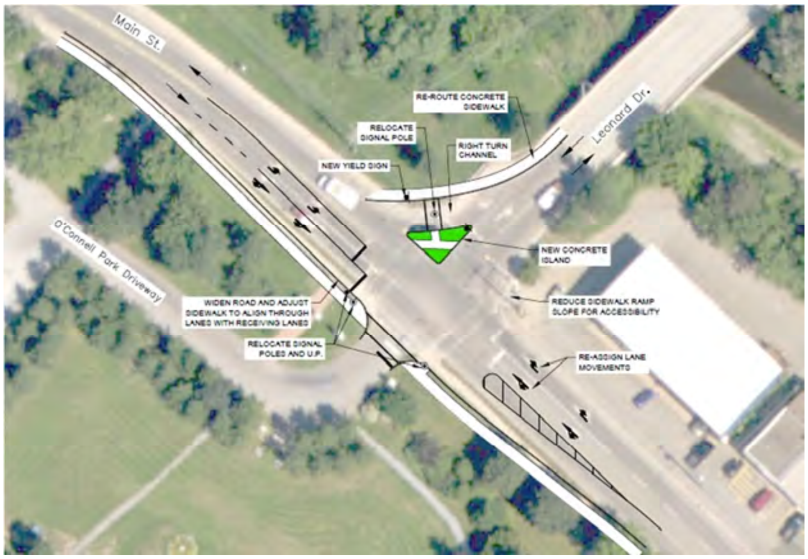


Figure 4-4 – Functional Sketch for Installation of a Right-Turn Channel, Leonard Drive at Main Street

Recommendation

Further investigation of the land impacts of the roundabout option should be considered at the intersection of Main Street @ Leonard Drive. The O'Connell Park driveway could be realigned to meet Main Street to the west of the roundabout, or at the roundabout itself, with a connection to the roundabout as the recommended option.

If not considered feasible due to cost or land requirements, the installation of the right-turn channel and modified westbound approach lanes shown in Figure 4-4 would improve the operation of the intersection and provides for improved pedestrian accessibility.

4.3 Main Street / Queen Street / Broad Street One-way Operation

Background

The Main Street / Queen Street / Broad Street loop are currently one-way roadways that are the primary route for eastbound / westbound traffic through downtown Sussex.

Traffic flow rationalization

The Main Street / Queen Street / Broad Street one way flow has existed in its current configuration for many years. Eastbound traffic is required to use Queen Street and Broad Street instead of Main Street. This routing results in only an addition of 150 metres of travel distance for through traffic. With projected 2020 AAWT of approximately 11,000 vehicles per day, traffic flow is improved through the existing one-way network when compared to two-way traffic flow. Any change from the existing one-way flow on these streets would impact the angled parking, would add complexity and add additional vehicle conflicts to the intersections along the route, and may affect the downtown character of this corridor.

Recommendation

It is recommended that the current one-way flow of Main Street / Queen Street / Broad Street be maintained.

4.3.1 Main Street at Queen Street

Background

There are deficiencies with respect to pedestrian accessibility and accessibility for maintenance due to the location of the signal controller that were identified as meriting further review.

As identified above, Main Street east of the intersection and Queen Street south of the intersection should maintain their existing one-way flow directions.

Pedestrian Signalization and Movements

Although the intersection is signalized, due to the one-way flow of two of the roadways and the lane alignment at this intersection many of the vehicular movements operate without opposing traffic. The pedestrian movements are permitted only during an exclusive pedestrian phase known as a "pedestrian scramble". Pedestrian scramble control is uncommon in Canada and is usually only installed at intersections with very high pedestrian volumes. Pedestrian scramble phases can increase delay to pedestrians and motorized vehicles and this increased delay can decrease driver and pedestrian compliance of the separated phases and decrease the benefit of such control.

Traffic Signal Warrant

A signal warrant analysis is completed to determine if the installation of traffic signals at an intersection will provide a positive impact on total intersection operation. That is, the benefits in time saved and improved safety that will accrue to vehicles entering from a side street will exceed the impact that signals will have in time lost and potential additional collisions for vehicles approaching the intersection on the main street.

The Canadian Traffic Signal Warrant Matrix Analysis (Transportation Association of Canada (TAC), 2005) considers 100 warrant points as an indication that traffic signals will provide a positive impact. Signal warrant analysis uses vehicular and pedestrian volumes, and intersection, roadway and study area characteristics to calculate a warrant point value.

Traffic Signal Warrant (Continued)

Signal warrant analysis was completed for the intersection of Main Street at Queen Street with projected 2020 traffic volumes to gain an understanding of existing need. Results of the signal warrant (Table A-14, Appendix A) found that the intersection received only 49 warrant points, indicating that traffic signals are not warranted at the intersection and could be considered for potential removal.

Intersection Level of Service Assessment

Synchro 9.0 traffic analysis software was used to model the projected 2020 traffic volumes with existing signalization and the projected 2020 traffic volumes modified with stop control. Under stop control the southbound approach was reconfigured as right-in, right-out only. The southbound through and eastbound left turn traffic volumes were reassigned to Morrison Avenue and the Queen Street / Broad Street / Main Street loop. Table 4-2 summarizes the intersection level of service.

Table 4-2 - LOS Main Street @ Queen Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement						Overall Intersection	
	EB-L	EB-R	WB-L	WB-T	WB-R	SB-TR	Delay	LOS
Weekday AM Peak Hour - Signalized (Page B-3)								
Delay	3.1	1.3	2.3	7.2	0.0	14.0	4.7	A
LOS	A	A	A	A	A	B		
v/c	0.02	0.27	0.11	0.3	0.01	0.20		
Queue	1.7	6.9	7.4	47.4	0.0	11.6		
Weekday AM Peak Hour - Unsignalized (Page B-28)								
Delay		0.0	8.5	0.0		11.0	1.5	A
LOS		A	A	A		B		
v/c		0.24	0.12	0.26		0.04		
Queue		0.0	3.2	0.0		1.0		
Weekday PM Peak Hour - Signalized (Page B-16)								
Delay	2.5	1.5	1.8	8.9	0.3	20.8	5.5	A
LOS	A	A	A	A	A	C		
v/c	0.03	0.44	0.17	0.54	0.03	0.29		
Queue	1.6	8.0	10.5	138.4	0.7	13.6		
Weekday PM Peak Hour - Unsignalized (Page B-29)								
Delay		0.0	10.4	0.0		15.5	1.7	A
LOS		A	B	A		C		
v/c		0.40	0.27	0.5		0.07		
Queue		0.0	8.5	0.0		1.8		

Under its current configuration as a signalized intersection with a pedestrian scramble phase, the intersection operates with minimal delay but its operation may be confusing to some users as there have been reports of vehicles travelling the wrong direction through the intersection. Additionally, maintaining the signalization would require modifications to relocate the signal controller and additional improvements to better accommodate pedestrians such as pedestrian ramps at the crosswalks. In the 2020 horizon year PM peak hour with signalization, there may be instances when queues for the westbound through movement impact the operations of the intersection of Main Street at Broad Street / Maple Avenue.

Intersection Level of Service Assessment (Continued)

A functional sketch of the intersection of Main Street at Queen Street as an unsignalized intersection with marked crosswalks crossing at the east, north, and south approaches is illustrated in Figure 4-5. This concept provides for improved and shortened pedestrian crossings, free flow traffic movements and directs traffic to the proper direction of travel, reducing the chance of wrong way movements.

It is estimated that the cost of these modifications will total $100,000 excluding HST.

Alternate Modifications

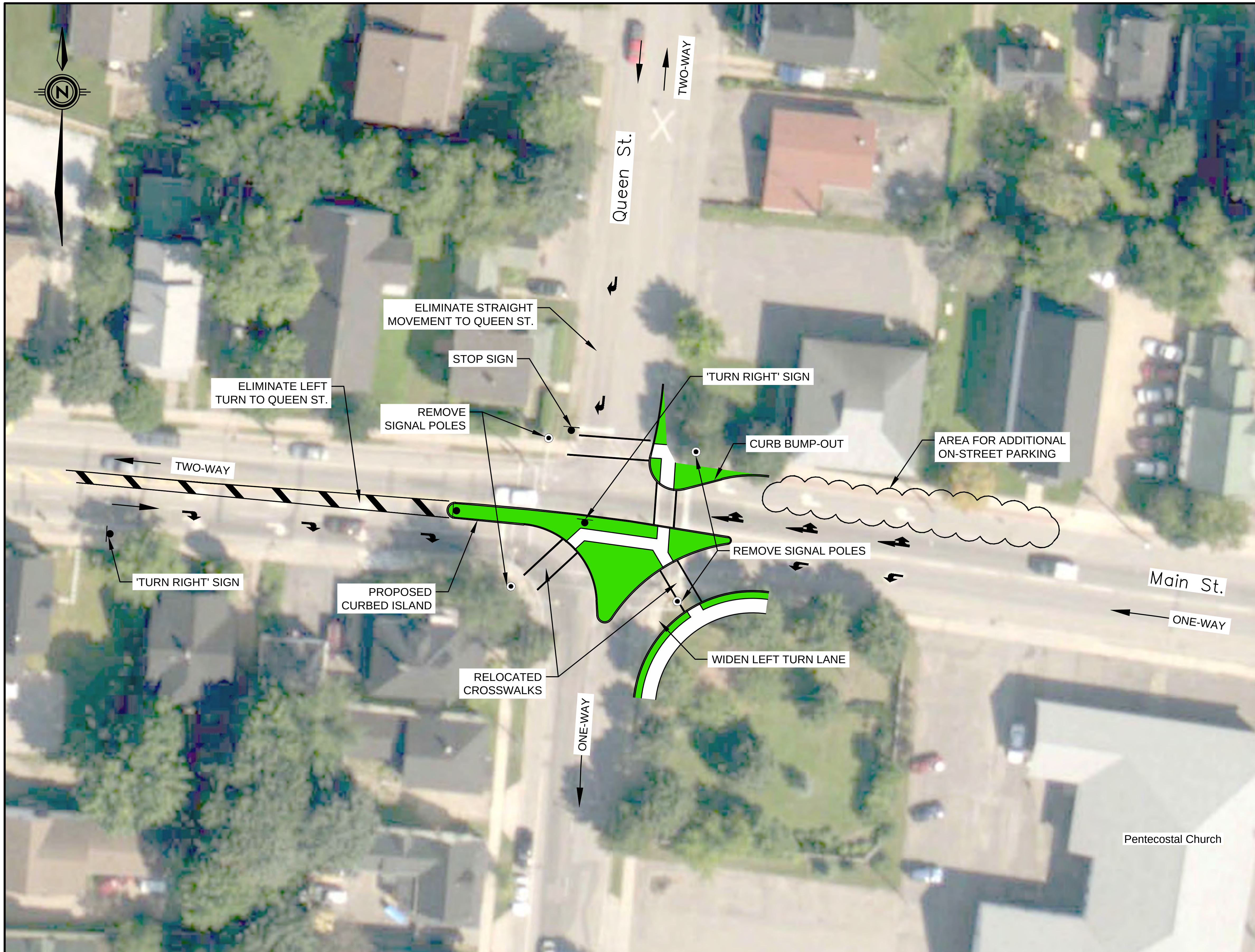
While not providing the full benefits to driver understanding and pedestrian safety realized through full channelization shown in Figure 4-5, there are benefits to modifying signage at this intersection. The following signage improvements at the intersection of Main Street @ Queen Street would improve driver understanding at the intersection:

a. Replace the RB-14L and RB-14R (left and right turn required) signs with RB-41L and RB-41R lane designation signage for the eastbound approach,
b. Remove the mandatory turn signs on the westbound approach for Main Street at Queen Street.
c. Remove the mandatory turn sign on the southbound approach for Queen Street at Main Street and install RB-11L signs. The RB-11L provides more clarity to drivers regarding the restricted movement.

Recommendation

The intersection of Queen Street at Main Street should be converted to stop control with shortened pedestrian crossings and vehicle channelization to direct traffic in the proper direction of travel.

While analysis includes consideration of diverted traffic volumes for the concept, additional review of turning movements at Morrison / Arnold should be completed with consideration of the installation of all-way stop control.



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P. NICKERSON

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PROJECT:
2016 TRAFFIC IMPROVEMENT STUDY

TITLE:
MAIN ST. @ QUEEN ST.
TRAFFIC SIGNAL REMOVAL CONCEPT

FIGURE 4-5

DATE: (YYYY/MM/DD)
2015/11/20

REV #
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4.3.2 Broad Street at Parking Lane Opposite Train Station

Background

Broad Street serves as the primary route for eastbound traffic travelling through the Town of Sussex but also serves as access and parking for many of the businesses and amenities in the downtown core.

Review has indicated that Broad Street should remain as a one-way street with its existing flow direction.

Alignment and Flow Direction

Broad Street is currently one-way eastbound with angled parking on both sides accessed by two one way loops as well as directly from Broad Street itself. The one way loop on the north side of Broad Street to access angled parking is currently one-way westbound and is counter to the flow direction of Broad Street itself.

In addition to the potential issues that this counter flow lane creates with respect to driver understanding and compliance, the turn out of this loop to re-enter traffic flow on Broad Street is very sharp with reduced visibility due to the building located on the corner. The reversal of this flow direction for the parking lane to one-way eastbound would remove the issue of this sight obstruction, and may improve the flow of Broad Street and the connections in and out of this parking lane.

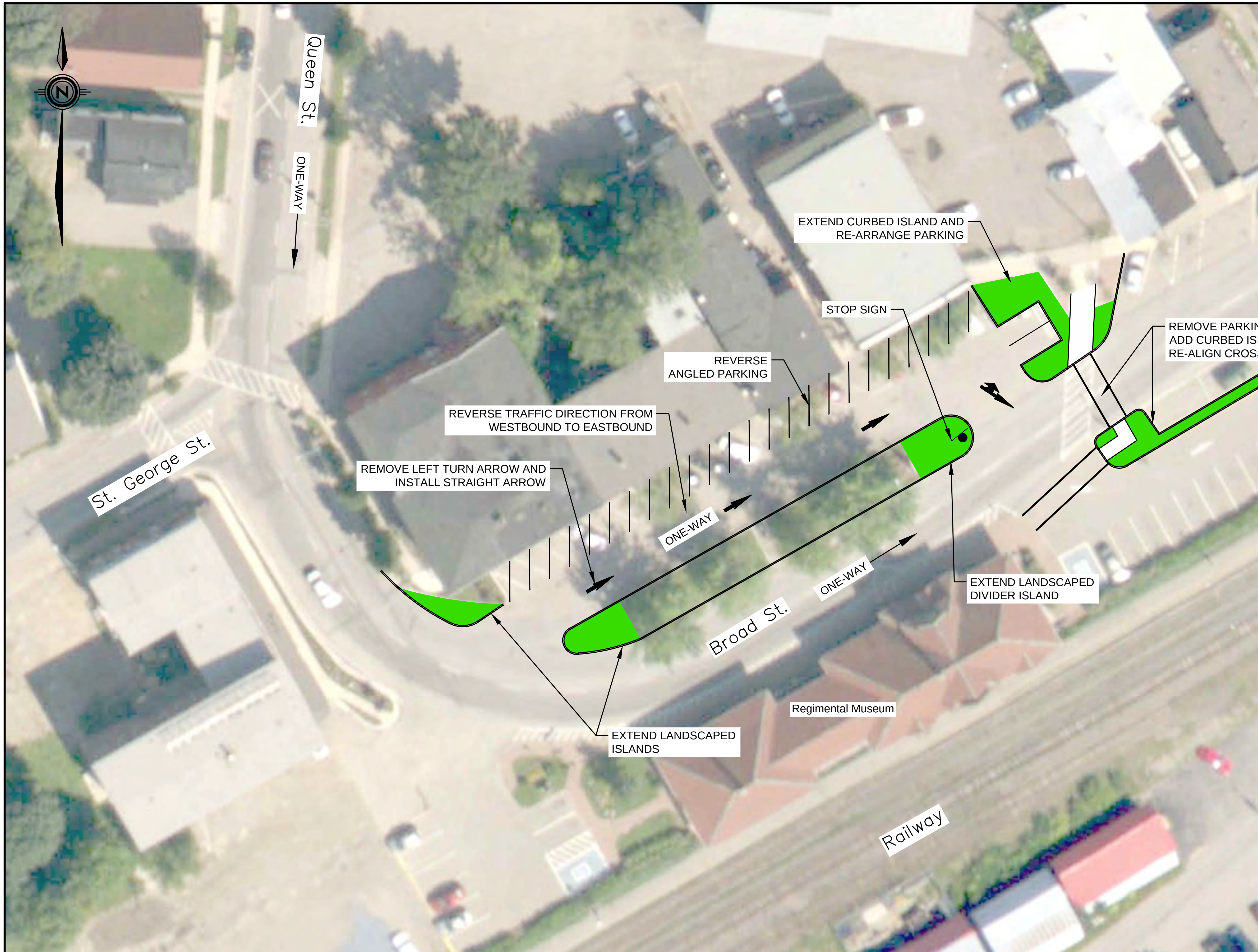
A functional sketch (Figure 4-6) of the recommended modifications to this area to improve visibility and signage of this parking lane has been prepared.

Modifications also provide for improved pedestrian accessibility and safety by allowing extension of sidewalk areas, and improved crosswalk alignment, and shorter street crossing distances.

It is estimated that the cost of these modifications will total $60,000 excluding HST.

Recommendation

The flow direction of the parking lane on the north side of Broad Street should be reversed to improve the traffic flow and driver understanding through this area as shown in Figure 4-6. This creates the opportunity for additional streetscaping features and improved pedestrian safety and pedestrian flow through this area.



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10 8 6 4 2 0 10 20

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DRAWN BY: P. NICKERSON

CHECKED BY: G. O'BRIEN

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PROJECT: 2016 TRAFFIC IMPROVEMENT STUDY

TITLE: BROAD ST. PARKING LANE CONCEPT

FIGURE 4-6

DATE: (YYYY/MM/DD) 2015/11/20

REV # 0

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4.3.3 Main Street at Broad Street / Maple Avenue

Background

The intersection of Main Street @ Broad Street / Maple Avenue is unsignalized with yield control on Broad Street. There is an at-grade railroad crossing of Main Street immediately to the east of the intersection.

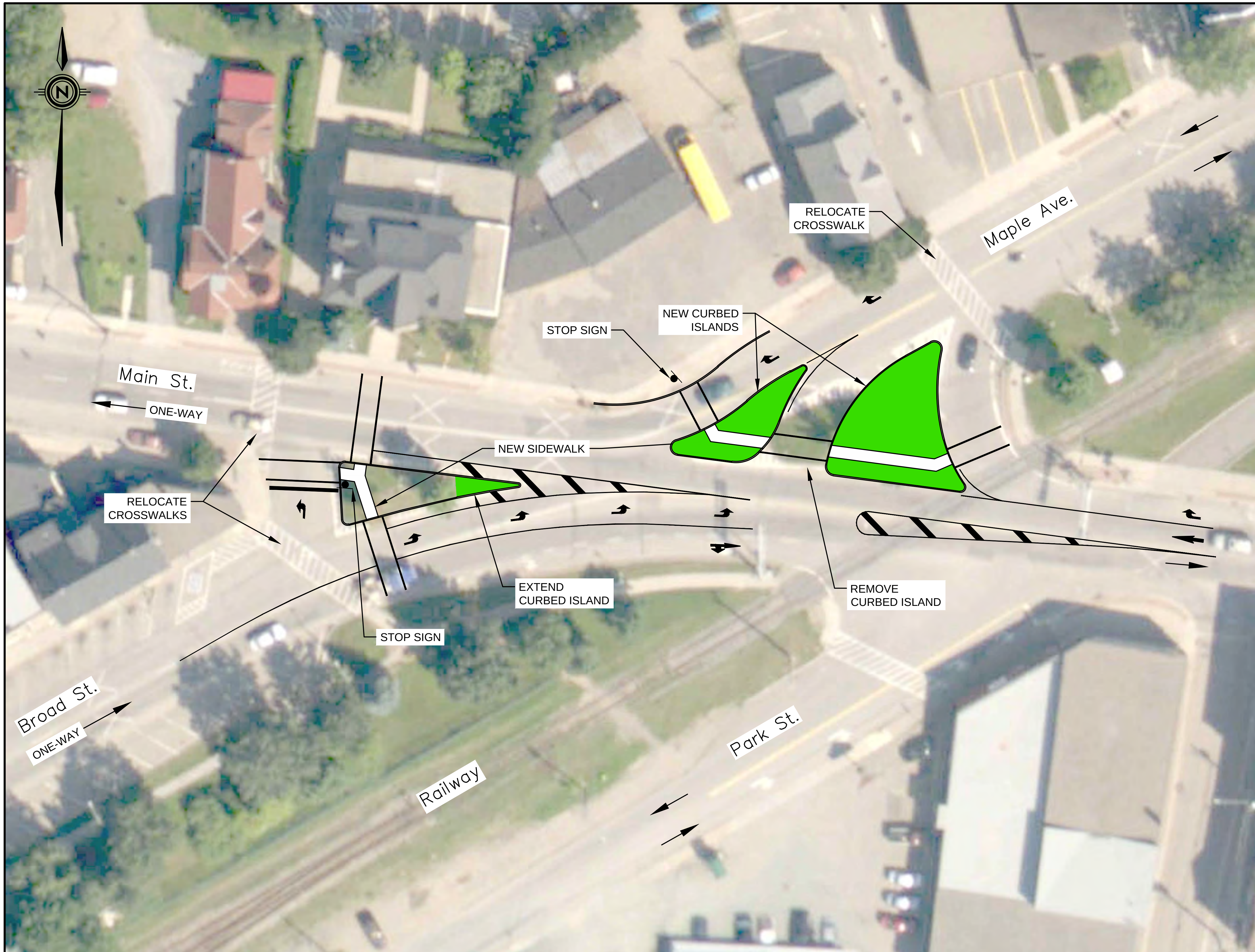
Alignment and Intersection Control

The intersection of Main Street at Broad Street / Maple Avenue is an atypical intersection due to the road alignments, intersection control, and proximity to the railroad tracks. Under its existing alignment and control, traffic proceeding through from Broad Street to Maple Avenue and left from Broad Street to Main Street is required to yield, however, traffic on Maple Avenue turning right onto Main Street, eastbound traffic from Broad Street to Main Street, and westbound traffic on Main Street proceeding through all operate under free flow conditions. From a level of performance perspective, the intersection appears to operate with a very good level of service due to the free flow conditions of the higher volume movements. However, due to the intersection alignment and atypical intersection approaches, the intersection can cause some driver confusion and resulting reduction in user safety. The intersection can also be difficult for pedestrians to navigate due to the current crosswalk configuration.

The intersection’s alignment and control have been reviewed and a functional sketch (Figure 4-7) prepared showing recommended modifications to improve driver expectations and pedestrian routing. Below is a summary of the improvements and the benefits of the realignment.

- Reconfiguring the Broad Street approach and bringing it in line with Main Street realigns the through movement of Broad Street to Main Street as a left turn. Drivers making this movement will experience a familiar left turn and will be expecting to yield to through traffic on Main Street. The movement will be possible with improved sight lines versus the current crossing movement.
- Providing an additional through lane for westbound traffic on Main Street improves the intersection operation by increasing the capacity of this higher volume movement, this may create more gaps for traffic performing the realigned left-turn from Broad Street to Maple Avenue.
- Requiring left-turning traffic from Broad Street to Main Street and right turning traffic from Maple Avenue to Main Street to come to a stop before making their movement adds clarity to the intersection control and is not expected to significantly increase the delay of these movements. Stop control is also expected to improve pedestrian safety at these crossings when compared to yield control or free flow conditions.
- The pedestrian crosswalks have been realigned to reduce the crossing distances as well as the walking distance for pedestrians travelling around this intersection.
- Consideration should be given to adding overhead crosswalk signs and flashing beacons (similar to the infrastructure crossing Main Street at Sussex Elementary School) for both the pedestrian crossings of Broad Street and of Main Street.

It is estimated that the cost of these modifications will total $100,000 excluding HST.



WSP

NOTES:
1. ALL MODIFICATIONS SHOWN ARE CONCEPTUAL ONLY.

SCALE: 1:500 METRIC
10 8 6 4 2 0 10 20

PROJECT NO: 151-07231	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm
DESIGNED BY: G. O'BRIEN / P. HATTON	
DRAWN BY: P. NICKERSON	
CHECKED BY: G. O'BRIEN	

PROJECT:
2016 TRAFFIC IMPROVEMENT STUDY

TITLE:
MAIN ST. AT BROAD ST./MAPLE AVE. INTERSECTION CHANNELIZATION CONCEPT

FIGURE 4-7	DATE: (YYYY/MM/DD) 2016/02/09	REV # 0

WSP REF. NO.: ---- K:\DARTMOUTH\2015\151-07231 TOWN OF SUSSEX_TIS\08_TRAFFIC\8.4_REPORT_FIGURES\151-07231 REPORT FIGURES.DWG 4-7 PRINTED: 10:26 AM 2016/02/12 BY: PATRICK.HATTON

Alignment and Intersection Control (Continued)

While not providing the full benefits to drivers and pedestrians that are realized by intersection realignment and channelization, there are benefits to modifying the signage and markings at the intersection. These modifications are summarized below:

- Replace the existing yield control with stop control for the Broad Street approach to the intersection;
- Install a concrete channelized island separating the through movement (to Marble Street) from the right turn movement (to Main Street);
- Install an additional post and stop sign in the new concrete island;
- Paint a stop bar for the through movement on Broad Street;
- Change the colour of the lines on the left side of the through lane to yellow.

Photo 13: Looking east on Broad Street (Maple Avenue is straight ahead) at the intersection of Main Street / Broad Street / Maple Avenue

Recommendation

The intersection of Main Street at Broad Street / Maple Avenue should be realigned to improve the safety and operations of the intersection as illustrated in Figure 4-7.

4.4 Main Street at Sunnyside Drive / Albert Street Intersection

Background

Sunnyside Drive and Albert Street intersect with Main Street to form an offset (approximately 12 metres) 4-legged, two-way stop controlled intersection. The geometric alignment at this intersection can cause operational difficulties due to overlapping left turns from Main Street and conflicting vehicle paths for any through movements between the two side streets.

Intersection Level of Service Assessment

The counted volumes at this intersection show high through volumes on Main Street with low turning movements into and out of Sunnyside Drive and Albert Street. The large through volumes on Main Street lead to increased delay for some left turning movements from Sunnyside Drive during some peak periods, however, the low volume leads to minimal queuing of these vehicles at the intersection. Table 4-3 below summarizes the intersection level of service analysis.

Table 4-3 - LOS Main Street @ Sunnyside Drive / Albert Street with Projected 2020 Traffic Volumes

LOS Criteria	Control Delay (sec/veh), LOS, v/c Ratio, and 95% Queue (m) by Intersection Movement							Overall Intersection	
	EB-L	EB-TR	WB-L	WB-TR	NB-LTR	SB-L	SB-TR	Delay	LOS
Weekday AM Peak Hour (Page B-7)									
Delay LOS v/c Queue	8.2 A 0.01 0.2	0.0 A 0.26 0.0	8.2 A 0.01 0.2	0.0 A 0.25 0.0	15.6 C 0.06 1.5	21.2 C 0.13 3.3	13.2 B 0.04 0.8	1.5	A
Weekday PM Peak Hour (Page B-20)									
Delay LOS v/c Queue	9.3 A 0.03 0.6	0.0 A 0.36 0.0	8.8 A 0.01 0.3	0.0 A 0.44 0.0	29.0 D 0.13 3.3	45.5 E 0.20 5.3	18.1 C 0.09 2.2	1.7	A

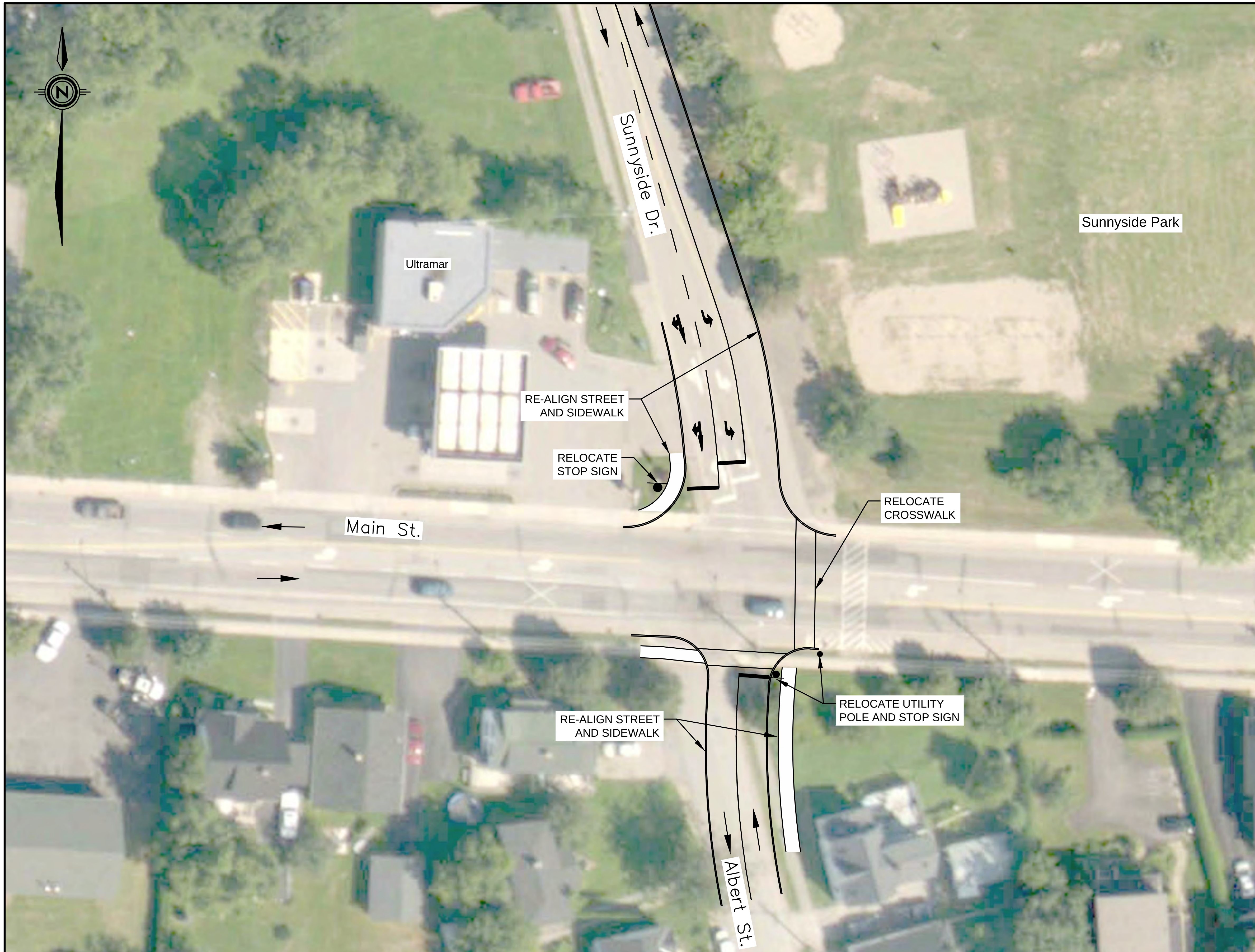
Roadway Alignment

The geometric alignment at this intersection can cause operational difficulties due to the misalignment of Sunnyside Drive and Albert Street. A functional sketch (Figure 4-8) illustrates how the intersection could be realigned to reduce vehicle conflicts and improve the operations of the intersection.

It is estimated that the cost of these modifications will total $150,000 excluding HST.

Recommendation

Planning should be completed with any required additional right-of-way acquired so that the realignment of the Sunnyside Drive / Albert Street approaches can be completed to form a standard four legged intersection, which may improve the functionality and safety of the intersection.



WSP

NOTES:
1. ALL MODIFICATIONS SHOWN ARE CONCEPTUAL ONLY.

SCALE: 1:500 METRIC
10 8 6 4 2 0 10 20

PROJECT NO:
151-07231

DESIGNED BY:
G. O'BRIEN / P. HATTON

DRAWN BY:
P. NICKERSON

CHECKED BY:
G. O'BRIEN

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

PROJECT:
2016 TRAFFIC IMPROVEMENT STUDY

TITLE:
MAIN ST. AT SUNNYSIDE DR./ALBERT ST. INTERSECTION REALIGNMENT CONCEPT

FIGURE 4-8

DATE: (YYYY/MM/DD)
2015/11/20

REV #
0

WSP REF. NO.: ---- K:\DARTMOUTH\2015\151-07231 TOWN OF SUSSEX_TIS\08_TRAFFIC\8.4_REPORT_FIGURES\151-07231 REPORT FIGURES.DWG 4-8 PRINTED: 10:26 AM 2016/02/12 BY: PATRICK.HATTON

4.5 Pedestrian Safety at Signalized intersections

Background

Town staff identified the need for a review of pedestrian safety and accessibility at the Town's four signalized intersections (listed below):

1. Main Street @ Route 121 / Moffett Avenue
2. Main Street @ Queen Street
3. Main Street @ Summer Street
4. Main Street @ Leonard Drive

The signalized intersection of Route 121 @ Lower Cove Road is owned and operated by New Brunswick Department of Transportation and Infrastructure.

WSP completed field investigation at each of the four signalized intersections to review conditions. The following sections outline observations and provide recommendations for improvement.

General Observations and Improvements

In general, observations at the intersections identified common deficiencies at several of the crossings including:

- Pushbutton accessibility;

Photo 14: Looking west on Main Street (Leonard Drive is to the right). There is no hard surface to allow accessible access to the pedestrian pushbuttons.

Photo 15: Looking at the northwest corner of Main Street at Moffett Avenue (Moffett Avenue is to the right).

- Pedestrian ramps too narrow or missing; and,
- Crosswalk alignment.

The following general modifications could be made at the signalized intersections to improve the pedestrian accessibility and the safety for visually impaired pedestrians:

- All pedestrian pushbuttons should be mounted on the signal poles at a height of 1.1 metres.
- The provision of locator buttons would assist the visually impaired community in locating the pedestrian pushbuttons to activate the pedestrian signal heads.
- The installation of Accessible Pedestrian Signals (APS) for the signalized crossings would assist the visually impaired community in determining which crosswalk has a walk signal.
- Do not maintain 'X' style advanced pedestrian markings.
- The crossings could be fitted with tactile pedestrian ramps which would provide a tactile cue to pedestrians as to the location of the crosswalk and to assist them with the proper alignment of their crossing.

Photo 16: Example of yellow tactile pedestrian ramps to assist visually impaired pedestrians in aligning their crossing

4.5.1 Pedestrian Considerations - Main Street at Route 121 / Moffett Avenue

Description of Pedestrian Crossings and Pedestrian Infrastructure

The intersection of Main Street @ Route 121 / Moffett Avenue has signalized pedestrian crosswalks crossing the east and north approaches. Additionally, there is a marked crosswalk crossing from the southeast corner to the right-turn channelization island. All marked crosswalks use parallel line pavement markings. Each of the signalized crossings has two pedestrian pushbuttons, one at each end. There are pedestrian ramps for each marked crossing.

Recommended Improvements

The following are the recommended improvements to improve accessibility, and provide audible and tactile feedback for pedestrians with visual and hearing impairments:

Recommended modifications to the Northwest corner:

- Install a concrete landing pad or add a new pole for a relocated pushbutton at the northwest corner. This will improve accessibility to the pedestrian push button.
- Alter the pedestrian signal head to be on the south side of the signal pole. This will place the pedestrian signal head more in-line with the crosswalk (See Photo 17).

Photo 17: Looking west on Main Street (Moffett Avenue is to the right). Relocating the pedestrian head in this photo to the other side of the pole would improve its visibility

Recommended Improvements (Continued)

Recommended modifications to the Northeast corner:

- Install additional sidewalk to improve the accessibility of the pedestrian pushbutton that activates the pedestrian signals to cross Main Street at the north east corner. This will improve the accessibility of the pushbutton.
- Alter the pedestrian signal head for the crossing of Moffett Avenue to be on the south side of the signal pole. This will place the pedestrian signal head more in-line with the crosswalk. Currently, during certain times of year, visibility of the pedestrian signal head is obscured by foliage of a tree and the reconfiguring of this pedestrian head will also improve this visibility throughout the year.

4.5.2 Pedestrian Considerations - Main Street at Queen Street

Description of Pedestrian Crossings and Pedestrian Infrastructure

The signalized intersection of Main Street @ Queen Street has signalized pedestrian crosswalks crossing all four legs of this intersection. All marked crosswalks use parallel line pavement markings. This intersection has a single pedestrian pushbutton at each of the four corners and the pedestrian pushbuttons activate an exclusive pedestrian phase. The intersection is missing a pedestrian ramp on the northwest corner for the crossing of Main Street creating difficulties for wheelchair users, visually impaired pedestrians, or pedestrians with a stroller. There are pedestrian ramps for all other crossings.

Recommended Improvements

This intersection was discussed in previous sections of this report and has been recommended that the traffic signals at this intersection be removed and additional channelization be constructed at the intersection as illustrated in Figure 4-5. It is recommended that pedestrian crosswalks be maintained on the east, north, and south approaches, with the crossing of the east approach being a marked crosswalk and signed with side mounted and overhead crosswalk signs (similar to the crosswalk crossing Main Street at Sussex Elementary School).

If the Town of Sussex wishes to retain traffic signalization at the intersection, the following are recommended to improve accessibility, and provide audible and tactile feedback for pedestrians with visual and hearing impairments:

Recommended modifications to the Northwest corner:

- Install a pedestrian ramp for the crossing of Main Street (See Photo 18)

Recommended Improvements (Continued)

Photo 18: Looking north on Queen Street toward the northwest corner of Main Street at Queen Street

- Relocate the signal control cabinet from this corner to improve access for maintenance activities.

Recommended modifications to the Northeast corner:
- Currently, during certain times of year, visibility of the pedestrian signal heads is obscured by foliage of a tree. Regular trimming of this tree would be required.

Recommended modifications to the Southeast corner:
- The signal control cabinet should be relocated to this corner if signalization is to be maintained. There appears to be sufficient municipal property and the controller being at this corner would allow the signal technician improved access to the controller cabinet, while providing good visibility of the intersection.

4.5.3 Pedestrian Considerations - Main Street at Summer Street

Description of Pedestrian Crossings and Pedestrian Infrastructure

The intersection of Main Street @ Summer Street has signalized pedestrian crosswalks crossing all four legs of this intersection. All marked crosswalks are parallel line pavement markings. There are two pedestrian pushbuttons (one for each crossing) at each of the four corners. There are pedestrian ramps for each marked crossing.

Recommended Improvements

There are no site specific improvements for pedestrian safety at this intersection as pedestrian signal heads and pushbuttons are all visible and appropriately located.

4.5.4 Pedestrian Considerations - Main Street at Leonard Drive

Description of Pedestrian Crossings and Pedestrian Infrastructure

The intersection of Main Street @ Leonard Drive has signalized pedestrian crosswalks crossing all four legs of this intersection. All marked crosswalks are parallel line pavement markings. There are two pedestrian pushbuttons (one for each crossing) at each of the four corners. There are pedestrian ramps for each marked crossing.

Recommended Improvements

This intersection was discussed in previous sections of this report and it has been recommended that this intersection be considered to be converted to a roundabout as indicated in Figure 4-3. A properly designed modern roundabout often improves safety for all users, including pedestrians, due to shorter crossings, lower traffic speeds, and removal of turning conflicts at crosswalks. To accommodate visually impaired pedestrians, the crossings of the roundabout should be fitted with tactile pedestrian ramps which provide a tactile cue to pedestrians as to the location of the crosswalk and to assist them with the proper alignment of their crossing (See Photo 16 of tactile pedestrian strips at a roundabout).

If the Town of Sussex wishes to retain traffic signalization, the following are recommended to improve accessibility, and provide audible and tactile feedback for pedestrians with visual and hearing impairments:

Recommended modifications to the Northwest corner:

- Both of the existing pushbuttons require the pedestrian to stop on a ramp to push the button. A wheelchair user may have difficulty accessing the pushbuttons at this corner. Altering the sidewalk grades to provide a flatter transition at the pushbuttons may improve this.
- During rain and snow events, ponded precipitation collects at the bottom of the pedestrian ramp at this corner. In colder weather this location would become icy and may cause a pedestrian to slip and fall as they enter the crosswalk.

Recommended modifications to the Northeast corner:

- Both of the existing pushbuttons require the pedestrian to stop on a ramp to push the button. A wheelchair user may have difficulty accessing the pushbuttons at this corner. Altering the sidewalk grades to provide a flatter transition at the pushbuttons may improve this.

Recommended modifications to the Southeast corner:

- Both of the existing pushbuttons are not accessible. The relocation of the signal pole and pedestrian pushbuttons, or installation of pedestrian landing pads or realigned sidewalk would improve the accessibility of these crossings.

Recommended modifications to the Southwest corner:

- Both of the existing pushbuttons are not accessible. The relocation of the signal pole and pedestrian pushbuttons, or installation of pedestrian landing pads or realigned sidewalk would improve the accessibility of these crossings.

5.0 Critical Path for Capital Planning

Background

It is recognized that due to budget considerations and construction schedules, not all recommendations can be implemented immediately. The sections below summarize the upgrades that could be planned for in the short (1-2 years), medium (3-5 years), and long (over 5 years) term periods. Order of magnitude cost estimates for each modification identified in Section 4 are included with each item. Cost estimates do not include HST, property acquisition, or landscaping features that could be installed.

Recommended Short Term Modifications

There are short term modifications with low costs that are expected to provide benefit to many road users in the next one or two years. Such modifications include:

1. **$20,000 -** Make changes to pedestrian signal heads to improve their visibility and install concrete landing pads to improve pedestrian accessibility as noted in Section 4.5 of this report.
2. **$15,000 -** Install Accessible Pedestrian Signals at the intersection of Main Street @ Summer Street.
3. **$15,000 -** Install Accessible Pedestrian Signals at the intersection of Main Street @ Route 121 / Moffett Avenue.
4. **$60,000 -** Reverse the flow direction and make geometric changes to the parking lane north of Broad Street as illustrated in Figure 4-6.

Recommended Medium Term Modifications

There are identified modifications that offer higher value and should be completed in the next three to five years. These include:

5. **$100,000 -** Realign the intersection of Main Street at Broad Street / Maple Avenue (See Figure 4-7). If the full realignment is not selected, signage and marking modifications on the Broad Street approach described in Section 4.3.3 could be made for approximately **$10,000**.
6. **$100,000 -** Remove the traffic signals from the intersection of Main Street / Queen Street and reconfigure the intersection with the north approach (Queen Street) as right-in, right-out only (See Figure 4-5).
7. **$300,000 -** Change the traffic flow on Rosemount Avenue to two-way traffic and make necessary geometric changes at the intersections with Marble Street and Leonard Drive (See Figures 4-1 and 4-2). The indicated cost assumes stop control will be used for the intersection of Marble Street / Rosemount Avenue / Eveleigh Street.

Recommended Longer Term Modifications

The recommended modifications that can be made over the longer term are summarized below:

8. **$1,500,000 -** Install a roundabout at the intersection of Main Street / Leonard Drive to improve the intersection operations (See Figure 4-3). In the interim, right turn channelization could be installed on the Leonard Drive approach to intersection (See Figure 4-4) for an order of magnitude cost of **$225,000**.
9. **$150,000 -** Realign Sunnyside Drive / Albert Street approaches to form a standard four legged intersection which may improve the functionality and safety of the intersection (See Figure 4-8).

6.0 Summary, Recommendations, and Conclusions

Site Description

1. The Town of Sussex is built around a road network that has remained largely intact since it was constructed many years ago. This study has reviewed options that could be implemented to help the Town maintain efficiency on its roadways and at its intersections.

Study Area Traffic Volumes

2. Historical volume data was obtained from NBDTI and peak period turning movements were counted at study area intersections.

Summary - Level of Service Analysis

3. Intersection performance analysis was completed for 13 study area intersections for the projected 2020 AM and PM peak hours. Analysis results show that there are minimal delays overall at study intersections with no major operational deficiencies noted.

Rosemount Avenue, Eveleigh Street Traffic Flow

4. Eveleigh Street and Rosemount Avenue are currently one-way roadways and act as couplets to each other. The total length of the one-way loop is approximately 800 metres and there are few interim destinations.

Main Street at Leonard Drive Traffic Operations

5. Intersection analysis determined that this intersection operates with minimal delay overall, however the right-turn lane on the Leonard Drive approach to this intersection has limited storage length due to the location of the bridge crossing Trout Creek. This short lane impacts the access to this right lane for right turning traffic and causes delay at this intersection.

Main Street / Queen Street / Broad Street Traffic Flow

6. The Main Street / Queen Street / Broad Street loop are currently one-way roadways and act as the primary route for eastbound traffic through downtown Sussex.

   The Main Street / Queen Street / Broad Street one way flow has existed in its current configuration for many years and overall traffic flow is improved through the existing one-way flow when compared to two-way traffic flow. Any change from the existing one-way flow on these streets would impact the angled parking, would add complexity to the intersection at Maple Avenue, and would affect the downtown character of this corridor.

Main Street at Queen Street

7. There are deficiencies with respect to pedestrian accessibility, and maintenance safety due to the location of the signal controller that led to this intersection being identified by Town Staff as meriting further review.

   Due to the one way nature of the roadways and the lane configuration, there are very few conflicting movements at this intersection. Signal warrant analysis was completed for the intersection of Main Street at Queen Street with projected 2020 traffic volumes. Results of the signal warrant found that the intersection received only 49 warrant points and is not warranted for traffic signals.

Main Street at Broad Street / Maple Avenue

8. The intersection of Main Street at Broad Street / Maple Avenue is an atypical intersection due to the road alignments, intersection control, and proximity to the railroad tracks.

Main Street at Sunnyside Drive / Albert Street

9. Sunnyside Drive and Albert Street intersect with Main Street to form an offset (approximately 12 metres) 4-legged, two-way stop controlled intersection. The geometric alignment at this intersection can cause operational difficulties due to the misalignment of Sunnyside Drive and Albert Street.

Recommendations

10. The current one-way flow of Main Street / Queen Street / Broad Street should be maintained.
11. Complete traffic signal modifications to better accommodate pedestrian accessibility. The cost estimate for the modifications is $50,000.
12. The flow direction of the parking lane on the north side of Broad Street should be reversed to improve the traffic flow and driver understanding through this area. This may create the opportunity for additional streetscaping features and improve pedestrian safety and pedestrian flow through this area. The cost estimate this flow conversion is $60,000.
13. The intersection of Main Street at Broad Street / Maple Avenue should be realigned to improve driver understanding, traffic flow and overall safety. The cost estimate for this flow conversion is $100,000.
14. The intersection of Main Street at Queen Street should be converted to stop control with shortened pedestrian crossings and channelized vehicle movements. The cost estimate for this project is $100,000.
15. Rosemount Avenue and Eveleigh Street between Marble Street and Perry Street should be converted to two-way traffic flow. The cost estimate for intersection modifications is $300,000.
16. The intersection of Main Street at Leonard Drive should be considered for conversion to a roundabout. The cost estimate for the conversion of this intersection to a roundabout is $1,500,000.
17. The Sunnyside Drive and Albert Street approaches to Main Street should be realigned to form a typical four legged intersection to reduce vehicle operations and improve operations at the intersection. The estimated cost is $150,000.

Conclusions

18. With implementation of recommended improvements, traffic flows within and through the Town of Sussex are expected to be improved and will help continue to deliver the safe and efficient operation of the roadway system for both motor vehicles and pedestrians.

Appendix A

Intersection Turning Movement Counts

Traffic Volume Diagrams

Left-Turn Lane Warrant

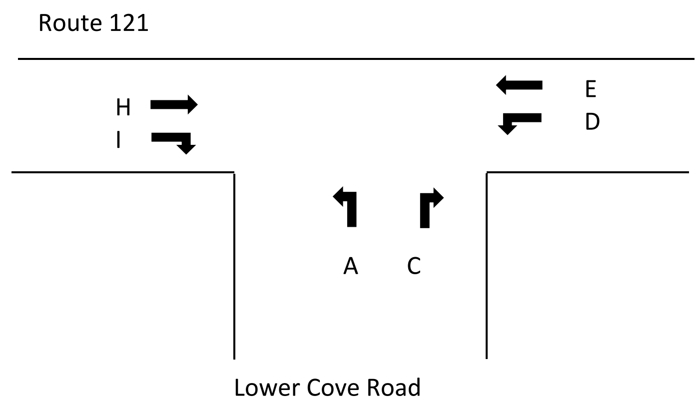
Traffic Signal Warrant

Table A-1

Route 121 @ Lower Cove Road

Sussex, NB

Thursday, July 23, 2015



AM Peak Period Volume Data

Time		Lower Cove Road Northbound Approach		Route 121 Westbound Approach		Route 121 Eastbound Approach		Total Vehicles
		A	C	D	E	H	I	
07:00	07:15	3	0	1	57	66	2	129
07:15	07:30	9	2	5	53	72	6	147
07:30	07:45	6	3	5	47	86	10	157
07:45	08:00	15	6	7	55	111	22	216
08:00	08:15	10	4	10	46	58	13	141
08:15	08:30	6	6	10	63	79	6	170
08:30	08:45	15	8	13	48	106	13	203
08:45	09:00	14	14	22	63	126	10	249
AM Peak Hour		**45**	**32**	**55**	**220**	**369**	**42**	**763**

PM Peak Period Volume Data

Time		Lower Cove Road Northbound Approach		Route 121 Westbound Approach		Route 121 Eastbound Approach		Total Vehicles
		A	C	D	E	H	I	
15:30	15:45	40	23	31	109	76	19	298
15:45	16:00	32	23	34	86	85	15	275
16:00	16:15	46	12	37	115	89	24	323
16:15	16:30	44	23	39	133	86	19	344
16:30	16:45	46	19	27	128	100	24	344
16:45	17:00	39	20	21	117	98	25	320
17:00	17:15	44	23	22	154	98	21	362
17:15	17:30	67	17	22	125	95	15	341
PM Peak Hour		**173**	**85**	**109**	**532**	**382**	**89**	**1370**

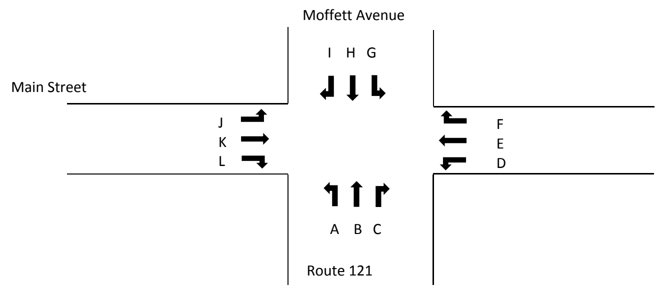
* Count completed by WSP

Table A-2

Main Street
@
Route 121/Moffett Ave

Sussex, NB

Wednesday, July 22, 2015



AM Peak Period Volume Data

Time		Route 121 Northbound Approach			Main Street Westbound Approach			Moffett Avenue Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
07:00	07:15	26	4	35	25	24	6	4	5	0	0	15	36	180
07:15	07:30	28	4	34	29	42	7	3	2	0	0	23	32	204
07:30	07:45	43	12	43	27	40	10	7	2	0	0	25	25	234
07:45	08:00	51	7	73	30	44	8	6	10	1	1	26	38	295
08:00	08:15	25	11	64	33	47	17	4	9	0	0	19	36	265
08:15	08:30	37	11	41	25	24	22	6	6	0	0	29	28	229
08:30	08:45	33	14	72	24	37	12	7	8	1	0	26	25	259
08:45	09:00	31	15	69	28	34	16	15	4	0	0	39	23	274
AM Peak Hour		**146**	**43**	**250**	**112**	**152**	**59**	**23**	**33**	**2**	**1**	**100**	**127**	**1048**

PM Peak Period Volume Data

Time		Route 121 Northbound Approach			Main Street Westbound Approach			Moffett Avenue Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
15:30	15:45	48	13	57	45	58	27	35	14	1	0	64	61	423
15:45	16:00	38	14	62	53	53	33	22	14	2	0	63	60	414
16:00	16:15	47	13	59	66	59	35	31	19	0	0	64	47	440
16:15	16:30	53	12	57	61	69	24	32	16	2	0	73	69	468
16:30	16:45	49	9	57	78	57	23	35	15	1	0	49	61	434
16:45	17:00	41	13	57	65	73	29	18	22	0	0	58	70	446
17:00	17:15	49	9	57	83	59	26	34	15	1	0	69	74	476
17:15	17:30	50	12	69	71	68	16	25	15	1	1	55	93	476
PM Peak Hour		**189**	**43**	**240**	**297**	**257**	**94**	**112**	**67**	**3**	**1**	**231**	**298**	**1832**

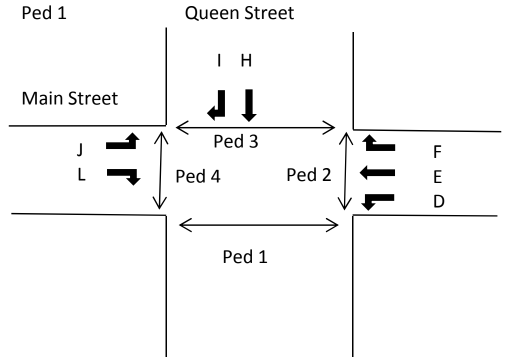
* Count completed by WSP

Table A-3

Main Street
@
Queen Street

Sussex, NB

Thursday, July 23, 2015



AM Peak Period Volume Data

Time		Queen Street Northbound Approach		Main Street Westbound Approach			Queen Street Southbound Approach		Main Street Eastbound Approach		Total Vehicles
				D	E	F	H	I	J	L	
07:00	07:15			8	48	2	1	4	1	63	127
07:15	07:30			13	68	3	3	1	0	69	157
07:30	07:45			22	60	3	7	1	3	73	169
07:45	08:00			39	83	3	7	7	3	104	246
08:00	08:15			21	86	4	7	8	1	52	179
08:15	08:30			28	79	4	10	5	5	74	205
08:30	08:45			33	81	4	8	4	3	69	202
08:45	09:00			35	90	9	8	1	3	96	242
AM Peak Hour				**121**	**329**	**15**	**32**	**24**	**12**	**299**	**832**

		Ped 1	Ped 2	Ped 3	Ped 4	Total Pedestrians
07:45	**08:45**	0	0	8	0	8

Midday Peak Period Volume Data

Time		Queen Street Northbound Approach		Main Street Westbound Approach			Queen Street Southbound Approach		Main Street Eastbound Approach		Total Vehicles
				D	E	F	H	I	J	L	
11:30	11:45			51	177	12	13	6	7	135	401
11:45	12:00			65	172	11	16	12	2	169	447
12:00	12:15			73	164	7	11	9	7	207	478
12:15	12:30			39	177	4	6	5	5	159	395
12:30	12:45			47	146	11	11	4	4	154	377
12:45	13:00			40	110	4	6	14	2	114	290
13:00	13:15			52	196	3	11	4	2	149	417
13:15	13:30			52	149	11	8	6	3	136	365
Midday Peak Hour				**228**	**690**	**34**	**46**	**32**	**21**	**670**	**1721**

		Ped 1	Ped 2	Ped 3	Ped 4	Total Pedestrians
11:30	**12:30**	4	0	9	4	17

PM Peak Period Volume Data

Time		Queen Street Northbound Approach		Main Street Westbound Approach			Queen Street Southbound Approach		Main Street Eastbound Approach		Total Vehicles
				D	E	F	H	I	J	L	
16:00	16:15			69	191	7	8	8	2	126	411
16:15	16:30			49	178	11	8	6	3	122	377
16:30	16:45			68	159	10	12	4	5	137	395
16:45	17:00			54	152	9	7	3	2	148	375
17:00	17:15			68	208	8	7	9	2	128	430
17:15	17:30			32	143	9	8	2	8	135	337
17:30	17:45			32	114	6	7	2	2	147	310
17:45	18:00			26	123	8	8	5	1	140	311
PM Peak Hour				**239**	**697**	**38**	**34**	**22**	**12**	**535**	**1577**

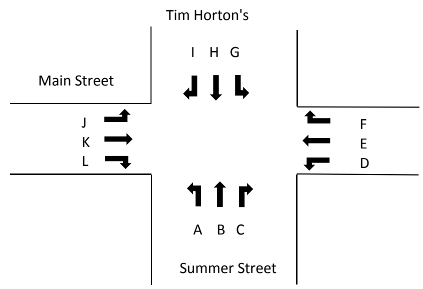
		Ped 1	Ped 2	Ped 3	Ped 4	Total Peds
16:15	**17:15**	7	1	5	2	15

* Count completed by WSP

Table A-4

Main Street
@
Summer Street

Sussex, NB
Wednesday, July 29, 2015



AM Peak Period Volume Data

Time		Summer Street Northbound Approach			Main Street Westbound Approach			Tim Horton's Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
07:00	07:15	2	5	1	0	30	37	29	1	14	14	33	3	169
07:15	07:30	5	3	2	1	32	22	17	22	19	13	50	0	186
07:30	07:45	13	10	3	2	47	26	19	0	16	10	49	3	198
07:45	08:00	14	7	0	3	68	22	23	2	18	15	78	1	251
08:00	08:15	9	7	2	1	51	28	20	3	16	12	54	2	205
08:15	08:30	15	9	3	3	62	34	19	1	12	11	58	3	230
08:30	08:45	19	8	2	4	57	21	20	3	17	21	62	6	240
08:45	09:00	15	9	7	6	76	28	20	2	27	17	61	2	270
AM Peak Hour		**58**	**33**	**14**	**14**	**246**	**111**	**79**	**9**	**72**	**61**	**235**	**13**	**945**

PM Peak Period Volume Data

Time		Summer Street Northbound Approach			Main Street Westbound Approach			Tim Horton's Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
15:30	15:45	30	3	8	3	86	10	15	2	24	15	71	1	268
15:45	16:00	22	6	7	5	72	13	9	2	14	10	104	5	269
16:00	16:15	29	4	9	4	106	20	14	3	13	5	105	2	314
16:15	16:30	24	1	5	5	96	14	9	2	21	13	102	2	294
16:30	16:45	30	3	3	5	118	16	22	2	11	8	94	6	318
16:45	17:00	17	7	6	6	103	12	15	0	10	15	95	5	291
17:00	17:15	30	3	13	3	103	13	18	5	17	14	123	2	344
17:15	17:30	26	9	7	4	92	7	23	4	10	15	100	8	305
PM Peak Hour		**103**	**22**	**29**	**18**	**416**	**48**	**78**	**11**	**48**	**52**	**412**	**21**	**1258**

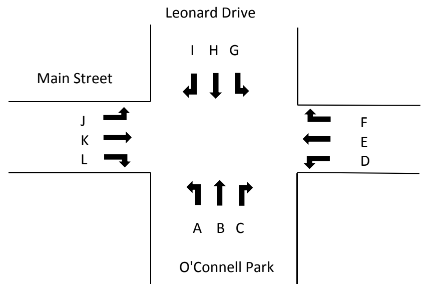
* Count completed by WSP

Table A-5

Main Street
@
Leonard Drive/O'Connell Park

Sussex, NB

Wednesday, July 22, 2015



AM Peak Period Volume Data

Time		O'Connell Park Northbound Approach			Main Street Westbound Approach			Leonard Drive Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
07:00	07:15	0	0	0	0	38	15	4	0	27	42	19	0	145
07:15	07:30	0	0	0	0	39	13	5	1	25	53	16	0	152
07:30	07:45	1	0	1	3	61	20	13	0	27	53	34	0	213
07:45	08:00	1	0	0	3	59	29	12	0	40	59	21	0	224
08:00	08:15	3	0	0	1	36	12	12	0	48	46	40	1	199
08:15	08:30	0	0	2	1	36	12	17	1	46	52	49	0	216
08:30	08:45	0	0	0	1	42	15	15	0	47	46	33	0	199
08:45	09:00	0	0	1	0	85	21	11	1	43	37	30	0	229
AM Peak Hour		**5**	**0**	**3**	**8**	**192**	**73**	**54**	**1**	**161**	**210**	**144**	**1**	**852**

PM Peak Period Volume Data

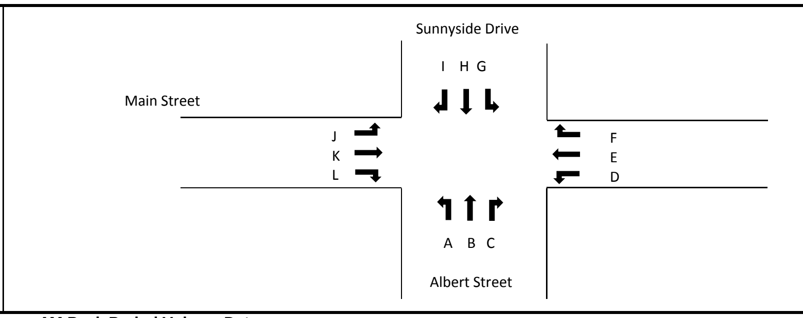
Time		O'Connell Park Northbound Approach			Main Street Westbound Approach			Leonard Drive Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
15:30	15:45	1	1	0	0	52	19	21	1	76	59	64	2	296
15:45	16:00	1	0	0	0	45	13	16	0	47	55	77	2	256
16:00	16:15	2	0	3	0	56	27	35	0	88	45	70	1	327
16:15	16:30	0	0	0	0	67	20	20	0	60	41	82	0	290
16:30	16:45	0	0	0	0	65	17	29	0	73	48	80	1	313
16:45	17:00	1	2	0	0	55	13	25	0	60	57	67	1	281
17:00	17:15	0	0	0	0	69	9	30	0	78	51	99	2	338
17:15	17:30	0	0	0	1	64	29	24	0	56	32	87	1	294
PM Peak Hour		**1**	**2**	**0**	**1**	**253**	**68**	**108**	**0**	**267**	**188**	**333**	**5**	**1226**

* Count completed by WSP

Table A-6

Main Street
@
Sunnyside Drive/Albert Street

Sussex, NB
Tuesday, December 2, 2014



AM Peak Period Volume Data

Time		Albert Street Northbound Approach			Main Street Westbound Approach			Sunnyside Drive Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
07:30	07:45	4	0	0	3	77	4	3	0	0	1	81	3	176
07:45	08:00	0	0	3	2	82	9	10	0	2	1	105	2	216
08:00	08:15	0	0	3	4	104	5	9	1	4	2	106	2	240
08:15	08:30	3	0	4	3	63	4	8	0	3	3	87	1	179
08:30	08:45	4	0	1	2	90	3	1	2	0	3	89	2	197
08:45	09:00	3	1	3	2	98	5	1	0	3	1	97	1	215
09:00	09:15	3	0	2	0	103	7	7	1	3	0	90	1	217
09:15	09:30	1	1	1	5	94	2	5	0	0	2	80	2	193
AM Peak Hour		**7**	**0**	**11**	**11**	**339**	**21**	**28**	**3**	**9**	**9**	**387**	**7**	**832**

Midday Peak Period Volume Data

Time		Albert Street Northbound Approach			Main Street Westbound Approach			Sunnyside Drive Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
11:30	11:45	3	0	3	1	142	5	8	0	3	2	131	4	302
11:45	12:00	1	1	2	0	155	7	8	0	4	4	121	2	305
12:00	12:15	2	0	5	6	142	6	4	2	2	2	138	3	312
12:15	12:30	6	1	1	3	130	9	5	0	4	4	137	7	307
12:30	12:45	4	0	0	2	151	9	1	0	3	2	135	3	310
12:45	13:00	5	1	2	6	133	16	10	3	2	1	127	4	310
13:00	13:15	5	0	4	1	156	6	5	0	2	0	109	5	293
13:15	13:30	4	0	2	2	116	4	6	2	3	2	113	5	259
Midday Peak Hour		**17**	**2**	**8**	**17**	**556**	**40**	**20**	**5**	**11**	**9**	**537**	**17**	**1239**

PM Peak Period Volume Data

Time		Albert Street Northbound Approach			Main Street Westbound Approach			Sunnyside Drive Southbound Approach			Main Street Eastbound Approach			Total Vehicles
		A	B	C	D	E	F	G	H	I	J	K	L	
16:00	16:15	3	0	2	4	148	7	3	0	1	3	117	5	293
16:15	16:30	2	0	5	3	129	9	4	0	3	3	126	4	288
16:30	16:45	2	0	1	3	153	10	1	0	2	8	132	4	316
16:45	17:00	1	0	0	2	155	9	4	0	9	3	104	0	287
17:00	17:15	4	0	3	0	147	10	9	1	4	6	111	5	300
17:15	17:30	1	0	1	2	116	10	4	0	5	2	113	5	259
17:30	17:45	0	0	3	4	109	6	5	0	2	1	78	2	210
17:45	18:00	0	0	0	2	97	5	4	0	2	2	116	0	228
PM Peak Hour		**9**	**0**	**9**	**8**	**584**	**38**	**18**	**1**	**18**	**20**	**473**	**13**	**1191**

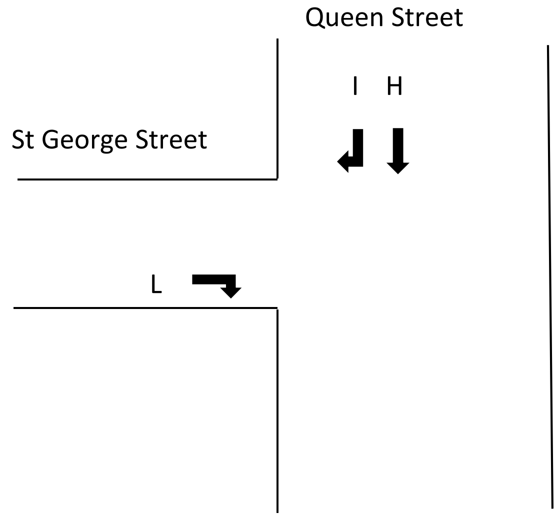
* Count provided to WSP by the Town of Sussex

Table A-7

Queen Street
@
St George Street

Sussex, NB

Thursday, July 30, 2015



AM Peak Period Volume Data

Time		Queen Street Southbound Approach		St George Street Eastbound Approach	Total Vehicles
		H	I	L	
07:00	07:15	53	4	12	57
07:15	07:30	82	7	16	89
07:30	07:45	88	7	8	95
07:45	08:00	110	24	31	134
08:00	08:15	82	11	25	93
08:15	08:30	106	12	17	118
08:30	08:45	84	16	25	100
08:45	09:00	112	17	28	129
AM Peak Hour		**382**	**63**	**98**	**445**

PM Peak Period Volume Data

Time		Queen Street Southbound Approach		St George Street Eastbound Approach	Total Vehicles
		H	I	L	
15:30	15:45	147	24	29	171
15:45	16:00	160	32	39	192
16:00	16:15	179	33	41	212
16:15	16:30	148	32	40	180
16:30	16:45	166	33	42	199
16:45	17:00	170	16	37	186
17:00	17:15	187	26	44	213
17:15	17:30	152	22	30	174
PM Peak Hour		**653**	**130**	**162**	**783**

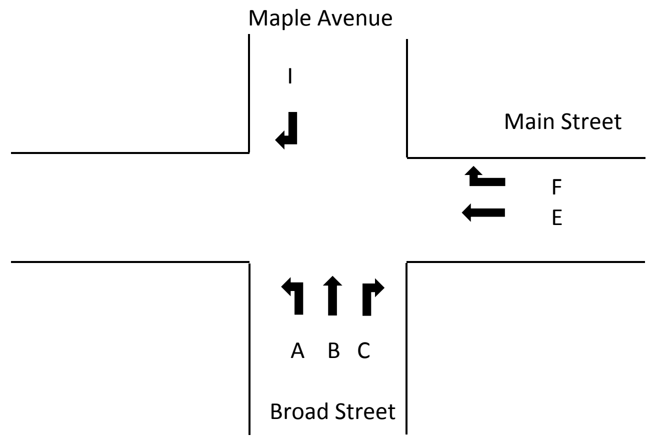
* Count completed by WSP

Table A-8

Main Street
@
Broad Street/Maple Avenue

Sussex, NB

Wednesday, July 22, 2015



AM Peak Period Volume Data

Time		Broad Street Northbound Approach			Main Street Westbound		Maple Avenue Southbound Approach	Total Vehicles
		A	B	C	E	F	I	
07:00	07:15	1	23	51	44	7	25	151
07:15	07:30	2	20	58	56	16	20	172
07:30	07:45	3	17	88	70	17	37	232
07:45	08:00	0	30	97	83	18	37	265
08:00	08:15	5	19	81	60	25	35	225
08:15	08:30	3	22	87	52	11	52	227
08:30	08:45	6	28	97	65	21	54	271
08:45	09:00	7	31	101	90	10	53	292
AM Peak Hour		**21**	**100**	**366**	**267**	**71**	**194**	**1015**

PM Peak Period Volume Data

Time		Broad Street Northbound Approach			Main Street Westbound		Maple Avenue Southbound Approach	Total Vehicles
		A	B	C	E	F	I	
15:30	15:45	12	28	154	101	20	76	391
15:45	16:00	15	50	147	106	21	68	407
16:00	16:15	13	40	136	146	17	111	463
16:15	16:30	10	29	150	118	12	80	399
16:30	16:45	14	29	145	124	21	82	415
16:45	17:00	17	29	144	130	18	61	399
17:00	17:15	17	44	151	129	13	100	454
17:15	17:30	14	46	145	118	7	71	401
PM Peak Hour		**52**	**148**	**578**	**494**	**68**	**341**	**1684**

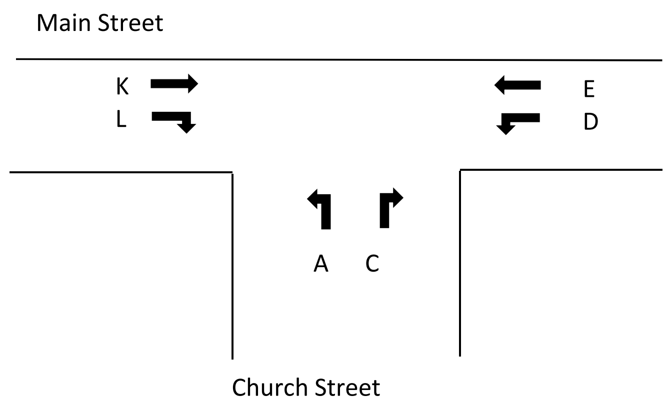
* Count completed by WSP

Table A-9

Main Street @ Church Street

Sussex, NB

Thursday, July 30, 2015



AM Peak Period Volume Data

Time		Church Street Northbound Approach		Main Street Westbound Approach		Main Street Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
07:00	07:15	6	3	3	40	45	2	99
07:15	07:30	5	5	1	50	70	7	138
07:30	07:45	4	0	1	73	72	2	152
07:45	08:00	9	6	1	95	102	9	222
08:00	08:15	7	2	3	82	74	5	173
08:15	08:30	10	1	2	90	105	4	212
08:30	08:45	12	2	2	97	72	1	186
08:45	09:00	8	2	4	102	111	3	230
AM Peak Hour		**37**	**7**	**11**	**371**	**362**	**13**	**801**

PM Peak Period Volume Data

Time		Church Street Northbound Approach		Main Street Westbound Approach		Main Street Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
15:30	15:45	10	8	3	115	121	13	270
15:45	16:00	3	7	2	116	127	5	260
16:00	16:15	7	3	1	147	144	13	315
16:15	16:30	7	7	5	156	139	5	319
16:30	16:45	14	2	3	159	145	9	332
16:45	17:00	7	2	4	130	160	11	314
17:00	17:15	17	3	6	146	157	14	343
17:15	17:30	5	3	4	134	136	13	295
PM Peak Hour		**45**	**14**	**18**	**591**	**601**	**39**	**1308**

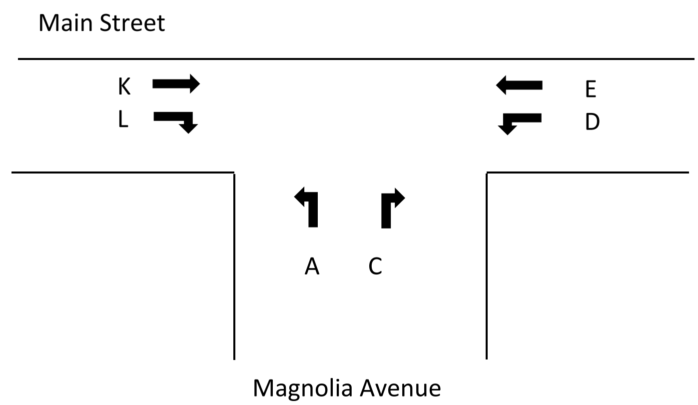
* Count completed by WSP

Table A-10

Main Street
@
Magnolia Avenue

Sussex, NB

Wednesday, July 29, 2015



AM Peak Period Volume Data

Time		Magnolia Avenue Northbound Approach		Main Street Westbound Approach		Main Street Eastbound Approach		Total Vehicles
		A	C	D	E	K	L	
07:00	07:15	3	4	0	69	56	3	135
07:15	07:30	3	5	2	57	72	3	142
07:30	07:45	3	14	1	81	72	4	175
07:45	08:00	1	13	5	99	87	9	214
08:00	08:15	1	4	11	83	72	6	177
08:15	08:30	4	18	15	106	72	7	222
08:30	08:45	4	7	11	90	71	11	194
08:45	09:00	5	16	11	107	71	6	216
AM Peak Hour		**14**	**45**	**48**	**386**	**286**	**30**	**809**

PM Peak Period Volume Data

Time		Magnolia Avenue Northbound Approach		Main Street Westbound Approach		Main Street Eastbound Approach		Total Vehicles
		3	16	D	E	K	L	
15:30	15:45	3	12	15	103	96	3	232
15:45	16:00	4	11	16	87	111	7	236
16:00	16:15	3	16	18	137	117	11	302
16:15	16:30	1	22	18	119	109	12	281
16:30	16:45	10	16	22	141	111	16	316
16:45	17:00	2	10	20	119	105	7	263
17:00	17:15	4	21	29	129	142	14	339
17:15	17:30	5	15	16	98	121	18	273
PM Peak Hour		**17**	**69**	**89**	**508**	**467**	**49**	**1199**

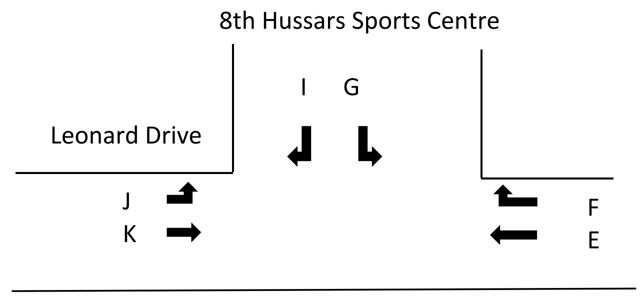
* Count completed by WSP

Table A-11

Leonard Drive
@
8th Hussars Sports Centre

Sussex, NB

Tuesday, July 28, 2015



AM Peak Period Volume Data

Time		Leonard Drive Westbound Approach		8th Hussars Sports Centre Southbound Approach		Leonard Drive Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
07:00	07:15	46	0	0	0	1	59	46
07:15	07:30	35	2	0	3	3	61	40
07:30	07:45	50	1	0	0	1	69	51
07:45	08:00	40	3	5	2	6	103	50
08:00	08:15	53	0	0	2	3	57	55
08:15	08:30	56	0	0	5	4	58	61
08:30	08:45	68	0	2	3	6	43	73
08:45	09:00	63	2	0	2	4	60	67
AM Peak Hour		**217**	**3**	**7**	**12**	**19**	**261**	**239**

PM Peak Period Volume Data

Time		Leonard Drive Westbound Approach		8th Hussars Sports Centre Southbound Approach		Leonard Drive Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
15:30	15:45	93	1	0	1	0	64	95
15:45	16:00	85	0	0	5	1	50	90
16:00	16:15	101	2	6	6	0	62	115
16:15	16:30	71	2	0	1	0	77	74
16:30	16:45	111	2	0	1	0	73	114
16:45	17:00	68	1	3	2	5	65	74
17:00	17:15	93	1	0	3	1	64	97
17:15	17:30	71	0	3	0	3	35	74
PM Peak Hour		**351**	**7**	**9**	**10**	**5**	**277**	**377**

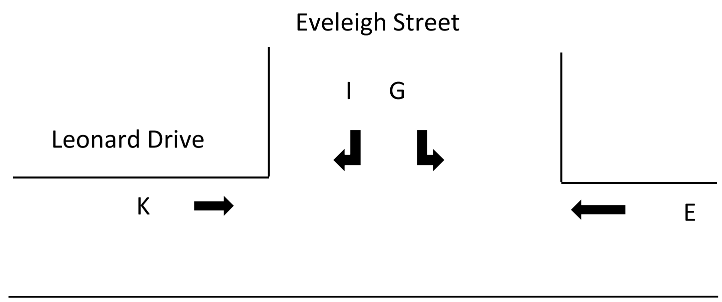
* Count completed by WSP

Table A-12

Leonard Drive
@
Eveleigh Street

Sussex, NB

Tuesday, July 28, 2015



AM Peak Period Volume Data

Time		Leonard Drive Westbound Approach	Eveleigh Street Southbound Approach		Leonard Drive Eastbound Approach	Total Vehicles
		E	G	I	K	
07:00	07:15	29	18	18	67	132
07:15	07:30	26	23	7	66	122
07:30	07:45	37	25	12	66	140
07:45	08:00	27	51	21	113	212
08:00	08:15	37	29	19	60	145
08:15	08:30	35	25	16	58	134
08:30	08:45	56	23	22	46	147
08:45	09:00	35	27	19	57	138
AM Peak Hour		**155**	**128**	**78**	**277**	**638**

PM Peak Period Volume Data

Time		Leonard Drive Westbound Approach	Eveleigh Street Southbound Approach		Leonard Drive Eastbound Approach	Total Vehicles
		E	G	I	K	
15:30	15:45	58	16	34	70	178
15:45	16:00	46	28	36	58	168
16:00	16:15	74	18	27	62	181
16:15	16:30	41	20	21	80	162
16:30	16:45	69	20	40	70	199
16:45	17:00	36	19	26	69	150
17:00	17:15	67	9	24	61	161
17:15	17:30	34	14	26	39	113
PM Peak Hour		**230**	**86**	**124**	**270**	**710**

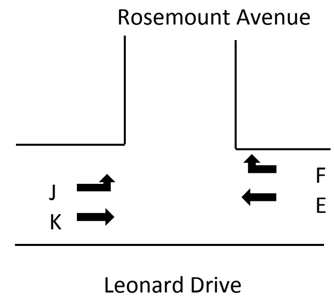
* Count completed by WSP

Table A-13

Leonard Drive @ Rosemount Avenue

Sussex, NB

Tuesday, July 28, 2015



AM Peak Period Volume Data

Time		Leonard Drive Westbound Approach		Leonard Drive Eastbound Approach		Total Vehicles
		E	F	J	K	
07:00	07:15	34	8	23	60	125
07:15	07:30	20	10	13	70	113
07:30	07:45	39	11	19	68	137
07:45	08:00	30	12	31	117	190
08:00	08:15	34	16	17	67	134
08:15	08:30	36	17	10	67	130
08:30	08:45	53	15	13	55	136
08:45	09:00	36	19	18	59	132
AM Peak Hour		**139**	**56**	**77**	**319**	**591**

Midday Peak Period Volume Data

Time		Leonard Drive Westbound Approach		Leonard Drive Eastbound Approach		Total Vehicles
		E	F	J	K	
11:30	11:45	61	20	23	55	159
11:45	12:00	64	43	21	43	171
12:00	12:15	80	49	38	86	253
12:15	12:30	50	27	28	87	192
12:30	12:45	35	28	32	59	154
12:45	13:00	49	23	31	97	200
13:00	13:15	51	22	41	79	193
13:15	13:30	53	24	26	86	189
Midday Peak Hour		**214**	**127**	**129**	**329**	**799**

PM Peak Period Volume Data

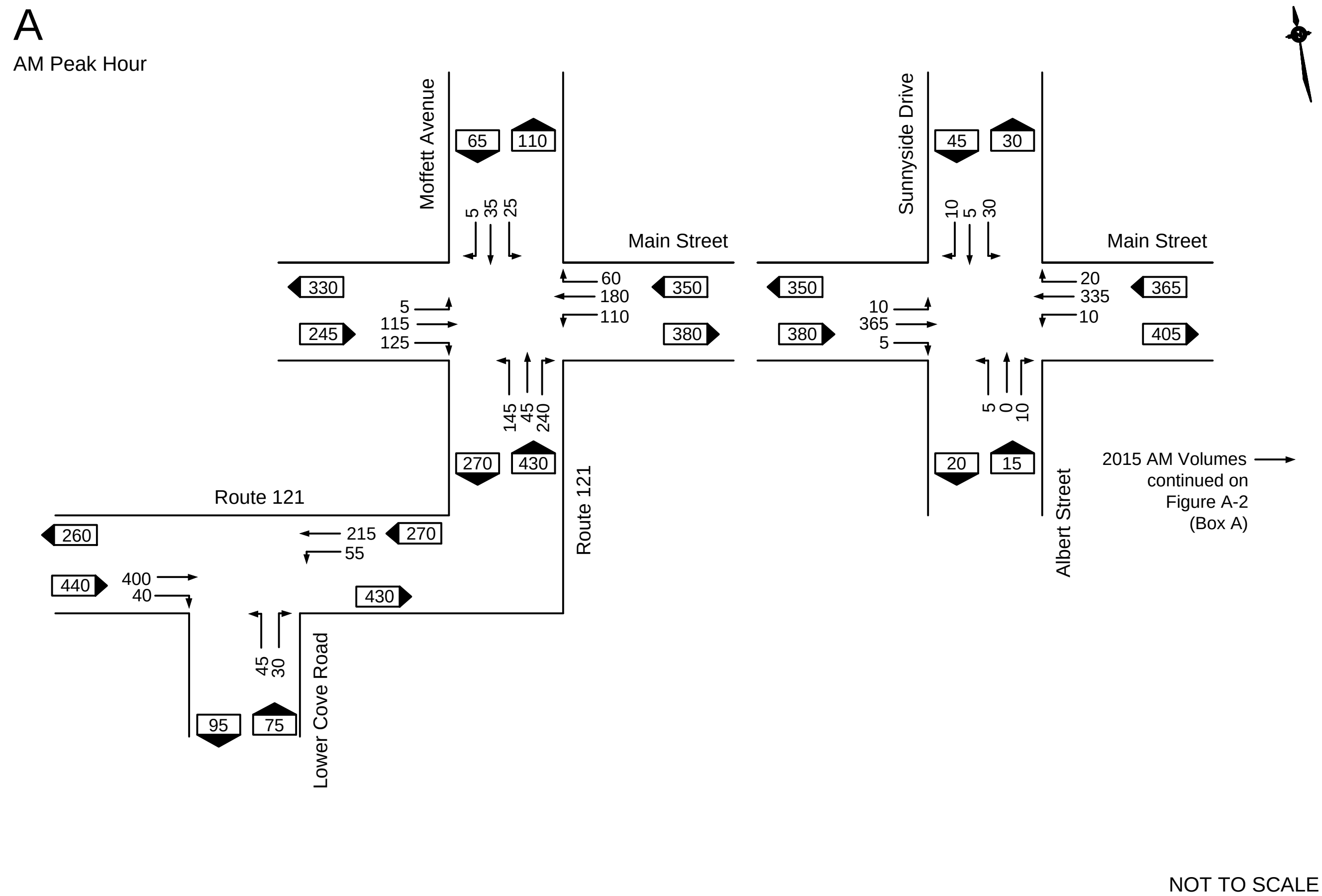
Time		Leonard Drive Westbound Approach		Leonard Drive Eastbound Approach		Total Vehicles
		E	F	J	K	
15:30	15:45	52	24	25	55	156
15:45	16:00	42	31	21	67	161
16:00	16:15	66	61	26	57	210
16:15	16:30	39	17	34	56	146
16:30	16:45	62	38	30	57	187
16:45	17:00	38	18	34	51	141
17:00	17:15	62	44	26	49	181
17:15	17:30	32	15	14	36	97
PM Peak Hour		**209**	**147**	**111**	**237**	**704**

* Count completed by WSP

2015 AM Peak Hour
Traffic Volumes

A

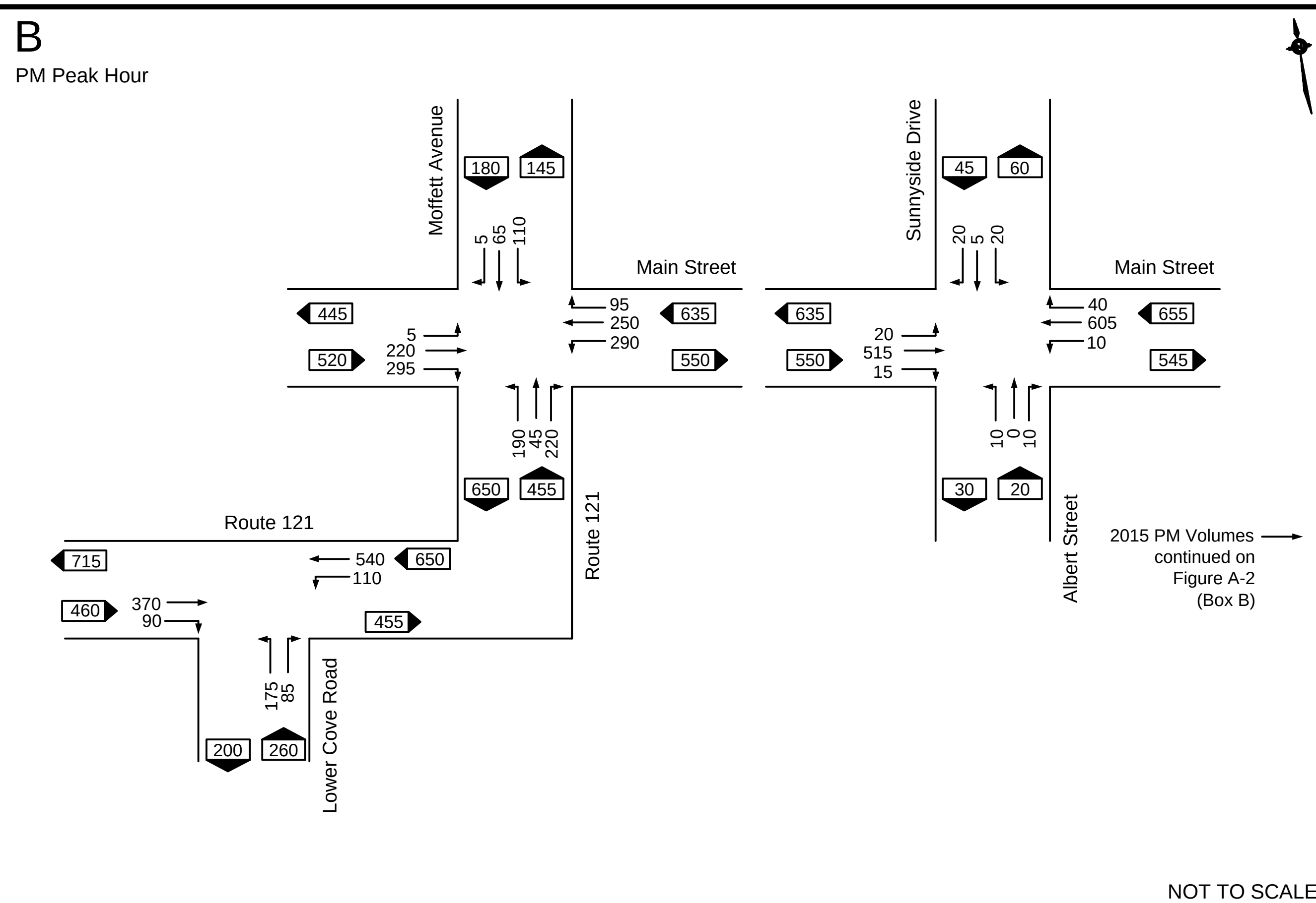
AM Peak Hour



2015 PM Peak Hour
Traffic Volumes

B

PM Peak Hour



WSP

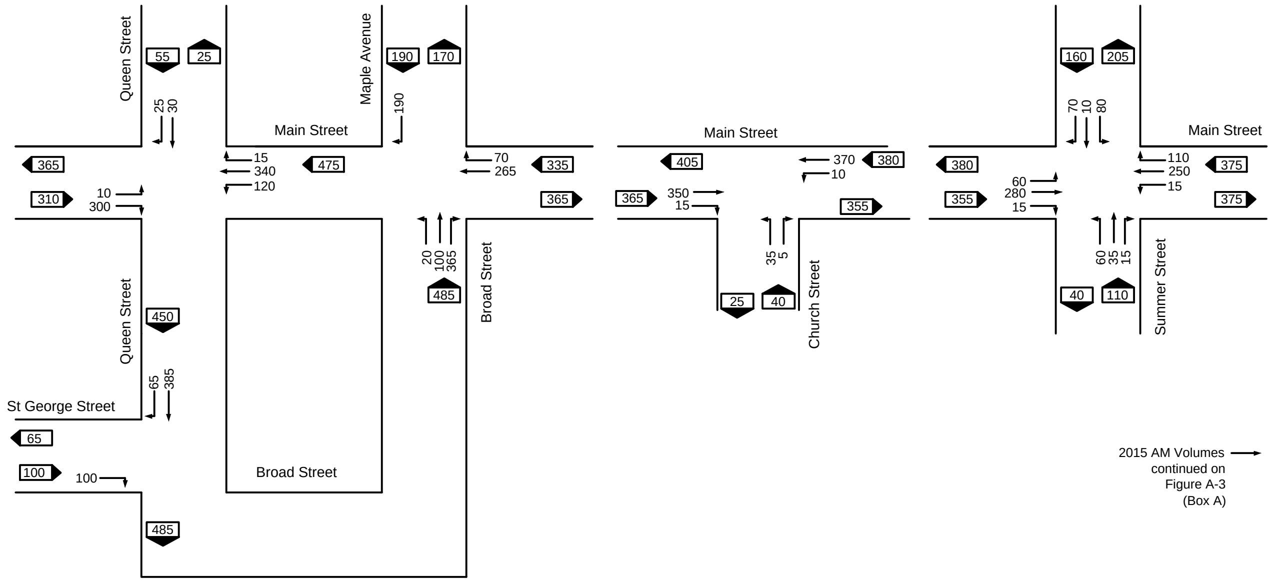
Traffic Improvement Study Sussex, NB	Figure A-1
Projected 2015 Weekday AM and PM Peak Hour Traffic Volumes	November 2015

2015 AM Peak Hour Traffic Volumes

A

AM Peak Hour

2015 AM Volumes continued on Figure A-1 (Box A)



2015 AM Volumes continued on Figure A-3 (Box A)

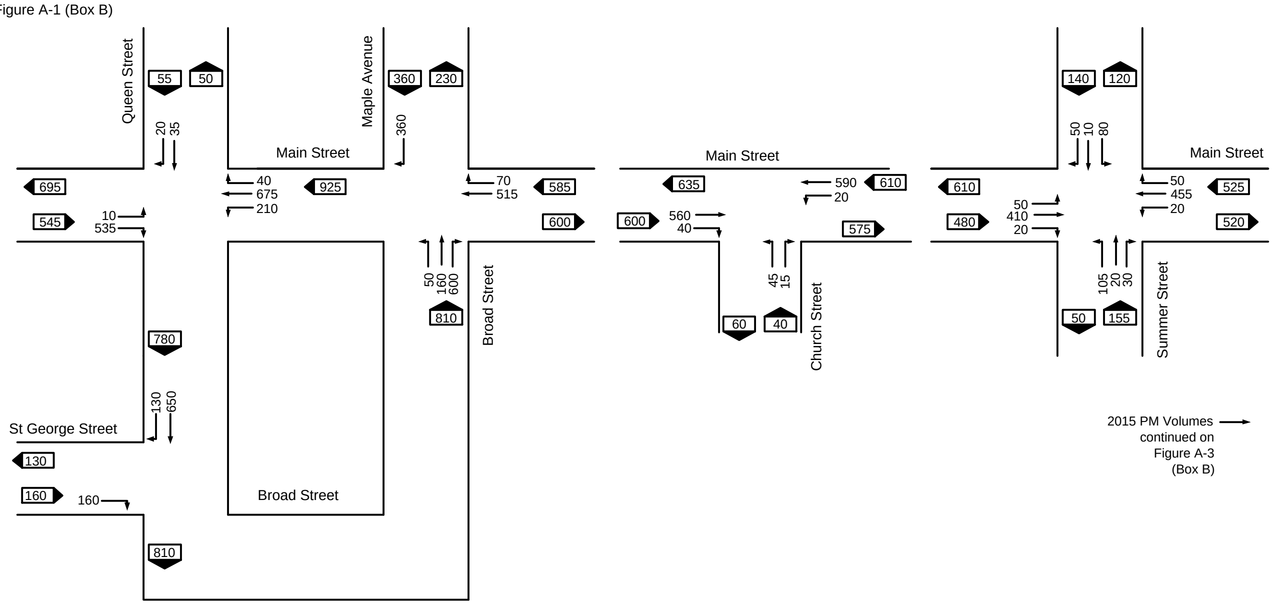
NOT TO SCALE

2015 PM Peak Hour Traffic Volumes

B

PM Peak Hour

2015 PM Volumes continued on Figure A-1 (Box B)



2015 PM Volumes continued on Figure A-3 (Box B)

NOT TO SCALE

WSP

Traffic Improvement Study
Sussex, NB

Figure A-2

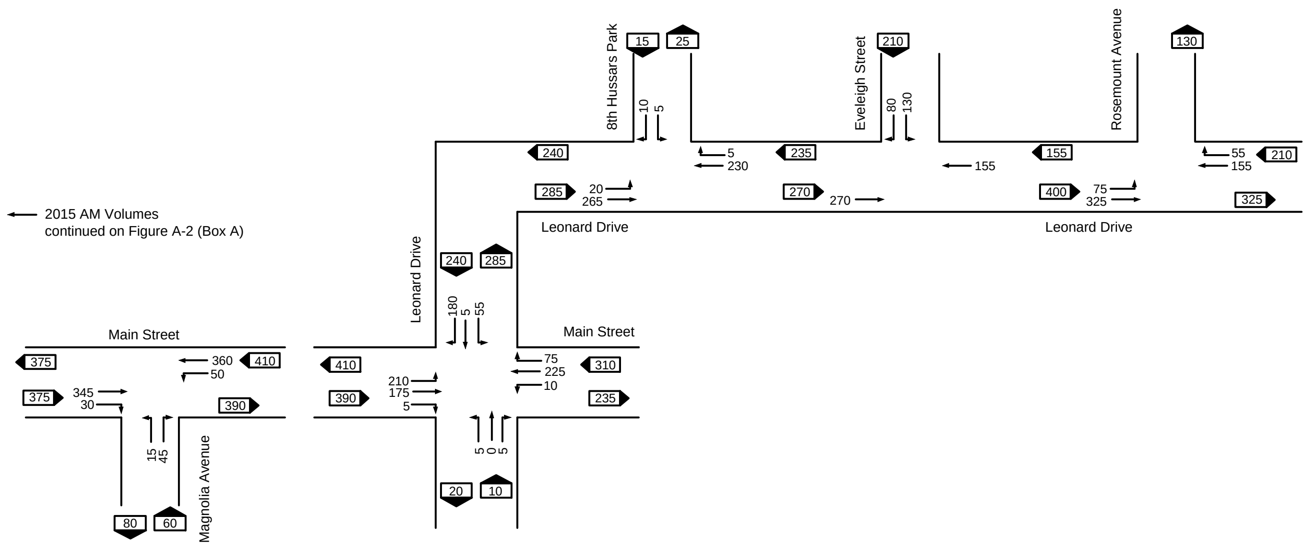
Projected 2015 AM and PM Peak Hour
Traffic Volumes

November 2015

2015 AM Peak Hour Traffic Volumes

A

AM Peak Hour

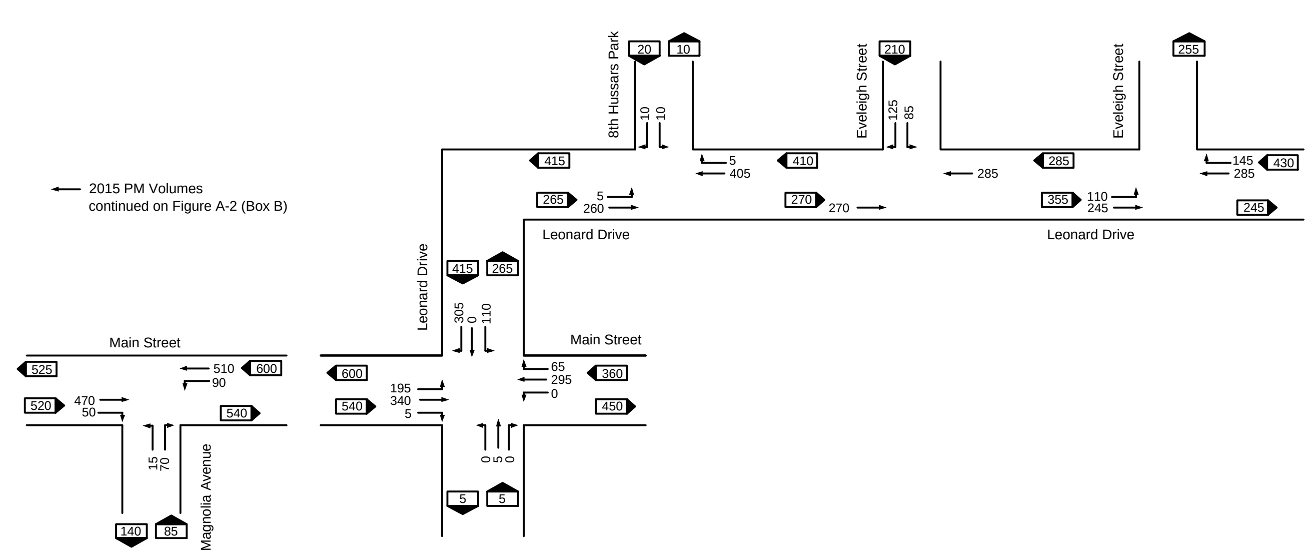


NOT TO SCALE

2015 PM Peak Hour Traffic Volumes

B

PM Peak Hour



NOT TO SCALE

WSP

Traffic Improvement Study
Sussex, NB

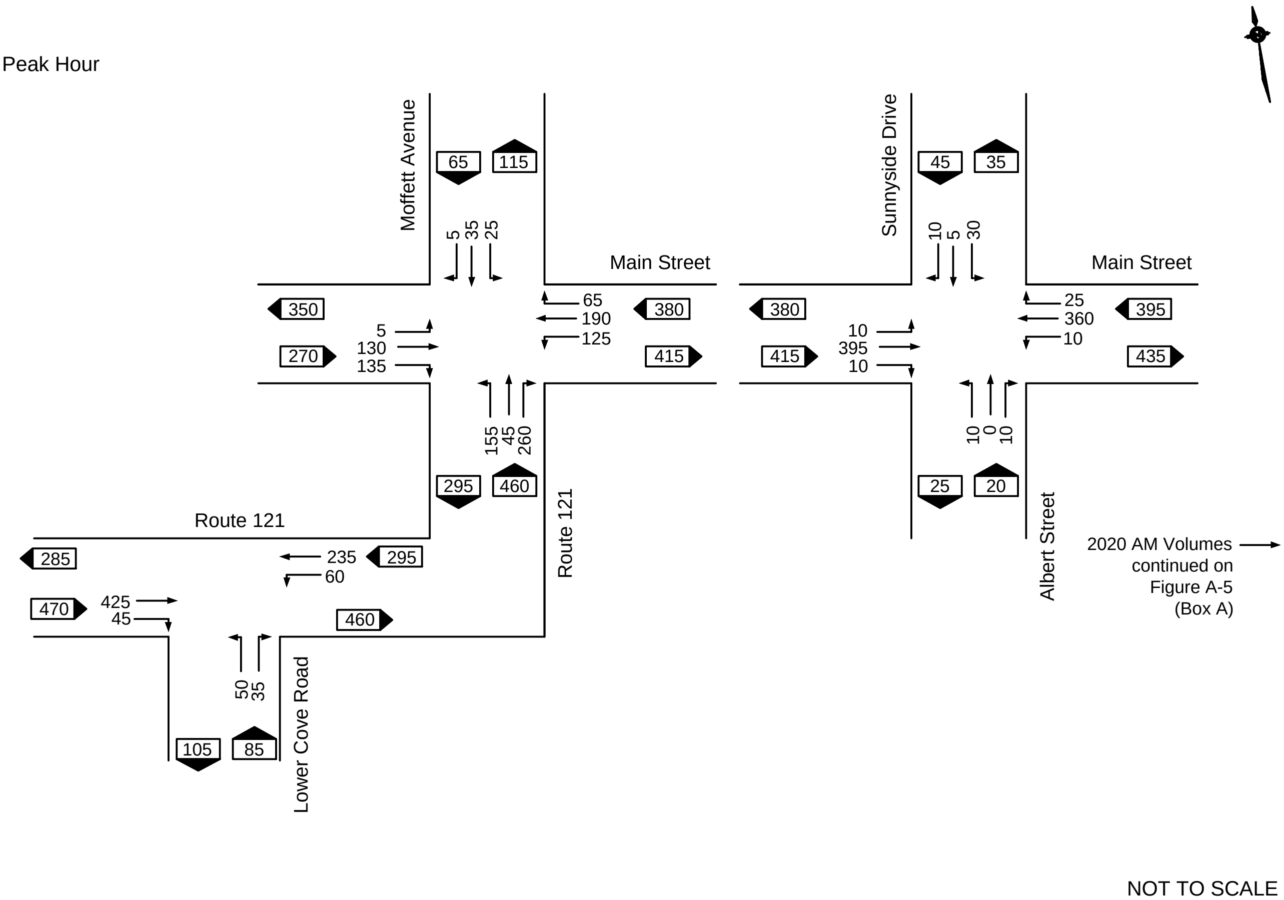
Figure A-3

Projected 2015 AM and PM Peak Hour Traffic Volumes

November 2015

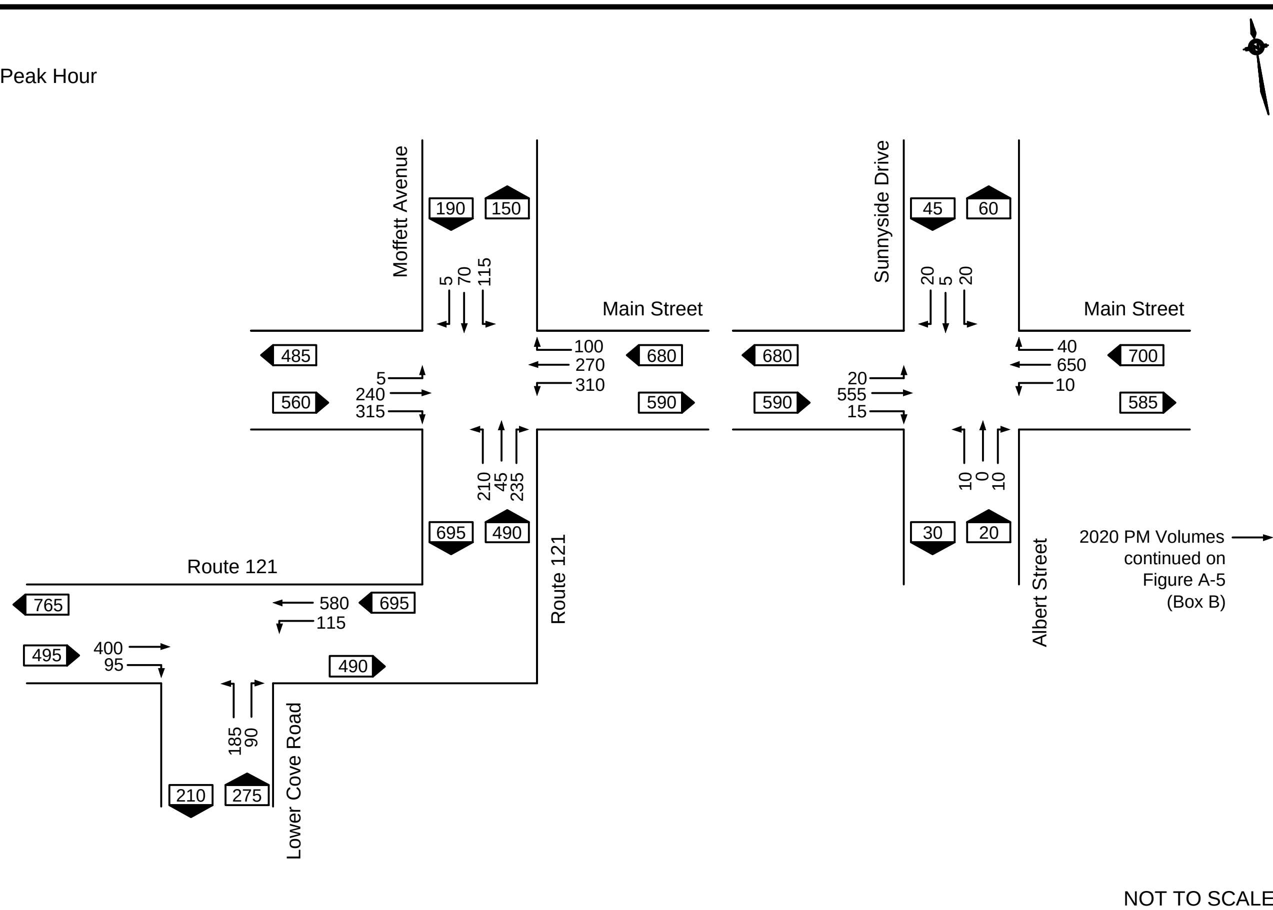
2020 AM Peak Hour
Traffic Volumes

A
AM Peak Hour



2020 PM Peak Hour
Traffic Volumes

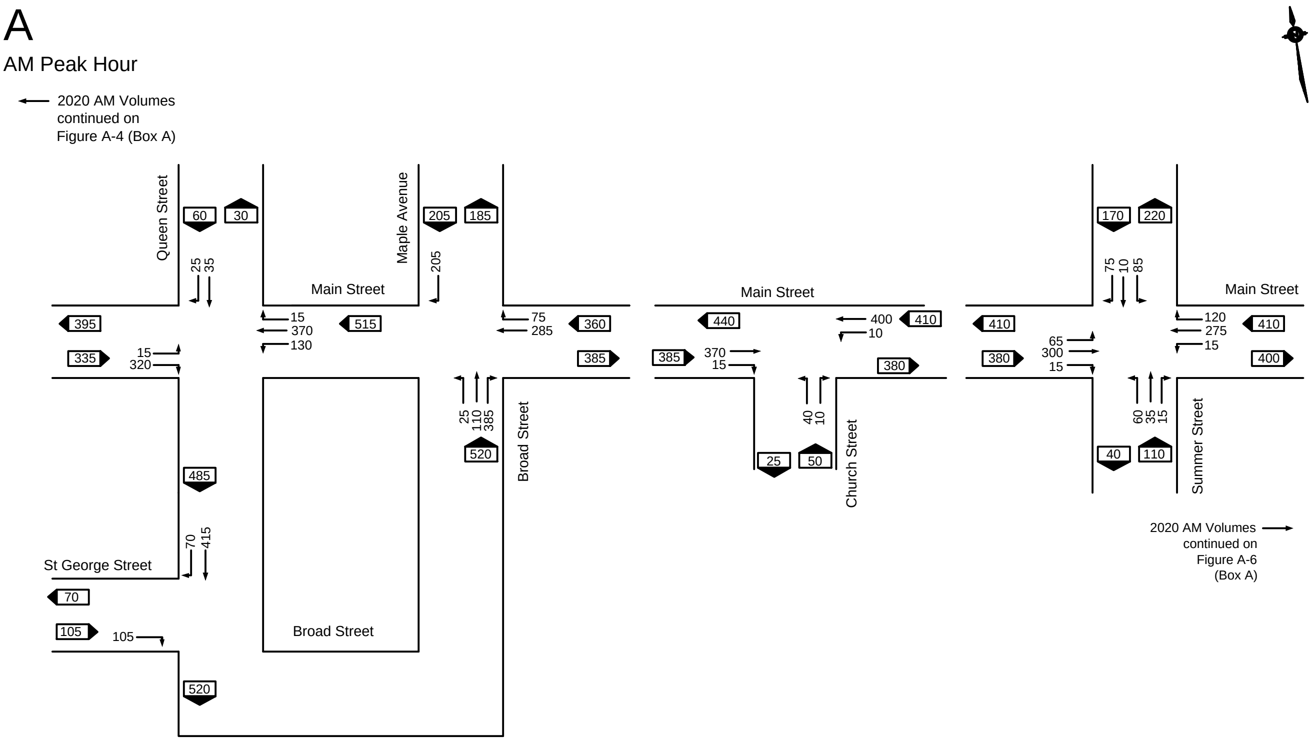
B
PM Peak Hour



WSP	Traffic Improvement Study Sussex, NB	Figure A-4
	Projected 2020 Weekday AM and PM Peak Hour Traffic Volumes	November 2015

2020 AM Peak Hour Traffic Volumes

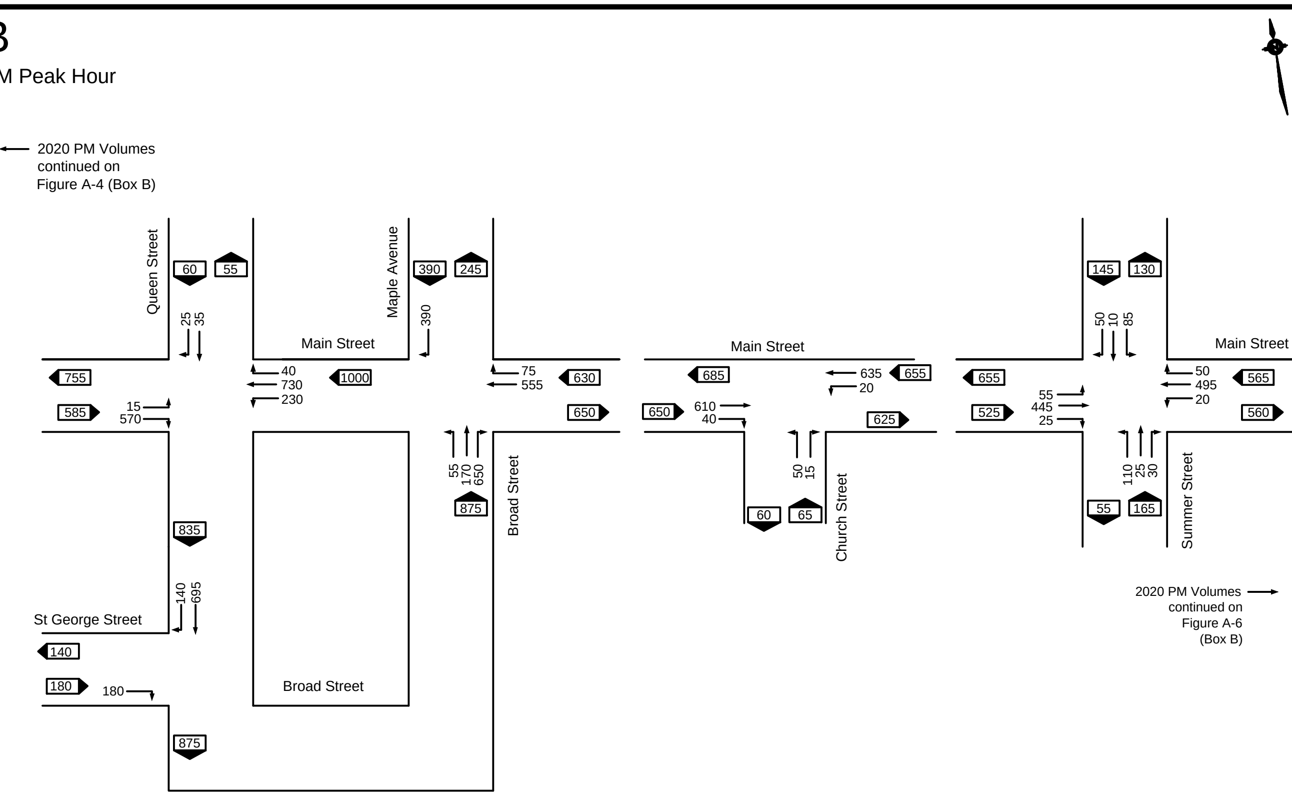
A
AM Peak Hour



NOT TO SCALE

2020 PM Peak Hour Traffic Volumes

B
PM Peak Hour



NOT TO SCALE

WSP

Traffic Improvement Study
Sussex, NB

Figure A-5

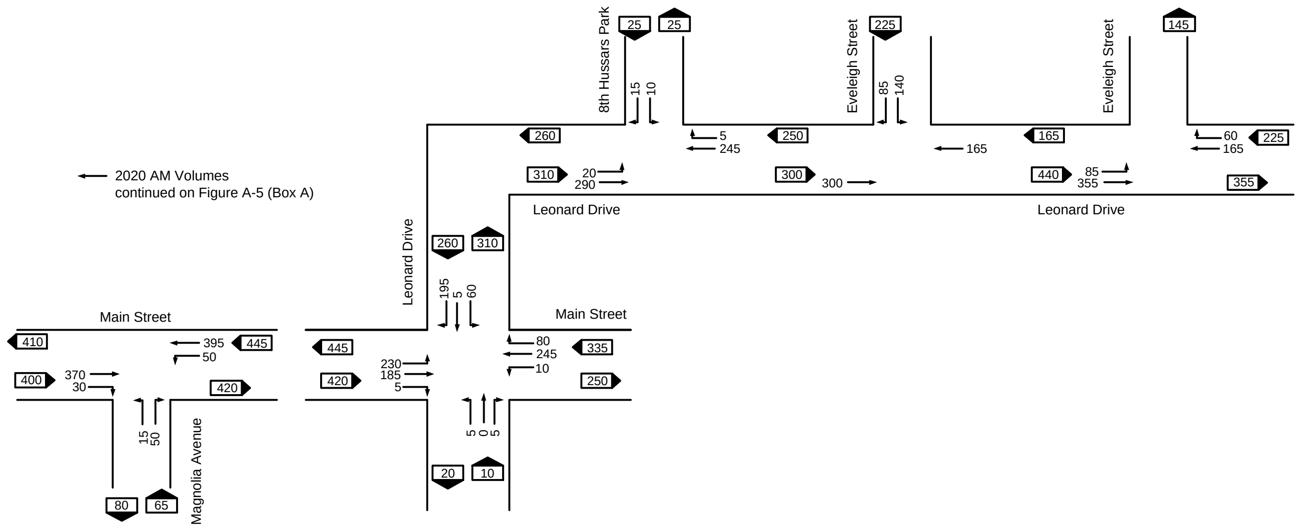
Projected 2020 AM and PM Peak Hour Traffic Volumes

November 2015

2020 AM Peak Hour Traffic Volumes

A

AM Peak Hour

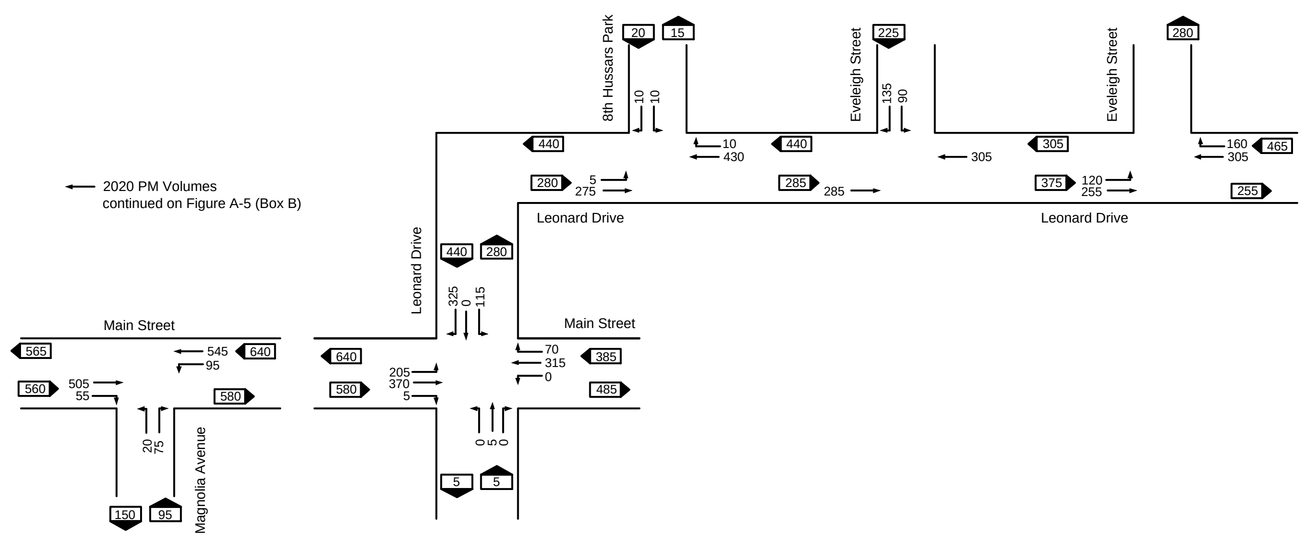


NOT TO SCALE

2020 PM Peak Hour Traffic Volumes

B

PM Peak Hour



NOT TO SCALE

WSP

Traffic Improvement Study
Sussex, NB

Figure A-6

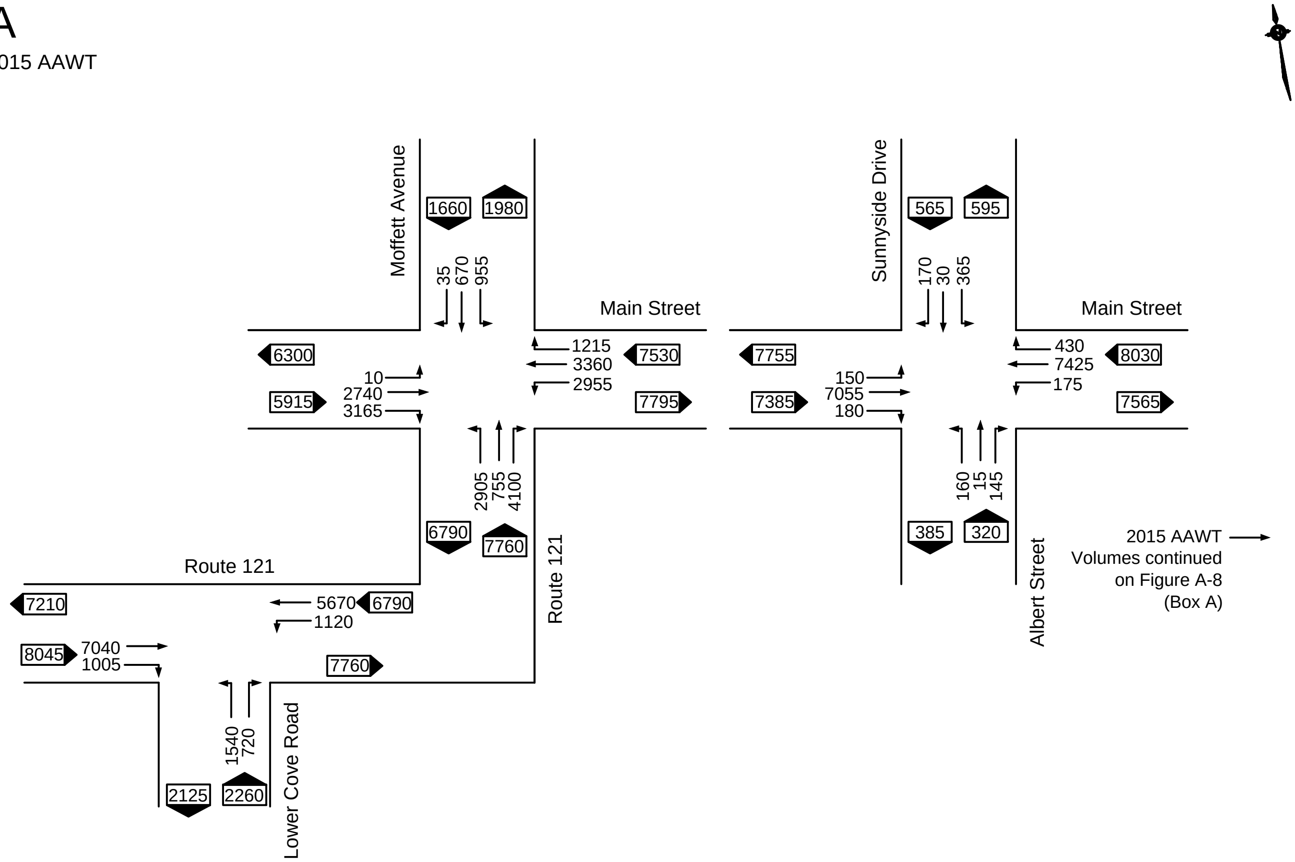
Projected 2020 AM and PM Peak Hour Traffic Volumes

November 2015

2015 Average Annual Weekday Traffic Volumes

A

2015 AAWT

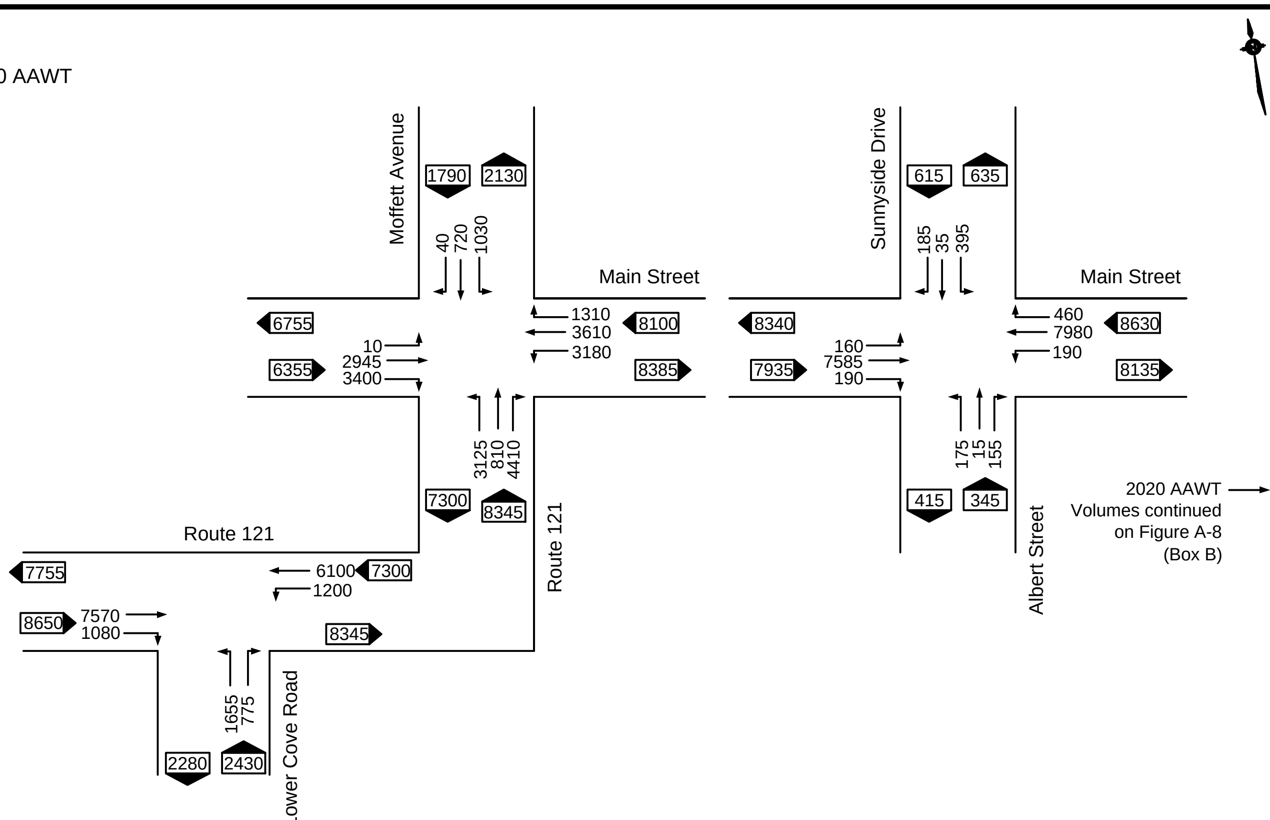


NOT TO SCALE

2020 Average Annual Weekday Traffic Volumes

B

2020 AAWT



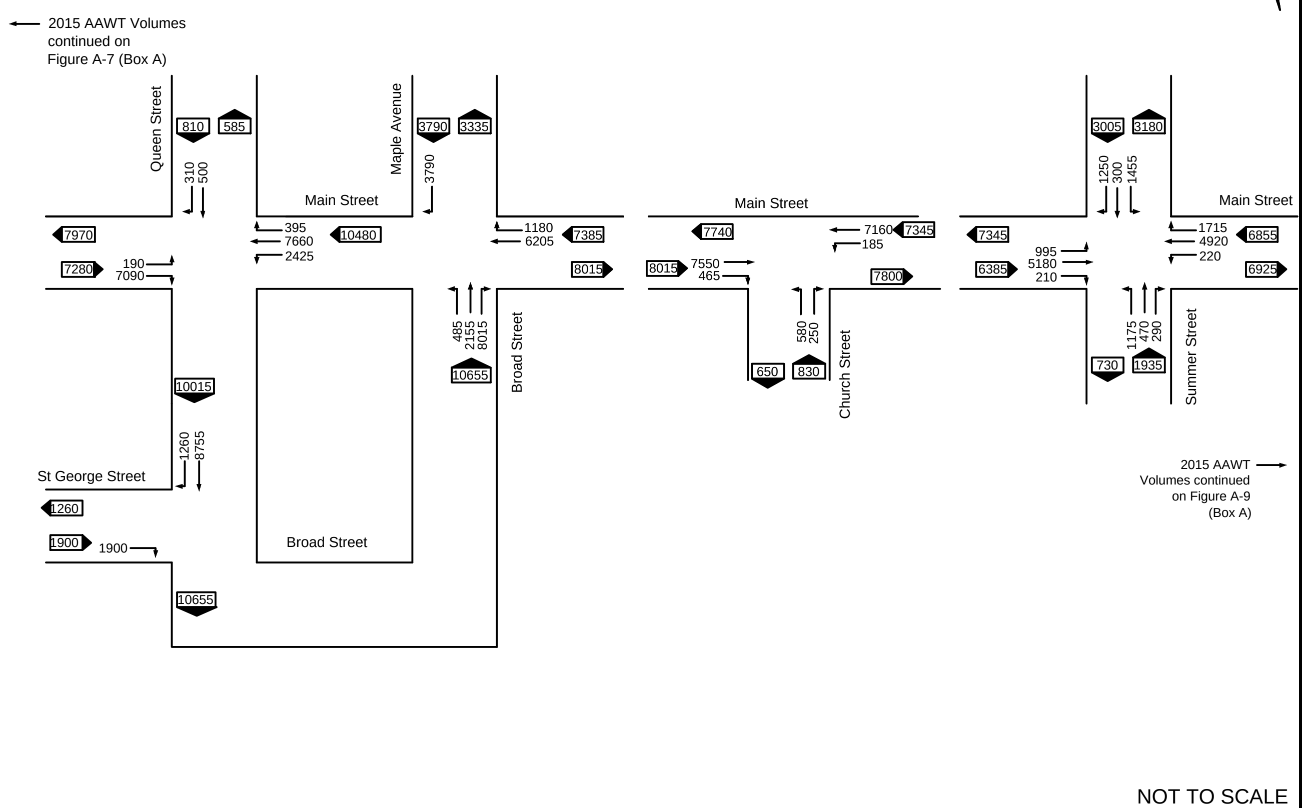
NOT TO SCALE

WSP	Traffic Improvement Study Sussex, NB	Figure A-7
	Projected 2015 and 2020 Average Annual Weekday Traffic (AAWT)	November 2015

2015 Average Annual Weekday Traffic Volumes

A

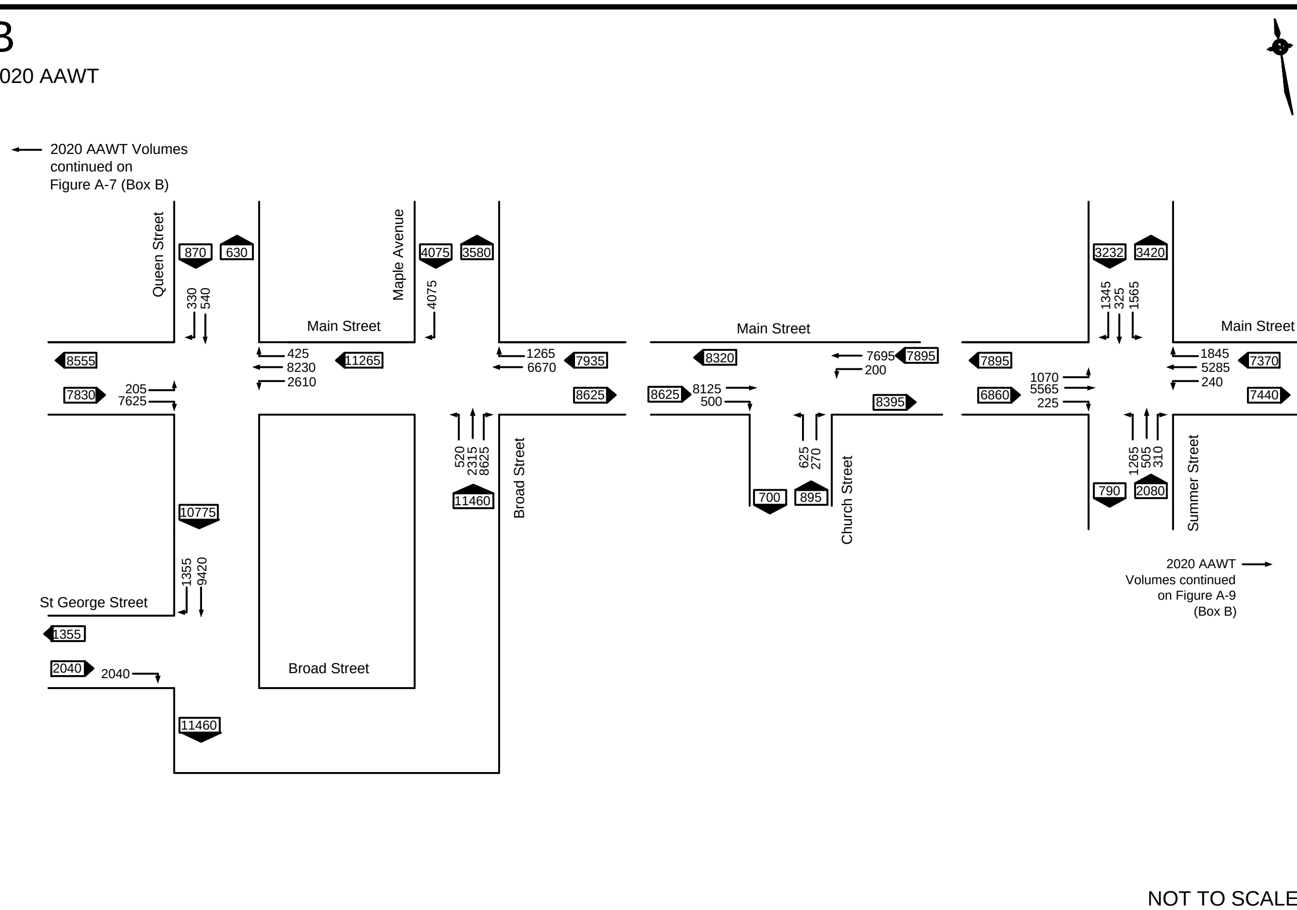
2015 AAWT



2020 Average Annual Weekday Traffic Volumes

B

2020 AAWT



WSP

Traffic Improvement Study
Sussex, NB

Figure A-8

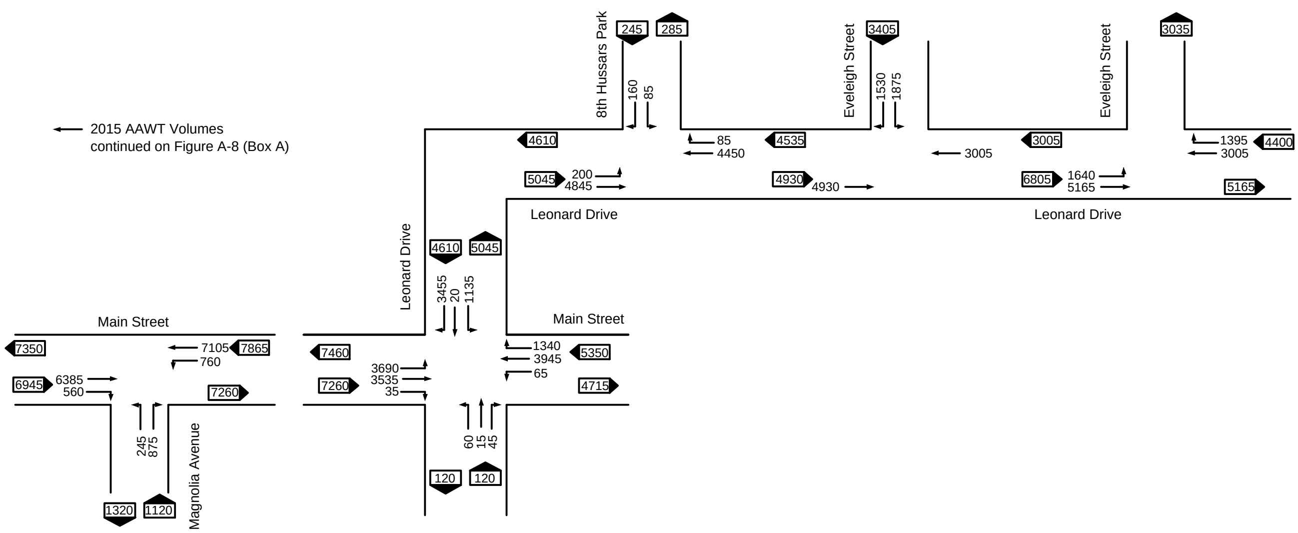
Projected 2015 and 2020 Average Annual Weekday Traffic (AAWT)

November 2015

2015 Average Annual Weekday Traffic Volumes

A

2015 AAWT

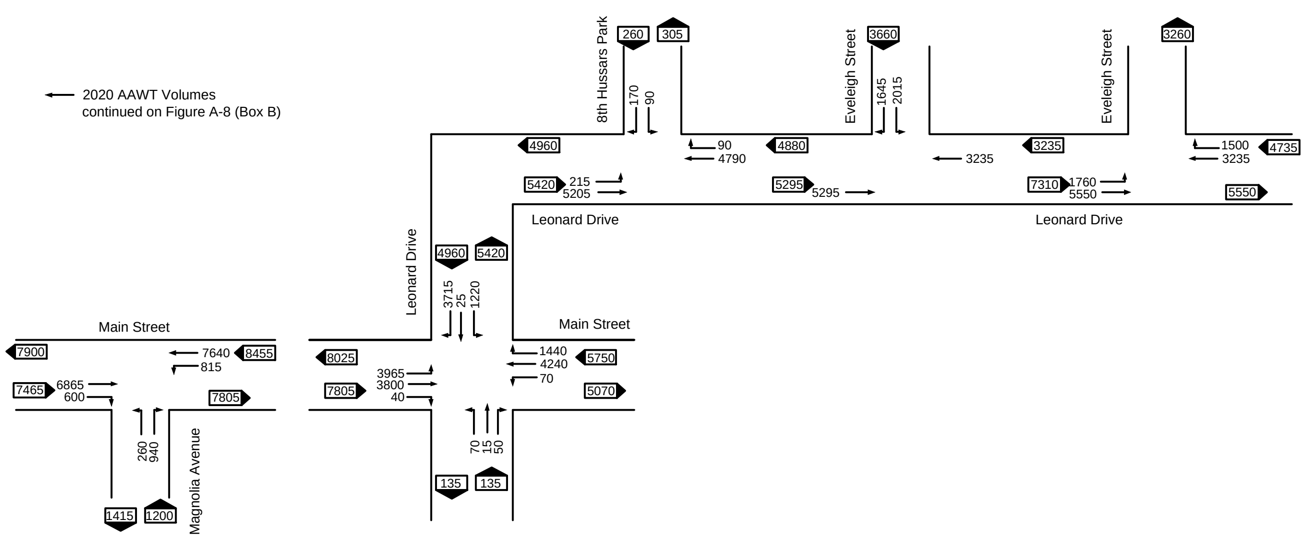


NOT TO SCALE

2020 Average Annual Weekday Traffic Volumes

B

2020 AAWT



NOT TO SCALE

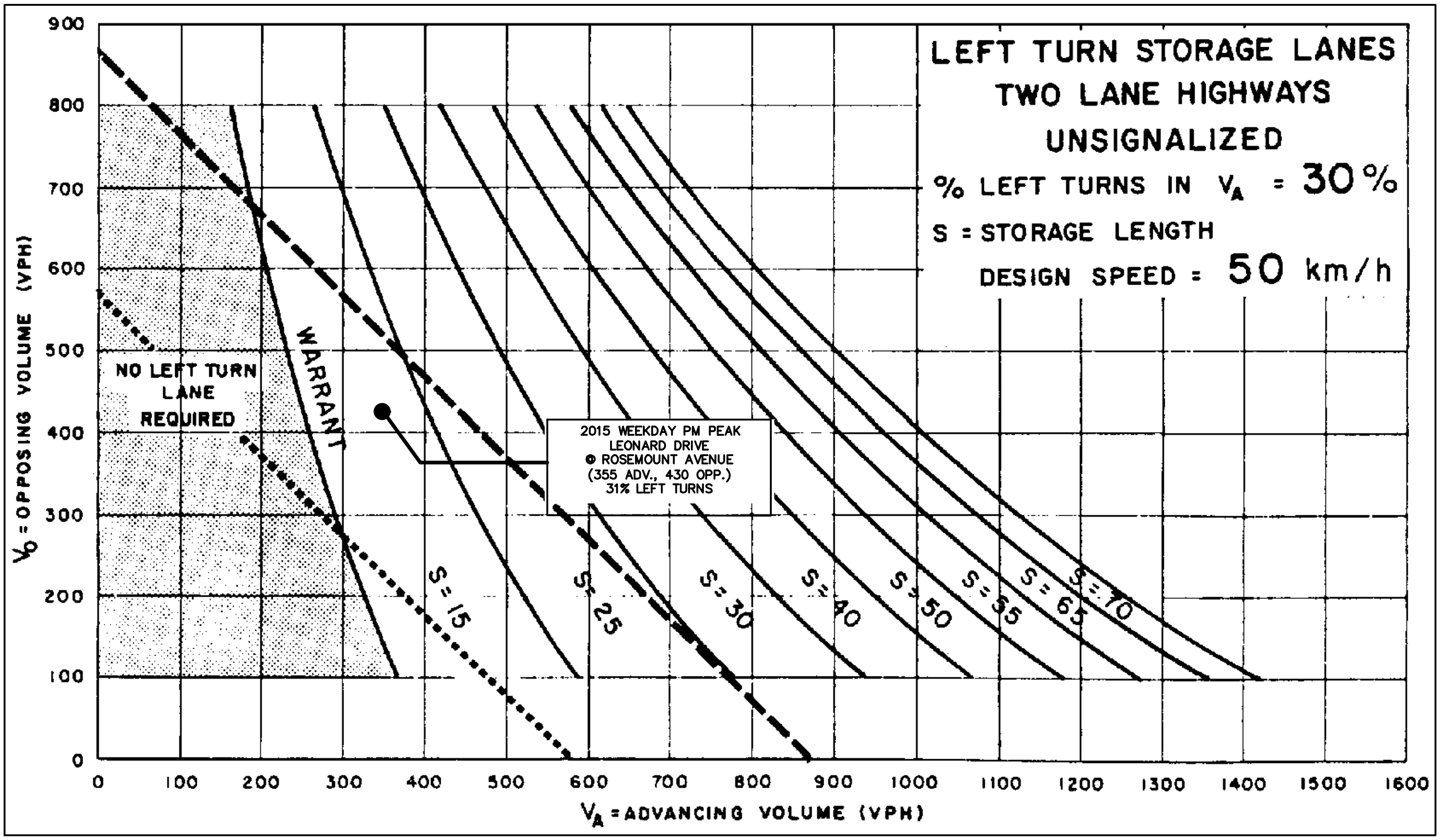
WSP

Traffic Improvement Study
Sussex, NB

Figure A-9

Projected 2015 and 2020 Average Annual Weekday Traffic Volumes (AAWT)

November 2015



WSP

Traffic Improvement Study
Sussex, NB

Figure A-10

Left Turn Lane Warrant: Leonard Drive @ Rosemount Avenue, Sussex, NB

November 2015

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table A-14 - Main Street @ Queen Street - Projected 2020 Traffic Volumes

Main Street (name)	Main Street	Direction (EW or NS)	EW	Date:	November 2015
Side Street (name)	Queen Street	Direction (EW or NS)	NS	City:	Sussex, NB

Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
Main Street	WB	1		1		1			
Main Street	EB	1				1			
Queen Street	NB								
Queen Street	SB				1				

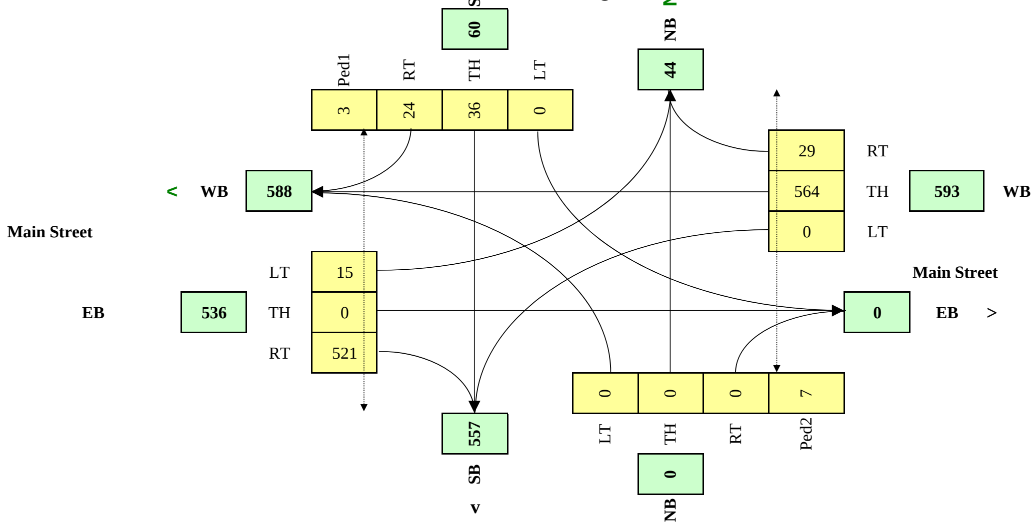
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Main Street	EW	50	2.0%	n	0.0
Queen Street	NS	50	2.0%	n	

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00	1	5	0	0
8:00 - 9:00	0	6	0	0
11:30 - 12:30	4	9	1	0
12:30 - 13:30	7	20	13	2
15:30 - 16:30	1	3	4	6
16:30 - 17:30	2	1	5	7
Total (6-hour peak)	**15**	**44**	**23**	**15**
Average (6-hour peak)	**3**	**7**	**4**	**3**

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	4,500
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB		
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT
7:00 - 8:00	0	0	0	0	20	15	0	280	10	10	0	330
8:00 - 9:00	0	0	0	0	35	20	0	360	25	15	0	315
11:30 - 12:30	0	0	0	0	50	35	0	740	35	25	0	720
12:30 - 13:30	0	0	0	0	40	30	0	645	30	10	0	595
15:30 - 16:30	0	0	0	0	40	25	0	730	40	15	0	575
16:30 - 17:30	0	0	0	0	30	20	0	630	35	15	0	590
Total (6-hour peak)	**0**	**0**	**0**	**0**	**215**	**145**	**0**	**3,385**	**175**	**90**	**0**	**3,125**
Average (6-hour peak)	**0**	**0**	**0**	**0**	**36**	**24**	**0**	**564**	**29**	**15**	**0**	**521**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$$

W =	49	40	9
		Veh	*Ped*
Not Warranted - Vs<75			

Appendix B

Intersection Performance Analysis

WSP

February 2016

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	425	45	60	235	50	35
Future Volume (vph)	425	45	60	235	50	35
Satd. Flow (prot)	1883	1601	1789	1883	1789	1601
Flt Permitted			0.497		0.950	
Satd. Flow (perm)	1883	1601	936	1883	1789	1601
Satd. Flow (RTOR)		49				38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	462	49	65	255	54	38
Turn Type	NA	Perm	Perm	NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4	8		2	2
Total Split (s)	60.0	60.0	60.0	60.0	30.0	30.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1
Act Effct Green (s)	27.8	27.8	27.8	27.8	7.0	7.0
Actuated g/C Ratio	0.73	0.73	0.73	0.73	0.18	0.18
v/c Ratio	0.34	0.04	0.10	0.19	0.17	0.12
Control Delay	5.9	2.2	5.3	5.0	16.0	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.9	2.2	5.3	5.0	16.0	7.2
LOS	A	A	A	A	B	A
Approach Delay	5.5			5.1	12.4	
Approach LOS	A			A	B	
Queue Length 50th (m)	17.1	0.0	2.0	8.3	4.1	0.0
Queue Length 95th (m)	35.2	3.0	6.4	18.1	9.4	4.9
Internal Link Dist (m)	597.2			315.6	371.6	
Turn Bay Length (m)		30.0	35.0			45.0
Base Capacity (vph)	1883	1601	936	1883	1158	1049
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	0.25	0.03	0.07	0.14	0.05	0.04

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 38.3
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.34
Intersection Signal Delay: 6.0 — Intersection LOS: A
Intersection Capacity Utilization 46.0% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Lower Cove Road & Route 121

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	130	135	125	190	65	155	45	260	25	35	5
Future Volume (vph)	5	130	135	125	190	65	155	45	260	25	35	5
Satd. Flow (prot)	0	3307	0	0	3430	0	1789	1642	0	1789	1851	0
Flt Permitted		0.945			0.753		0.673			0.560		
Satd. Flow (perm)	0	3128	0	0	2625	0	1268	1642	0	1055	1851	0
Satd. Flow (RTOR)		147			30			283			5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	293	0	0	414	0	168	332	0	27	43	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	28.0	28.0		10.0	38.0		12.0	42.0		10.0	40.0	
Total Lost Time (s)		6.1			6.1		3.0	6.1		3.0	6.1	
Act Effct Green (s)		17.3			17.3		48.2	41.7		44.2	34.1	
Actuated g/C Ratio		0.23			0.23		0.64	0.56		0.59	0.45	
v/c Ratio		0.35			0.66		0.19	0.32		0.04	0.05	
Control Delay		12.7			29.5		6.6	3.8		6.3	12.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		12.7			29.5		6.6	3.8		6.3	12.4	
LOS		B			C		A	A		A	B	
Approach Delay		12.7			29.5			4.7			10.0	
Approach LOS		B			C			A			B	
Queue Length 50th (m)		8.8			26.1		7.8	2.5		1.2	2.9	
Queue Length 95th (m)		18.1			39.8		19.1	18.8		4.5	9.3	
Internal Link Dist (m)		133.2			230.9			315.6			172.9	
Turn Bay Length (m)							15.0			20.0		
Base Capacity (vph)		1039			1139		878	1039		691	844	
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		0.28			0.36		0.19	0.32		0.04	0.05	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 55.1% ICU Level of Service B
Analysis Period (min) 15

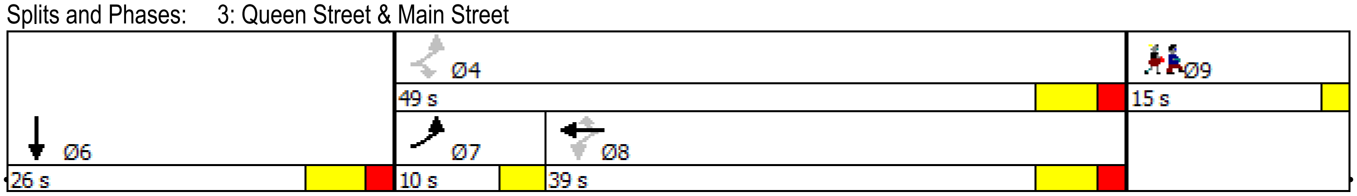
Splits and Phases: 2: Route 121/Moffett Avenue & Main Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	320	130	370	15	0	0	0	0	35	25
Future Volume (vph)	15	0	320	130	370	15	0	0	0	0	35	25
Satd. Flow (prot)	1789	0	1601	1789	1883	1601	0	0	0	0	1778	0
Flt Permitted	0.471			0.950								
Satd. Flow (perm)	884	0	1601	1789	1883	1552	0	0	0	0	1778	0
Satd. Flow (RTOR)			348	141		98					27	
Confl. Peds. (#/hr)	8					8						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	0	348	141	402	16	0	0	0	0	65	0
Turn Type	pm+pt		Perm	Perm	NA	Perm					NA	
Protected Phases	7				8						6	
Permitted Phases	4		4	8		8						
Total Split (s)	10.0		49.0	39.0	39.0	39.0					26.0	
Total Lost Time (s)	3.0		6.1	6.1	6.1	6.1					6.1	
Act Effct Green (s)	30.5		30.6	29.1	29.1	29.1					7.0	
Actuated g/C Ratio	0.75		0.75	0.71	0.71	0.71					0.17	
v/c Ratio	0.02		0.27	0.11	0.30	0.01					0.20	
Control Delay	3.1		1.3	2.3	7.2	0.0					14.0	
Queue Delay	0.0		0.0	0.0	0.0	0.0					0.0	
Total Delay	3.1		1.3	2.3	7.2	0.0					14.0	
LOS	A		A	A	A	A					B	
Approach Delay					5.7						14.0	
Approach LOS					A						B	
Queue Length 50th (m)	0.3		0.0	0.0	13.9	0.0					2.8	
Queue Length 95th (m)	1.7		6.9	7.4	47.4	0.0					11.6	
Internal Link Dist (m)		530.8			155.2			80.3			150.1	
Turn Bay Length (m)	25.0					45.0						
Base Capacity (vph)	828		1525	1481	1531	1281					939	
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	0.02		0.23	0.10	0.26	0.01					0.07	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 40.7
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.30
Intersection Signal Delay: 4.7 Intersection LOS: A
Intersection Capacity Utilization 46.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Queen Street & Main Street



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	15.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

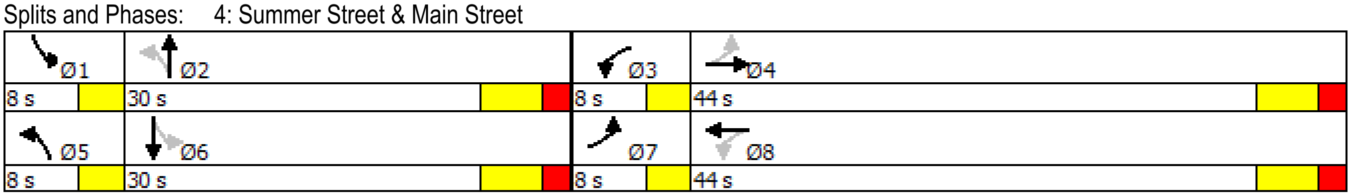
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	300	15	15	275	120	60	35	15	85	10	75
Future Volume (vph)	65	300	15	15	275	120	60	35	15	85	10	75
Satd. Flow (prot)	1789	1870	0	1789	1799	0	1789	1801	0	1789	1635	0
Flt Permitted	0.412			0.555			0.727			0.727		
Satd. Flow (perm)	776	1870	0	1045	1799	0	1369	1801	0	1369	1635	0
Satd. Flow (RTOR)		3			30			16			82	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	342	0	16	429	0	65	54	0	92	93	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	8.0	44.0		8.0	44.0		8.0	30.0		8.0	30.0	
Total Lost Time (s)	3.0	6.1		3.0	6.1		3.0	6.1		3.0	6.1	
Act Effct Green (s)	28.1	25.9		27.1	23.2		12.0	7.3		12.0	7.3	
Actuated g/C Ratio	0.61	0.56		0.59	0.50		0.26	0.16		0.26	0.16	
v/c Ratio	0.12	0.32		0.02	0.47		0.16	0.18		0.23	0.28	
Control Delay	6.1	10.5		5.7	14.0		14.4	18.9		15.0	10.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.1	10.5		5.7	14.0		14.4	18.9		15.0	10.7	
LOS	A	B		A	B		B	B		B	B	
Approach Delay		9.8			13.7			16.5			12.8	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	2.8	18.2		0.6	31.4		3.9	3.2		5.7	0.9	
Queue Length 95th (m)	7.5	47.0		2.6	59.0		12.6	12.4		16.5	11.9	
Internal Link Dist (m)		200.3			133.6			54.0			61.6	
Turn Bay Length (m)	30.0			40.0			10.0			15.0		
Base Capacity (vph)	596	1503		704	1452		406	1043		406	975	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.23		0.02	0.30		0.16	0.05		0.23	0.10	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 46
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 50.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: Summer Street & Main Street

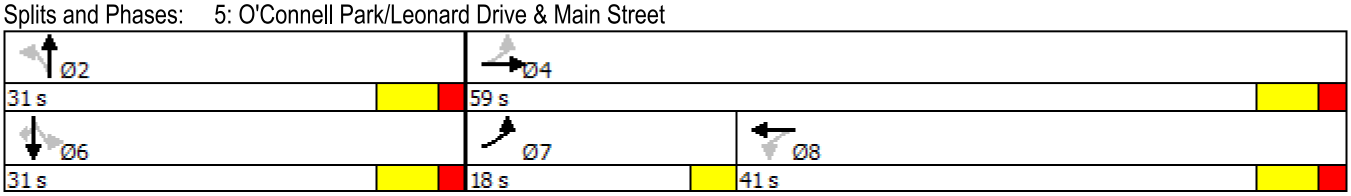


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	185	5	10	245	80	5	0	5	60	5	195
Future Volume (vph)	230	185	5	10	245	80	5	0	5	60	5	195
Satd. Flow (prot)	1789	1876	0	1789	1814	0	0	1713	0	0	1801	1601
Flt Permitted	0.375			0.629				0.823			0.734	
Satd. Flow (perm)	706	1876	0	1185	1814	0	0	1445	0	0	1382	1601
Satd. Flow (RTOR)		2			21			74				212
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	250	206	0	11	353	0	0	10	0	0	70	212
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		6
Total Split (s)	18.0	59.0		41.0	41.0		31.0	31.0		31.0	31.0	31.0
Total Lost Time (s)	3.0	6.1		6.1	6.1			6.1			6.1	6.1
Act Effct Green (s)	31.9	28.7		13.9	13.9			8.0			8.0	8.0
Actuated g/C Ratio	0.65	0.58		0.28	0.28			0.16			0.16	0.16
v/c Ratio	0.35	0.19		0.03	0.67			0.03			0.31	0.48
Control Delay	5.1	5.3		14.1	22.3			0.2			24.6	8.3
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	5.1	5.3		14.1	22.3			0.2			24.6	8.3
LOS	A	A		B	C			A			C	A
Approach Delay		5.2			22.1			0.2			12.3	
Approach LOS		A			C			A			B	
Queue Length 50th (m)	6.7	6.8		0.7	24.9			0.0			5.4	0.0
Queue Length 95th (m)	16.1	15.8		3.7	53.6			0.0			17.1	15.1
Internal Link Dist (m)		206.5			259.3			15.8			105.4	
Turn Bay Length (m)	25.0			25.0								8.0
Base Capacity (vph)	797	1800		867	1333			789			722	937
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.31	0.11		0.01	0.26			0.01			0.10	0.23

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 49.4
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 50.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: O'Connell Park/Leonard Drive & Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	395	10	10	360	25	10	0	10	30	5	10
Future Volume (Veh/h)	10	395	10	10	360	25	10	0	10	30	5	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	429	11	11	391	27	11	0	11	33	5	11
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	418			440			883	896	434	888	888	404
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	418			440			883	896	434	888	888	404
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			96	100	98	87	98	98
cM capacity (veh/h)	1141			1120			254	274	622	256	277	646

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	11	440	11	418	22	33	16
Volume Left	11	0	11	0	11	33	0
Volume Right	0	11	0	27	11	0	11
cSH	1141	1700	1120	1700	361	256	456
Volume to Capacity	0.01	0.26	0.01	0.25	0.06	0.13	0.04
Queue Length 95th (m)	0.2	0.0	0.2	0.0	1.5	3.3	0.8
Control Delay (s)	8.2	0.0	8.2	0.0	15.6	21.2	13.2
Lane LOS	A		A		C	C	B
Approach Delay (s)	0.2		0.2		15.6	18.6	
Approach LOS					C	C	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	105	0	0	415	70
Future Volume (Veh/h)	0	105	0	0	415	70
Sign Control	Yield			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)	0	114	0	0	451	76
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					104	
pX, platoon unblocked						
vC, conflicting volume	489	264	527			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	489	264	527			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	84	100			
cM capacity (veh/h)	508	735	1036			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	114	301	226
Volume Left	0	0	0
Volume Right	114	0	76
cSH	735	1700	1700
Volume to Capacity	0.16	0.18	0.13
Queue Length 95th (m)	4.2	0.0	0.0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.8	0.0	
Approach LOS	B		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	370	15	10	400	40	10
Future Volume (Veh/h)	370	15	10	400	40	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	402	16	11	435	43	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	315			224		
pX, platoon unblocked					0.98	
vC, conflicting volume			418		867	410
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			418		852	410
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		87	98
cM capacity (veh/h)			1141		319	642

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	418	446	54
Volume Left	0	11	43
Volume Right	16	0	11
cSH	1700	1141	356
Volume to Capacity	0.25	0.01	0.15
Queue Length 95th (m)	0.0	0.2	4.0
Control Delay (s)	0.0	0.3	16.9
Lane LOS		A	C
Approach Delay (s)	0.0	0.3	16.9
Approach LOS			C

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	370	30	50	395	15	50
Future Volume (Veh/h)	370	30	50	395	15	50
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	402	33	54	429	16	54
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (m)	158			230		
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			435		939	402
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			345		891	309
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		94	92
cM capacity (veh/h)			1119		274	674

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	402	33	54	429	70
Volume Left	0	0	54	0	16
Volume Right	0	33	0	0	54
cSH	1700	1700	1119	1700	874
Volume to Capacity	0.24	0.02	0.05	0.25	0.08
Queue Length 95th (m)	0.0	0.0	1.2	0.0	2.0
Control Delay (s)	0.0	0.0	8.4	0.0	12.7
Lane LOS			A		B
Approach Delay (s)	0.0		0.9		12.7
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	290	245	5	10	15
Future Volume (Veh/h)	20	290	245	5	10	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	315	266	5	11	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		130				
pX, platoon unblocked					0.97	
vC, conflicting volume	271				628	268
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	271				603	268
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	98
cM capacity (veh/h)	1292				442	770

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	337	271	27
Volume Left	22	0	11
Volume Right	0	5	16
cSH	1292	1700	591
Volume to Capacity	0.02	0.16	0.05
Queue Length 95th (m)	0.4	0.0	1.1
Control Delay (s)	0.7	0.0	11.4
Lane LOS	A		B
Approach Delay (s)	0.7	0.0	11.4
Approach LOS			B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	41.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↰	↱
Traffic Volume (veh/h)	0	300	165	0	140	85
Future Volume (Veh/h)	0	300	165	0	140	85
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	326	179	0	152	92
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	179				505	179
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	179				505	179
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				71	89
cM capacity (veh/h)	1397				527	864

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	326	179	152	92
Volume Left	0	0	152	0
Volume Right	0	0	0	92
cSH	1700	1700	527	864
Volume to Capacity	0.19	0.11	0.29	0.11
Queue Length 95th (m)	0.0	0.0	9.0	2.7
Control Delay (s)	0.0	0.0	14.6	9.7
Lane LOS			B	A
Approach Delay (s)	0.0	0.0	12.7	
Approach LOS			B	

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	30.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	85	355	165	60	0	0
Future Volume (Veh/h)	85	355	165	60	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	92	386	179	65	0	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	244				782	212
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	244				782	212
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				100	100
cM capacity (veh/h)	1322				338	829

Direction, Lane #	EB 1	WB 1
Volume Total	478	244
Volume Left	92	0
Volume Right	0	65
cSH	1322	1700
Volume to Capacity	0.07	0.14
Queue Length 95th (m)	1.7	0.0
Control Delay (s)	2.1	0.0
Lane LOS	A	
Approach Delay (s)	2.1	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	400	95	115	580	185	90
Future Volume (vph)	400	95	115	580	185	90
Satd. Flow (prot)	1883	1601	1789	1883	1789	1601
Flt Permitted			0.482		0.950	
Satd. Flow (perm)	1883	1601	908	1883	1789	1601
Satd. Flow (RTOR)		103				98
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	435	103	125	630	201	98
Turn Type	NA	Perm	Perm	NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases		4	8		2	2
Total Split (s)	60.0	60.0	60.0	60.0	30.0	30.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.1	6.1
Act Effct Green (s)	25.6	25.6	25.6	25.6	11.4	11.4
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.23	0.23
v/c Ratio	0.45	0.12	0.27	0.65	0.49	0.22
Control Delay	9.6	2.1	9.0	12.8	22.2	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	2.1	9.0	12.8	22.2	6.4
LOS	A	A	A	B	C	A
Approach Delay	8.1			12.2	17.0	
Approach LOS	A			B	B	
Queue Length 50th (m)	20.2	0.0	5.2	33.9	13.4	0.0
Queue Length 95th (m)	45.8	5.3	15.7	75.3	38.5	9.7
Internal Link Dist (m)	597.2			315.6	371.6	
Turn Bay Length (m)		30.0	35.0			45.0
Base Capacity (vph)	1806	1539	871	1806	893	848
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	0.24	0.07	0.14	0.35	0.23	0.12

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 49.7
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 11.7 — Intersection LOS: B
Intersection Capacity Utilization 52.9% — ICU Level of Service A
Analysis Period (min) 15

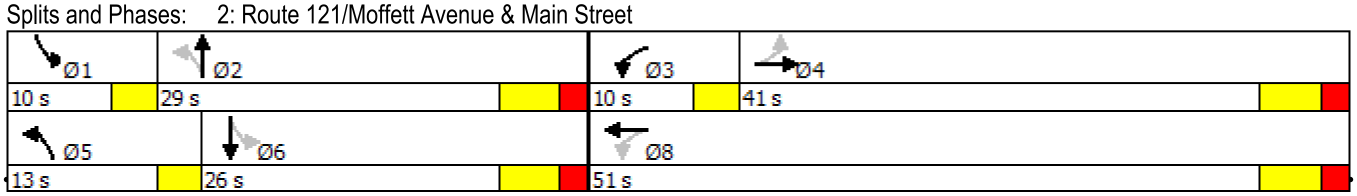
Splits and Phases: 1: Lower Cove Road & Route 121

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	240	315	310	270	100	210	45	235	115	70	5
Future Volume (vph)	5	240	315	310	270	100	210	45	235	115	70	5
Satd. Flow (prot)	0	3278	0	0	3423	0	1789	1646	0	1789	1866	0
Flt Permitted		0.949			0.606		0.489			0.588		
Satd. Flow (perm)	0	3111	0	0	2121	0	921	1646	0	1107	1866	0
Satd. Flow (RTOR)		342			31			255			3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	608	0	0	739	0	228	304	0	125	81	0
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	41.0	41.0		10.0	51.0		13.0	29.0		10.0	26.0	
Total Lost Time (s)		6.1			6.1		3.0	6.1		3.0	6.1	
Act Effct Green (s)		29.4			29.4		21.8	11.0		16.8	8.8	
Actuated g/C Ratio		0.48			0.48		0.36	0.18		0.27	0.14	
v/c Ratio		0.36			0.87dl		0.48	0.60		0.32	0.30	
Control Delay		5.0			17.1		19.9	12.2		18.3	30.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		5.0			17.1		19.9	12.2		18.3	30.0	
LOS		A			B		B	B		B	C	
Approach Delay		5.0			17.1			15.5			22.9	
Approach LOS		A			B			B			C	
Queue Length 50th (m)		8.8			32.7		17.4	4.8		9.0	8.2	
Queue Length 95th (m)		18.8			57.7		44.5	28.7		25.6	23.2	
Internal Link Dist (m)		133.2			230.9			315.6			172.9	
Turn Bay Length (m)							15.0			20.0		
Base Capacity (vph)		2127			1581		490	825		389	666	
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		0.29			0.47		0.47	0.37		0.32	0.12	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 61.1
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 13.7 Intersection LOS: B
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 2: Route 121/Moffett Avenue & Main Street

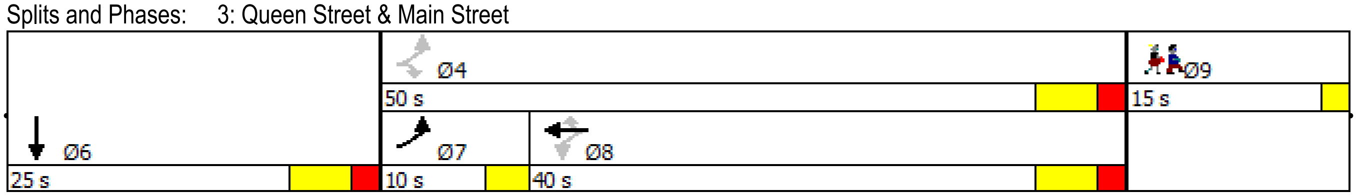


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	0	570	230	730	40	0	0	0	0	35	25
Future Volume (vph)	15	0	570	230	730	40	0	0	0	0	35	25
Satd. Flow (prot)	1789	0	1601	1789	1883	1601	0	0	0	0	1761	0
Flt Permitted	0.264			0.950								
Satd. Flow (perm)	497	0	1575	1779	1883	1558	0	0	0	0	1761	0
Satd. Flow (RTOR)			620	223		98					27	
Confl. Peds. (#/hr)	5		7	7		5	1		2	2		1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	0	620	250	793	43	0	0	0	0	65	0
Turn Type	pm+pt		Perm	Perm	NA	Perm					NA	
Protected Phases	7				8						6	
Permitted Phases	4		4	8		8						
Total Split (s)	10.0		50.0	40.0	40.0	40.0					25.0	
Total Lost Time (s)	3.0		6.1	6.1	6.1	6.1					6.1	
Act Effct Green (s)	50.3		49.9	48.0	48.0	48.0					7.0	
Actuated g/C Ratio	0.82		0.82	0.78	0.78	0.78					0.11	
v/c Ratio	0.03		0.44	0.17	0.54	0.03					0.29	
Control Delay	2.5		1.5	1.8	8.9	0.3					20.8	
Queue Delay	0.0		0.0	0.0	0.0	0.0					0.0	
Total Delay	2.5		1.5	1.8	8.9	0.3					20.8	
LOS	A		A	A	A	A					C	
Approach Delay					6.9						20.8	
Approach LOS					A						C	
Queue Length 50th (m)	0.4		0.0	0.8	37.9	0.0					4.5	
Queue Length 95th (m)	1.6		8.0	10.5	#138.4	0.7					13.6	
Internal Link Dist (m)		530.8			155.2			80.3			150.1	
Turn Bay Length (m)	25.0					45.0						
Base Capacity (vph)	557		1401	1443	1477	1243					566	
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	0.03		0.44	0.17	0.54	0.03					0.11	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 61.2
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.54
Intersection Signal Delay: 5.5 Intersection LOS: A
Intersection Capacity Utilization 68.2% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Queen Street & Main Street



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	
Peak Hour Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Total Split (s)	15.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (m)	
Queue Length 95th (m)	
Internal Link Dist (m)	
Turn Bay Length (m)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

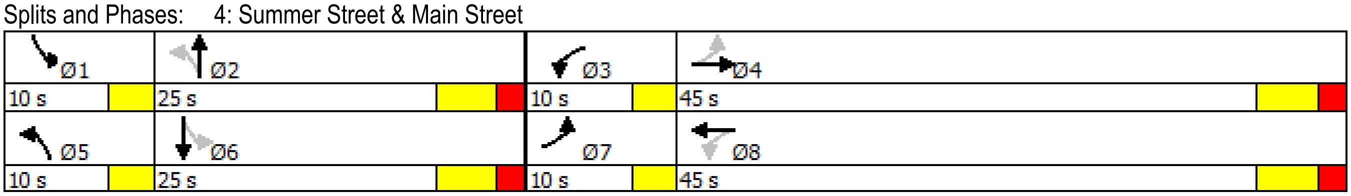
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	445	25	20	495	50	110	25	30	85	10	50
Future Volume (vph)	55	445	25	20	495	50	110	25	30	85	10	50
Satd. Flow (prot)	1789	1868	0	1789	1857	0	1789	1727	0	1789	1648	0
Flt Permitted	0.304			0.411								
Satd. Flow (perm)	573	1868	0	774	1857	0	1883	1727	0	1883	1648	0
Satd. Flow (RTOR)		4			7			33			54	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	60	511	0	22	592	0	120	60	0	92	65	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Total Split (s)	10.0	45.0		10.0	45.0		10.0	25.0		10.0	25.0	
Total Lost Time (s)	3.0	6.1		3.0	6.1		3.0	6.1		3.0	6.1	
Act Effct Green (s)	38.8	35.4		38.3	33.6		13.2	7.4		13.2	7.4	
Actuated g/C Ratio	0.67	0.61		0.66	0.58		0.23	0.13		0.23	0.13	
v/c Ratio	0.11	0.45		0.03	0.55		0.29	0.24		0.22	0.25	
Control Delay	5.6	12.7		5.4	15.7		21.7	20.6		20.9	15.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.6	12.7		5.4	15.7		21.7	20.6		20.9	15.2	
LOS	A	B		A	B		C	C		C	B	
Approach Delay		11.9			15.3			21.4			18.5	
Approach LOS		B			B			C			B	
Queue Length 50th (m)	2.6	33.5		0.9	59.1		10.5	3.0		7.9	1.2	
Queue Length 95th (m)	6.8	80.9		3.3	99.2		26.8	14.3		21.5	12.3	
Internal Link Dist (m)		200.3			133.6			54.0			61.6	
Turn Bay Length (m)	30.0			40.0			10.0			15.0		
Base Capacity (vph)	553	1350		654	1343		419	663		419	647	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.11	0.38		0.03	0.44		0.29	0.09		0.22	0.10	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 57.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 15.1 Intersection LOS: B
Intersection Capacity Utilization 61.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: Summer Street & Main Street

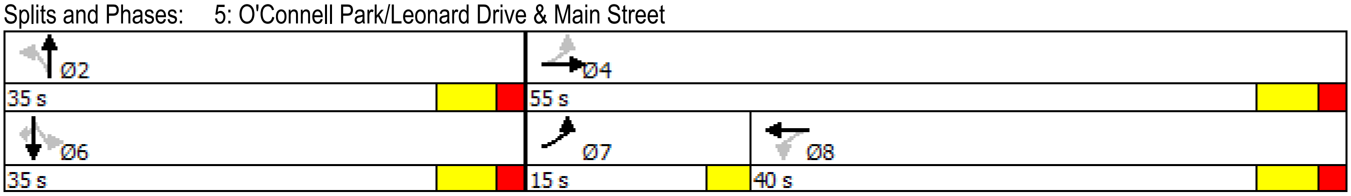


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	370	5	0	315	70	0	5	0	115	0	325
Future Volume (vph)	205	370	5	0	315	70	0	5	0	115	0	325
Satd. Flow (prot)	1789	1880	0	1883	1833	0	0	1883	0	0	1789	1601
Flt Permitted	0.314										0.754	
Satd. Flow (perm)	591	1880	0	1883	1833	0	0	1883	0	0	1420	1601
Satd. Flow (RTOR)		1			14							342
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	223	407	0	0	418	0	0	5	0	0	125	353
Turn Type	pm+pt	NA		Perm	NA			NA		Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		6
Total Split (s)	15.0	55.0		40.0	40.0		35.0	35.0		35.0	35.0	35.0
Total Lost Time (s)	3.0	6.1		6.1	6.1			6.1			6.1	6.1
Act Effct Green (s)	34.5	31.2			17.5			11.3			11.3	11.3
Actuated g/C Ratio	0.62	0.56			0.32			0.20			0.20	0.20
v/c Ratio	0.37	0.38			0.71			0.01			0.43	0.59
Control Delay	6.8	8.2			24.1			20.2			26.2	7.9
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	6.8	8.2			24.1			20.2			26.2	7.9
LOS	A	A			C			C			C	A
Approach Delay		7.7			24.1			20.2			12.7	
Approach LOS		A			C			C			B	
Queue Length 50th (m)	7.7	19.0			34.9			0.4			10.8	0.9
Queue Length 95th (m)	20.4	43.4			70.8			3.0			28.6	19.9
Internal Link Dist (m)		206.5			259.3			15.8			105.4	
Turn Bay Length (m)	25.0											8.0
Base Capacity (vph)	641	1634			1186			1034			779	1033
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	0.35	0.25			0.35			0.00			0.16	0.34

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 55.3
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 13.8 Intersection LOS: B
Intersection Capacity Utilization 60.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: O'Connell Park/Leonard Drive & Main Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	555	15	10	650	40	10	0	10	20	5	20
Future Volume (Veh/h)	20	555	15	10	650	40	10	0	10	20	5	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	603	16	11	707	43	11	0	11	22	5	22
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	750			619			1408	1427	611	1408	1414	728
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	750			619			1408	1427	611	1408	1414	728
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			89	100	98	80	96	95
cM capacity (veh/h)	859			961			104	130	494	110	133	423

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	22	619	11	750	22	22	27
Volume Left	22	0	11	0	11	22	0
Volume Right	0	16	0	43	11	0	22
cSH	859	1700	961	1700	172	110	301
Volume to Capacity	0.03	0.36	0.01	0.44	0.13	0.20	0.09
Queue Length 95th (m)	0.6	0.0	0.3	0.0	3.3	5.3	2.2
Control Delay (s)	9.3	0.0	8.8	0.0	29.0	45.5	18.1
Lane LOS	A		A		D	E	C
Approach Delay (s)	0.3		0.1		29.0	30.4	
Approach LOS					D	D	

Intersection Summary

Average Delay	1.7		
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	180	0	0	695	140
Future Volume (Veh/h)	0	180	0	0	695	140
Sign Control	Yield			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)	0	196	0	0	755	152
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)					104	
pX, platoon unblocked						
vC, conflicting volume	831	454	907			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	831	454	907			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	65	100			
cM capacity (veh/h)	308	554	746			

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	196	503	404
Volume Left	0	0	0
Volume Right	196	0	152
cSH	554	1700	1700
Volume to Capacity	0.35	0.30	0.24
Queue Length 95th (m)	12.1	0.0	0.0
Control Delay (s)	15.0	0.0	0.0
Lane LOS	C		
Approach Delay (s)	15.0	0.0	
Approach LOS	C		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	610	40	20	635	50	15
Future Volume (Veh/h)	610	40	20	635	50	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	663	43	22	690	54	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	315			224		
pX, platoon unblocked					0.78	
vC, conflicting volume			706		1418	684
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			706		1395	684
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		54	96
cM capacity (veh/h)			892		118	448

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	706	712	70
Volume Left	0	22	54
Volume Right	43	0	16
cSH	1700	892	142
Volume to Capacity	0.42	0.02	0.49
Queue Length 95th (m)	0.0	0.6	17.7
Control Delay (s)	0.0	0.6	52.9
Lane LOS		A	F
Approach Delay (s)	0.0	0.6	52.9
Approach LOS			F

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	505	55	95	545	20	75
Future Volume (Veh/h)	505	55	95	545	20	75
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	549	60	103	592	22	82
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (m)	158			230		
pX, platoon unblocked			0.84		0.88	0.84
vC, conflicting volume			609		1347	549
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			442		1149	371
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		87	86
cM capacity (veh/h)			942		171	568

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	549	60	103	592	104
Volume Left	0	0	103	0	22
Volume Right	0	60	0	0	82
cSH	1700	1700	942	1700	721
Volume to Capacity	0.32	0.04	0.11	0.35	0.14
Queue Length 95th (m)	0.0	0.0	2.8	0.0	3.8
Control Delay (s)	0.0	0.0	9.3	0.0	15.9
Lane LOS			A		C
Approach Delay (s)	0.0		1.4		15.9
Approach LOS					C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	275	430	10	10	10
Future Volume (Veh/h)	5	275	430	10	10	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	299	467	11	11	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		130				
pX, platoon unblocked					0.97	
vC, conflicting volume	478				782	472
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	478				763	472
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	98
cM capacity (veh/h)	1084				361	592

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	304	478	22
Volume Left	5	0	11
Volume Right	0	11	11
cSH	1084	1700	449
Volume to Capacity	0.00	0.28	0.05
Queue Length 95th (m)	0.1	0.0	1.2
Control Delay (s)	0.2	0.0	13.4
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	13.4
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	285	305	0	90	135
Future Volume (Veh/h)	0	285	305	0	90	135
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	310	332	0	98	147
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	332				642	332
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	332				642	332
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				78	79
cM capacity (veh/h)	1227				438	710

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	310	332	98	147
Volume Left	0	0	98	0
Volume Right	0	0	0	147
cSH	1700	1700	438	710
Volume to Capacity	0.18	0.20	0.22	0.21
Queue Length 95th (m)	0.0	0.0	6.4	5.9
Control Delay (s)	0.0	0.0	15.6	11.4
Lane LOS			C	B
Approach Delay (s)	0.0	0.0	13.1	
Approach LOS			B	

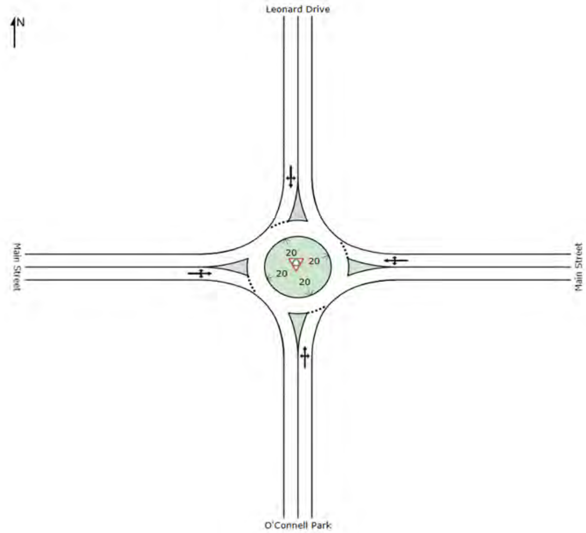
Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

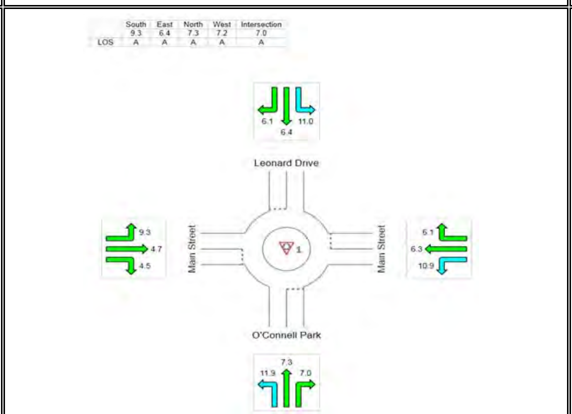
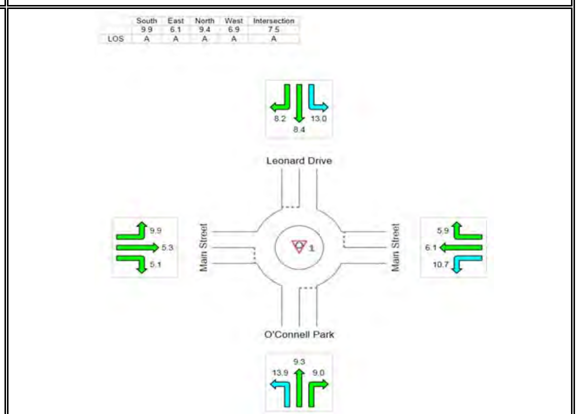
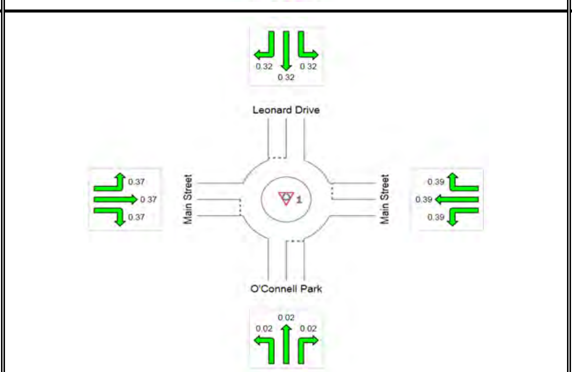
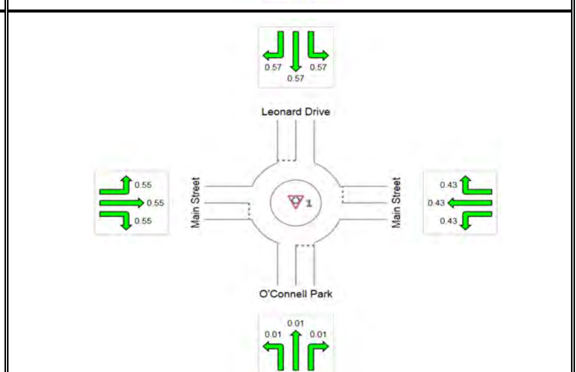
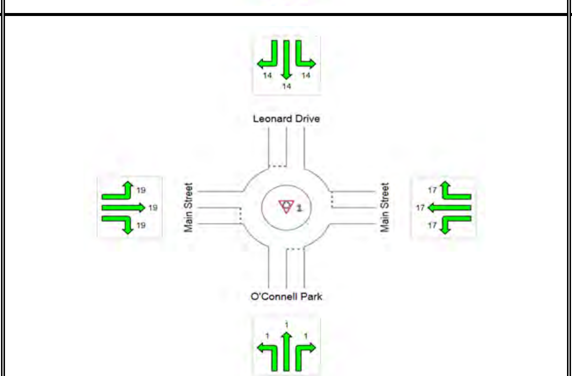
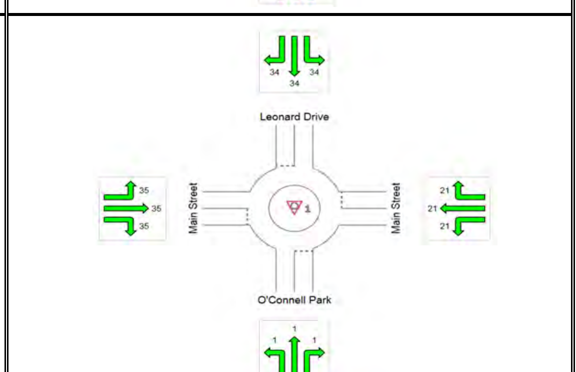
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	120	255	305	160	0	0
Future Volume (Veh/h)	120	255	305	160	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	130	277	332	174	0	0
Pedestrians						
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	506				956	419
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	506				956	419
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				100	100
cM capacity (veh/h)	1059				251	634

Direction, Lane #	EB 1	WB 1
Volume Total	407	506
Volume Left	130	0
Volume Right	0	174
cSH	1059	1700
Volume to Capacity	0.12	0.30
Queue Length 95th (m)	3.2	0.0
Control Delay (s)	3.7	0.0
Lane LOS	A	
Approach Delay (s)	3.7	0.0
Approach LOS		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

Main Street @ Leonard Drive / O'Connell Park (4-leg Configuration)
Preliminary Roundabout Lane Configuration



	2020 AM Peak Hour	2020 PM Peak Hour
Average Delay (Seconds)		
Volume-to-Capacity (V/C) Ratio		
95th Percentile Queue Length (m)		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	370	130	370	30	0	0	0	0	0	25
Future Volume (Veh/h)	0	0	370	130	370	30	0	0	0	0	0	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	402	141	402	33	0	0	0	0	0	27
Pedestrians											8	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	443			402			711	725	0	910	1110	426
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	443			402			711	725	0	910	1110	426
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			88			100	100	100	100	100	96
cM capacity (veh/h)	1109			1157			300	306	1085	229	182	623

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	402	141	435	27
Volume Left	0	141	0	0
Volume Right	402	0	33	27
cSH	1700	1157	1700	623
Volume to Capacity	0.24	0.12	0.26	0.04
Queue Length 95th (m)	0.0	3.2	0.0	1.0
Control Delay (s)	0.0	8.5	0.0	11.0
Lane LOS		A		B
Approach Delay (s)	0.0	2.1		11.0
Approach LOS				B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	620	230	730	55	0	0	0	0	0	25
Future Volume (Veh/h)	0	0	620	230	730	55	0	0	0	0	0	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	674	250	793	60	0	0	0	0	0	27
Pedestrians		1			2			7			5	
Lane Width (m)		3.7			3.7			0.0			3.7	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	858			681			1328	1365	9	1667	2009	829
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	858			681			1328	1365	9	1667	2009	829
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			73			100	100	100	100	100	93
cM capacity (veh/h)	779			912			96	106	1071	60	43	368

Direction, Lane #	EB 1	WB 1	WB 2	SB 1
Volume Total	674	250	853	27
Volume Left	0	250	0	0
Volume Right	674	0	60	27
cSH	1700	912	1700	368
Volume to Capacity	0.40	0.27	0.50	0.07
Queue Length 95th (m)	0.0	8.5	0.0	1.8
Control Delay (s)	0.0	10.4	0.0	15.5
Lane LOS		B		C
Approach Delay (s)	0.0	2.4		15.5
Approach LOS				C

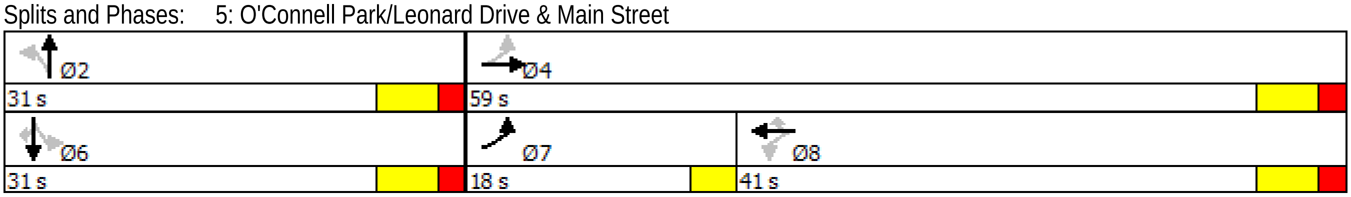
Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	185	5	10	245	80	5	0	5	60	5	195
Future Volume (vph)	230	185	5	10	245	80	5	0	5	60	5	195
Satd. Flow (prot)	1789	1876	0	0	1880	1601	0	1713	0	0	1801	1601
Flt Permitted	0.467				0.980			0.821			0.734	
Satd. Flow (perm)	880	1876	0	0	1846	1601	0	1441	0	0	1382	1601
Satd. Flow (RTOR)		2				87		74				212
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	250	206	0	0	277	87	0	10	0	0	70	212
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Total Split (s)	18.0	59.0		41.0	41.0	41.0	31.0	31.0		31.0	31.0	31.0
Total Lost Time (s)	3.0	6.1			6.1	6.1		6.1			6.1	6.1
Act Effct Green (s)	29.6	26.4			12.0	12.0		7.8			7.8	7.8
Actuated g/C Ratio	0.63	0.56			0.26	0.26		0.17			0.17	0.17
v/c Ratio	0.32	0.19			0.58	0.18		0.03			0.30	0.48
Control Delay	4.9	5.4			21.6	5.4		0.2			23.0	7.9
Queue Delay	0.0	0.0			0.0	0.0		0.0			0.0	0.0
Total Delay	4.9	5.4			21.6	5.4		0.2			23.0	7.9
LOS	A	A			C	A		A			C	A
Approach Delay		5.2			17.7			0.2			11.7	
Approach LOS		A			B			A			B	
Queue Length 50th (m)	6.6	6.7			19.4	0.0		0.0			5.0	0.0
Queue Length 95th (m)	15.9	15.6			43.2	7.8		0.0			16.1	14.4
Internal Link Dist (m)		206.5			259.3			15.8			105.4	
Turn Bay Length (m)	25.0					25.0						8.0
Base Capacity (vph)	856	1834			1418	1250		823			757	973
Starvation Cap Reductn	0	0			0	0		0			0	0
Spillback Cap Reductn	0	0			0	0		0			0	0
Storage Cap Reductn	0	0			0	0		0			0	0
Reduced v/c Ratio	0.29	0.11			0.20	0.07		0.01			0.09	0.22

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 46.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 47.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: O'Connell Park/Leonard Drive & Main Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	370	5	0	315	70	0	5	0	115	0	325
Future Volume (vph)	205	370	5	0	315	70	0	5	0	115	0	325
Satd. Flow (prot)	1789	1880	0	0	1883	1601	0	1883	0	0	1789	1601
Flt Permitted	0.388										0.754	
Satd. Flow (perm)	731	1880	0	0	1883	1601	0	1883	0	0	1420	1601
Satd. Flow (RTOR)		1				74						342
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	223	407	0	0	342	76	0	5	0	0	125	353
Turn Type	pm+pt	NA			NA	Perm		NA		Perm	NA	Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Total Split (s)	15.0	55.0		40.0	40.0	40.0	35.0	35.0		35.0	35.0	35.0
Total Lost Time (s)	3.0	6.1			6.1	6.1		6.1			6.1	6.1
Act Effct Green (s)	31.5	28.3			14.8	14.8		10.9			10.9	10.9
Actuated g/C Ratio	0.61	0.55			0.29	0.29		0.21			0.21	0.21
v/c Ratio	0.34	0.40			0.64	0.15		0.01			0.42	0.58
Control Delay	6.6	8.5			22.8	5.5		18.4			24.1	7.6
Queue Delay	0.0	0.0			0.0	0.0		0.0			0.0	0.0
Total Delay	6.6	8.5			22.8	5.5		18.4			24.1	7.6
LOS	A	A			C	A		B			C	A
Approach Delay		7.8			19.7			18.4			11.9	
Approach LOS		A			B			B			B	
Queue Length 50th (m)	7.5	18.6			27.4	0.2		0.4			9.9	0.8
Queue Length 95th (m)	19.9	42.6			57.0	7.7		2.8			26.2	18.9
Internal Link Dist (m)		206.5			259.3			15.8			105.4	
Turn Bay Length (m)	25.0					25.0						8.0
Base Capacity (vph)	699	1697			1283	1114		1094			825	1073
Starvation Cap Reductn	0	0			0	0		0			0	0
Spillback Cap Reductn	0	0			0	0		0			0	0
Storage Cap Reductn	0	0			0	0		0			0	0
Reduced v/c Ratio	0.32	0.24			0.27	0.07		0.00			0.15	0.33

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 51.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 12.4 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: O'Connell Park/Leonard Drive & Main Street