

February 19, 2021

Ms. Stephanie Mah, MES Planning, MCIP, LPP  
 Planner, Urban Designer  
 Clayton Developments

**RE: Review of Traffic Impacts from Land Use By-Law Modifications for Zone R-1  
 and Revision Carriagewood Estates Development Layout - Daisy Drive, Beaver Bank, Nova Scotia**

Dear Ms. Mah:

Plans to modify the land use by-law for R-1 zoned lots within the Beaver Bank, Hammonds Plains and Upper Sackville plan area are being reviewed. This consists of adjusting the minimum lot area from 6,000 square feet and a frontage of 60ft to a minimum size of 4,000 square feet with a frontage of 40ft, providing a potential opportunity for the R-1 zoned lots to be subdivided and increase the density in the area.

WSP reviewed the market analysis report completed by Turner Drake and Partners who looked at the potential impacts to the modified land use by-law for R-1 zoned lots. This included the review of surrounding properties and potential for additional subdivision and increased number of units in the area. This could occur where an existing 80ft lot is divided into two 40ft lots as well as two 60ft lots being subdivided into three 40ft lots. Turner Drake and Partners concluded that a large commercial undertaking for developments is not expected from lowering the R-1 Zone lots to a 40ft frontage.

Clayton Developments has revised the concept plan for Carriagewood Estates to include both 60ft frontage lots and 40ft frontage lots for single family homes as shown in Figure 1.



**Figure 1 - Revised Concept Plan for Carriagewood Estates**



**Traffic Impacts from Land Use By-Law Modifications for Zone R-1  
Carriagewood Estates Development - Daisy Drive, Beaver Bank, Nova Scotia**

The proposed concept change will adjust the overall layout of the site however site access points will remain the same as well as the number of units within the new development. A Traffic Impact Study was completed for the development in 2014. The area development has also been reviewed in 2021 with an Addendum Traffic Impact Study completed to consider an update to the site plan and to review changes to the transportation network that may have changed since 2014. A copy of this Addendum is attached.

**CONCLUSIONS:**

- 1 - Since the changes to the lot frontage has not changed the number of units planned in the Carriagewood Estates Development, the conclusions reached in the Traffic Impact Study and Addendum remain valid.
- 2 - Since the expected uptake for subdivision of existing land parcels is expected to be low and occur over a long duration with potential for few units per year, traffic generated by these additional units is included as part of the ongoing background volume growth. Background volume growth has been considered in the Carriagewood Estates Traffic Impact Study and Addendum.

If you have any questions or comments, please contact me by email at [greg.obrien@wsp.com](mailto:greg.obrien@wsp.com) or by telephone at 902-444-8347.

Sincerely  
**Original Signed**

Greg O'Brien, P.Eng.  
Atlantic Practice Manager, Traffic Engineering and Transportation Planning  
WSP Canada Inc.



Attachment –Traffic Impact Study - Addendum, Carriagewood Estates Development, February 2021

February 19, 2021

Mr. Scott MacCallum, P.Eng., MBA  
Director of Operations  
Clayton Developments

[via email: [smacallum@claytondev.com](mailto:smacallum@claytondev.com)]

**RE: Traffic Impact Study – Addendum  
Carriagewood Estates Development - Daisy Drive, Beaver Bank, Nova Scotia**

Dear Mr. MacCallum:

In October 2014, WSP completed a Traffic Impact Study for the proposed Carriagewood Estates development in Beaver Bank, NS. The Traffic Impact Study reviewed the following concepts for the proposed site development: site access, estimate of generated trips, intersection level of service analysis, intersection signal warrant analysis and the warrants for left and right-turn lanes at the intersections of Beaver Bank Road and Trinity Lane, as well as Beaver Bank Road and Mayflower Avenue.

In 2014, it was determined that a right-turn lane on the northbound approach to Mayflower Avenue was warranted based on projected PM peak hour volumes for 2024. It was recommended to continue to review the need for a right-turn lane periodically and that consideration be given to adding a paved surface to the existing gravel section of Trinity Lane.

Since the previous Traffic Impact Study was completed in 2014, paving on Trinity Lane has been completed, the concept plan for the proposed site development has been modified, as shown in Figure 1, and Phase 1B has completed construction. This addendum is a follow up to the 2014 Traffic Impact Study and will review current and projected traffic volumes based on the planned modifications for Carriagewood Estates.

## EXISTING CONDITIONS

### SITE DESCRIPTION AND ACCESS POINTS

The latest concept layout is shown in Figure 1. Although it displays an alternate road network within the proposed development area compared to the previous 2014 concept design, the site access locations and overall number of units remain the same. Similarly, to the previous concept design in 2014, the 2021 concept design will provide access to Carriagewood Estates will be from an extension on Daisy Drive and a proposed connection to Trinity Lane as shown in Figure 1. Access to Beaver Bank Road will remain being from the Mayflower and Beaver Bank Intersection as well as the Trinity Lane and Beaver Bank intersection.

The proposed development includes a total of 270 single family homes for Carriagewood Estates with 14 units completed in Phase 1B on Splinter Court, shown in Figure 2. This leaves a total of 256 homes remaining to be built.

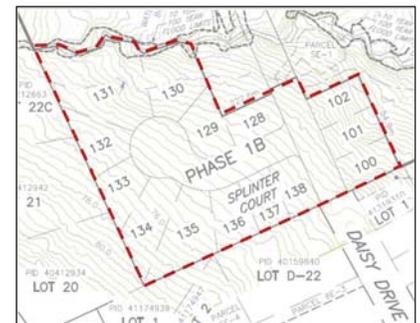


Figure 2 - Phase 1B: Splinter Court



## DESCRIPTION OF STREETS AND INTERSECTIONS

Streets and accesses remain the same as described in the 2014 Traffic Impact Study with the exception of Trinity Lane and Splinter Court.

**Trinity Lane** is a 2-lane residential street that runs North-South approximately 1.3km between Mayflower Avenue and Beaver Bank Road. Though not posted, it has an assumed speed limit of 50km/h. This road has been paved since the 2014 Traffic Impact Study completed for this area as shown in Photo 1.



Photo 1 - Trinity Lane at Mayflower Avenue

**Splinter Court** is a new street that was developed as part as Phase 1B, shown in Photo 2.



Photo 2 - Splinter Court from Daisy Drive

## TRAFFIC VOLUME DATA

WSP collected turning movement counts at the intersection of Beaver Bank Road and Mayflower Avenue in February of 2021. Counts are summarized in Table A-1, Appendix A, with peak hours indicated by shaded areas. Trips generated by the existing 14 units on Splinter Court have been captured on the turning movement counts collected during February 2021.



The turning movements observed during the morning and evening peak periods at Beaver Bank Road and Mayflower Avenue are shown in Figure A-1, boxes A and B.

The projected background volumes were developed for the 2031 horizon year using a growth factor of 1% per year. A design hourly volume (DHV) factor of 5% was applied to the projected volumes 2031 to account for a decrease in travel due to the COVID-19 pandemic. Projected 2031 background volumes without site development are shown in Figure A-1, boxes C and D.

## TRIP GENERATION

When using the published trip generation rates in *Trip Generation Manual, 10<sup>th</sup> Edition* (Institute of Transportation Engineers, Washington, 2017) the transportation engineer’s objective should be to provide a realistic estimate of the number of trips that will be generated. Generated trips for Single Family Homes (Land Use 210) were estimated for the AM and PM peak hours of traffic by the number of units. Trip generation estimates were prepared using *Trip Generation Manual, 10<sup>th</sup> Edition* (Institute of Transportation Engineers, Washington, 2017) for the expected build-out of Carriagewood Estates.

The Traffic Impact Study Completed in 2014 included 270 Units. While the overall development continues to include 270 units, 14 have already been constructed as discussed. Trip Generation for the remaining 256 units is included in Table 1.

It was estimated that the additional 256 single family homes for Carriagewood Estates development will generate:

- 178 two-way trips (45 entering and 133 exiting) during the AM peak hour; and,
- 238 two-way trips (150 entering and 88 exiting) during the PM peak hour.

**Table 1 - Trip Generation Estimates for Proposed Residential Development**

Land Use <sup>1</sup>	Units <sup>2</sup>	Trip Generation Rates <sup>3</sup>				Trips Generated <sup>4</sup>			
		AM Peak		PM Peak		AM Peak		PM Peak	
		In	Out	In	Out	In	Out	In	Out
<b>CARRIAGEWOOD DEVELOPMENT</b>									
Single-Family Detached Housing (Land Use 210)	256 Units	Equations from Pages 3 and 4 (Residential - Land Uses 200 - 299)				47	140	158	93
		5% Reduction in Trip Estimate for Non-Auto Modes <sup>5</sup>				2	7	8	5
<b>Total Primary Trips Generated by the Proposed Site</b>					<b>45</b>	<b>133</b>	<b>150</b>	<b>88</b>	
Notes: 1. Land Use Code 210 is from Trip Generation, 10th Edition, (Institute of Transportation Engineers, Washington, 2017). 2. 'Number of Residential Units' for Single-Family Detached Housing. 3. Trip generation rates are 'vehicles per hour unit'. 4. Trips generated are 'vehicles per hour' for AM and PM peak hours. 5. A 5% reduction for non-auto trips generated has been used for all land uses to account for transit, cycling and walking trips.									

## TRIP DISTRIBUTION & ASSIGNMENT

Trips generated by the residential units for the proposed development have been distributed and assigned to the local street network based on the previous 2014 Traffic Impact Study which was reviewed and considered valid for 2021 conditions. The external trips generated by the proposed development have been distributed in the following proportions based on the review of the local street network and development surrounding the site, as well as local knowledge of the area:

- 10% - North on Beaver Bank Road
- 90% - South on Beaver Bank Road

Trips assigned to Beaver Bank Road from Mayflower Avenue are shown diagrammatically in Appendix A, Figure A-2, boxes A and B. Project 2031 volumes with site development are included in Figure A-2, boxes C and D.



## TURNING LANE WARRANT ANALYSIS

### LEFT TURN LANE WARRANT ANALYSIS

Analysis of left turn lane warrants were previously completed in 2014 for southbound left turns from Beaver Bank Road into Mayflower Avenue and Trinity Lane for projected 2024 volumes both without and with the addition of site generated trips. As stated in the previous Traffic Impact Study, the analysis indicated that left turn lanes are not expected to be warranted for all scenarios. Due to the minimal change in projected volumes and very low left-turning volumes from Beaver Bank Road, the previous conclusion remains valid and left-turn lanes are not considered to be warranted.

### RIGHT TURN LANE WARRANT ANALYSIS

Operational problems may result at an intersection where a ‘high’ number of vehicles slow to make a right turn into a site. The *Ohio Department of Transportation State Highway Access Management Manual* contains nomographs for evaluating right turn lane warrants on two lane roads. The analysis is based on right turning and advancing volumes.

As completed in the previous Traffic Impact Study for the proposed development, a right turn lane warrant analysis was completed based on the newly projected 2031 volumes. The right turn lane warrant evaluation included in Figure A-3, Appendix A, indicates that a right turn lane is warranted on the northbound approach to Mayflower Avenue during the PM peak hour based on projected 2031 volumes both without and with added site generated trips. It is also noted that a right turn lane is warranted based on 2021 PM peak hour volumes and was previously warranted with 2014 PM peak hour volumes.

## INTERSECTION PERFORMANCE ANALYSIS

An intersection performance analysis was completed for the previous study in 2014 to determine the performance level of an intersection. Level of service (LOS) is defined in terms of delay which is a measure of driver discomfort and frustration, fuel consumption, and increased travel time.

Due to the minimal change in site generated trips and projected volumes, the intersection performance analysis is still considered valid and can be referenced in the 2014 Traffic Impact Study. From the previous findings in 2014, there is a reserved intersection capacity and is expected to experience minimal delay allowing satisfactory LOS for projected 2024 volumes. While additional background growth will increase volumes for 2031, the original conclusions remain valid due to the reserved capacity of the intersection.

## SUMMARY

1. A Traffic Impact Study (TIS) was completed in 2014 for a residential subdivision consisting of 270 detached single family homes in Beaver Bank, NS. Phase 1B, Splinter Court, has since been complete and includes a total of 14 units. It is anticipated that the remaining 256 units will be complete by 2031.
2. Although the layout of the proposed development has been altered, the two original site access points will remain the same. These include: (i) an extension of Daisy Drive and (ii) a connection to Trinity Lane. Access to Beaver Bank Road will be from Mayflower Avenue (at the south of the development) and Trinity Lane (north of the development).
3. Trinity Lane has been paved since the 2014 Traffic Impact Study has been completed.
4. Since traffic volumes from the previous Traffic Impact Study were completed many years ago, new counts for the Mayflower Intersection have been collected and found to be consistent with volume projections within the area.
5. The remaining portion of the development will include 256 single family residential units. Trip generation estimates, estimated using rates published in *Trip Generation Manual, 10<sup>th</sup> Edition* (Institute of Transportation Engineers, Washington, 2017), indicate that the proposed development is expected to generate:
  - 178 two-way trips (45 entering and 133 exiting) during the AM peak hour; and,
  - 238 two-way trips (150 entering and 88 exiting) during the PM peak hour.

6. External trips generated by the development have been assigned based on review of the local street network and development surrounding the site as well as local knowledge of the area. Trips were distributed as follows:
  - 10% to the North on Beaver Bank Road
  - 20% to the South on Beaver Bank Road
7. Analysis of left turn lane warrants were previously completed in the 2014 Traffic Impact Study for southbound left turns from Beaver Bank Road into Mayflower Avenue for projected 2031 volumes, both without and with the addition of site generated trips. The analysis indicated that left turn lanes are not expected to be warranted for all scenarios.
8. Right turn lane warrants were completed for northbound right turns from Beaver Bank Road into Mayflower Avenue for projected 2031 volumes both without and with the addition of site generated trips. Similar to the right turn warrant analysis completed in 2014, the warrant evaluation has indicated that a right turn lane is warranted on the northbound approach to Mayflower Avenue during the PM peak hour based on projected 2031 volumes both without and with added site generated trips. It was also noted that a right turn lane is warranted based on 2021 PM peak hour traffic volumes.
9. Intersection performance analysis was previously completed for Beaver Bank Road intersections at Mayflower Avenue in the 2014 Traffic Impact Study. Results have indicated that intersection performance is expected to be satisfactory based on 2024 AM and PM peak hour volumes both without and with site development. The intersection performance for the projected 2031 AM and PM peak hour volumes is also expected to be satisfactory both without and with site development.

## CONCLUSION AND RECOMMENDATIONS

With the recent development of Phase 1B and growth of the surrounding area, traffic volumes remain consistent with predicted volumes and conclusions and recommendations of the Traffic Impact Study remain valid. Trinity Lane has been paved since the recommendations were made.

**Recommendation:** *The need for a right turn lane on the northbound approach to Mayflower Avenue (warranted based on projected 2024 [and 2031] PM peak hour volumes without and with development) should be reviewed periodically.*

**Conclusion:** Site generated trips are not expected to have a significant impact to traffic performance in the Study Area.

If you have any questions or comments, please contact me by email at [greg.obrien@wsp.com](mailto:greg.obrien@wsp.com) or by telephone at 902-444-8347.

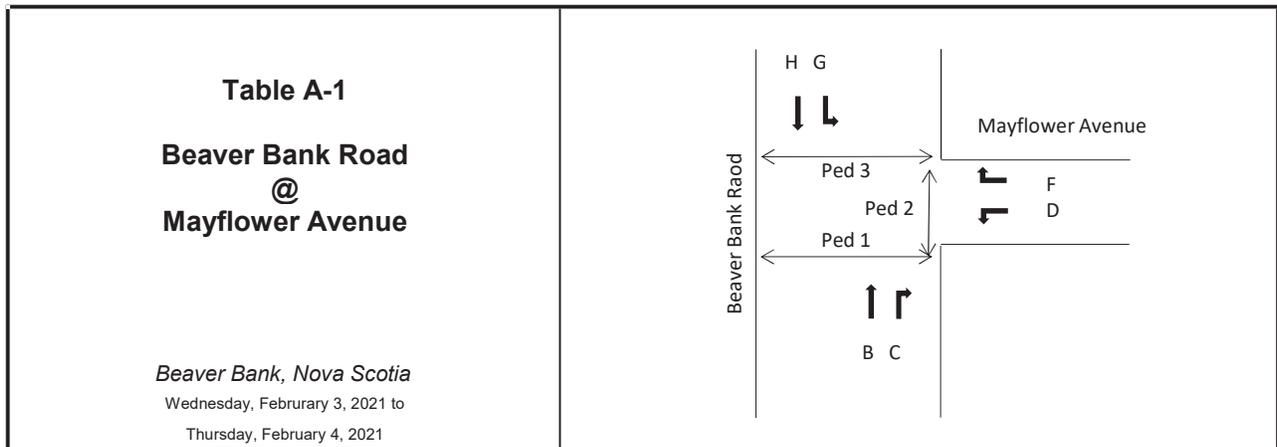
Since **Original Signed**

Greg O'Brien, P.Eng.  
Atlantic Practice Manager, Traffic Engineering and Transportation Planning  
WSP Canada Inc.





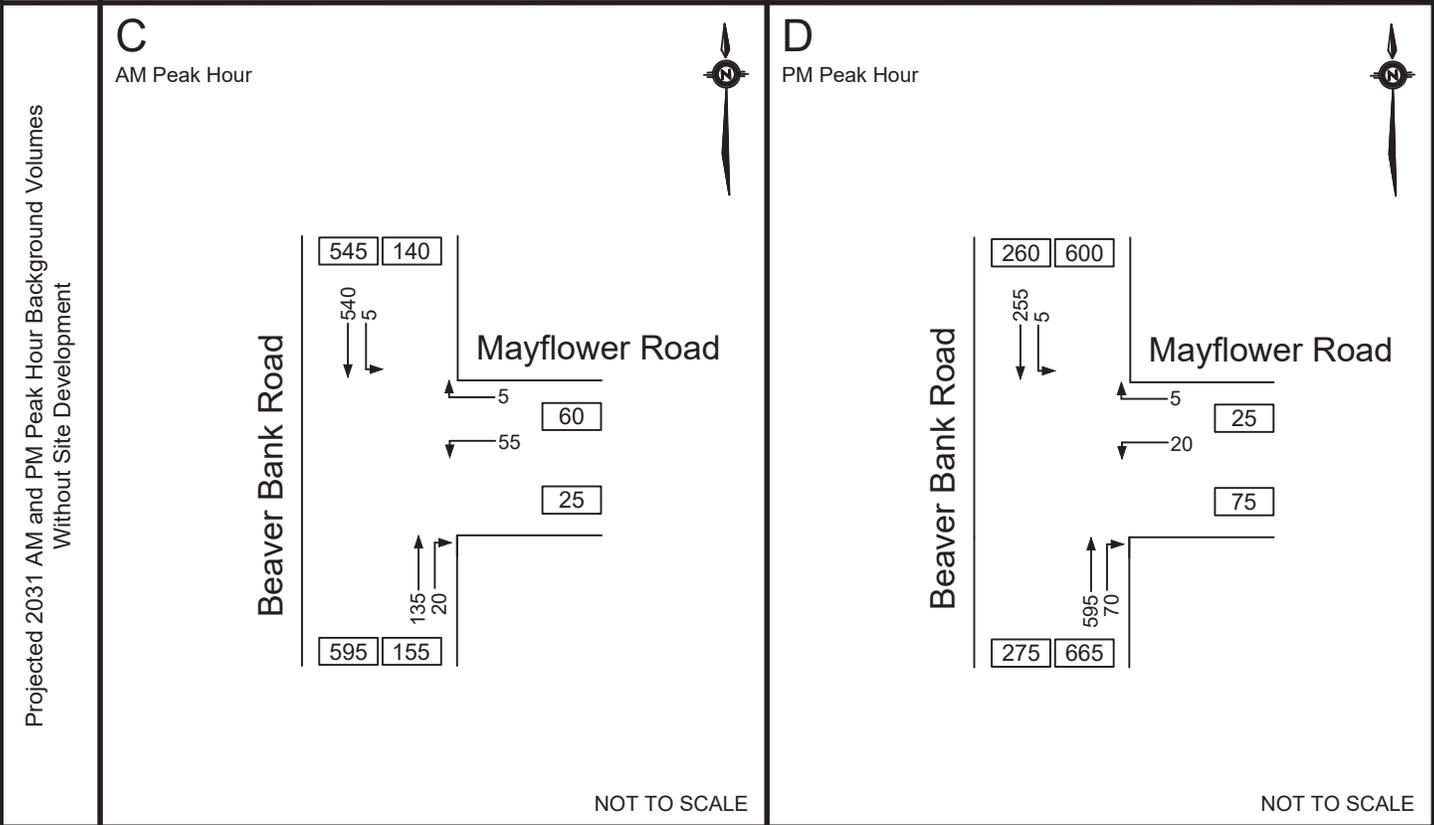
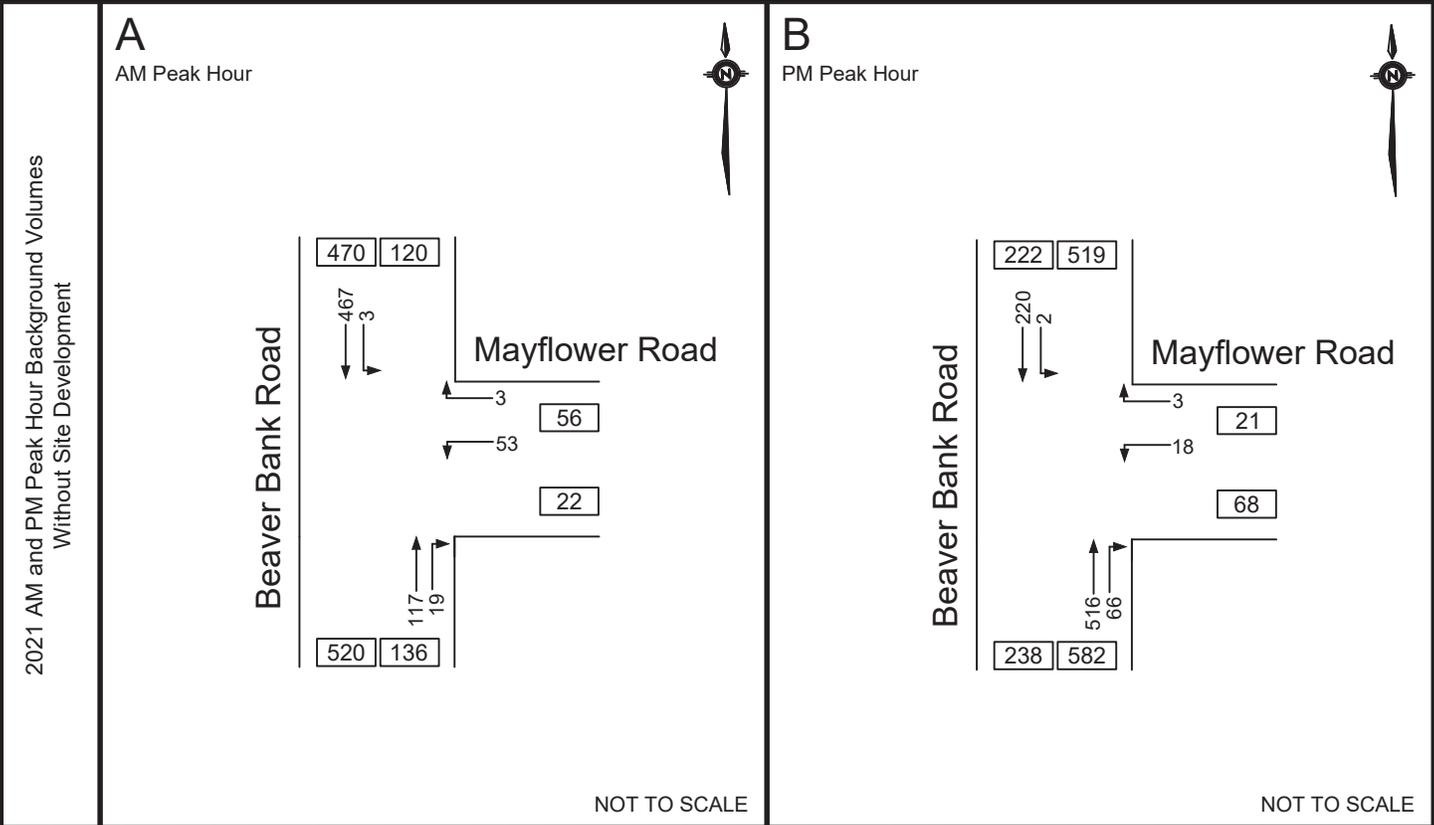
**APPENDIX A – TRAFFIC VOLUME DATA AND  
WARRANTS**

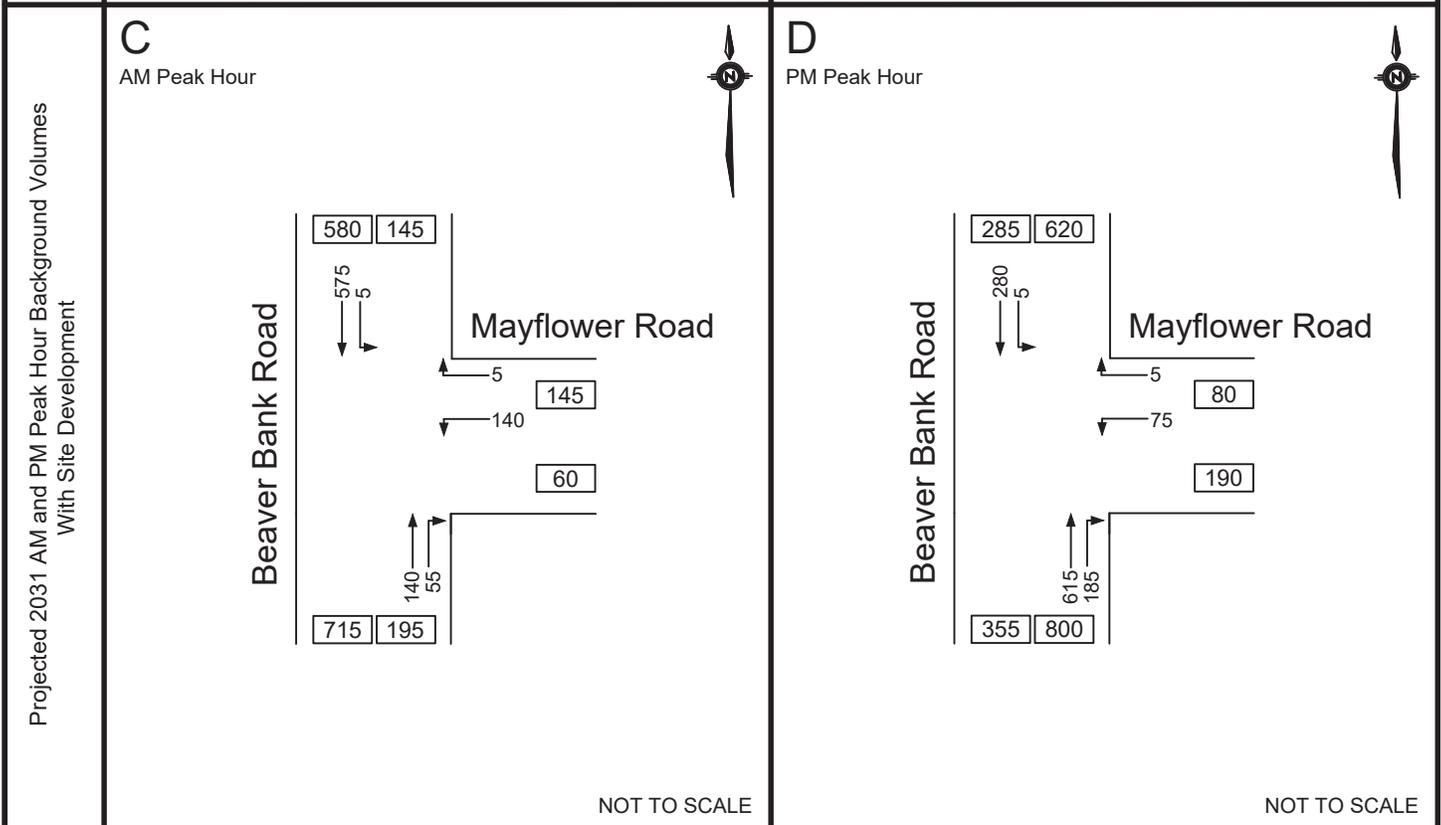
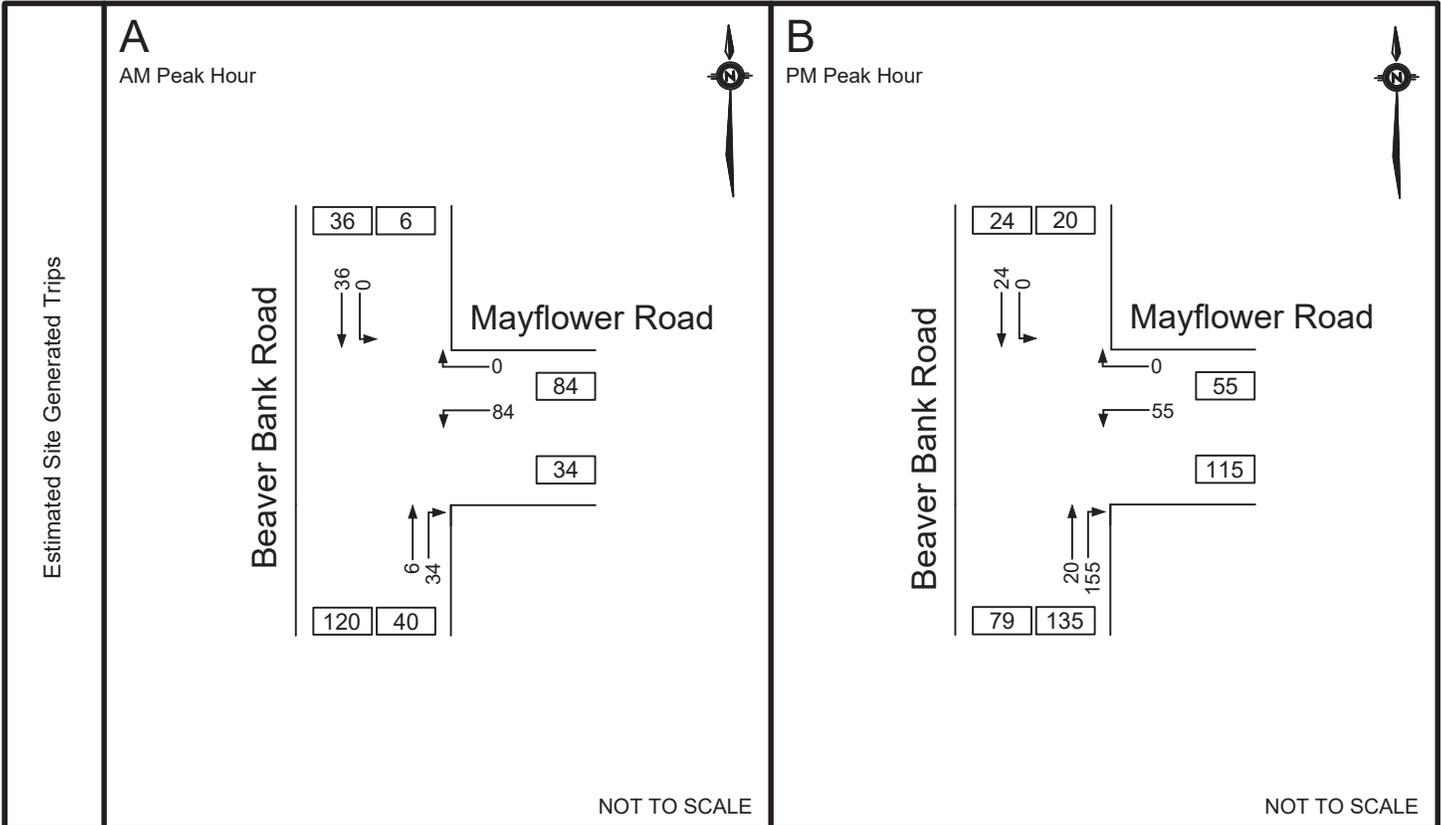


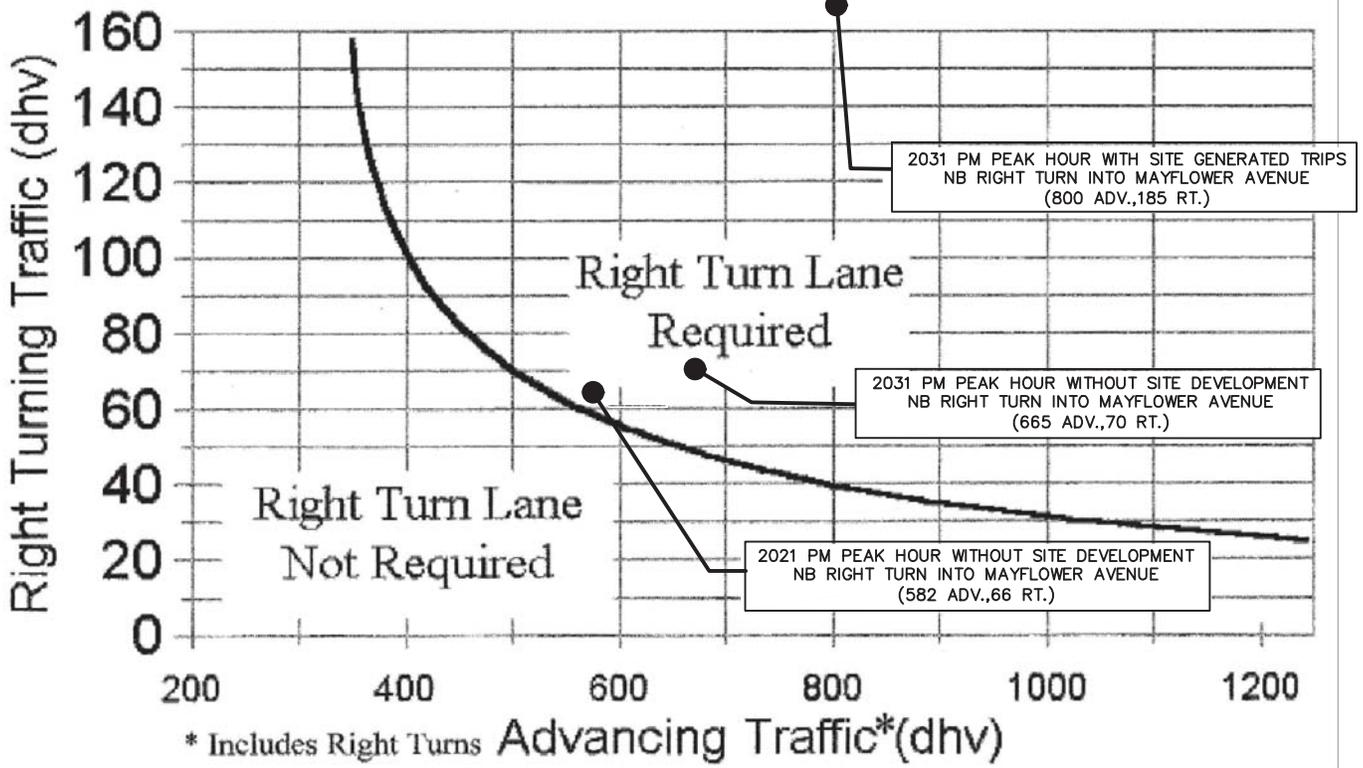
<b>AM Peak Period Volume Data</b>								
Time		Beaver Bank Road Northbound Approach		Mayflower Avenue Westbound Approach		Beaver Bank Road Southbound Approach		Total Vehicles
		B	C	D	F	G	H	
07:00	07:15	16	3	12	0	0	112	143
07:15	07:30	25	4	16	0	0	116	161
07:30	07:45	35	4	18	1	0	135	193
07:45	08:00	57	5	12	1	0	117	192
08:00	08:15	32	5	9	0	2	117	165
08:15	08:30	53	5	14	1	1	98	172
<b>AM Peak Hour</b>		<b>177</b>	<b>19</b>	<b>53</b>	<b>3</b>	<b>3</b>	<b>467</b>	<b>722</b>
07:00	08:00	133	16	58	2	0	480	689
08:00	09:00	85	10	23	1	3	215	337
		<b>Ped 1</b>		<b>Ped 2</b>		<b>Ped 3</b>		<b>Total Peds</b>
07:00	08:00	0		2		0		2
08:00	09:00	0		0		3		3

<b>PM Peak Period Volume Data</b>								
Time		Beaver Bank Road Northbound Approach		Mayflower Avenue Westbound Approach		Beaver Bank Road Southbound Approach		Total Vehicles
		B	C	D	F	G	H	
16:00	16:15	49	5	4	0	0	18	76
16:15	16:30	130	21	4	1	1	67	224
16:30	16:45	116	13	5	0	1	47	182
16:45	17:00	115	18	4	2	0	55	194
17:00	17:15	146	16	5	0	1	49	217
17:15	17:30	139	19	4	1	0	69	232
17:30	17:45	104	15	9	0	0	44	172
17:45	18:00	96	8	7	2	2	41	156
<b>PM Peak Hour</b>		<b>516</b>	<b>66</b>	<b>18</b>	<b>3</b>	<b>2</b>	<b>220</b>	<b>825</b>
16:00	17:00	410	57	17	3	2	187	676
17:00	18:00	485	58	25	3	3	203	777
		<b>Ped 1</b>		<b>Ped 2</b>		<b>Ped 3</b>		<b>Total Peds</b>
16:00	17:00	-		-		-		0
17:00	18:00	-		-		-		0

\* Count completed by WSP







Traffic Impact Study - Addendum - Proposed Residential Development  
 Carriagewood Estates  
 Beaver Bank, NS

Figure A-3

Right Turn Lane Warrants  
 Beaver Bank Road into Mayflower Avenue

February 2021