

RESEARCH DRIVE DEVELOPMENT TRAFFIC IMPACT STUDY FINAL REPORT

PREPARED FOR:
PORTUCANA CONSTRUCTION & AJ LEGROW HOLDINGS

APRIL 2022

Project No. 221-03040

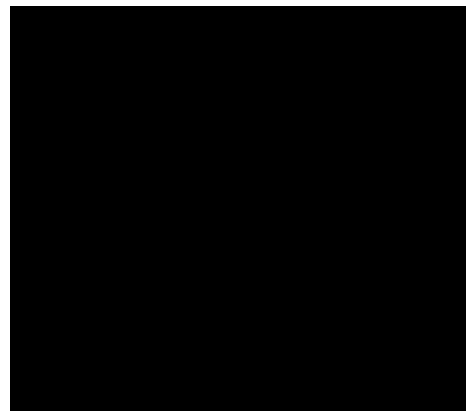


TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	STUDY AREA DESCRIPTIONS.....	3
3	BACKGROUND TRAFFIC	4
4	TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT.....	5
5	INTERSECTION OPERATIONAL ANALYSIS.....	7
5.1	Analysis Scenarios	8
5.2	Int #1: Portland Street at Prince Arthur Avenue	9
5.3	Int #2: Prince Arthur Avenue at Fenwick Street	10
5.4	Int #3: Neptune Crescent at Ragus Road	11
5.5	Int #4: Neptune Crescent at Mount Hope Avenue	12
6	SUMMARY & CONCLUSIONS	13
6.1	Summary	13
6.2	Conclusions	14

APPENDICES

- A** TRAFFIC VOLUME DATA
- B** WARRANT ANALYSIS
- C** INTERSECTION PERFORMANCE ANALYSIS



1 INTRODUCTION

Background

Plans are being prepared by Portucana Construction and AJ LeGrow Holdings for a residential development of 937 apartment units in Dartmouth, Nova Scotia, see Figure 1. The proposed development is planned to include 12 mid-rise apartment buildings, as shown in Figure 2. Halifax Regional Municipality (HRM) has requested that a Traffic Impact Study be completed to review the impacts to the adjacent road network. WSP Canada Inc. has been retained to complete a Traffic Impact Study (TIS) for the proposed Research Drive Development.



Figure 1 – Study Area and Study Intersections

A Traffic Impact Study Usually Considers Four Questions

A TIS usually consists of determining answers for the following questions:

1. **What is the existing transportation situation** adjacent to the study site? How have volumes changed historically?
2. **What transportation changes are expected** at key Study Area locations? How many vehicle and active mode trips are expected to be generated by the proposed development during weekday peak hours? What routes are the trips expected to use to travel within and through the Study Area?
3. **What transportation impacts will occur** on Study Area roads, sidewalks, and intersections?
4. **What transportation improvements are required** to mitigate project impacts on Study Area travel? Are there transportation modifications that should be made to improve the travel experience for all users?

Study Objectives

The objectives of the traffic impact study are to:

1. Develop projected 2037 background weekday AM and PM peak hourly volumes for Study Intersections.
2. Estimate the number of weekday AM and PM peak hour trips that will be generated by the proposed development.
3. Distribute and assign site generated trips to Study Intersections to project 2037 peak hourly volumes that include site generated trips.
4. Evaluate impacts of site generated traffic on the performance of Study Intersections.
5. Complete warrant analyses, as necessary, for Study Intersections and recommend improvements that may be needed at Study Intersections to mitigate the impacts of site development.

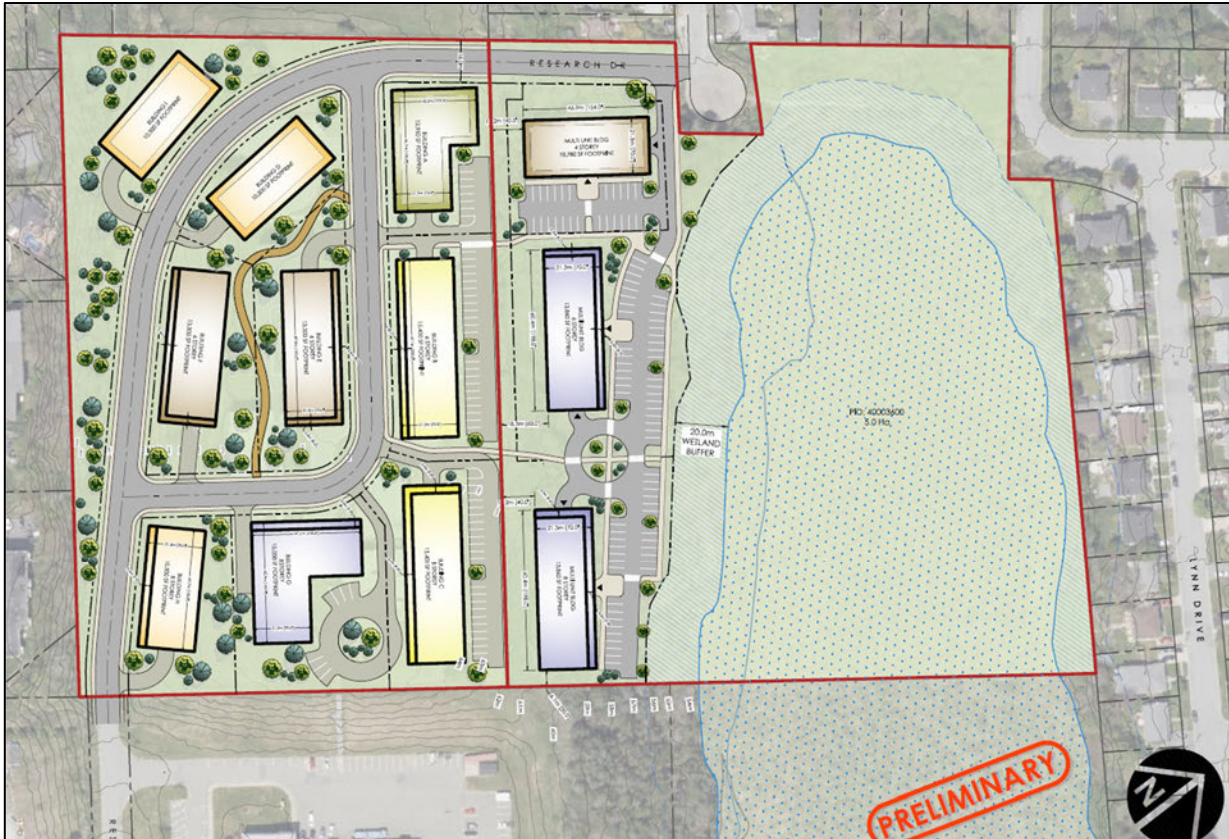


Figure 2 – Site Plan

2 STUDY AREA DESCRIPTIONS

Description of Existing Development

There is currently an office building located on the proposed site and is approximately 80% occupied. The office building of approximately 65,000ft² will be demolished and the proposed 12 mid-rise apartment buildings will be constructed in phases. The access to the existing office building is via Research Drive.

Description of Proposed Development

The proposed residential development is planned to include 12 mid-rise apartment buildings with a total of 937 units. It is anticipated that the development will be completed by 2037.

Existing Study Road Descriptions

Prince Arthur Avenue is a minor collector roadway with two lanes with one lane in each direction. The posted speed limit within the study area is 50 km/h. There is an asphalt sidewalk on the west side and a concrete sidewalk on the east side of Prince Arthur Avenue. There are no transit services on Prince Arthur Avenue.

Fenwick Street is a local road that has two lanes with one lane in each direction and a posted speed limit is 50 km/h. There is sidewalk on both sides of Fenwick Street to Clement Street and then sidewalk on the south side to Research Drive. There are no transit services on Fenwick Street.

Research Drive is a local road that has two lanes with one lane in each direction and a posted speed limit is 50 km/h. There are no sidewalk facilities or transit services on Research Drive.

Neptune Crescent is a local road that has two lanes with one lane in each direction and a posted speed limit is 50 km/h. There are no sidewalk facilities or transit services on Research Drive.

Mount Hope Avenue is a minor collector road that has two lanes with one lane in each direction and a posted speed limit is 50 km/h. There is a sidewalk on the north side and an asphalt multi-use pathway on the south side of Mount Hope Avenue. Transit Route #67 provides service along Mount Hope Avenue.

Existing Study Intersection Descriptions

Intersection #1 – Portland Street at Prince Arthur Avenue is a 3-leg signalized intersection with a shared through/right-turn lane in the eastbound direction and a dedicated left-turn lane with a through lane in the westbound direction on Portland Street. The northbound approach has a left-turn and right-turn lane on Prince Arthur Avenue. There are marked pedestrian crossings on all approaches.

Intersection #2 – Prince Arthur Avenue at Fenwick Street is a 3-leg intersection with stop control on the Fenwick Street approach (westbound approach). All approaches have a shared movement and there are two marked pedestrian crossings, one on the east side of the intersection crossing Fenwick Street and a second that is further removed from the intersection on the west leg of Prince Arthur Avenue.

Intersection #3 – Neptune Crescent at Ragus Road is a 4-leg intersection with stop control on Ragus Road. All approaches are shared movements and there are no marked pedestrian crossings at this intersection.

Intersection #4 – Mount Hope Avenue at Neptune Crescent is a 3-leg intersection with stop control on Neptune Crescent. All approaches are shared movements and there are no marked pedestrian crossings at this intersection.



3 BACKGROUND TRAFFIC

***Turning
Movement
Counts***

Turning movement volumes were collected by WSP on Tuesday, March 22nd, 2022 at Study Intersection 1 during the morning (7:00-9:00AM) and afternoon (4:00-6:00PM) peak periods and at Study Intersection 2 to 4 during the morning (7:00-9:00AM), midday (11:30AM-1:30PM) and afternoon (4:00-6:00PM) peak periods. Intersection counts have been tabulated in 15-minute intervals with peak hours indicated by shaded areas. Turning movement volumes are provided in Tables A-1 to A-4, Appendix A.

***Traffic Growth
Rate***

An annual growth rate of 1.0%, based on historic growth, was applied to the background volumes for this Traffic Impact Study.

4 TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT

Prepared Trip Generation Estimates

When using the published trip generation rates in the *Trip Generation Manual (Institute of Transportation Engineers)*, the transportation engineer's objective should be to provide a realistic estimate of the number of trips that will be generated by the proposed development.

Anticipated Land Use for the Existing & Proposed Development

The existing development has an office building of approximately 65,000ft² that was 80% occupied during the traffic data collection. The proposed development is expected to include 937 mid-rise apartment units.

Estimation of Trips Generated by the Existing & Proposed Development

Trips generated by the General Office Building (Land Use 710) are estimated for the AM and PM peak hours by square footage and Multi-family Housing Mid-Rise (Land Use 221) are estimated for the AM and PM peak hours of traffic by unit count. Trip generation estimates for the proposed development were prepared using published rates from *Trip Generation Manual, 11th Edition* (Institute of Transportation Engineers, Washington, 2021).

Reductions to Trip Generation Estimates

The total trip generation estimate for the proposed development were reduced by 5% to account for cycling and walking (non-auto) trips.

Trips Generated by the Existing & Proposed Development

Trip generation estimates for the existing and proposed developments are summarized in Table 1. It is estimated that the development will generate:

- 251 two-way primary vehicle trips (6 entering and 245 exiting) during the AM peak hour; and,
- 273 two-way pass-by vehicle trips (199 entering and 74 exiting) during the PM peak hour.

Table 1 – Trip Generation Estimates for the Existing & Proposed Developments

Land Use ¹	Units ²	Trip Generation Rates ³				Trip Generation Estimates ³			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
Existing Development									
General Office Building (Land Use 710)	52.0 Sq.ft.	1.34	0.18	0.24	1.20	70	9	13	62
Proposed Development									
Multi-family Housing (Mid-Rise) (Land Use 221)	937 Units	0.09	0.28	0.24	0.15	80	267	223	143
Trip Generation Estimates for Proposed Development						80	267	223	143
5% Reduction for Non-Auto Trips ⁴						4	13	11	7
Primary Trip Estimate for the Proposed Development						6	245	199	74
NOTES: 1. Land Use Codes are from Trip Generation, 11th Edition, (Institute of Transportation Engineers, Washington, 2021). 2. 'Residential Units' for Multi-Family Housing. 3. Rates are 'vehicles per hour per unit'; trips generated are 'vehicles per hour for peak hours'. 4. A 5% reduction for non-auto trips generated by the residential units have been used to account for cycling and walking trips.									



Trip Distribution and Assignment

The proposed development generated trips were distributed to the Study Intersections based on counted volumes and local knowledge of the area considering major trip origins and destinations in the region. The estimated directional distributions are provided below.

Direction	Distribution	Description
North & West on Portland	25%	(Dartmouth, Macdonald Bridge and surrounding areas)
North & East on Portland	20%	(Cole Harbour, Hwy 111 and surrounding areas)
South	10%	(Easter Passage and surrounding areas)
West to Pleasant	20%	(Woodside, Macdonald Bridge and surrounding areas)
East to Hwy 111	25%	(MacKay Bridge, Sackville and surrounding areas)

Volume Figures

Peak hourly estimated site generated vehicle volumes were distributed and assigned to external streets and intersections in the study area using the above assumptions. Assigned AM and PM peak hourly site generated volumes are illustrated diagrammatically on Figures A-2A and A-2B, Appendix A. Assigned site development trips were added to background volumes (Figures A-1A and A-1B) to provide estimates of the AM and PM peak hour volumes at study area intersections for development build-out which are illustrated diagrammatically on Figures A-3A and A-3B, Appendix A.

5 INTERSECTION OPERATIONAL ANALYSIS

Intersection Level of Service (LOS) Analysis was completed to estimate how intersections may be expected to operate into the future without and with site generated trips. This section of the report addresses how left-turn lane warrants and traffic signal warrants were conducted and how each intersection was evaluated. The following subsections identify each study intersection and summarize the results of the operational analysis.

Left-Turn Lane Warrant Analysis

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.

Left turn lane analyses have been completed for the intersection of Neptune Crescent at Ragus Road and Neptune Crescent at Mount Hope Avenue using projected 2037 peak hourly volumes without and with site generated trips. The following are the results:

- Neptune Crescent at Ragus Road – **Left-turn not warranted**
- Neptune Crescent at Mount Hope Avenue – **Left-turn lane warranted** on Mount Hope Avenue without and with the proposed development

Traffic Signal Warrant Analysis

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.

Evaluation of traffic signal warrants were completed for appropriate intersections using 2037 traffic volumes with the proposed development and **traffic signals are not warranted** at any of the study intersections.

Intersection Capacity Analysis Results

Synchro 11.0 software have been used for performance evaluation of the Study Intersections. Summaries of the results are provided in the following sub-sections and detailed results of the analyses are included in Appendix C.

Intersection Level of Service Analysis

The level or quality of performance of an intersection in terms of traffic movement is determined by a level of service (LOS) analysis. LOS for intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time.

LOS criteria, as shown in Table 2, 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 2 – Level of Service Criteria

Signalized Intersections Control Delay (Seconds per Vehicle)	LOS Description	Roundabouts and Two Way Stop Controlled (TWSC) Intersections Control Delay (Seconds per Vehicle)
Less than 10.0	Very low delay; most vehicles do not stop (Excellent)	Less than 10.0
Between 10.0 and 20.0	Higher delay; most vehicles stop (Very Good)	Between 10.0 and 15.0
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
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
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
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

5.1 ANALYSIS SCENARIOS

Summary Analysis Scenarios Considered

Scenario 1 – Future 2037 without Site: Represents future 2037 traffic volumes on the existing road network, including the existing traffic control and lane configurations of the Study Intersections with the exception of the intersection of Neptune/Mount Hope, which has been analyzed with the addition of an eastbound left-turn lane, as warranted.

Scenario 2 – Future 2037 with Site: Represents future 2037 traffic volumes on the existing road network, including the existing traffic control and lane configurations of the Study Intersections with the proposed development, with the exception of the intersection of Neptune/Mount Hope, which has been analyzed with the addition of an eastbound left-turn lane, as warranted.

5.2 INT #1: PORTLAND STREET AT PRINCE ARTHUR AVENUE

Intersection #1 – Portland Street at Prince Arthur Avenue:

Operational performance results for this intersection are provided in Table 3 for both the AM and PM peak hours.

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours with the exception of the eastbound through/right-turn movement that is nearing capacity without and with the proposed development in the PM peak period. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 3 - Intersection Capacity Analysis: Portland Street at Prince Arthur Avenue

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement					Overall Intersection
	Portland Street			Prince Arthur Avenue		
	EB-TR	WB-L	WB-T	NB-L	NB-R	Delay
Future 2037 without Site AM Peak Hour (Page C-1)						
Delay	21.8	7.5	10.8	21.6	7.5	12.8
v/c	0.68	0.48	0.65	0.14	0.46	
Queue	62.6	19.5	69.3	13.9	16.8	
Future 2037 with Site AM Peak Hour (Page C-9)						
Delay	22.4	7.7	11.1	24.2	7.5	13.4
v/c	0.68	0.48	0.65	0.33	0.52	
Queue	68.2	22.3	77.5	27.7	18.5	
Future 2037 without Site PM Peak Hour (Page C-5)						
Delay	27.9	23.0	5.7	38.1	11.1	19.5
v/c	0.88	0.68	0.40	0.26	0.57	
Queue	192.1	41.6	47.5	26.6	23.4	
Future 2037 with Site PM Peak Hour (Page C-13)						
Delay	32.7	34.6	5.2	46.4	12.2	23.9
v/c	0.91	0.76	0.38	0.38	0.62	
Queue	259.8	69.0	48.6	33.3	24.1	

5.3 INT #2: PRINCE ARTHUR AVENUE AT FENWICK STREET

Intersection #2 – Prince Arthur Avenue at Fenwick Street:

Operational performance results for this intersection are provided in Table 4 for both the AM and PM peak hours. A traffic signal warrant was completed for the 2030 Future with Site scenario, and it was determined that:

- 2037 Future with Site: Traffic signals are **not warranted** (14 Warrant Points, Table B-1, Appendix B)

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 4 - Intersection Capacity Analysis: Prince Arthur Avenue at Fenwick Street

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement			Overall Intersection
	Prince Arthur Avenue		Fenwick Street	
	EB-TR	WB-LT	NB-LR	Delay
Future 2037 without Site AM Peak Hour (Page C-2)				
Delay	0.0	2.1	10.1	1.7
v/c	0.12	0.21	0.04	
Queue	0.0	1.2	0.9	
Future 2037 with Site AM Peak Hour (Page C-10)				
Delay	0.0	2.1	10.3	3.3
v/c	0.12	0.22	0.18	
Queue	0.0	1.3	5.1	
Future 2037 without Site PM Peak Hour (Page C-6)				
Delay	0.0	1.0	11.3	2.3
v/c	0.19	0.22	0.17	
Queue	0.0	0.5	5.0	
Future 2037 with Site PM Peak Hour (Page C-14)				
Delay	0.0	3.4	12.1	3.7
v/c	0.19	0.30	0.24	
Queue	0.0	2.7	7.3	

5.4 INT #3: NEPTUNE CRESCENT AT RAGUS ROAD

Intersection #3 – Neptune Crescent at Ragus Road:

Operational performance results for this intersection are provided in Table 5 for both the AM and PM peak hours.

A left-turn lane warrant was completed for the intersection, and it was determined that a left-turn lane is not warranted, see Figure B-1 & B-2 in Appendix B. Based on the existing traffic control and lane configurations, traffic signal warrants were completed for the study scenarios, and it was determined that:

- 2037 Future with Site: Traffic signals are **not warranted** (9 Warrant Points, Table B-2, Appendix B)

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 5 - Intersection Capacity Analysis: Neptune Crescent at Ragus Road

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement				Overall Intersection n
	Ragus Drive		Neptune Crescent		Delay
	EB-LTR	WB-LTR	NB-LTR	SB-LTR	
Future 2037 without Site AM Peak Hour (Page C-3)					
Delay	9.9	10.7	2.4	0.0	3.0
v/c	0.04	0.02	0.12	0.04	
Queue	0.9	0.4	0.9	0.0	
Future 2037 with Site AM Peak Hour (Page C-11)					
Delay	11.0	12.2	2.5	0.0	2.1
v/c	0.04	0.02	0.13	0.14	
Queue	1.1	0.5	1.0	0.0	
Future 2037 without Site PM Peak Hour (Page C-7)					
Delay	9.8	11.2	2.0	0.0	2.9
v/c	0.08	0.01	0.09	0.09	
Queue	2.1	0.2	0.6	0.0	
Future 2037 with Site PM Peak Hour (Page C-15)					
Delay	11.2	12.8	1.2	0.0	2.6
v/c	0.12	0.01	0.17	0.13	
Queue	3.3	0.3	0.6	0.0	

5.5 INT #4: NEPTUNE CRESCENT AT MOUNT HOPE AVENUE

Intersection #4 – Neptune Crescent at Mount Hope Avenue:

Operational performance results for this intersection are provided in Table 6 for both the AM and PM peak hours.

A left-turn lane warrant was completed for the intersection, and it was determined that a left-turn lane is warranted on Mount Hope Avenue in the eastbound direction, see Figure B-1 in Appendix B. Based on the existing traffic control and lane configurations, traffic signal warrants were completed for the study scenarios, and it was determined that:

- 2037 Future with Site: Traffic signals are **not warranted** (61 Warrant Points, Table B-3, Appendix B)

The intersection is expected to operate within HRM acceptable limits during the AM and PM peak hours. The southbound left-turn lane in the PM peak period is expected to perform with 68 seconds of delay, however the v/c ratio is within HRM Guidelines. Negligible changes in the operational performance of this intersection are expected with the addition of the proposed development.

Table 6 - Intersection Capacity Analysis: Neptune Crescent at Mount Hope Avenue

LOS Criteria	Control Delay (sec/veh), v/c Ratio, and 95 th %ile Queue (m) by Intersection Movement					Overall Intersection
	Mount Hope Avenue			Neptune Crescent		
	EB-L	EB-T	WB-TR	SB-L	SB-R	Delay
Future 2037 without Site AM Peak Hour (Page C-4)						
Delay	9.4	0.0	0.0	18.6	13.6	1.1
v/c	0.03	0.10	0.46	0.11	0.05	
Queue	0.6	0.0	0.0	3.0	1.3	
Future 2037 with Site AM Peak Hour (Page C-12)						
Delay	9.4	0.0	0.0	23.2	15.1	3.2
v/c	0.03	0.10	0.46	0.33	0.18	
Queue	0.7	0.0	0.0	11.4	5.3	
Future 2037 without Site PM Peak Hour (Page C-8)						
Delay	8.2	0.0	0.0	36.3	10.3	4.5
v/c	0.03	0.37	0.23	0.55	0.04	
Queue	0.7	0.0	0.0	24.3	1.0	
Future 2037 with Site PM Peak Hour (Page C-16)						
Delay	8.5	0.0	0.0	68.1	10.7	8.7
v/c	0.07	0.37	0.27	0.79	0.06	
Queue	1.8	0.0	0.0	43.6	1.6	

6 SUMMARY & CONCLUSIONS

6.1 SUMMARY

Background	1. Plans are being prepared by Portucana Construction and AJ LeGrow Holdings for a residential development of 937 apartment units in Dartmouth, Nova Scotia. The proposed development is planned to include 12 mid-rise apartment buildings.
Description of Existing Development	2. There is currently an office building located on the proposed site and is approximately 80% occupied. The office building of approximately 65,000ft ² will be demolished and the proposed 12 mid-rise apartment buildings will be constructed in phases. The access to the existing office building is via Research Drive.
Description of Proposed Development	3. The proposed development is planned to include 937 mid-rise apartment units and it is anticipated that the development will be completed by 2037.
Proposed Site Access	4. The access to the proposed development will be via the existing driveway on Research Drive.
Study Area Roads	5. The study considers Portland Street, Prince Arthur Avenue, Fenwick Street, Neptune Crescent and Mount Hope Avenue.
Turning Movement Counts	6. Turning movement volumes were collected by WSP on Tuesday, March 22 nd , 2022.
Background Traffic Volumes	7. Projected 2037 peak hour future background volumes include an annual growth of 1.0% between 2022 and 2037.
Estimation of Existing & Proposed Development Trips	8. Trip generation estimates for the proposed Exhibition Expansion were prepared using rates published in <i>Trip Generation, 11th Edition</i> (Institute of Transportation Engineers, Washington, 2021). 9. It is estimated that the development will generate: • 251 two-way primary vehicle trips (6 entering and 245 exiting) during the AM peak hour; and, • 273 two-way pass-by vehicle trips (199 entering and 74 exiting) during the PM peak hour.
Trip Distribution and Assignment	10. Proposed development generated trips were distributed to the Study Intersections based on counted volumes and local knowledge of the area considering major trip origins and destinations in the region. Trips were distributed to the north and west on Portland Street (25%), north and east on Portland Street (20%), west (20%), east (25%) and south (10%).
Analysis Scenarios Considered	11. Scenario 1 – Future 2037 without Site: Represents future 2037 traffic volumes on the existing road network, including the existing traffic control and lane configurations of the Study Intersections with the exception of the intersection of Neptune/Mount Hope, which has been analyzed with the addition of an eastbound left-turn lane, as warranted. 12. Scenario 2 – Future 2037 with Site: Represents future 2037 traffic volumes on the existing road network, including the existing traffic control and lane configurations of the Study Intersections with the proposed development, with the exception of the intersection of Neptune/Mount Hope, which has been analyzed with the addition of an eastbound left-turn lane, as warranted.

**Warrant
Analysis
Summary**

13. Warrant reviews were completed for left-turn lanes and traffic signals with the projected traffic volumes.
14. It was determined that left-turn lanes are warranted at the following study intersection:
 - Neptune Crescent @ Mount Hope Avenue (without and with site development)
15. It was determined that traffic signals are not warranted at the study intersections.

**Summary –
Intersection
Capacity
Analysis**

16. Intersection performance analysis was completed using *Synchro 11* at the Study Intersections.
 17. The **Portland Street at Prince Arthur Avenue intersection** is expected to work well during the study analysis scenarios during both the AM and PM peak periods without and with the proposed development. During the PM peak period the eastbound through/right-turn is nearing capacity both without and with the development.
 18. The **Prince Arthur Avenue at Fenwick Street intersection** is expected to operate well during both the AM and PM peak periods and within HRM Guidelines.
 19. The **Neptune Crescent at Ragus Road intersection** is expected to operate well during both the AM and PM peak periods and within HRM Guidelines.
 20. The **Neptune Crescent at Mount Hope Avenue intersection** is expected to operate well during both the AM and PM peak periods with the inclusion of the eastbound left-turn lane on Mount Hope Avenue and within HRM Guidelines.
-

6.2 CONCLUSIONS

Conclusions

21. Trips generated by the Research Drive Development are expected to have a minimal or negligible impact on the operational performance of any of the Study Intersections and the adjacent street network.
 22. HRM should monitor the Portland Street at Prince Arthur Avenue intersection to determine the optimal intersection configuration to accommodate future growth on the network without the proposed development.
-

APPENDIX

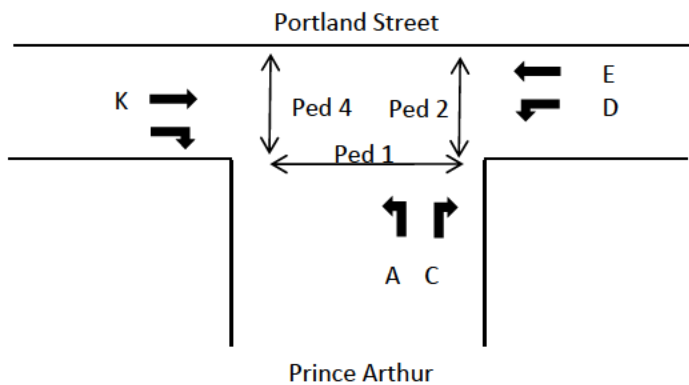
A

TRAFFIC VOLUME DATA



Table A-1
Portland Street
@
Prince Arthur Avenue

Dartmouth, Nova Scotia
Tuesday, March 22, 2022



AM Peak Period Volume Data

Time	Prince Arthur Avenue Northbound Approach		Portland Street Westbound Approach		Portland Street Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
07:00 07:15	5	20	9	102	37	6	179
07:15 07:30	3	20	15	149	58	3	248
07:30 07:45	0	32	22	152	62	5	273
07:45 08:00	7	40	28	148	73	9	305
08:00 08:15	10	37	34	160	70	8	319
08:15 08:30	10	36	48	142	66	10	312
08:30 08:45	8	44	54	138	63	14	321
08:45 09:00	12	65	84	110	75	17	363
AM Peak Hour	40	182	220	550	274	49	1315
07:00 08:00	15	112	74	551	230	23	1005
08:00 09:00	40	182	220	550	274	49	1315
	Ped 1		Ped 2		Ped 4		Total Peds
07:00 08:00	3		0		1		4
08:00 09:00	9		0		7		16

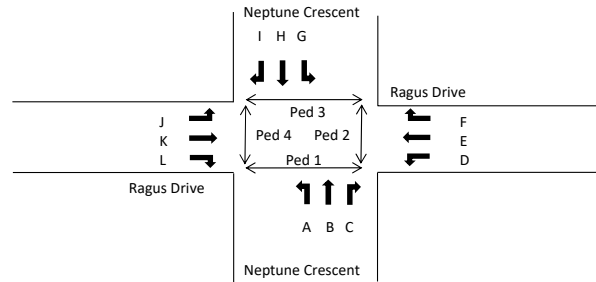
PM Peak Period Volume Data

Time	Prince Arthur Avenue Northbound Approach		Portland Street Westbound Approach		Portland Street Eastbound Approach		Total Vehicles
	A	C	D	E	K	L	
15:30 15:45	8	46	31	96	133	8	322
15:45 16:00	15	54	37	92	152	7	357
16:00 16:15	19	45	28	85	160	9	346
16:15 16:30	5	46	57	109	168	7	392
16:30 16:45	14	65	38	101	160	7	385
16:45 17:00	20	45	40	100	161	9	375
17:00 17:15	14	49	45	104	162	10	384
17:15 17:30	14	37	40	102	163	7	363
PM Peak Hour	53	205	180	414	651	33	1536
15:30 16:30	47	191	153	382	613	31	1417
16:30 17:30	62	196	163	407	646	33	1507
	Ped 1		Ped 2		Ped 4		Total Peds
15:30 16:30	10		1		6		17
16:30 17:30	18		0		1		19

Table A-2 Prince Arthur Avenue @ Fenwick Street Dartmouth, NS Tuesday, March 22, 2022				Prince Arthur Avenue Prince Arthur Avenue Fenwick Street J K I G Ped 3 Ped 4 Ped 2 F E				
AM Peak Period Volume Data								
Time		Fenwick Street Westbound Approach		Prince Ar hur Avenue Southbound Approach		Prince Ar hur Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
07:00	07:15	0	3	2	7	17	1	30
07:15	07:30	3	2	4	12	15	0	36
07:30	07:45	3	5	4	17	25	2	56
07:45	08:00	2	6	11	24	26	2	71
08:00	08:15	0	4	10	27	25	0	66
08:15	08:30	0	2	12	35	25	1	75
08:30	08:45	2	4	12	45	32	2	97
08:45	09:00	2	6	16	76	71	4	175
AM Peak Hour		4	16	50	183	153	7	413
07:00	08:00	8	16	21	60	83	5	193
08:00	09:00	4	16	50	183	153	7	413
		Ped 2		Ped 3		Ped 4		Total Peds
07:00	08:00	2		0		2		4
08:00	09:00	15		0		69		84
Midday Peak Period Volume Data								
Time		Fenwick Street Westbound Approach		Prince Ar hur Avenue Southbound Approach		Prince Ar hur Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
11:30	11:45	1	3	2	25	21	2	54
11:45	12:00	0	4	5	21	21	0	51
12:00	12:15	0	1	1	19	29	2	52
12:15	12:30	2	9	4	29	35	0	79
12:30	12:45	0	5	4	20	30	1	60
12:45	13:00	1	2	8	23	28	3	65
13:00	13:15	0	6	3	27	37	1	74
13:15	13:30	1	5	3	24	24	1	58
Midday Peak Hour		3	22	19	99	130	5	278
11:30	12:30	3	17	12	94	106	4	236
12:30	13:30	2	18	18	94	119	6	257
		Ped 2		Ped 3		Ped 4		Total Peds
11:30	12:30	6		1		10		17
12:30	13:30	3		2		125		130
PM Peak Period Volume Data								
Time		Fenwick Street Westbound Approach		Prince Ar hur Avenue Southbound Approach		Prince Ar hur Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
15:30	15:45	4	5	4	30	37	1	81
15:45	16:00	1	13	2	32	53	3	104
16:00	16:15	3	15	0	29	39	2	88
16:15	16:30	2	6	6	37	33	1	85
16:30	16:45	2	16	5	26	51	4	104
16:45	17:00	1	17	7	29	29	0	83
17:00	17:15	0	18	3	46	38	4	109
17:15	17:30	6	8	3	34	28	4	83
PM Peak Hour		9	85	23	199	243	14	573
15:30	16:30	10	39	12	128	162	7	358
16:30	17:30	9	59	18	135	146	12	379
		Ped 2		Ped 3		Ped 4		Total Peds
15:30	16:30	0		2		6		8
16:30	17:30	2		0		13		15

Table A-3
Neptune Crescent
@
Ragus Drive

Dartmouth, NS
Tuesday, March 22, 2022



AM Peak Period Volume Data

Time	Neptune Crescent Northbound Approach			Ragus Drive Westbound Approach			Neptune Crescent Southbound Approach			Ragus Drive Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
07:00 07:15	3	7	2	5	0	0	0	6	1	1	1	0	26
07:15 07:30	2	8	0	0	1	0	0	8	1	0	0	3	23
07:30 07:45	12	25	2	2	0	0	0	5	0	1	0	2	49
07:45 08:00	12	24	1	1	2	0	0	10	3	5	0	2	60
08:00 08:15	8	26	0	2	0	0	0	4	1	3	0	4	48
08:15 08:30	14	20	2	1	0	0	0	7	2	3	0	0	49
08:30 08:45	8	24	1	6	0	0	0	12	1	3	0	2	57
08:45 09:00	6	27	1	6	0	1	0	7	2	3	1	3	57
AM Peak Hour	42	94	4	10	2	0	0	33	7	14	0	8	214
07:00 08:00	29	64	5	8	3	0	0	29	5	7	1	7	158
08:00 09:00	36	97	4	15	0	1	0	30	6	12	1	9	211
	Ped 1			Ped 2			Ped 3			Ped 4			Total Peds
07:00 08:00	1			1			1			1			4
08:00 09:00	1			0			0			3			4

Midday Volume Data

Time	Neptune Crescent Northbound Approach			Ragus Drive Westbound Approach			Neptune Crescent Southbound Approach			Ragus Drive Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
11:30 11:45	13	7	1	2	2	0	0	7	2	4	1	6	45
11:45 12:00	14	6	5	1	0	1	0	20	1	3	0	4	55
12:00 12:15	5	10	0	1	0	0	0	16	2	3	2	7	46
12:15 12:30	9	10	2	1	1	0	0	11	3	1	0	3	41
12:30 12:45	5	10	0	2	0	0	0	12	1	2	0	4	36
12:45 13:00	10	14	1	2	1	1	0	11	0	4	0	2	46
13:00 13:15	6	13	2	0	0	0	0	8	2	3	1	11	46
13:15 13:30	9	6	3	4	0	0	0	4	0	0	0	5	31
Midday Peak Hour	41	33	8	5	3	1	0	54	8	11	3	20	187
11:30 12:30	41	33	8	5	3	1	0	54	8	11	3	20	187
12:30 13:30	30	43	6	8	1	1	0	35	3	9	1	22	159
	Ped 1			Ped 2			Ped 3			Ped 4			Total Peds
11:30 12:30	0			0			0			0			0
12:30 13:30	0			2			1			1			4

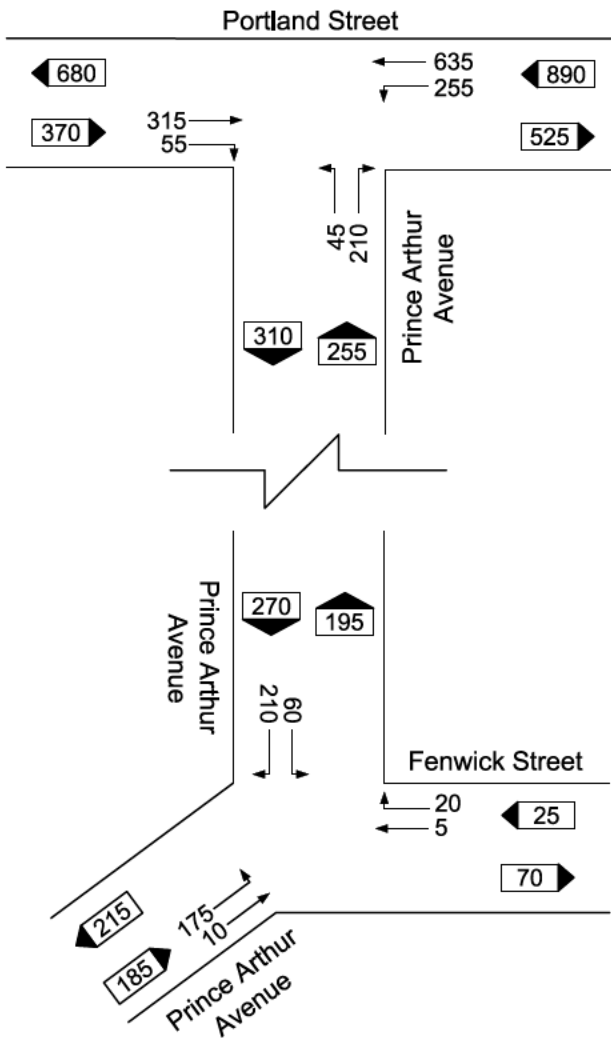
PM Peak Period Volume Data

Time	Neptune Crescent Northbound Approach			Ragus Drive Westbound Approach			Neptune Crescent Southbound Approach			Ragus Drive Eastbound Approach			Total Vehicles
	A	B	C	D	E	F	G	H	I	J	K	L	
15:30 15:45	4	11	6	5	0	0	0	14	3	1	0	5	49
15:45 16:00	9	14	2	5	1	0	0	17	0	1	1	3	53
16:00 16:15	10	23	0	5	1	0	0	35	3	4	1	11	93
16:15 16:30	8	19	3	1	0	0	0	12	2	5	0	6	56
16:30 16:45	2	17	1	0	0	0	0	24	4	5	0	4	57
16:45 17:00	7	15	1	1	0	0	0	18	3	3	0	14	62
17:00 17:15	5	16	0	2	0	0	0	33	4	5	0	13	78
17:15 17:30	11	32	1	0	0	0	0	17	3	6	0	3	73
PM Peak Hour	25	80	3	3	0	0	0	92	14	19	0	34	270
15:30 16:30	31	67	11	16	2	0	0	78	8	11	2	25	251
16:30 17:30	25	80	3	3	0	0	0	92	14	19	0	34	270
	Ped 1			Ped 2			Ped 3			Ped 4			Total Peds
15:30 16:30	0			1			2			1			4
16:30 17:30	0			1			1			0			2

Table A-4 Mount Hope Avenue @ Neptune Crescent Dartmouth, NS Tuesday, March 22, 2022				Neptune Crescent Mount Hope Avenue I G Ped 3 Ped 4 Ped 2 J K F E				
AM Peak Period Volume Data								
Time		Mount Hope Avenue Westbound Approach		Neptune Crescent Southbound Approach		Mount Hope Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
07:00	07:15	76	9	7	3	3	41	139
07:15	07:30	130	13	5	5	4	26	183
07:30	07:45	120	34	7	4	5	42	212
07:45	08:00	144	37	6	8	6	28	229
08:00	08:15	118	32	8	2	4	34	198
08:15	08:30	115	29	7	4	4	28	187
08:30	08:45	97	26	15	3	5	39	185
08:45	09:00	95	32	14	4	7	41	193
AM Peak Hour		497	132	28	18	19	132	826
07:00	08:00	470	93	25	20	18	137	763
08:00	09:00	425	119	44	13	20	142	763
		Ped 2		Ped 3		Ped 4		Total Peds
07:00	08:00	0		1		0		1
08:00	09:00	0		2		1		3
Midday Peak Period Volume Data								
Time		Mount Hope Avenue Westbound Approach		Neptune Crescent Southbound Approach		Mount Hope Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
11:30	11:45	67	12	10	5	5	95	194
11:45	12:00	67	13	18	11	13	75	197
12:00	12:15	70	12	16	14	8	69	189
12:15	12:30	76	13	12	1	8	79	189
12:30	12:45	91	14	14	5	5	67	196
12:45	13:00	60	16	9	6	8	57	156
13:00	13:15	73	18	9	9	4	63	176
13:15	13:30	73	11	10	2	4	74	174
Midday Peak Hour		304	52	60	31	34	290	771
11:30	12:30	280	50	56	31	34	318	769
12:30	13:30	297	59	42	22	21	261	702
		Ped 2		Ped 3		Ped 4		Total Peds
11:30	12:30	0		1		0		1
12:30	13:30	1		1		0		2
PM Peak Period Volume Data								
Time		Mount Hope Avenue Westbound Approach		Neptune Crescent Southbound Approach		Mount Hope Avenue Eastbound Approach		Total Vehicles
		E	F	G	I	J	K	
15:30	15:45	59	18	21	6	3	119	226
15:45	16:00	52	22	22	7	5	98	206
16:00	16:15	66	28	40	6	7	141	288
16:15	16:30	59	24	21	1	4	133	242
16:30	16:45	55	11	27	6	8	138	245
16:45	17:00	47	15	29	7	6	85	189
17:00	17:15	37	21	35	8	6	82	189
17:15	17:30	52	3	16	2	11	53	137
PM Peak Hour		232	85	110	20	24	510	981
15:30	16:30	236	92	104	20	19	491	962
16:30	17:30	191	50	107	23	31	358	760
		Ped 2		Ped 3		Ped 4		Total Peds
15:30	16:30	0		1		1		2
16:30	17:30	1		0		0		1

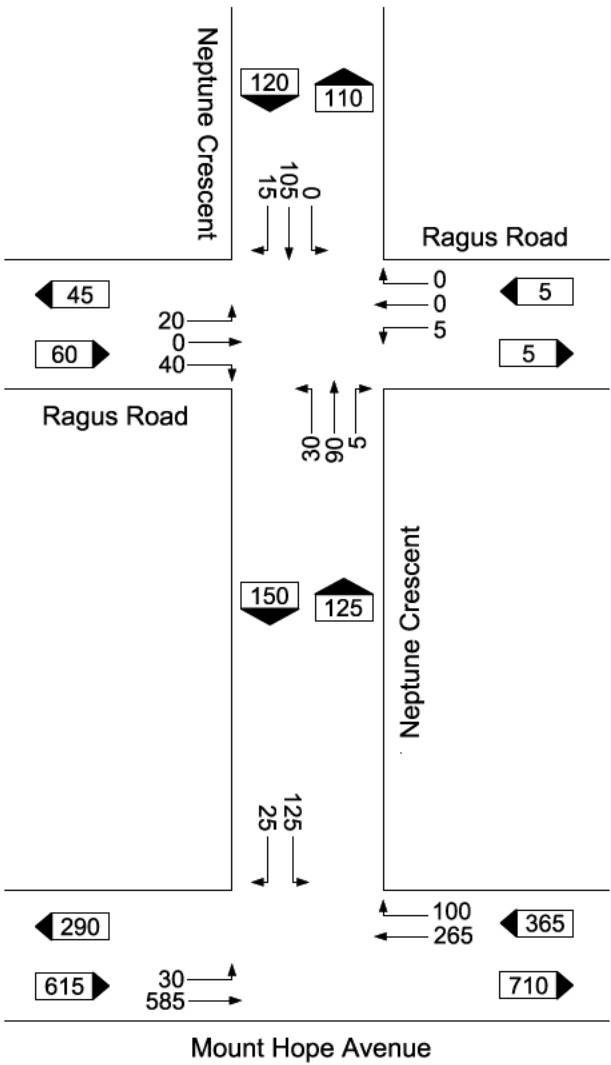
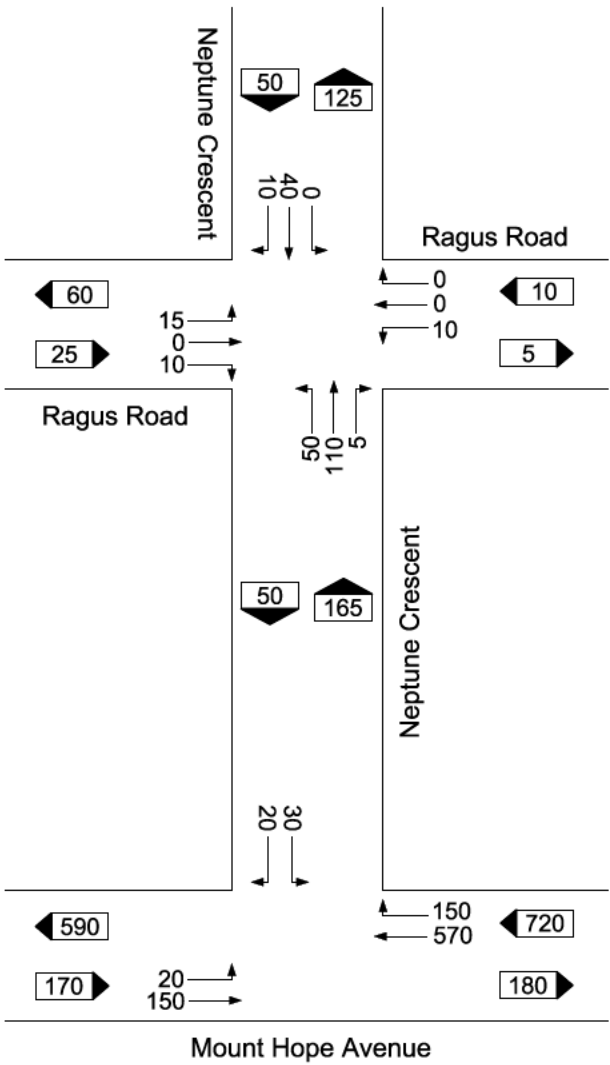
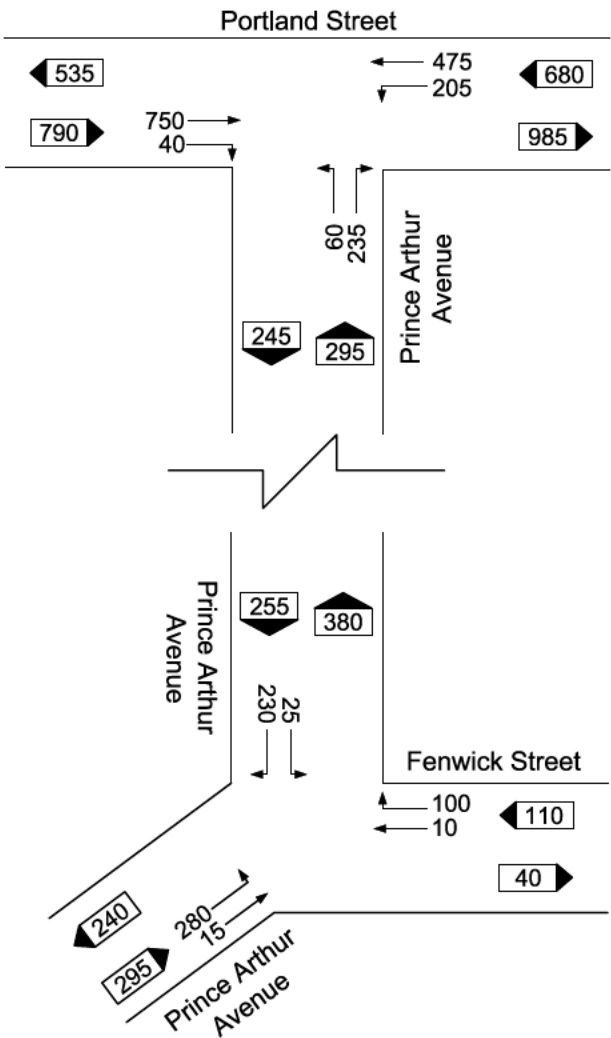
A

AM Peak Hour



B

PM Peak Hour



NOT TO SCALE

NOT TO SCALE



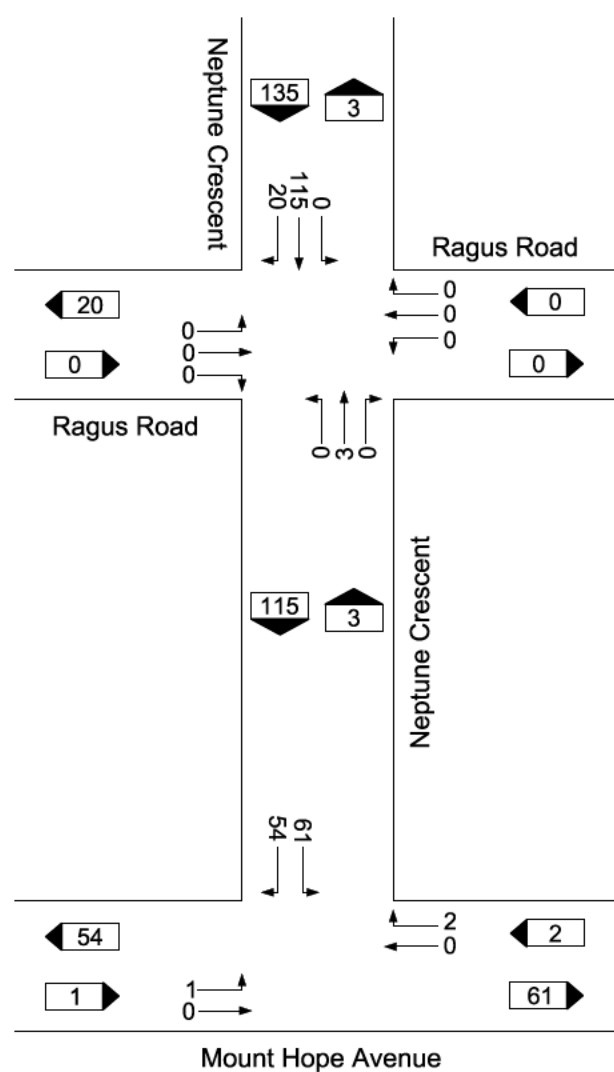
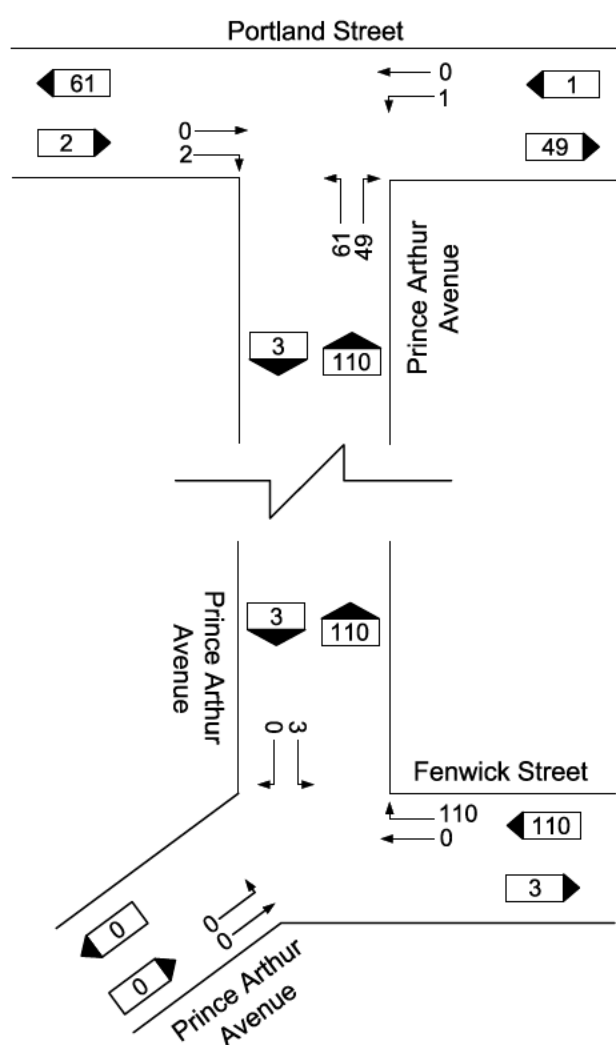
Traffic Impact Study - Research Drive
Dartmouth, Nova Scotia

Figure A-1

2037 Weekday AM and PM Peak Hour
Future Background Without Site Generated Trips

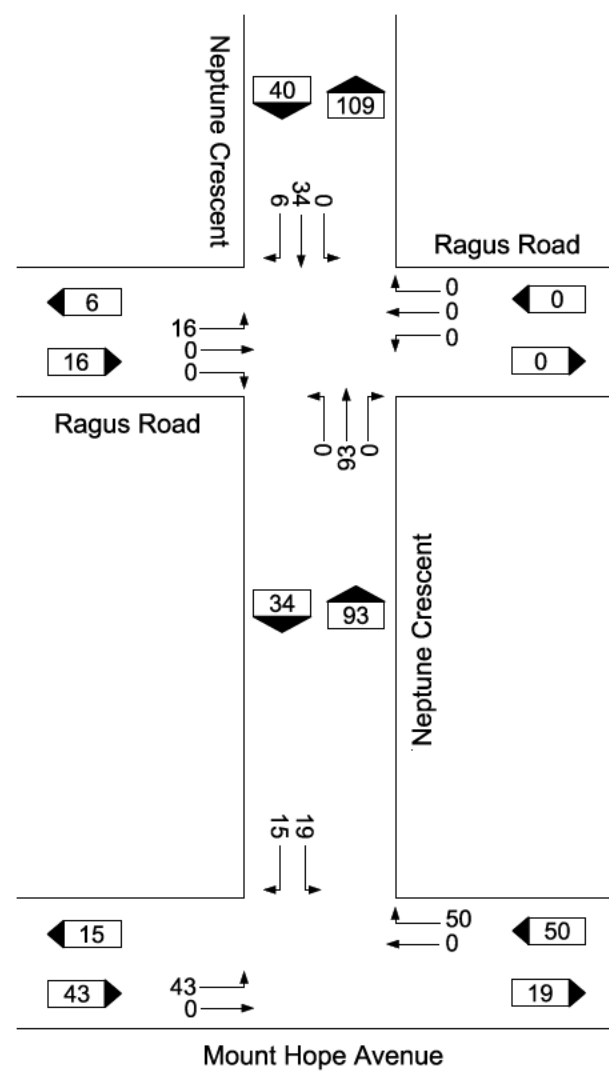
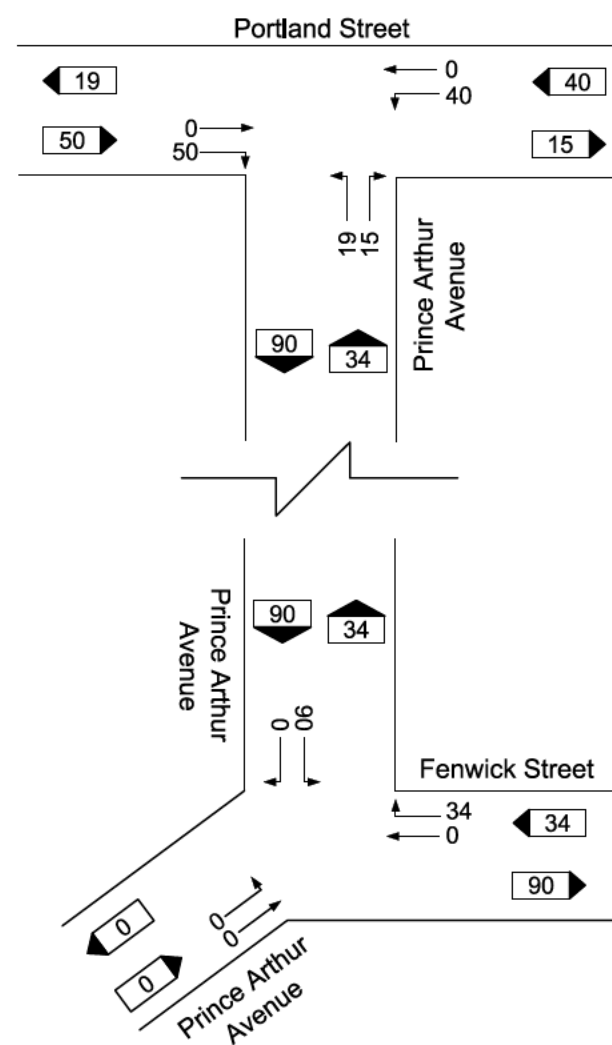
April 2022

AM Peak Hour



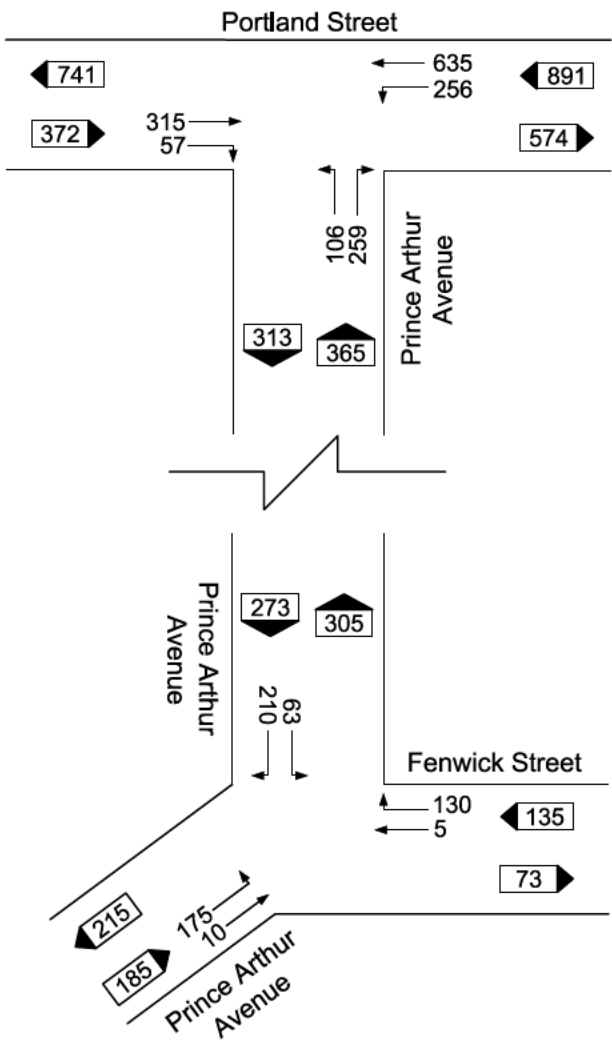
NOT TO SCALE

PM Peak Hour

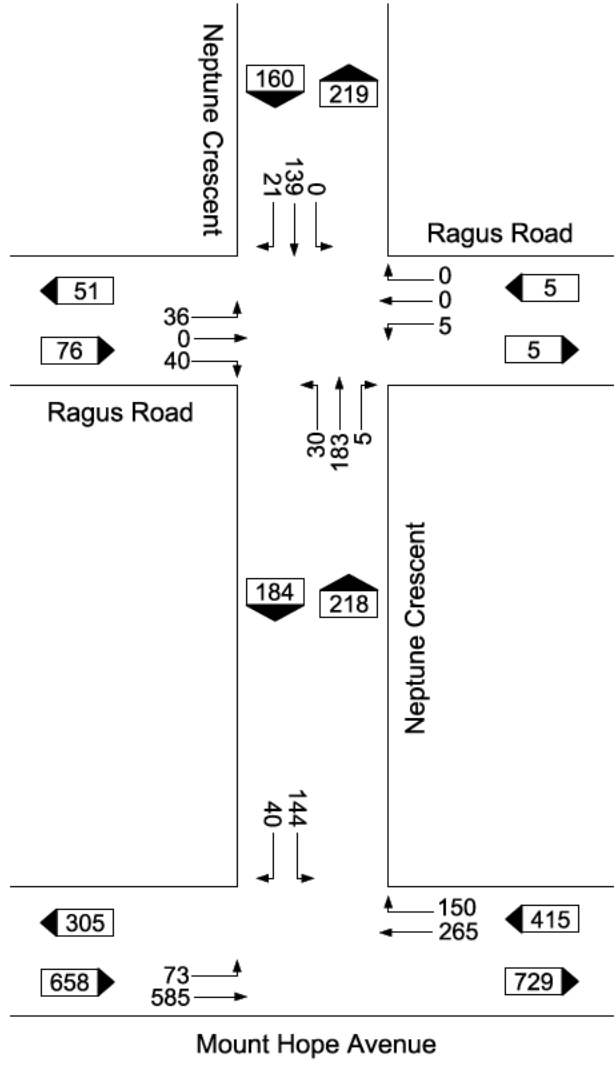
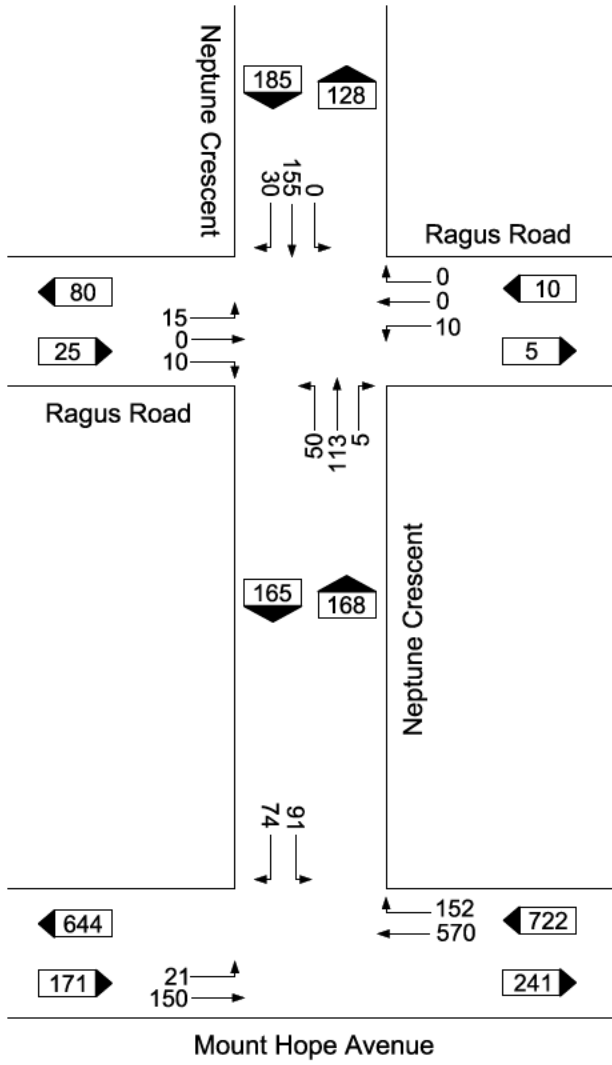
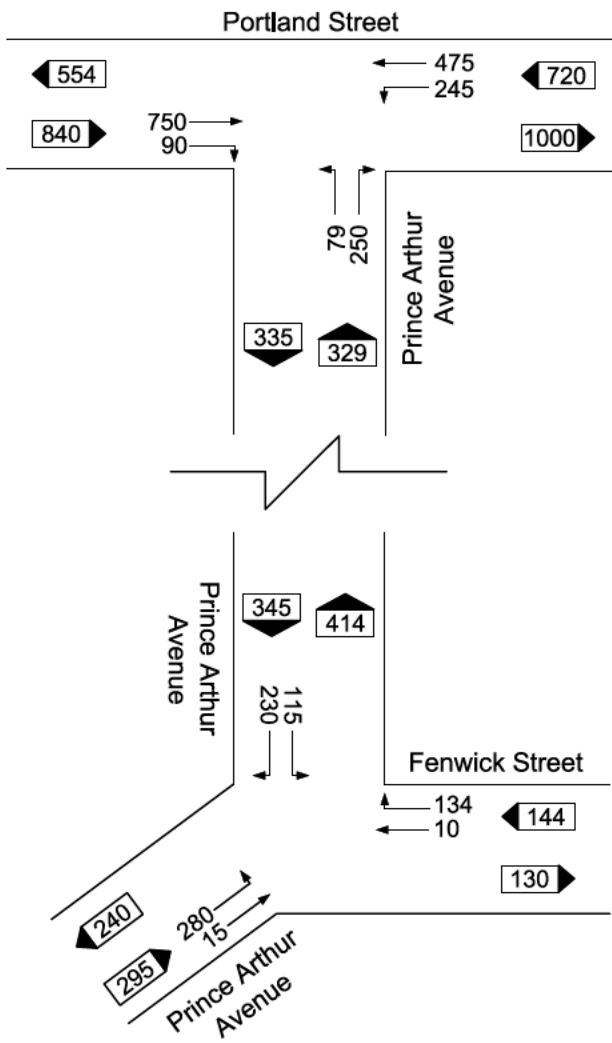


NOT TO SCALE

A
AM Peak Hour



B
PM Peak Hour



NOT TO SCALE

NOT TO SCALE



Traffic Impact Study - Research Drive
Dartmouth, Nova Scotia

Figure A-3

2037 Weekday AM and PM Peak Hour
Future Background Network With Site Generated Trips

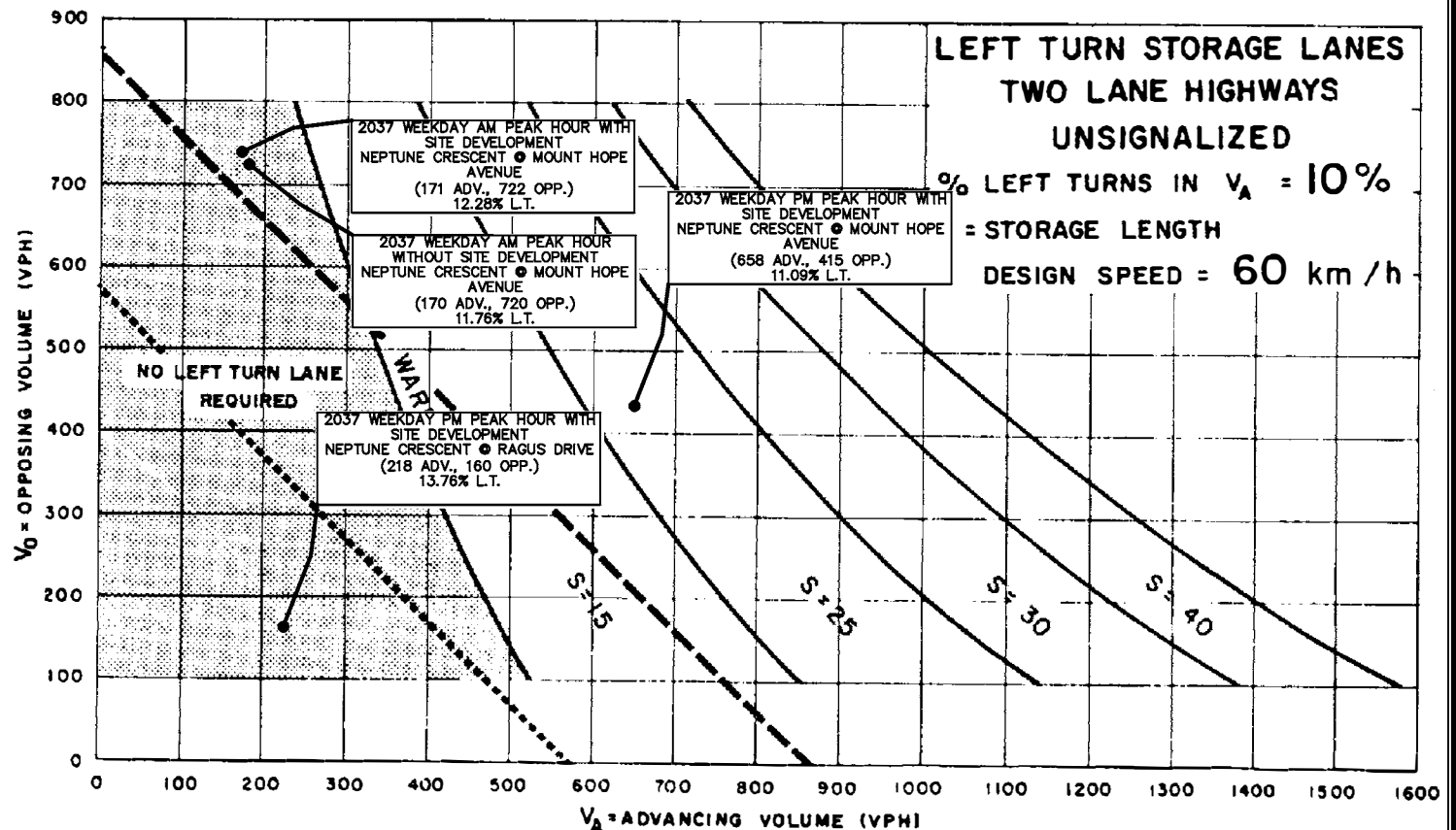
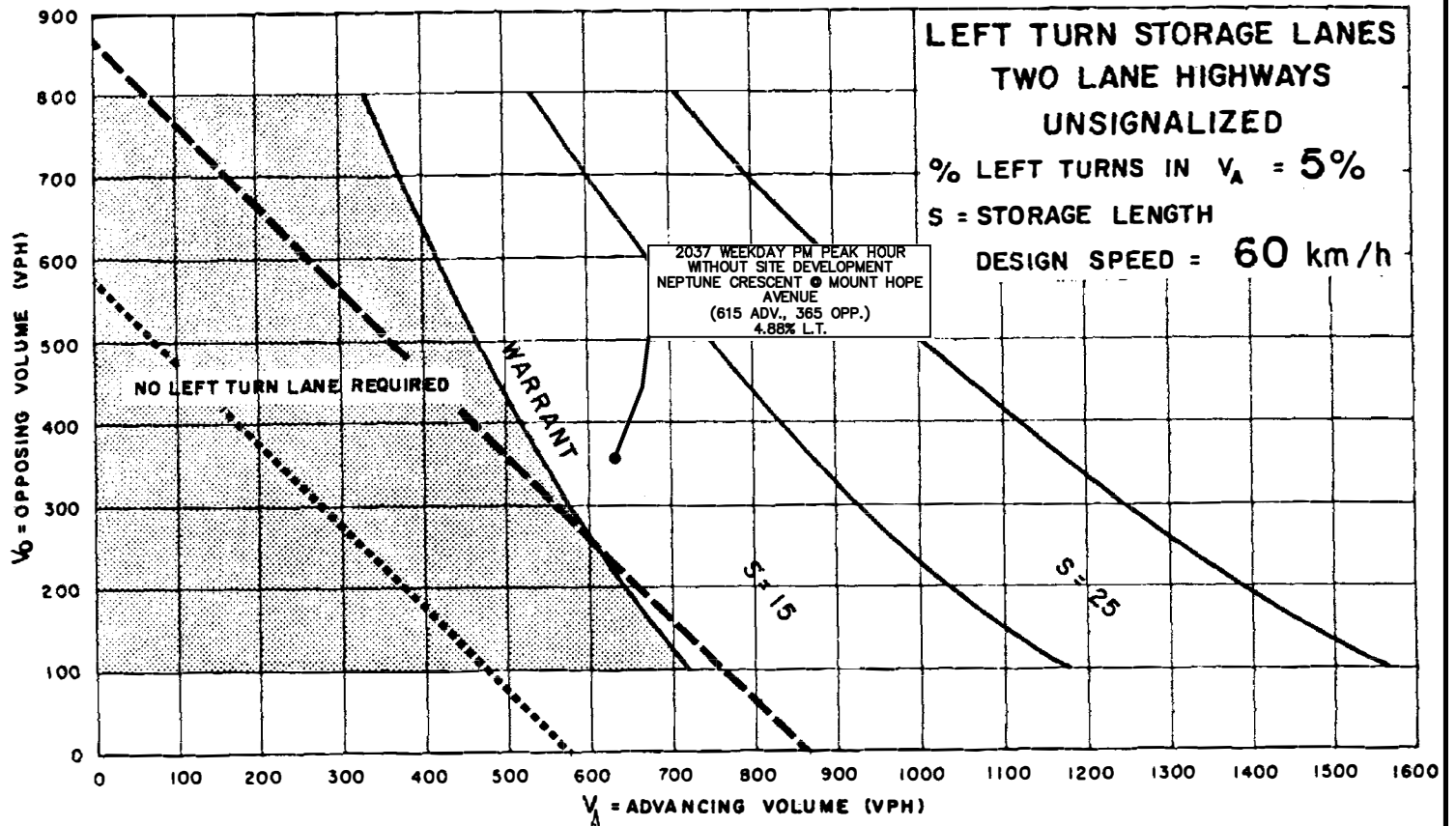
April 2022

APPENDIX

B

WARRANT ANALYSIS



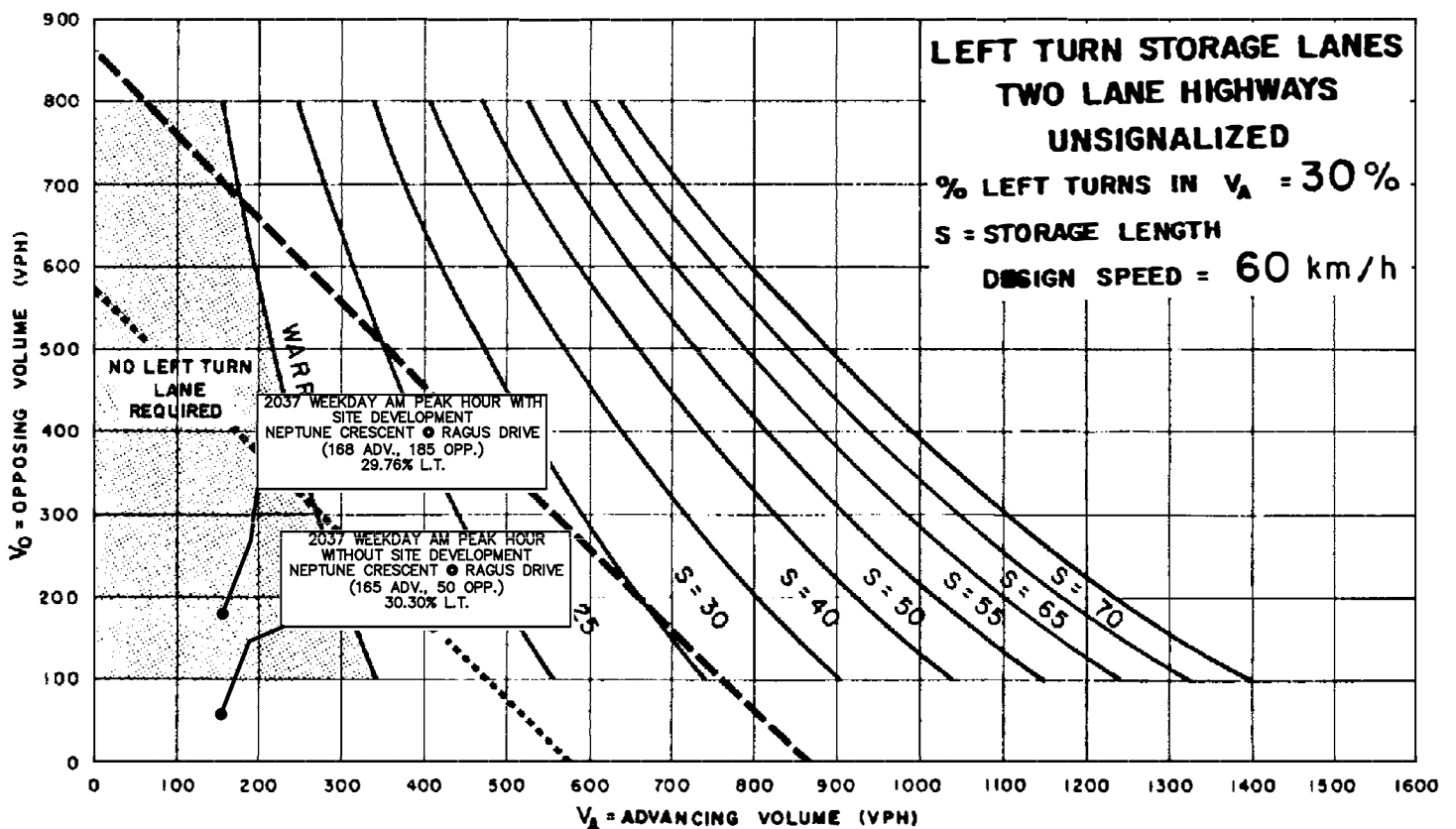
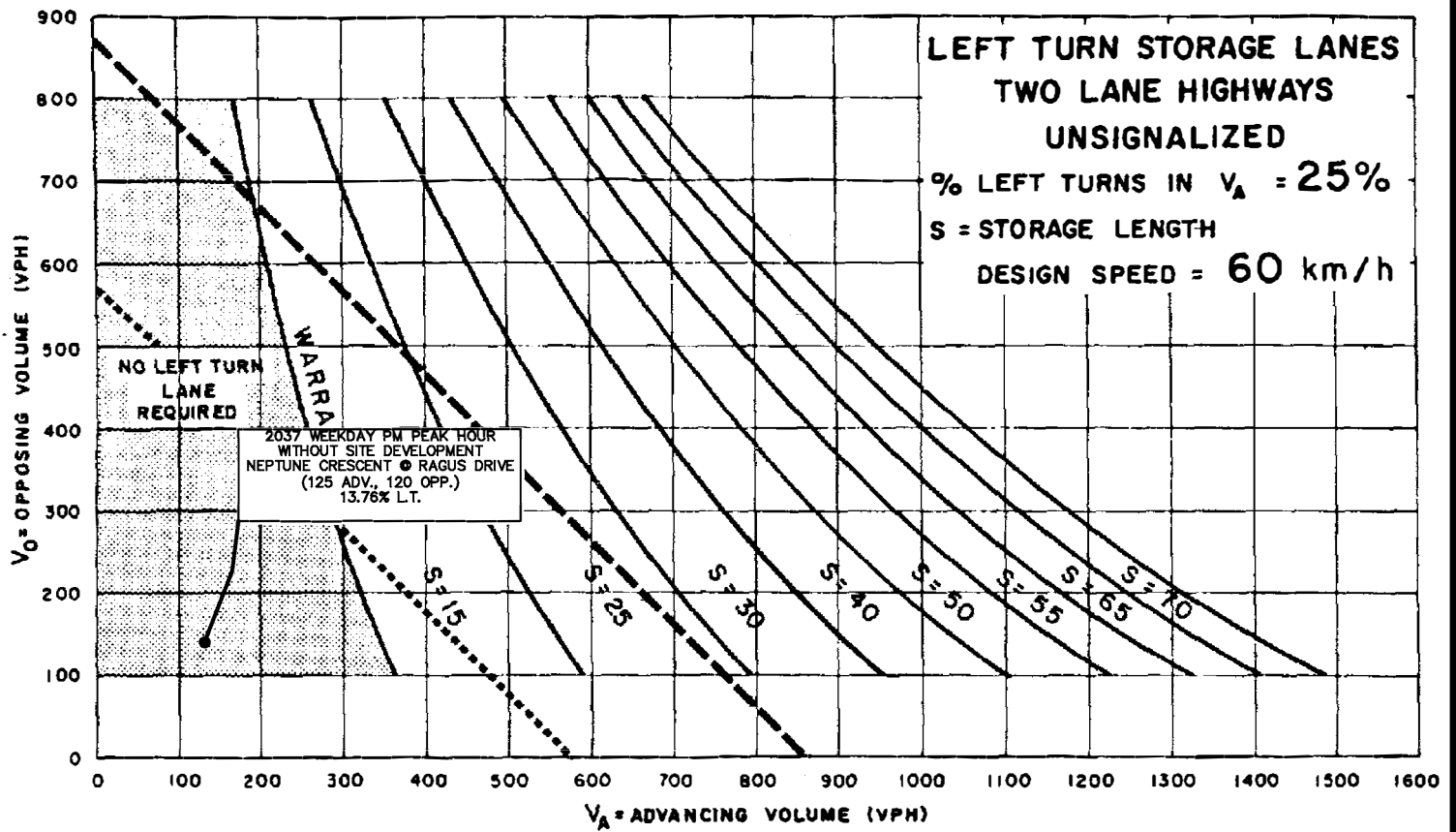


Traffic Impact Study - Research Drive Development
Dartmouth Lake, Nova Scotia

Figure B-1

Left Turn Lane Warrants
Projected 2037 with Site Volumes

April 2022



Traffic Impact Study - Research Drive Development
 Dartmouth Lake, Nova Scotia

Figure B-2

Left Turn Lane Warrants
 Projected 2037 with Site Volumes

April 2022

2005 Canadian Traffic Signal Warrant Matrix Analysis

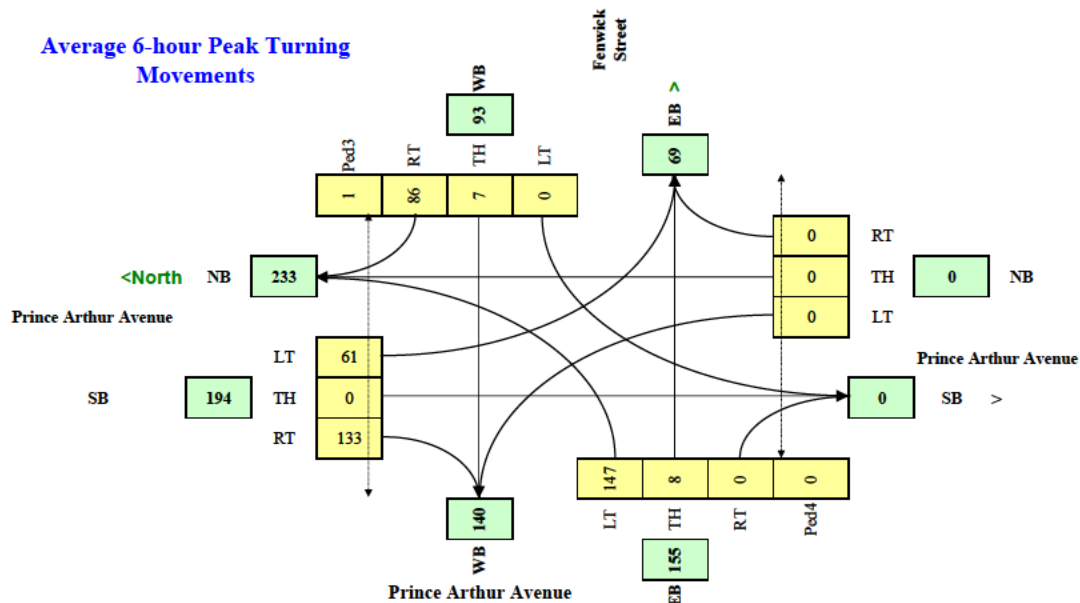
Table: B-1 - Prince Arthur Avenue at Fenwick Street
2037 Future w Site

Main Street (name)	Prince Arthur Avenue		Direction (EW or NS)		NS	Date:		April 2022	
Side Street (name)	Fenwick Street		Direction (EW or NS)		EW	City:		Dartmouth, NS	
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes	
	NB								
Prince Arthur Avenue	SB			1			185	0	
Prince Arthur Avenue	WB				1				
Fenwick Street	EB		1						
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)				
Prince Arthur Avenue	NS	50	2.0%	n	0.0				
Fenwick Street	EW	50	2.0%	n					

	Ped1	Ped2	Ped3	Ped4
	NS	NS	EW	EW
	W Side	E Side	N Side	S side
7:00 - 8:00	2	2	0	
8:00 - 9:00	69	15	0	
11:30 - 12:30	10	6	1	
12:30 - 13:30	125	3	2	
15:30 - 16:30	6	0	2	
16:30 - 17:30	13	2	0	
Total (6-hour peak)	225	28	5	0
Average (6-hour peak)	38	5	1	0

Demographics		
Elementary School	(y/n)	y
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	y
Metro Area Population (#)		400,000
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	25	0	70	0	10	130	95	5	0
8:00 - 9:00	0	0	0	60	0	210	0	5	100	175	10	0
11:30 - 12:30	0	0	0	35	0	110	0	5	55	120	5	0
12:30 - 13:30	0	0	0	45	0	110	0	0	55	135	5	0
15:30 - 16:30	0	0	0	90	0	145	0	10	75	185	10	0
16:30 - 17:30	0	0	0	110	0	155	0	10	100	170	15	0
Total (6-hour peak)	0	0	0	365	0	800	0	40	515	880	50	0
Average (6-hour peak)	0	0	0	61	0	133	0	7	86	147	8	0



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

W = 14 14 0
 Veh Ped
NOT Warranted

2005 Canadian Traffic Signal Warrant Matrix Analysis

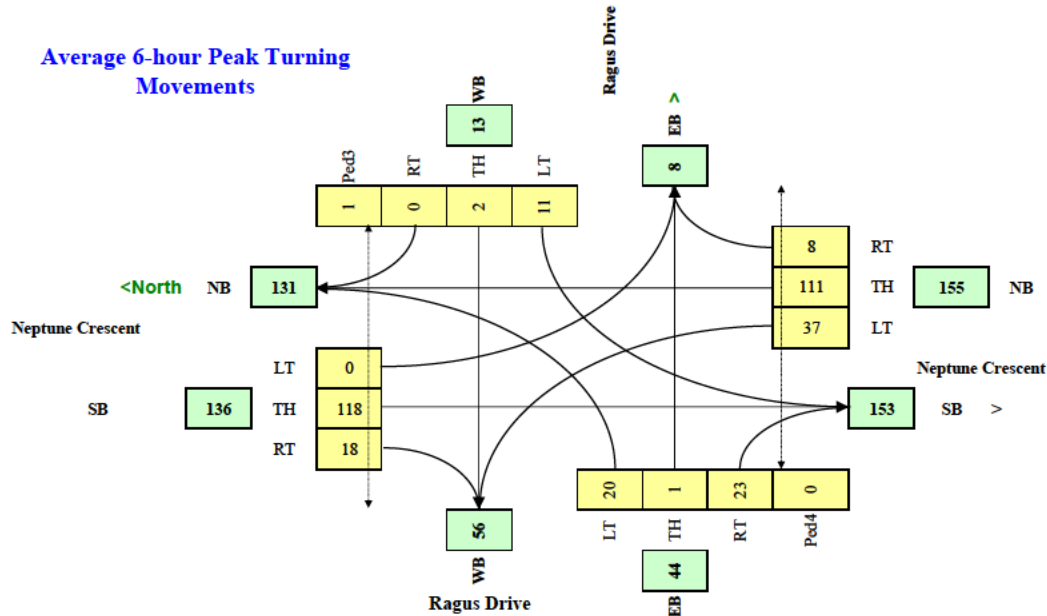
Table: B-2 - Neptune Crescent at Ragus Drive
2037 Future w Site

Main Street (name)	Neptune Crescent		Direction (EW or NS)		NS		Date:		April 2022	
Side Street (name)	Ragus Drive		Direction (EW or NS)		EW		City:		Dartmouth, NS	
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes		
Neptune Crescent	NB			1			1,300	1		
Neptune Crescent	SB			1			850	1		
Ragus Drive	WB			1						
Ragus Drive	EB			1						
Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)					
Neptune Crescent	NS	50	2.0%	n	0.0					
Ragus Drive	EW	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	1	1	1
8 00 - 9 00	3	0	0	1
11 30 - 12 30	0	0	0	0
12 30 - 13 30	1	2	1	0
15 30 - 16 30	1	1	2	0
16 30 - 17 30	0	1	1	0
Total (6-hour peak)	6	5	5	2
Average (6-hour peak)	1	1	1	0

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	400,000
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	35	75	5	0	150	25	10	5	0	10	0	10
8 00 - 9 00	40	115	5	0	120	20	15	0	0	15	0	10
11 30 - 12 30	45	60	10	0	100	15	5	5	0	15	5	25
12 30 - 13 30	35	75	5	0	80	10	10	0	0	15	0	25
15 30 - 16 30	35	155	15	0	120	15	20	0	0	25	0	30
16 30 - 17 30	30	185	5	0	140	20	5	0	0	40	0	40
Total (6-hour peak)	220	665	45	0	710	105	65	10	0	120	5	140
Average (6-hour peak)	37	111	8	0	118	18	11	2	0	20	1	23



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

W =	9	9	0
	Veh	Ped	
Not Warranted - Vs < 75			

2005 Canadian Traffic Signal Warrant Matrix Analysis

Table: B-3 - Mount Hope Avenue at Neptune Crescent
2037 Future w Site

Main Street (name)	Mount Hope Avenue	Direction (EW or NS)	EW	Date:	April 2022
Side Street (name)	Neptune Crescent	Direction (EW or NS)	NS	City:	Dartmouth, NS

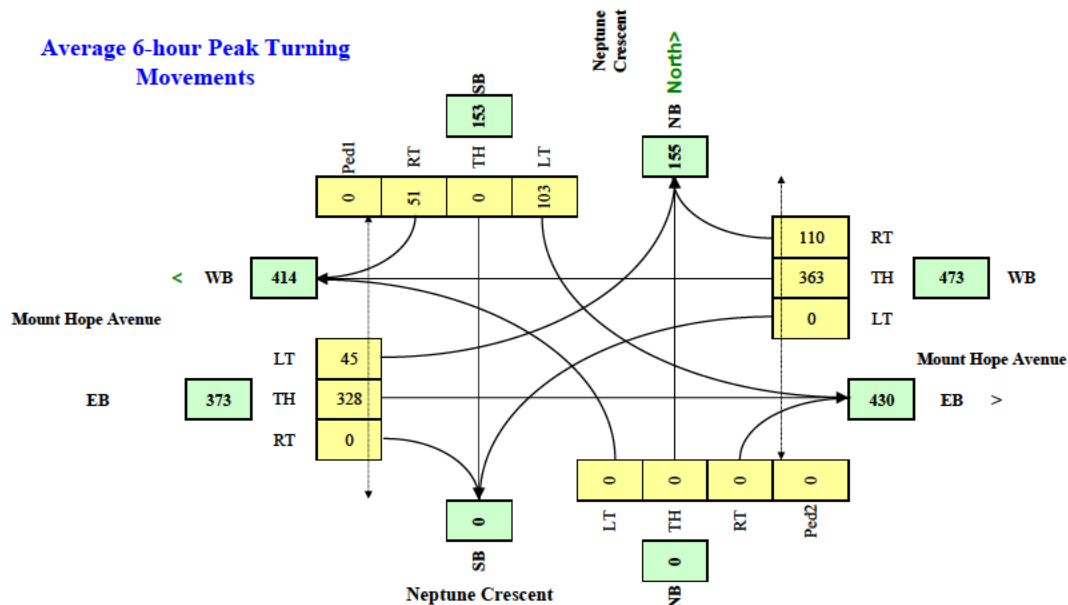
Lane Configuration		Excl LT	Th & LT	Through or Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Mount Hope Avenue	EB		1				850	1
Mount Hope Avenue	WB				1		10,000	1
Neptune Crescent	NB							
Neptune Crescent	SB			1				

Other input		Speed (Km/h)	Trucks %	Bus Rt (y/n)	Median (m)
Mount Hope Avenue	EW	50	2.0%	n	0.0
Neptune Crescent	NS	50	2.0%	n	

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

Demographics		
Elementary School	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population (#)		400,000
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	90	0	75	0	540	110	20	160	0
8 00 - 9 00	0	0	0	95	0	55	0	490	140	25	165	0
11 30 - 12 30	0	0	0	85	0	55	0	320	70	50	365	0
12 30 - 13 30	0	0	0	70	0	45	0	340	80	35	300	0
15 30 - 16 30	0	0	0	135	0	35	0	270	150	60	565	0
16 30 - 17 30	0	0	0	140	0	40	0	220	110	80	410	0
Total (6-hour peak)	0	0	0	615	0	305	0	2,180	660	270	1,965	0
Average (6-hour peak)	0	0	0	103	0	51	0	363	110	45	328	0



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

W =	61	61	0
	Veh	Ped	
NOT Warranted			

APPENDIX

C

INTERSECTION PERFORMANCE ANALYSIS



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↘	↗	↘	↗
Traffic Volume (vph)	315	55	255	635	45	210
Future Volume (vph)	315	55	255	635	45	210
Satd. Flow (prot)	1825	0	1770	1863	1770	1583
Flt Permitted			0.322		0.950	
Satd. Flow (perm)	1825	0	600	1863	1770	1583
Satd. Flow (RTOR)	11					228
Lane Group Flow (vph)	402	0	277	690	49	228
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	57.0		23.0	80.0	30.0	30.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effect Green (s)	17.1		32.8	30.5	10.4	10.4
Actuated g/C Ratio	0.32		0.62	0.57	0.20	0.20
v/c Ratio	0.68		0.48	0.65	0.14	0.46
Control Delay	21.8		7.5	10.8	21.6	7.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	21.8		7.5	10.8	21.6	7.5
LOS	C		A	B	C	A
Approach Delay	21.8			9.8	10.0	
Approach LOS	C			A	A	
Queue Length 50th (m)	32.6		10.3	39.5	4.0	0.0
Queue Length 95th (m)	62.6		19.5	69.3	13.9	16.8
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1706		792	1863	810	848
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.24		0.35	0.37	0.06	0.27

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 53.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 12.8

Intersection LOS: B

Intersection Capacity Utilization 55.9%

ICU Level of Service B

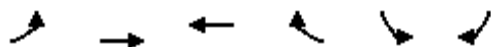
Analysis Period (min) 15

Splits and Phases: 1: Prince Arthur Avenue & Portland Street

↙ Ø1	→ Ø2	↖ Ø4
23 s	57 s	30 s
↖ Ø6		
80 s		

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	175	10	60	210	5	20
Future Volume (Veh/h)	175	10	60	210	5	20
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)	190	11	65	228	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)				205		
pX, platoon unblocked						
vC, conflicting volume			201		554	196
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			201		554	196
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		99	97
cM capacity (veh/h)			1371		470	846
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	201	293	27			
Volume Left	0	65	5			
Volume Right	11	0	22			
cSH	1700	1371	737			
Volume to Capacity	0.12	0.05	0.04			
Queue Length 95th (m)	0.0	1.2	0.9			
Control Delay (s)	0.0	2.1	10.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.1	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			37.5%	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)	15	0	10	10	0	0	50	110	5	0	40	10
Future Volume (Veh/h)	15	0	10	10	0	0	50	110	5	0	40	10
Sign Control		Stop			Stop			Free			Free	
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)	16	0	11	11	0	0	54	120	5	0	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)												
pX, platoon unblocked												
vC, conflicting volume	279	282	48	290	284	122	54			125		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	279	282	48	290	284	122	54			125		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	99	98	100	100	97			100		
cM capacity (veh/h)	655	605	1020	638	603	929	1551			1462		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	27	11	179	54								
Volume Left	16	11	54	0								
Volume Right	11	0	5	11								
cSH	767	638	1551	1462								
Volume to Capacity	0.04	0.02	0.03	0.00								
Queue Length 95th (m)	0.9	0.4	0.9	0.0								
Control Delay (s)	9.9	10.7	2.4	0.0								
Lane LOS	A	B	A									
Approach Delay (s)	9.9	10.7	2.4	0.0								
Approach LOS	A	B										
Intersection Summary												
Average Delay			3.0									
Intersection Capacity Utilization			25.5%	ICU Level of Service					A			
Analysis Period (min)			15									



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	150	570	150	30	20
Future Volume (Veh/h)	20	150	570	150	30	20
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	163	620	163	33	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	783				908	702
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	783				908	702
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				89	95
cM capacity (veh/h)	835				297	438
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	22	163	783	33	22	
Volume Left	22	0	0	33	0	
Volume Right	0	0	163	0	22	
cSH	835	1700	1700	297	438	
Volume to Capacity	0.03	0.10	0.46	0.11	0.05	
Queue Length 95th (m)	0.6	0.0	0.0	3.0	1.3	
Control Delay (s)	9.4	0.0	0.0	18.6	13.6	
Lane LOS	A			C	B	
Approach Delay (s)	1.1		0.0	16.6		
Approach LOS				C		
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			49.1%		ICU Level of Service	
Analysis Period (min)			15			
A						

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↘	↗	↘	↗
Traffic Volume (vph)	750	40	205	475	60	235
Future Volume (vph)	750	40	205	475	60	235
Satd. Flow (prot)	1850	0	1770	1863	1770	1583
Flt Permitted			0.107		0.950	
Satd. Flow (perm)	1850	0	199	1863	1770	1583
Satd. Flow (RTOR)	4					255
Lane Group Flow (vph)	858	0	223	516	65	255
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	69.8		17.0	86.8	23.2	23.2
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effect Green (s)	40.9		56.5	54.2	11.2	11.2
Actuated g/C Ratio	0.52		0.72	0.69	0.14	0.14
v/c Ratio	0.88		0.68	0.40	0.26	0.57
Control Delay	27.9		23.0	5.7	38.1	11.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	27.9		23.0	5.7	38.1	11.1
LOS	C		C	A	D	B
Approach Delay	27.9			10.9	16.6	
Approach LOS	C			B	B	
Queue Length 50th (m)	101.0		10.7	25.8	8.7	0.0
Queue Length 95th (m)	192.1		41.6	47.5	26.6	23.4
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1538		417	1751	407	560
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.56		0.53	0.29	0.16	0.46

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 78.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 19.5

Intersection LOS: B

Intersection Capacity Utilization 75.1%

ICU Level of Service D

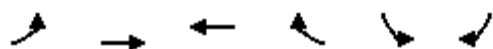
Analysis Period (min) 15

Splits and Phases: 1: Prince Arthur Avenue & Portland Street

↙ Ø1	→ Ø2	↖ Ø4
17 s	69.8 s	23.2 s
↘ Ø6		
86.8 s		

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	280	15	25	230	10	100
Future Volume (Veh/h)	280	15	25	230	10	100
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)	304	16	27	250	11	109
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			320		616	312
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			320		616	312
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	85
cM capacity (veh/h)			1240		444	728
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	320	277	120			
Volume Left	0	27	11			
Volume Right	16	0	109			
cSH	1700	1240	688			
Volume to Capacity	0.19	0.02	0.17			
Queue Length 95th (m)	0.0	0.5	5.0			
Control Delay (s)	0.0	1.0	11.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.0	11.3			
Approach LOS			B			
Intersection Summary						
Average Delay		2.3				
Intersection Capacity Utilization		45.9%		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)	20	0	40	5	0	0	30	90	5	0	105	15
Future Volume (Veh/h)	20	0	40	5	0	0	30	90	5	0	105	15
Sign Control		Stop			Stop			Free			Free	
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	0	43	5	0	0	33	98	5	0	114	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)												
pX, platoon unblocked												
vC, conflicting volume	288	291	122	332	296	100	130	103				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	288	291	122	332	296	100	130	103				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	97	100	95	99	100	100	98	100				
cM capacity (veh/h)	652	605	929	583	601	955	1455	1489				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	65	5	136	130								
Volume Left	22	5	33	0								
Volume Right	43	0	5	16								
cSH	812	583	1455	1489								
Volume to Capacity	0.08	0.01	0.02	0.00								
Queue Length 95th (m)	2.1	0.2	0.6	0.0								
Control Delay (s)	9.8	11.2	2.0	0.0								
Lane LOS	A	B	A									
Approach Delay (s)	9.8	11.2	2.0	0.0								
Approach LOS	A	B										
Intersection Summary												
Average Delay	2.9											
Intersection Capacity Utilization	23.4%			ICU Level of Service					A			
Analysis Period (min)	15											



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	30	585	265	100	125	25
Future Volume (Veh/h)	30	585	265	100	125	25
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)	33	636	288	109	136	27
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	397				1044	342
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	397				1044	342
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				45	96
cM capacity (veh/h)	1162				246	700
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	33	636	397	136	27	
Volume Left	33	0	0	136	0	
Volume Right	0	0	109	0	27	
cSH	1162	1700	1700	246	700	
Volume to Capacity	0.03	0.37	0.23	0.55	0.04	
Queue Length 95th (m)	0.7	0.0	0.0	24.3	1.0	
Control Delay (s)	8.2	0.0	0.0	36.3	10.3	
Lane LOS	A			E	B	
Approach Delay (s)	0.4		0.0	32.0		
Approach LOS				D		
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization			44.4%	ICU Level of Service		A
Analysis Period (min)			15			

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↘	↗	↘	↗
Traffic Volume (vph)	315	57	256	635	106	259
Future Volume (vph)	315	57	256	635	106	259
Satd. Flow (prot)	1824	0	1770	1863	1770	1583
Flt Permitted			0.320		0.950	
Satd. Flow (perm)	1824	0	596	1863	1770	1583
Satd. Flow (RTOR)	10					282
Lane Group Flow (vph)	404	0	278	690	115	282
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	54.0		24.0	78.0	32.0	32.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effect Green (s)	17.8		33.9	31.6	11.0	11.0
Actuated g/C Ratio	0.32		0.62	0.57	0.20	0.20
v/c Ratio	0.68		0.48	0.65	0.33	0.52
Control Delay	22.4		7.7	11.1	24.2	7.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.4		7.7	11.1	24.2	7.5
LOS	C		A	B	C	A
Approach Delay	22.4			10.1	12.3	
Approach LOS	C			B	B	
Queue Length 50th (m)	33.3		10.3	39.5	10.1	0.0
Queue Length 95th (m)	68.2		22.3	77.5	27.7	18.5
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1598		802	1863	855	910
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.25		0.35	0.37	0.13	0.31

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 55.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 13.4

Intersection LOS: B

Intersection Capacity Utilization 56.1%

ICU Level of Service B

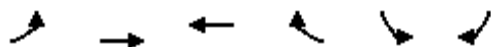
Analysis Period (min) 15

Splits and Phases: 1: Prince Arthur Avenue & Portland Street

↖ Ø1	→ Ø2	↖ Ø4
24 s	54 s	32 s
↖ Ø6		
78 s		

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	175	10	63	210	5	130
Future Volume (Veh/h)	175	10	63	210	5	130
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)	190	11	68	228	5	141
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			201		560	196
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			201		560	196
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		99	83
cM capacity (veh/h)			1371		465	846
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	201	296	146			
Volume Left	0	68	5			
Volume Right	11	0	141			
cSH	1700	1371	823			
Volume to Capacity	0.12	0.05	0.18			
Queue Length 95th (m)	0.0	1.3	5.1			
Control Delay (s)	0.0	2.1	10.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.1	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			42.7%	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)	15	0	10	10	0	0	50	113	5	0	155	30
Future Volume (Veh/h)	15	0	10	10	0	0	50	113	5	0	155	30
Sign Control		Stop			Stop			Free			Free	
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)	16	0	11	11	0	0	54	123	5	0	168	33
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	420	184	429	434	126	201	128				
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	418	420	184	429	434	126	201	128				
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1	4.1				
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	97	100	99	98	100	100	96	100				
cM capacity (veh/h)	529	504	858	513	494	925	1371	1458				
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	27	11	182	201								
Volume Left	16	11	54	0								
Volume Right	11	0	5	33								
cSH	627	513	1371	1458								
Volume to Capacity	0.04	0.02	0.04	0.00								
Queue Length 95th (m)	1.1	0.5	1.0	0.0								
Control Delay (s)	11.0	12.2	2.5	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	11.0	12.2	2.5	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay	2.1											
Intersection Capacity Utilization	32.3%			ICU Level of Service					A			
Analysis Period (min)	15											



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	150	570	152	91	74
Future Volume (Veh/h)	21	150	570	152	91	74
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)	23	163	620	165	99	80
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	785				912	702
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	785				912	702
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				67	82
cM capacity (veh/h)	834				296	438
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	23	163	785	99	80	
Volume Left	23	0	0	99	0	
Volume Right	0	0	165	0	80	
cSH	834	1700	1700	296	438	
Volume to Capacity	0.03	0.10	0.46	0.33	0.18	
Queue Length 95th (m)	0.7	0.0	0.0	11.4	5.3	
Control Delay (s)	9.4	0.0	0.0	23.2	15.1	
Lane LOS	A			C	C	
Approach Delay (s)	1.2		0.0	19.5		
Approach LOS				C		
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			50.9%	ICU Level of Service		A
Analysis Period (min)			15			

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰		↱	↰	↱	↱
Traffic Volume (vph)	750	90	245	475	79	250
Future Volume (vph)	750	90	245	475	79	250
Satd. Flow (prot)	1837	0	1770	1863	1770	1583
Flt Permitted			0.085		0.950	
Satd. Flow (perm)	1837	0	158	1863	1770	1583
Satd. Flow (RTOR)	9					272
Lane Group Flow (vph)	913	0	266	516	86	272
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases			6			4
Total Split (s)	67.0		20.0	87.0	23.0	23.0
Total Lost Time (s)	6.2		4.0	6.2	6.0	6.0
Act Effect Green (s)	49.7		69.1	66.8	11.6	11.6
Actuated g/C Ratio	0.55		0.76	0.73	0.13	0.13
v/c Ratio	0.91		0.76	0.38	0.38	0.62
Control Delay	32.7		34.6	5.2	46.4	12.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	32.7		34.6	5.2	46.4	12.2
LOS	C		C	A	D	B
Approach Delay	32.7			15.2	20.4	
Approach LOS	C			B	C	
Queue Length 50th (m)	140.9		27.1	26.2	16.0	0.0
Queue Length 95th (m)	#259.8		#69.0	48.6	33.3	24.1
Internal Link Dist (m)	286.7			138.5	181.4	
Turn Bay Length (m)			45.0			30.0
Base Capacity (vph)	1271		412	1624	341	525
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.72		0.65	0.32	0.25	0.52

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 91.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 23.9

Intersection LOS: C

Intersection Capacity Utilization 80.3%

ICU Level of Service D

Analysis Period (min) 15

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

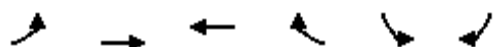
Queue shown is maximum after two cycles.

Splits and Phases: 1: Prince Arthur Avenue & Portland Street

↙ Ø1	→ Ø2	↖ Ø4
20 s	67 s	23 s
↖ Ø6		
87 s		

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↱	↘↗	
Traffic Volume (veh/h)	280	15	115	230	10	134
Future Volume (Veh/h)	280	15	115	230	10	134
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)	304	16	125	250	11	146
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				205		
pX, platoon unblocked						
vC, conflicting volume			320		812	312
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			320		812	312
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		96	80
cM capacity (veh/h)			1240		313	728
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	320	375	157			
Volume Left	0	125	11			
Volume Right	16	0	146			
cSH	1700	1240	666			
Volume to Capacity	0.19	0.10	0.24			
Queue Length 95th (m)	0.0	2.7	7.3			
Control Delay (s)	0.0	3.4	12.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.4	12.1			
Approach LOS			B			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			53.0%	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)	36	0	40	5	0	0	30	183	5	0	139	21
Future Volume (Veh/h)	36	0	40	5	0	0	30	183	5	0	139	21
Sign Control		Stop			Stop			Free			Free	
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)	39	0	43	5	0	0	33	199	5	0	151	23
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	430	432	162	473	442	202	174			204		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	430	432	162	473	442	202	174			204		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	95	99	100	100	98			100		
cM capacity (veh/h)	526	504	882	468	498	839	1403			1368		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	82	5	237	174								
Volume Left	39	5	33	0								
Volume Right	43	0	5	23								
cSH	667	468	1403	1368								
Volume to Capacity	0.12	0.01	0.02	0.00								
Queue Length 95th (m)	3.3	0.3	0.6	0.0								
Control Delay (s)	11.2	12.8	1.2	0.0								
Lane LOS	B	B	A									
Approach Delay (s)	11.2	12.8	1.2	0.0								
Approach LOS	B	B										
Intersection Summary												
Average Delay			2.6									
Intersection Capacity Utilization			34.2%	ICU Level of Service					A			
Analysis Period (min)			15									



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	73	585	265	150	144	40
Future Volume (Veh/h)	73	585	265	150	144	40
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)	79	636	288	163	157	43
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	451				1164	370
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	451				1164	370
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				21	94
cM capacity (veh/h)	1109				200	676
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total	79	636	451	157	43	
Volume Left	79	0	0	157	0	
Volume Right	0	0	163	0	43	
cSH	1109	1700	1700	200	676	
Volume to Capacity	0.07	0.37	0.27	0.79	0.06	
Queue Length 95th (m)	1.8	0.0	0.0	43.6	1.6	
Control Delay (s)	8.5	0.0	0.0	68.1	10.7	
Lane LOS	A			F	B	
Approach Delay (s)	0.9		0.0	55.7		
Approach LOS				F		
Intersection Summary						
Average Delay			8.7			
Intersection Capacity Utilization			45.4%		ICU Level of Service	
Analysis Period (min)			15			
			A			