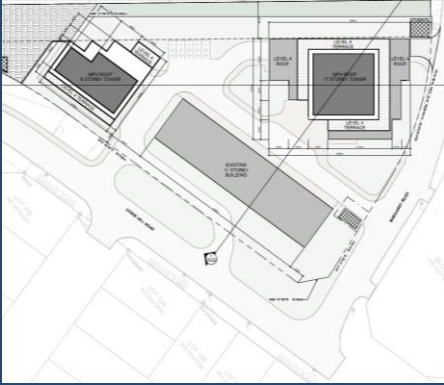


Traffic Impact Study

May 26th, 2023

Halifax, Nova Scotia

41 Cowie Hill Road



SUBMITTED BY:

DesignPoint Engineering & Surveying Ltd.

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Bedford, NS B4B 2J3

SUBMITTED TO:

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Issued For	By	Date
Submission to Halifax Regional Municipality	HFM	May 26 th , 2023
<p>Transportation Engineer Harrison McGrath, P. Eng.</p> 		

This report was prepared by DesignPoint Engineering & Surveying Ltd. for Hazelview Investments using the care and skill ordinarily exercised by members of the engineering profession currently practicing under similar circumstances on similar projects in Nova Scotia.

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1.0 INTRODUCTION

1.1 Project Overview

DesignPoint Engineering & Surveying Ltd. has been engaged to complete a traffic impact study for a proposed development on Cowie Hill Road and Margaret Road. The project redevelops the 41 Cowie Hill Road parking lot and adds an 8-storey building with 58 residential units and a 17-storey building with 122 residential units. Each building will have underground parking. The site will have four driveways, the two existing driveways from Cowie Hill Road and two from Margaret Road.

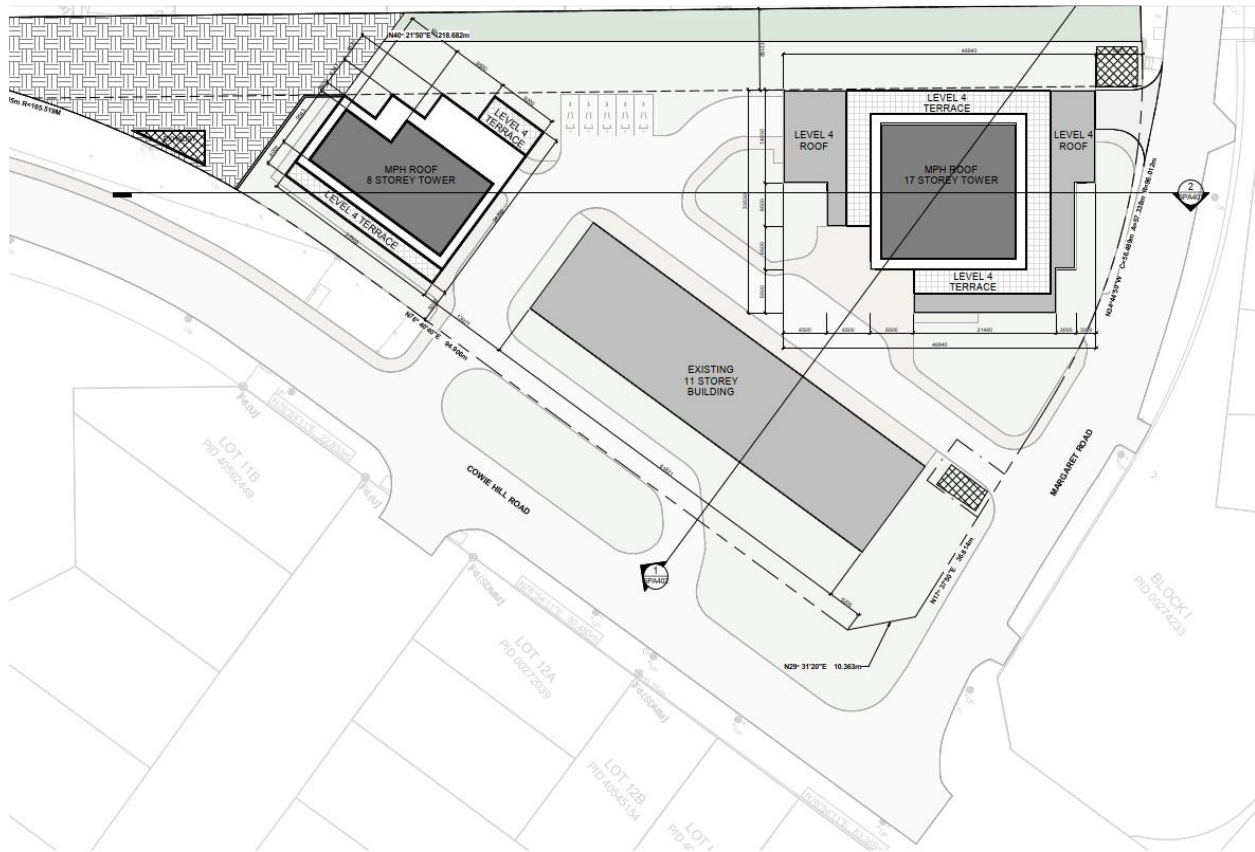


Figure 1 - Proposed site plan

1.2 Study Area

The site is located at the corner of Cowie Hill Road and Margaret Road, approximately 75 m from Herring Cove Road. Only the intersection of Cowie Hill Road and Herring Cove Road has been included in the traffic analysis for this study, as Margaret Road is a low volume local road.

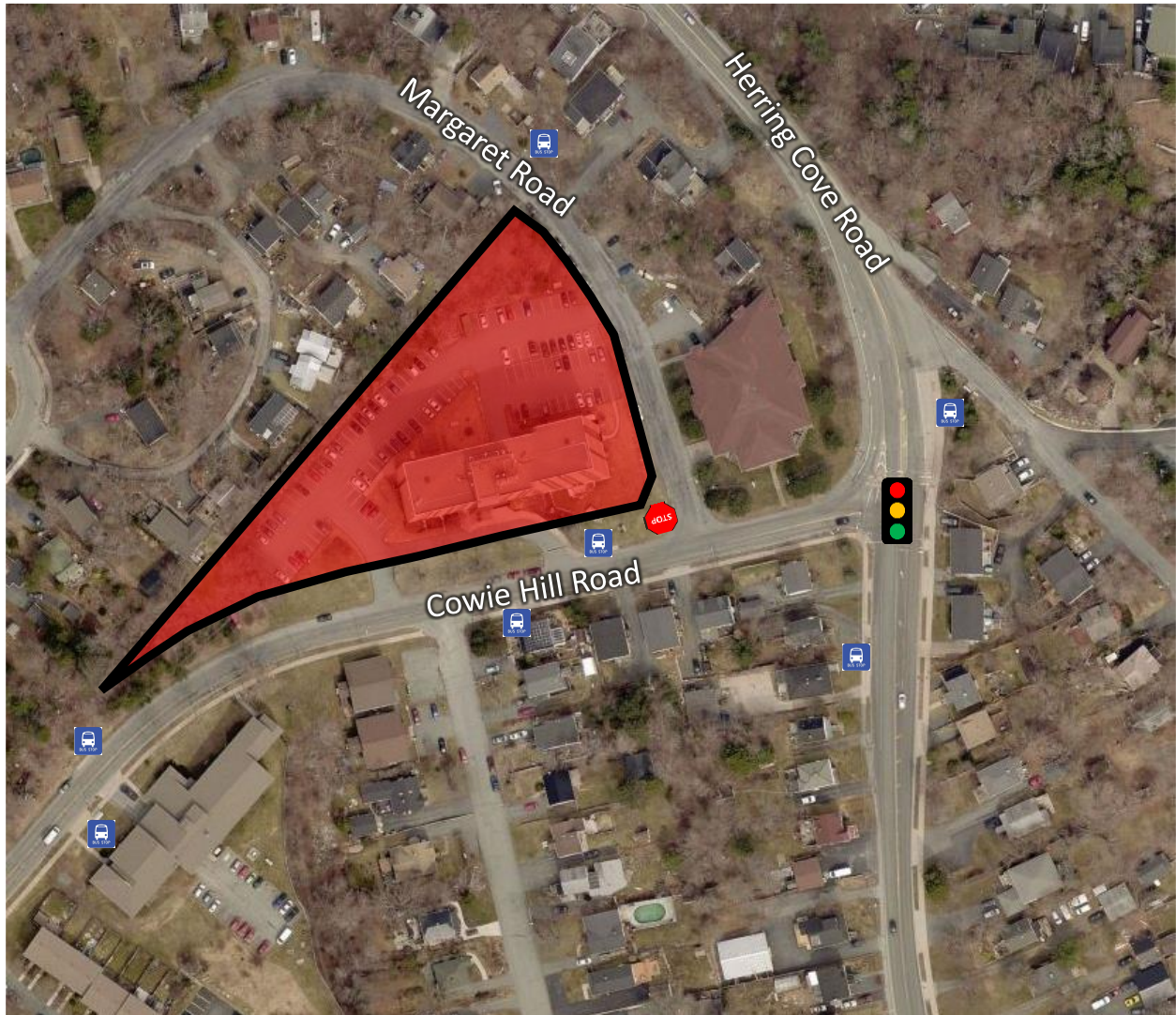


Figure 2 - Study area

Margaret Road

Margaret Road is a two-lane local street with a posted speed of 50 km/h. There is no curb or sidewalk other than an asphalt curb along the frontage of 1 Margaret Road, opposite the proposed development. Parking is permitted along the shoulder on the east side of the street, and there is no parking on the west side. Halifax Transit Route 24 provides service on Margaret Road, with a bus stop located at the northern extent of the site. Route 24 also services the bus stops directly in front of the property on Cowie Hill Road.



Figure 3 - Margaret Road towards Cowie Hill Road

Cowie Hill Road

Cowie Hill Road is a two-lane minor collector street with a posted speed of 50 km/h. The street is curbed, with a sidewalk on the south side and a sidewalk on the north side connecting the site to Herring Cove Road. Halifax Transit Routes 24 and 127 operate on Cowie Hill Road, with bus stops along the site's frontage.



Figure 4 - Cowie Hill Road towards Herring Cove Road

Herring Cove Road

Herring Cove Road is a two-lane arterial street with a posted speed of 50 km/h. It is the main corridor connecting Armdale and Spryfield to the Halifax Peninsula. There are sidewalks on both sides of the road south of Cowie Hill Road and a sidewalk on the west side north of Cowie Hill Road. Bus stops are located on the north and south sides of the Cowie Hill Road intersection, approximately 150 m from the development, which is served by routes 9A/B and 127. Route 9A/B is a 'corridor route' with high-frequency transit service.

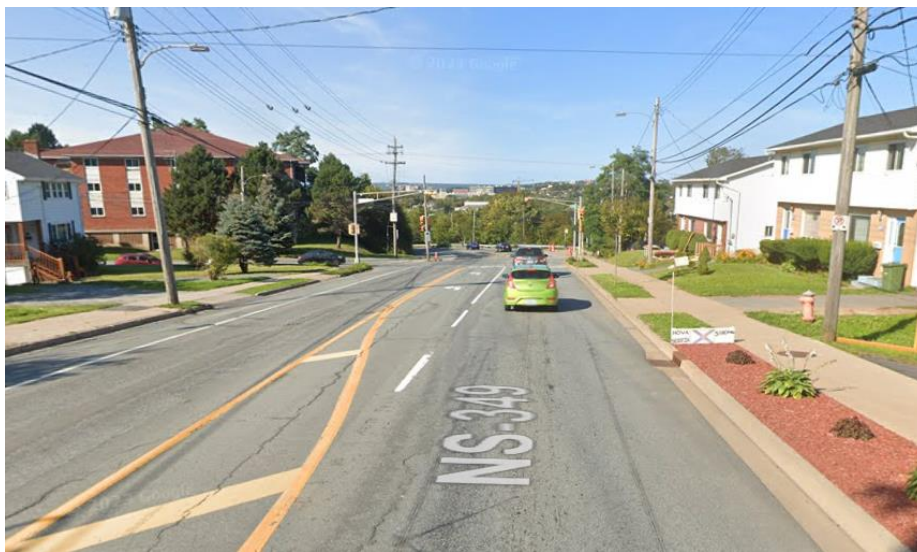


Figure 5 - Herring Cove Road towards Cowie Hill Road

HRM’s Rapid Transit Strategy includes Herring Cove Road as a bus rapid transit (BRT) corridor with a planned station at the Cowie Hill Road intersection. In addition to transit infrastructure, HRM plans to add cycling infrastructure on Herring Cove Road to connect Cowie Hill Road to the Armdale Roundabout.

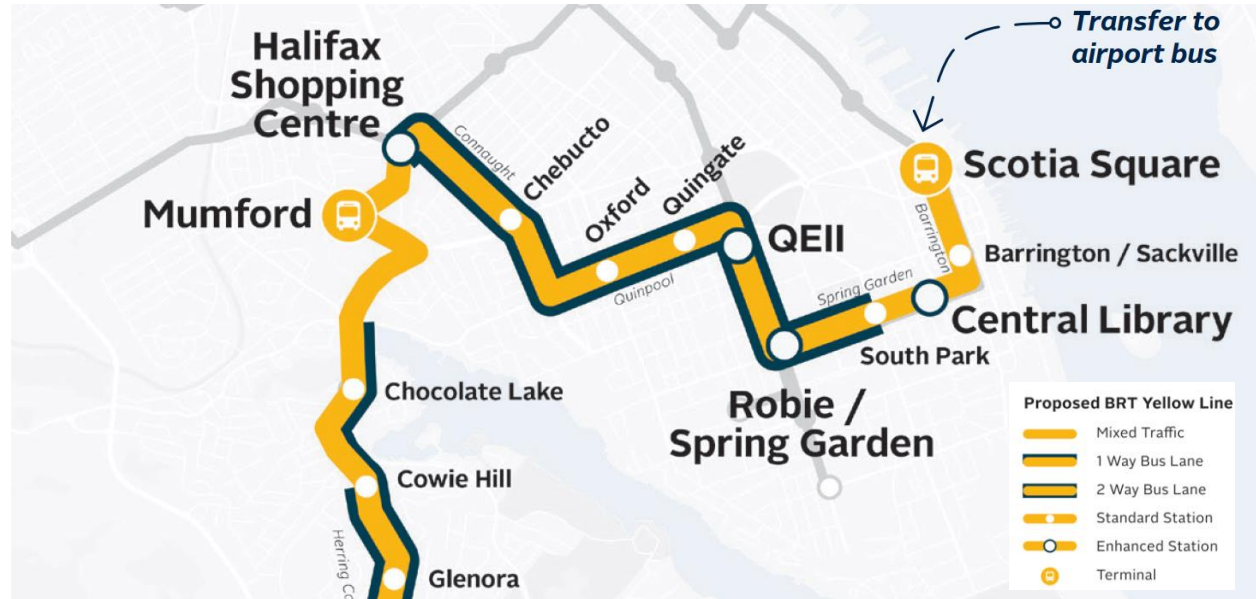


Figure 6 - HRM Rapid Transit Strategy 'Yellow Line' routing

Intersection of Cowie Hill Road and Margaret Road

The intersection of Cowie Hill Road and Margaret Road is a three-legged unsignalized intersection with stop control on Margaret Road. There are no turn lanes or marked crosswalks on any of the three approaches. The intersection is approximately 50 m from the Herring Cove Road and Cowie Hill Road intersection.

Intersection of Cowie Hill Road and Herring Cove Road

The intersection of Cowie Hill Road and Herring Cove Road is a three-legged signalized intersection. The Cowie Hill Road approach is a single shared lane for left and right turning vehicles. The southbound Herring Cove Road approach has a through lane and a channelized right turn lane that is 60 m long. The northbound Herring Cove Road approach has a through lane and a left turn lane with 35 m of storage. There are marked pedestrian crossings at each leg of the intersection.

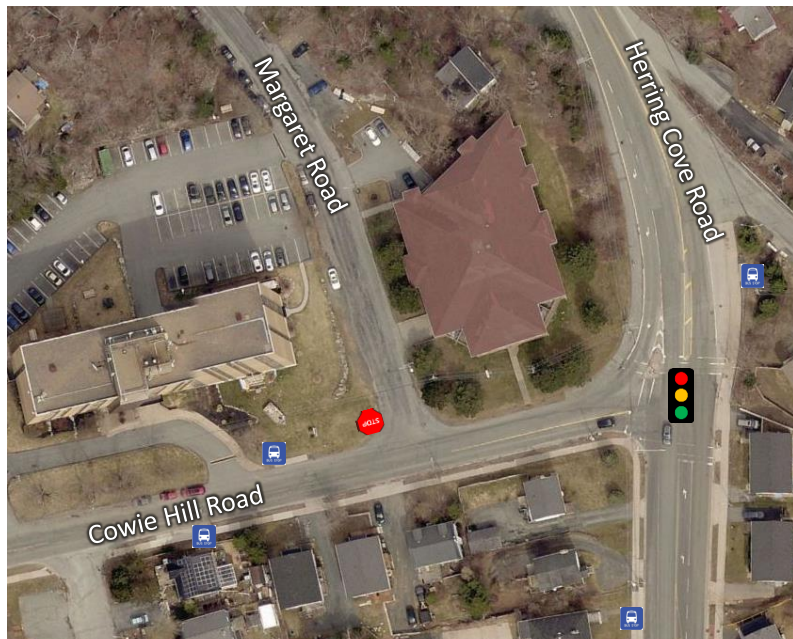


Figure 7 - Intersections of Cowie Hill Road/Margaret Road and Cowie Hill Road/Herring Cove Road

2.0 2023 EXISTING CONDITIONS

2.1 Existing Traffic Volumes

Traffic data for the intersection of Herring Cove Road and Cowie Hill Road was collected on Tuesday, May 2nd, 2023, using MioVision video data collection. Data were collected for 7-9 AM, 11 AM – 1 PM, and 4-6 PM. Peak hour turning movements for the AM and PM peak hours are provided in Figure 8.



Figure 8 - 2023 Existing traffic volumes for AM & PM peak hours

2.2 Existing Traffic Operations

A level of service (LOS) analysis is a method to determine how well a transportation facility, typically an intersection, performs from a driver's perspective during a specified period (usually peak hours). The LOS is a measure of the average delay of each vehicle travelling through an intersection with grades ranging from 'A' to 'F'. 'A' is associated with minimal delay, and 'F' is associated with heavily congested conditions with unacceptable delays for drivers. The desired or acceptable level of service can vary depending on the location and context of individual streets. For this study, the LOS limit for an intersection is 'E' and individual movements 'F' and the volume-to-capacity ratio thresholds are 0.85 for shared movements and 1.0 for dedicated turn lanes.

Table 1 provides the LOS criteria defined by the *Highway Capacity Manual* for signalized intersections.

Table 1 - Highway Capacity Manual level of service criteria for signalized intersections

Level of Service	Average Control Delay (seconds per vehicle)	General Description
A	≤ 10	Free flow
B	> 10 – 20	Stable flow (slight delays)
C	> 20 – 35	Stable flow (acceptable delays)
D	> 35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	> 55 – 80	Unstable flow (intolerable delay)
F ¹	> 80	Forced flow (congested and queues fail to clear)

Source: Highway Capacity Manual 2010

1. If the volume-to-capacity ratio for a lane group exceeds 1.0, LOS 'F' is assigned to the individual lane group. LOS for an overall approach or an intersection is determined solely by the control delay

The traffic analysis has been completed using Synchro traffic modelling software. A summary of the AM and PM peak hour level of service measures for the intersection of Herring Cove Road and Cowie Hill Road is provided in Table 2. The Synchro reports are provided in Appendix C.

Table 2 - Level of service summary for 2023 existing traffic volumes

AM Peak Hour - 2023 Existing Traffic											
LOS Criteria	Intersection Control	Cowie Hill Rd			Herring Cove Rd			Herring Cove Rd			Intersection
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	
Vehicle Count		98		27	31	589			287	57	
v/c			0.48		0.05	0.49			0.27	0.07	
Delay (s)			19.6		6	8.9			6.7	2.2	9.2
LOS			B		A	A			A	A	A
95th% Queue (m)			18.6		4.5	61.6			28.0	2.8	
PM Peak Hour - 2023 Existing Traffic											
LOS Criteria	Intersection Control	Cowie Hill Rd			Herring Cove Rd			Herring Cove Rd			Intersection
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	
Vehicle Count		79		68	45	540			838	104	
v/c			0.49		0.30	0.45			0.73	0.12	
Delay (s)			14.8		11.1	7.9			14.6	1.8	11.6
LOS			B		B	A			B	A	B
95th% Queue (m)			19.1		6.8	53.8			136.8	4.2	

The analysis shows no existing operational concerns with the intersection's operation in isolation. Herring Cove Road does experience heavy congestion, especially during the AM peak in the northbound direction. The Armdale Roundabout is a bottleneck for the corridor and can create extensive queueing.

3.0 DEVELOPMENT TRAFFIC

3.1 Access Review

The proposed site plan includes four accesses. The two existing accesses on Cowie Hill Road will remain. The current access on Margaret Road will be closed, and two new accesses will be added.

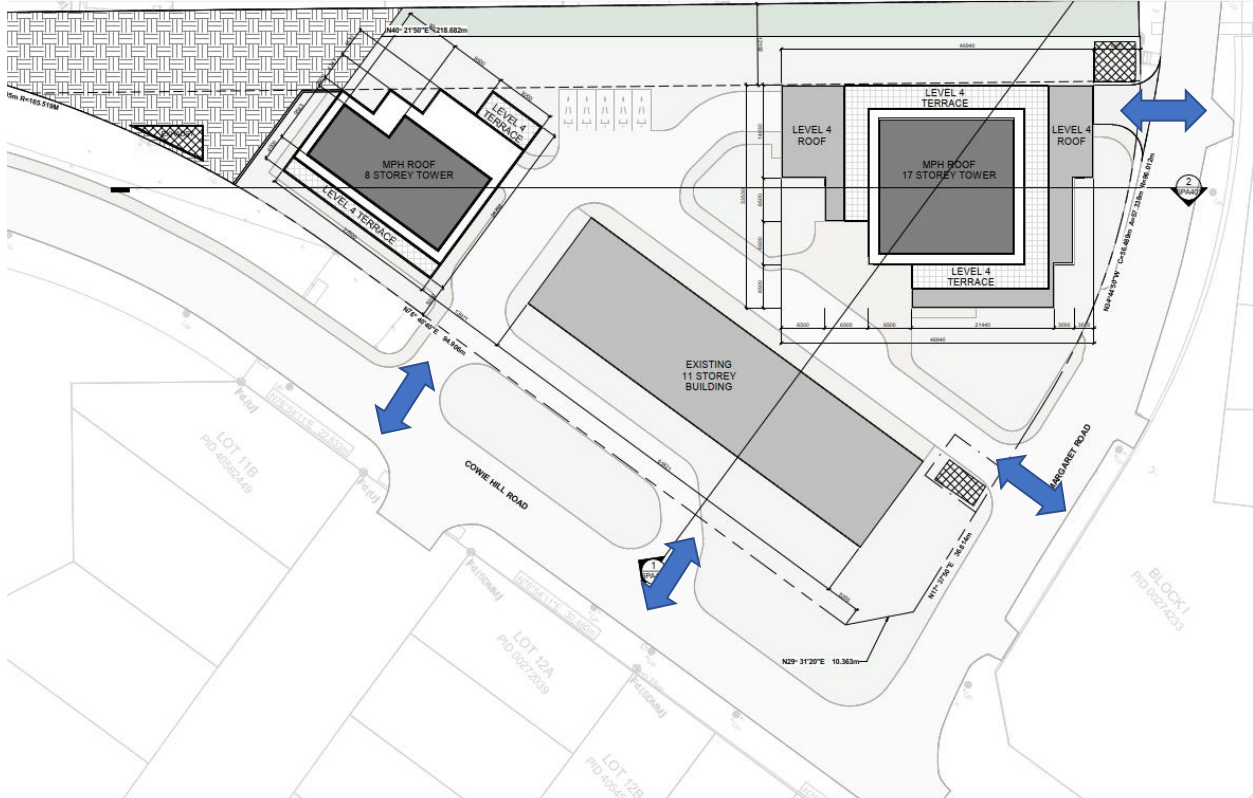


Figure 9 - Proposed access locations



Figure 10 - Proposed Cowie Hill Road access sight lines to the east (left photo) and to the west (right photo)



Figure 11 - Proposed southern Margaret Road access sight lines to the south (left photo) and to the north (right photo)



Figure 12 - Proposed northern Margaret Road access sight lines to the south (left photo) and to the north (right photo)

Stopping Sight Distance

Stopping sight distance is the minimum requirement for sight distances at driveways and intersections. Stopping sight distance is the distance a vehicle takes to avoid coming in contact with an obstacle at the relative speed. It is the combination of the distance travelled during the perception and reaction time, the time it takes a driver to determine the need to stop, and the braking distance, which is the distance travelled once the brakes are applied to when the vehicle comes to a stop.

The *Transportation Association of Canada Geometric Design Guide for Canadian Roads* provides a minimum stopping sight distance for various design speeds. Cowie Hill Road has a posted speed limit of 50 km/h, but drivers are expected to exceed the speed limit due to the slope. A 60 km/h design speed has been used for the Cowie Hill Road driveway, and a 50 km/h design speed has been used for Margaret Road.

Table 3 - Proposed Access Stopping Sight Distance

Driveway	Direction of Travel	Design Speed	Minimum Stopping Sight Distance (Adjusted Grade)	Measured Sight Distance	Pass/Fail
Cowie Hill Rd (west)	Eastbound	60 km/h	75 m (+9%)	140 m	Pass
	Westbound	60 km/h	97 m (-9%)	100 m	Pass
Cowie Hill Rd (east)	Eastbound	60 km/h	75 m (+9%)	95 m	Pass
	Westbound	60 km/h	97 m (-9%)	+100 m	Pass
Margaret Rd (north)	Northbound	50 km/h	61 m (+3%)	80 m	Pass
	Southbound	50 km/h	66 m (-3%)	70 m	Pass
Margaret Rd (south)	Northbound	50 km/h	65 m (0%)	50 m*	Fail
	Southbound	50 km/h	65 m (0%)	55 m	Fail

* Distance to Cowie Hill intersection.

Sight lines on Margaret Road are partially restricted by on-street parking. Although traffic data has not been collected on Margaret Road, vehicle speeds and volumes were observed to be low during site visits. The geometry of the road does not promote high speeds. While the stopping sight distance is not met, the location of the southern driveway on Margaret Road does not present a significant safety risk. The current driveway has similar sight distance restrictions caused by on-street parking. HRM could consider relocating on-street parking to the east side of Margaret Road, on the outside of the curve, or removing some on-street parking adjacent to the proposed driveway locations to improve sight lines.



Figure 13 - Existing driveway on Margaret Road sight lines to the south (left photo) and to the north (right photo)

3.2 Site Generated Traffic

Site generated traffic has been calculated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition. Data from HRM’s Mode Share app for the census tract indicates that 20% of residents commute by transit and 7% by active transportation. The site’s proximity to existing and future transit service supports a high percentage of transit use. Site generated trips have been reduced based on these rates. The development is expected to generate 43 two-way vehicle trips during the AM peak hour and 57 two-way vehicle trips during the PM peak hour.

Table 4 - Site generated trip calculations

Land Use	Code	Units	Variable	Trip Generation Rates ¹						Trips Generated			
				AM Peak			PM Peak			AM Peak		PM Peak	
				Rate	In	Out	Rate	In	Out	In	Out	In	Out
Multifamily Housing (Mid-Rise)	221	58	Dwellings	0.24	23%	77%	0.40	61%	39%	3	11	14	9
Multifamily Housing (High-Rise)	222	122	Dwellings	0.37	26%	74%	0.45	62%	38%	12	34	34	21
Estimated Site Generated Trips										15	45	48	30
Mode Share Reduction (20% Transit, 7% Active Transportation)										4	12	13	8
Total Estimated Site Generated Trips										11	32	35	22
Notes:	1. Trip generation rates from ITE <i>Trip Generation Manual</i> , 11th Edition, fitted line equations. 2. Mode share rates from HRM Mode Share app, 2016 Census data for census tract.												

3.3 Trip Distribution

It has been estimated that 15% of site generated traffic would travel west on Cowie Hill Road towards Dunbrack Street, and 85% would travel east to Herring Cove Road. Herring Cove Road is the quickest route to major employment areas, including the Halifax Peninsula, Downtown Dartmouth, and Burnside. The turning movement distribution at the Cowie Hill Road and Herring Cove Road follows the existing traffic distribution shown in Figure 14. Site generated trip distribution is provided in Figure 15.

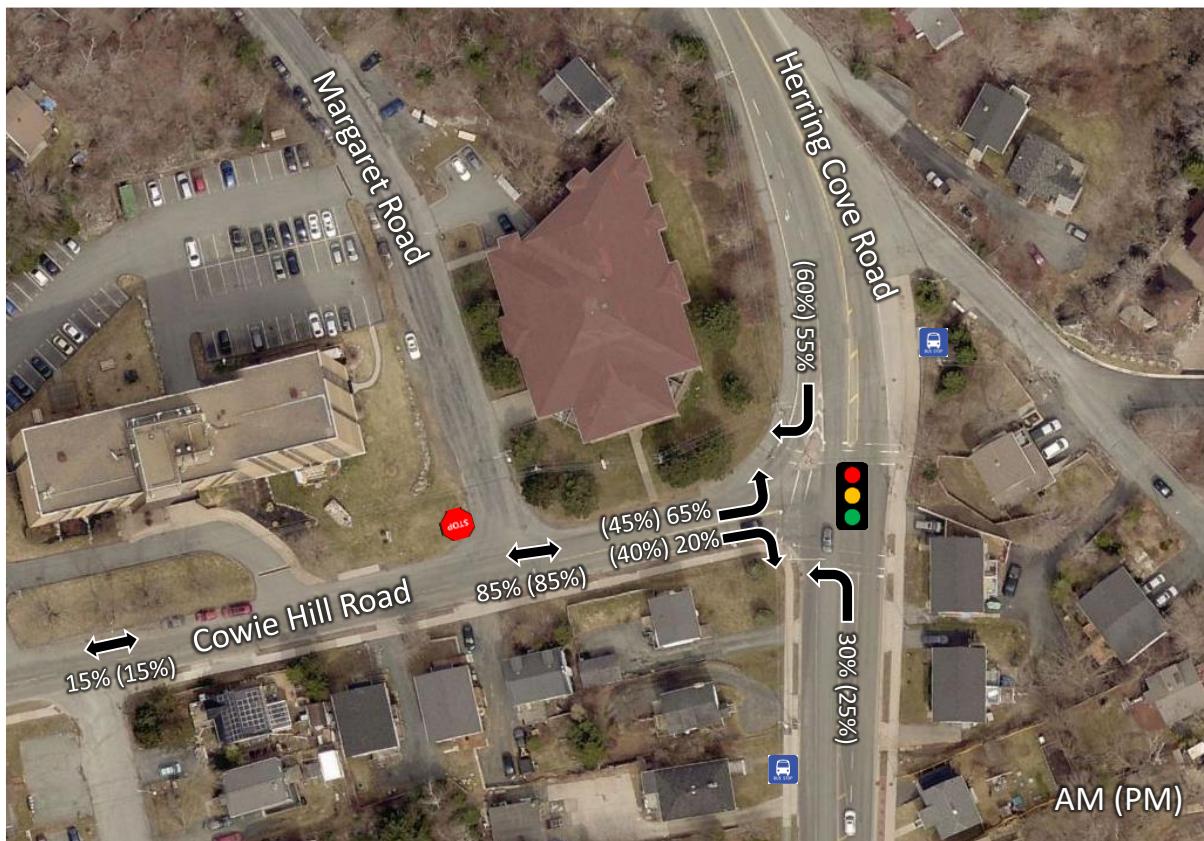


Figure 104 - Trip distribution

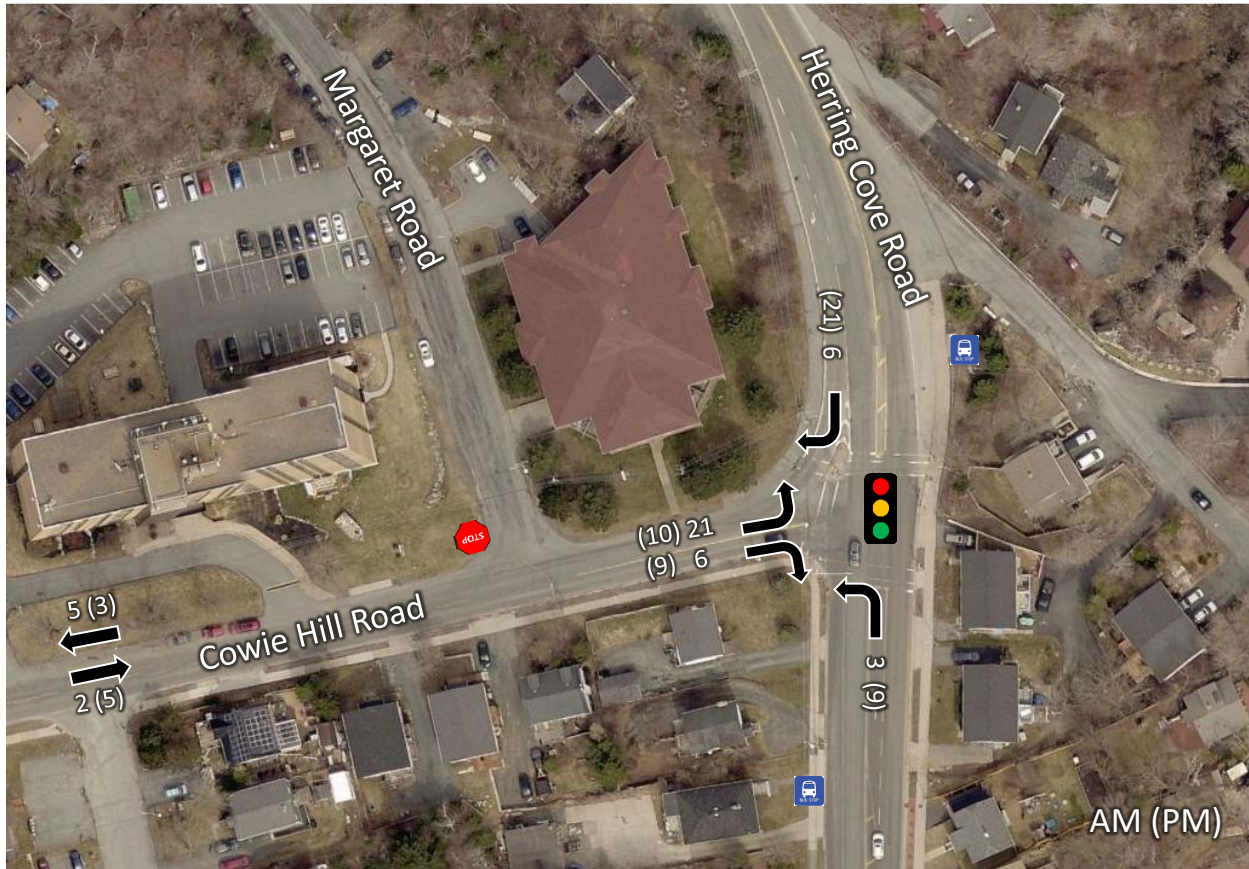


Figure 15 - Site generated trips distributed

4.0 FUTURE CONDITIONS

4.1 2028 Background Traffic Volumes

Background traffic is the traffic added by general annual traffic growth. The development is expected to be completed in 2028, which has been used as the horizon year. A 2.0% annual growth rate has been applied to existing traffic volumes to determine background traffic volumes. Background volumes for the Cowie Hill Road and Herring Cove Road intersection are shown in Figure 16.



Figure 116 - 2028 Background traffic volumes for AM & PM peak hours

A level of service analysis has been completed for 2023 background traffic volumes to determine how the intersection of Cowie Hill Road and Herring Cove Road would operate in the future without the addition of site generated traffic. A summary of the results is provided in Table 5. All level of service measures meet the minimum requirements, and there are no concerns with traffic operations for the intersection.

Table 5 - Level of service summary for 2023 background traffic volumes

AM Peak Hour - 2028 Background Traffic												
LOS Criteria	Intersection Control	Cowie Hill Rd			Herring Cove Rd			Herring Cove Rd			Intersection	
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR		
Vehicle Count		108		30	34	648			316	63		
v/c			0.51		0.06	0.55			0.31	0.08		
Delay (s)				19.7		6.4	10.1			7.2	2.2	10
LOS				B		A	B			A	A	B
95th% Queue (m)				20.2		5.0	74.5			32.5	3.0	
PM Peak Hour - 2028 Background Traffic												
LOS Criteria	Intersection Control	Cowie Hill Rd			Herring Cove Rd			Herring Cove Rd			Intersection	
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR		
Vehicle Count		87		75	50	594			922	114		
v/c			0.61		0.40	0.49			0.79	0.13		
Delay (s)				24.6		14.2	8.1			15.7	1.5	13.2
LOS				C		B	A			B	A	B
95th% Queue (m)				30.7		8.8	67.3			183.3	4.3	

4.2 2028 Total Traffic Volumes



The 2028 total traffic volumes are the results of 2028 background volumes plus site generated traffic added by the completed development. Total traffic volumes for the intersection of Cowie Hill Road and Herring Cove Road are provided in Figure 17.



Figure 127 - 2028 total traffic volumes for AM & PM peak hours

A level of service analysis has been completed for AM & PM peak hours using total traffic volumes. A summary of the Synchro results is provided in Table 6. There are no operational concerns with the intersection of Cowie Hill Road and Herring Cove Road with the addition of traffic added by the proposed development.

Table 6 - Level of service summary for 2028 total traffic volumes

AM Peak Hour - 2028 Total Traffic											
LOS Criteria	Intersection Control	Cowie Hill Rd			Herring Cove Rd			Herring Cove Rd			Intersection
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	
Vehicle Count		129		36	37	648			316	69	
v/c		0.57			0.08	0.63	0.35			0.10	
Delay (s)		21.1			7.1	12.5	8.3			2.4	11.9
LOS		C			A	B	A			A	B
95th% Queue (m)		23.9			5.7	79.9	34.9			3.3	
AM Peak Hour - 2028 Total Traffic											
LOS Criteria	Intersection Control	Cowie Hill Rd			Herring Cove Rd			Herring Cove Rd			Intersection
		EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR	
Vehicle Count		97		84	59	594			922	135	
v/c		0.64			0.51	0.50	0.80			0.15	
Delay (s)		25.9			21.6	8.6	17			1.5	14.4
LOS		C			C	A	B			A	B
95th% Queue (m)		34.8			12.1	71.6	189.7			4.8	

4.3 Auxiliary Turn Lane and Signal Warrants

Traffic volumes on Cowie Hill Road are not high enough to warrant turn lanes or signals at the Margaret Road intersection. The intersection of Cowie Hill Road and Herring Cove Road is already signalized and has the necessary turn lanes. No additional turn lane or signal warrants have been completed.

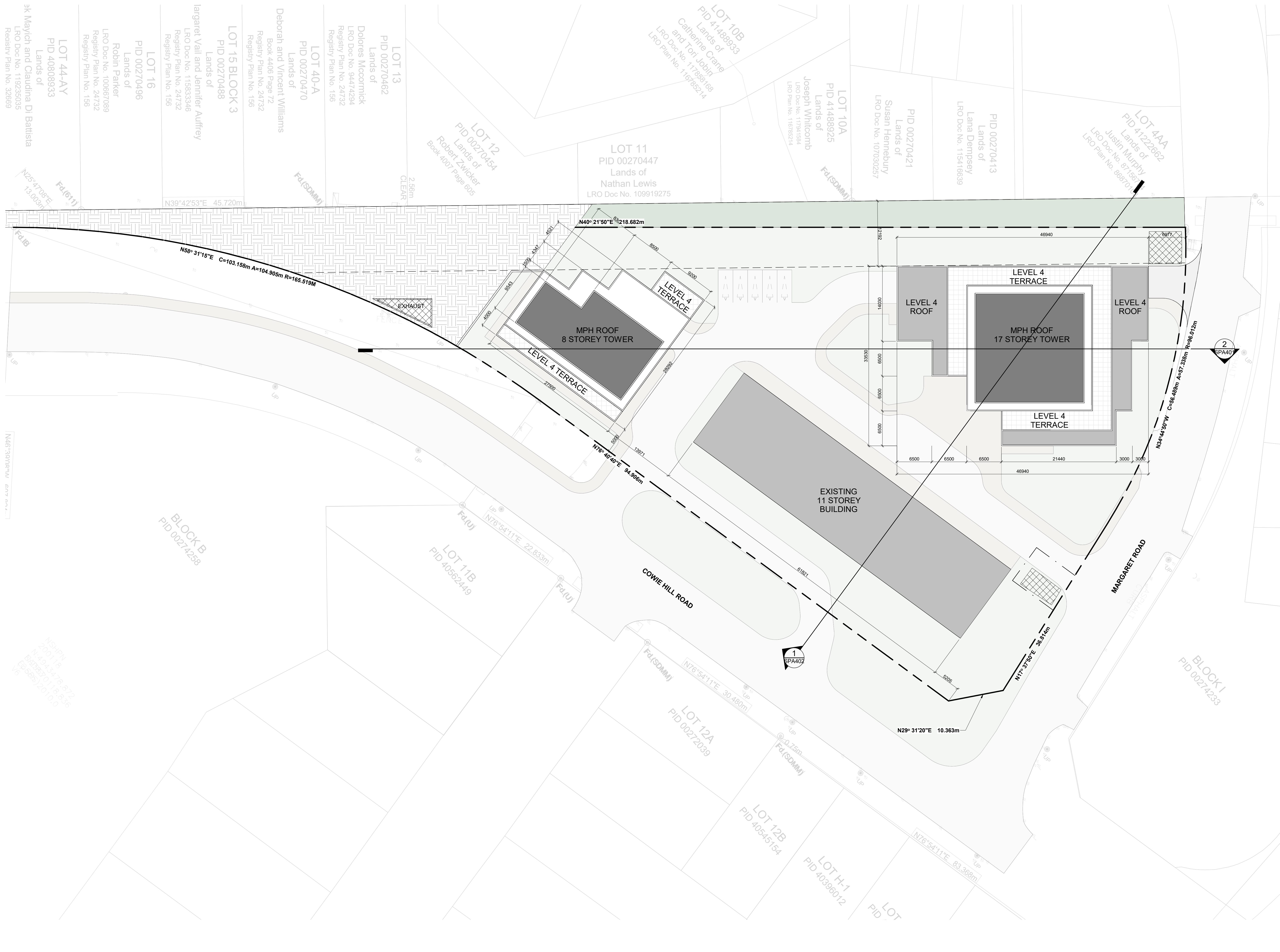
5.0 CONCLUSIONS

The following conclusions were developed from this traffic impact study:

- The proposed development replaces a parking lot, an 8-storey and 17-storey building, with 180 residential units.
- There are three transit routes serving the site within a 150 m walking distance. Route 9A/B is a high frequency corridor route. HRM plans to add a bus rapid transit route on Herring Cove Road, with a station at the Cowie Hill Road intersection, further improving transit service in the area.
- There are four (4) accesses proposed for the site. One of the accesses on Margaret Road does not meet stopping sight distance due to on-street parking. Considering the road conditions, we believe this is still an acceptable driveway location. Should HRM wish to improve the proposed (or existing) driveway, the on-street parking could be removed or relocated to the other side of the street.
- The proposed development is estimated to generate 43 two-way vehicle trips during the AM peak hour and 57 two-way vehicle trips during the PM peak hour.
- The intersection of Herring Cove Road and Cowie Hill Road is the critical intersection in the area. When analyzed in isolation, there are no current or future operational concerns. All level of service measure minimums are met.
- Herring Cove Road experiences significant peak hour congestion, most notably during the AM peak hour. Queues can extend to the Cowie Hill Road intersection and are caused by the limited capacity of the Armdale Roundabout.
- The existing street network can accommodate traffic generated by development without upgrades. The implementation of transit and active transportation infrastructure by HRM on Herring Cove Road will promote multi-modal travel. The location of this development, adjacent to a planned bus rapid transit route and station, will benefit future residents and HRM's transit ridership.

APPENDIX A – PROPOSED SITE PLAN

This drawing, as an instrument of service, is provided by and is the property of Turner Fleischer Architects Inc. The contractor must verify and accept responsibility for all dimensions and conditions on site and must notify Turner Fleischer Architects Inc. of any variations from the supplied information. This drawing is not to be scaled. The architect is not responsible for the accuracy of survey, structural, mechanical, electrical, etc. information shown on this drawing. Refer to the appropriate consultants' drawings before proceeding with the work. Contractor must conform to all applicable codes and requirements of authorities having jurisdiction. The contractor working from drawings not specifically marked "For Contractor" must assume full responsibility and bear costs for any corrections or damages resulting from his work.



#	DATE	Revision	DESCRIPTION	BY
1	Date 1	Revision 1		

PROJECT
41 Cowie Hill Road, Halifax, NS

DRAWING
SITE PLAN / ROOF PLAN

PROJECT NO. 23.073P01	
PROJECT DATE	
DRAWN BY Author	
CHECKED BY Checker	
SCALE 1 : 300	

DRAWING NO. SPA006	REV 1
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APPENDIX B – TRAFFIC TURNING MOVEMENT COUNT

Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

Full Length (7 AM-9 AM, 11 AM-1 PM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 1062951, Location: 44.632473, -63.618514



engineering • surveying • solutions

Provided by: DesignPoint Engineering & Surveying Ltd.

90 Western Parkway, Suite 500,
Bedford, NS, B4B 2J3, CA

Leg Direction	Herring Cove Rd Southbound					Herring Cove Rd Northbound					Cowie Hill Rd Eastbound					Int
	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	
2023-05-02 7:00AM	8	67	0	75	1	222	8	0	230	0	5	37	0	42	0	347
7:15AM	12	83	0	95	0	199	17	0	216	1	4	30	0	34	0	345
7:30AM	12	63	0	75	1	79	2	0	81	0	5	19	0	24	0	180
7:45AM	25	74	0	99	2	89	4	0	93	1	13	12	0	25	0	217
Hourly Total	57	287	0	344	4	589	31	0	620	2	27	98	0	125	0	1089
8:00AM	10	75	0	85	1	56	23	0	79	0	10	11	0	21	0	185
8:15AM	14	94	0	108	0	57	27	0	84	0	12	16	0	28	0	220
8:30AM	15	95	0	110	3	81	30	0	111	1	9	16	0	25	2	246
8:45AM	4	90	0	94	3	91	13	0	104	2	21	19	0	40	2	238
Hourly Total	43	354	0	397	7	285	93	0	378	3	52	62	0	114	4	889
11:00AM	12	115	0	127	1	128	10	0	138	0	9	18	0	27	1	292
11:15AM	10	106	0	116	1	110	7	0	117	0	7	7	0	14	0	247
11:30AM	9	138	0	147	1	122	7	0	129	0	15	16	0	31	0	307
11:45AM	10	120	0	130	6	118	14	0	132	2	7	11	0	18	2	280
Hourly Total	41	479	0	520	9	478	38	0	516	2	38	52	0	90	3	1126
12:00PM	12	113	0	125	2	123	13	0	136	0	11	20	0	31	1	292
12:15PM	16	117	0	133	1	123	13	0	136	0	10	23	0	33	0	302
12:30PM	9	118	0	127	1	111	11	0	122	0	7	19	0	26	1	275
12:45PM	14	120	0	134	0	120	12	0	132	1	5	15	0	20	2	286
Hourly Total	51	468	0	519	4	477	49	0	526	1	33	77	0	110	4	1155
4:00PM	25	205	0	230	1	123	17	0	140	1	11	35	0	46	2	416
4:15PM	24	206	0	230	4	119	22	0	141	1	23	26	0	49	3	420
4:30PM	23	202	0	225	3	139	7	0	146	2	14	22	0	36	0	407
4:45PM	23	215	0	238	0	141	8	0	149	0	22	19	0	41	0	428
Hourly Total	95	828	0	923	8	522	54	0	576	4	70	102	0	172	5	1671
5:00PM	26	195	0	221	2	123	12	0	135	1	20	18	0	38	0	394
5:15PM	32	226	0	258	1	137	18	0	155	1	12	20	0	32	0	445
5:30PM	16	176	0	192	3	124	17	0	141	1	11	15	0	26	1	359
5:45PM	16	185	0	201	1	102	12	0	114	2	11	21	0	32	1	347
Hourly Total	90	782	0	872	7	486	59	0	545	5	54	74	0	128	2	1545
Total	377	3198	0	3575	39	2837	324	0	3161	17	274	465	0	739	18	7475
% Approach	10.5%	89.5%	0%	-	-	89.8%	10.2%	0%	-	-	37.1%	62.9%	0%	-	-	-
% Total	5.0%	42.8%	0%	47.8%	-	38.0%	4.3%	0%	42.3%	-	3.7%	6.2%	0%	9.9%	-	-
Lights	366	3092	0	3458	-	2738	321	0	3059	-	268	454	0	722	-	7239
% Lights	97.1%	96.7%	0%	96.7%	-	96.5%	99.1%	0%	96.8%	-	97.8%	97.6%	0%	97.7%	-	96.8%
Articulated Trucks	0	18	0	18	-	7	0	0	7	-	1	0	0	1	-	26
% Articulated Trucks	0%	0.6%	0%	0.5%	-	0.2%	0%	0%	0.2%	-	0.4%	0%	0%	0.1%	-	0.3%
Buses and Single-Unit Trucks	11	88	0	99	-	92	3	0	95	-	5	11	0	16	-	210
% Buses and Single-Unit Trucks	2.9%	2.8%	0%	2.8%	-	3.2%	0.9%	0%	3.0%	-	1.8%	2.4%	0%	2.2%	-	2.8%
Pedestrians	-	-	-	-	39	-	-	-	-	17	-	-	-	-	18	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	100%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

Full Length (7 AM-9 AM, 11 AM-1 PM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

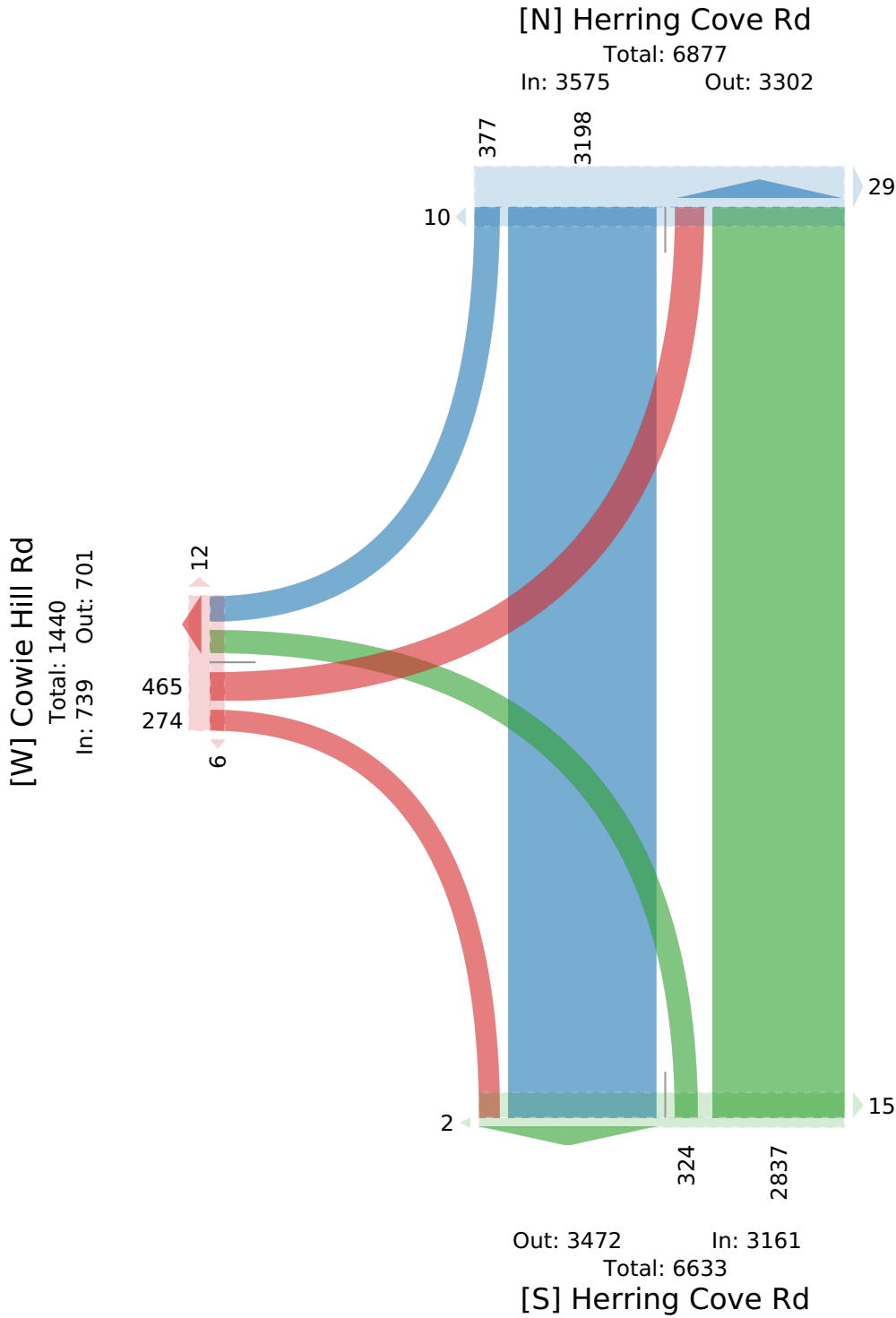
ID: 1062951, Location: 44.632473, -63.618514



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Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

AM Peak (7 AM - 8 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 1062951, Location: 44.632473, -63.618514



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Leg Direction	Herring Cove Rd Southbound					Herring Cove Rd Northbound					Cowie Hill Rd Eastbound					Int
	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	
2023-05-02 7:00AM	8	67	0	75	1	222	8	0	230	0	5	37	0	42	0	347
7:15AM	12	83	0	95	0	199	17	0	216	1	4	30	0	34	0	345
7:30AM	12	63	0	75	1	79	2	0	81	0	5	19	0	24	0	180
7:45AM	25	74	0	99	2	89	4	0	93	1	13	12	0	25	0	217
Total	57	287	0	344	4	589	31	0	620	2	27	98	0	125	0	1089
% Approach	16.6%	83.4%	0%	-	-	95.0%	5.0%	0%	-	-	21.6%	78.4%	0%	-	-	-
% Total	5.2%	26.4%	0%	31.6%	-	54.1%	2.8%	0%	56.9%	-	2.5%	9.0%	0%	11.5%	-	-
PHF	0.570	0.864	-	0.869	-	0.663	0.456	-	0.674	-	0.519	0.662	-	0.744	-	0.785
Lights	56	275	0	331	-	578	31	0	609	-	25	93	0	118	-	1058
% Lights	98.2%	95.8%	0%	96.2%	-	98.1%	100%	0%	98.2%	-	92.6%	94.9%	0%	94.4%	-	97.2%
Articulated Trucks	0	1	0	1	-	0	0	0	0	-	0	0	0	0	-	1
% Articulated Trucks	0%	0.3%	0%	0.3%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0.1%
Buses and Single-Unit Trucks	1	11	0	12	-	11	0	0	11	-	2	5	0	7	-	30
% Buses and Single-Unit Trucks	1.8%	3.8%	0%	3.5%	-	1.9%	0%	0%	1.8%	-	7.4%	5.1%	0%	5.6%	-	2.8%
Pedestrians	-	-	-	-	4	-	-	-	-	2	-	-	-	-	0	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

AM Peak (7 AM - 8 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

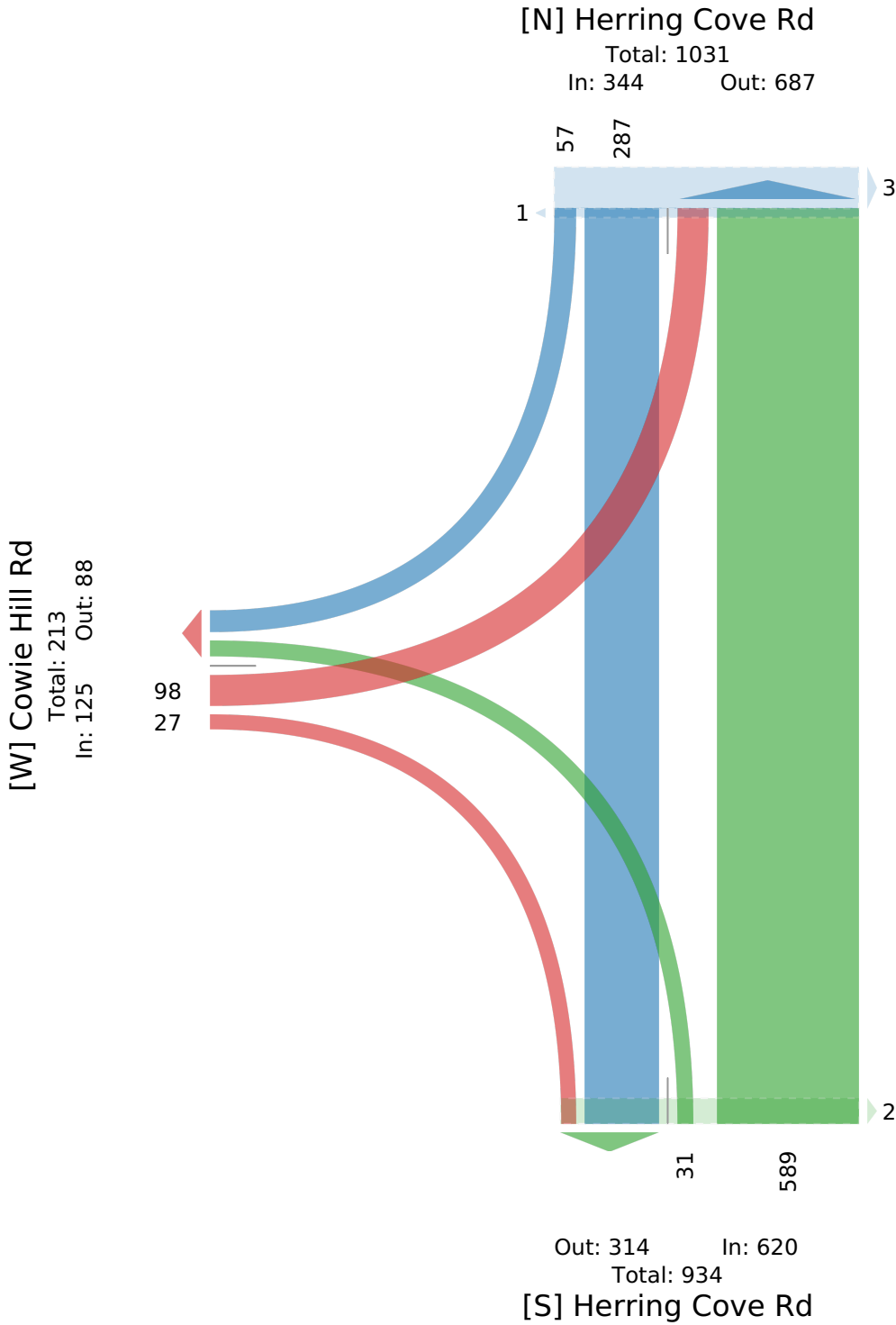
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Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

Midday Peak (11:30 AM - 12:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 1062951, Location: 44.632473, -63.618514



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Leg Direction	Herring Cove Rd Southbound					Herring Cove Rd Northbound					Cowie Hill Rd Eastbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
2023-05-02 11:30AM	9	138	0	147	1	122	7	0	129	0	15	16	0	31	0	307
11:45AM	10	120	0	130	6	118	14	0	132	2	7	11	0	18	2	280
12:00PM	12	113	0	125	2	123	13	0	136	0	11	20	0	31	1	292
12:15PM	16	117	0	133	1	123	13	0	136	0	10	23	0	33	0	302
Total	47	488	0	535	10	486	47	0	533	2	43	70	0	113	3	1181
% Approach	8.8%	91.2%	0%	-	-	91.2%	8.8%	0%	-	-	38.1%	61.9%	0%	-	-	-
% Total	4.0%	41.3%	0%	45.3%	-	41.2%	4.0%	0%	45.1%	-	3.6%	5.9%	0%	9.6%	-	-
PHF	0.734	0.884	-	0.910	-	0.988	0.839	-	0.980	-	0.717	0.761	-	0.856	-	0.962
Lights	47	465	0	512	-	466	47	0	513	-	42	69	0	111	-	1136
% Lights	100%	95.3%	0%	95.7%	-	95.9%	100%	0%	96.2%	-	97.7%	98.6%	0%	98.2%	-	96.2%
Articulated Trucks	0	4	0	4	-	2	0	0	2	-	0	0	0	0	-	6
% Articulated Trucks	0%	0.8%	0%	0.7%	-	0.4%	0%	0%	0.4%	-	0%	0%	0%	0%	-	0.5%
Buses and Single-Unit Trucks	0	19	0	19	-	18	0	0	18	-	1	1	0	2	-	39
% Buses and Single-Unit Trucks	0%	3.9%	0%	3.6%	-	3.7%	0%	0%	3.4%	-	2.3%	1.4%	0%	1.8%	-	3.3%
Pedestrians	-	-	-	-	10	-	-	-	-	2	-	-	-	-	3	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

Midday Peak (11:30 AM - 12:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

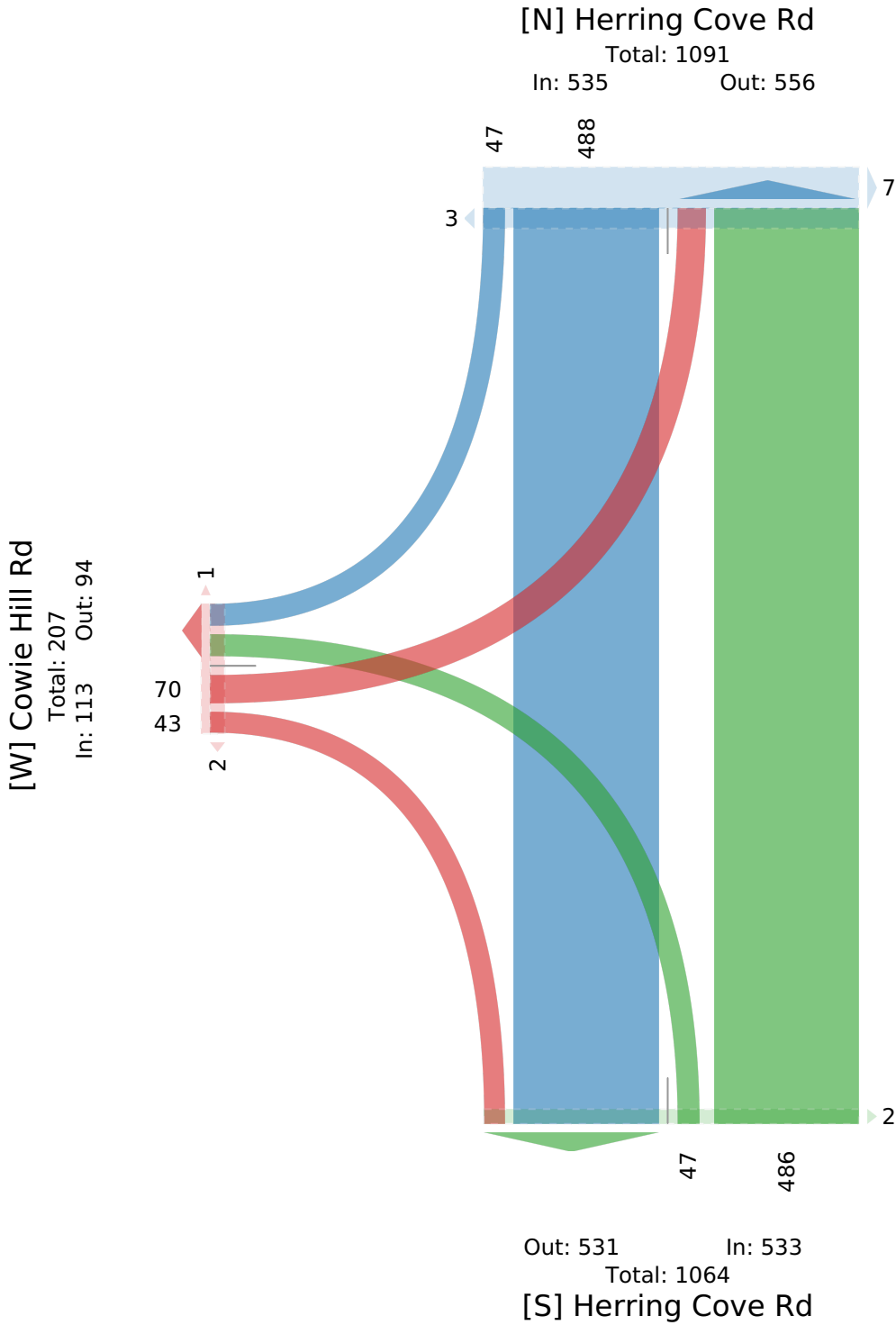
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Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

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Leg Direction	Herring Cove Rd Southbound					Herring Cove Rd Northbound					Cowie Hill Rd Eastbound					Int
	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	
2023-05-02 4:30PM	23	202	0	225	3	139	7	0	146	2	14	22	0	36	0	407
4:45PM	23	215	0	238	0	141	8	0	149	0	22	19	0	41	0	428
5:00PM	26	195	0	221	2	123	12	0	135	1	20	18	0	38	0	394
5:15PM	32	226	0	258	1	137	18	0	155	1	12	20	0	32	0	445
Total	104	838	0	942	6	540	45	0	585	4	68	79	0	147	0	1674
% Approach	11.0%	89.0%	0%	-	-	92.3%	7.7%	0%	-	-	46.3%	53.7%	0%	-	-	-
% Total	6.2%	50.1%	0%	56.3%	-	32.3%	2.7%	0%	34.9%	-	4.1%	4.7%	0%	8.8%	-	-
PHF	0.813	0.927	-	0.913	-	0.957	0.625	-	0.944	-	0.773	0.898	-	0.896	-	0.940
Lights	100	824	0	924	-	528	45	0	573	-	68	77	0	145	-	1642
% Lights	96.2%	98.3%	0%	98.1%	-	97.8%	100%	0%	97.9%	-	100%	97.5%	0%	98.6%	-	98.1%
Articulated Trucks	0	2	0	2	-	1	0	0	1	-	0	0	0	0	-	3
% Articulated Trucks	0%	0.2%	0%	0.2%	-	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	4	12	0	16	-	11	0	0	11	-	0	2	0	2	-	29
% Buses and Single-Unit Trucks	3.8%	1.4%	0%	1.7%	-	2.0%	0%	0%	1.9%	-	0%	2.5%	0%	1.4%	-	1.7%
Pedestrians	-	-	-	-	6	-	-	-	-	4	-	-	-	-	0	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Cowie Hill Road at Herring Cove Road - TMC

Tue May 2, 2023

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

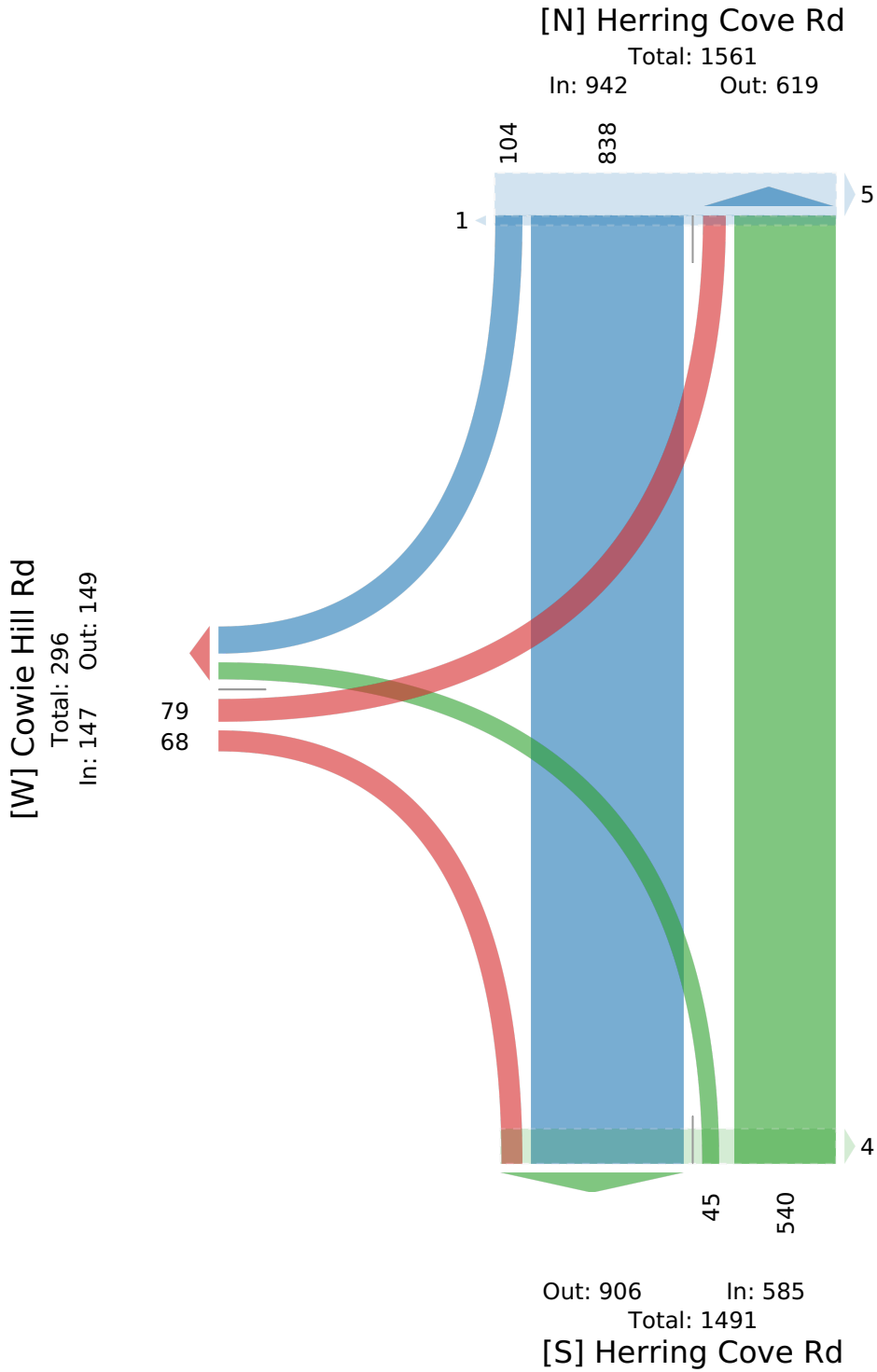
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APPENDIX C – SYNCHRO REPORTS

3: Herring Cove Road & Cowie Hill Road Existing Network

AM Peak - 2023 Existing Traffic



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	98	27	31	589	287	57
Future Volume (vph)	98	27	31	589	287	57
Satd. Flow (prot)	1762	0	1789	1847	1830	1601
Flt Permitted	0.963		0.563			
Satd. Flow (perm)	1753	0	1060	1847	1830	1601
Satd. Flow (RTOR)	28					78
Confl. Peds. (#/hr)	4	2				
Peak Hour Factor	0.76	0.72	0.84	0.99	0.88	0.73
Heavy Vehicles (%)	1%	2%	2%	4%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	167	0	37	595	326	78
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Total Split (s)	24.0		32.5	32.5	32.5	32.5
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effect Green (s)	9.2		32.9	32.9	32.9	32.9
Actuated g/C Ratio	0.18		0.65	0.65	0.65	0.65
v/c Ratio	0.48		0.05	0.49	0.27	0.07
Control Delay	19.6		6.0	8.9	6.7	2.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	19.6		6.0	8.9	6.7	2.2
LOS	B		A	A	A	A
Approach Delay	19.6			8.7	5.8	
Approach LOS	B			A	A	
Queue Length 50th (m)	10.8		1.2	28.1	12.6	0.0
Queue Length 95th (m)	18.6		4.5	61.6	28.0	2.8
Internal Link Dist (m)	181.0			223.9	232.1	
Turn Bay Length (m)			35.0			60.0
Base Capacity (vph)	648		691	1204	1193	1071
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	0.26		0.05	0.49	0.27	0.07

Intersection Summary

Cycle Length: 56.5

Actuated Cycle Length: 50.4

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 9.2

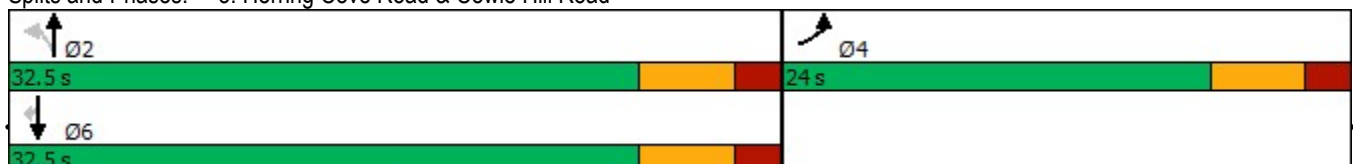
Intersection LOS: A

Intersection Capacity Utilization 48.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Herring Cove Road & Cowie Hill Road



3: Herring Cove Road & Cowie Hill Road Existing Network

PM Peak - 2023 Existing Traffic



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	79	68	45	540	838	104
Future Volume (vph)	79	68	45	540	838	104
Satd. Flow (prot)	1691	0	1789	1883	1883	1570
Flt Permitted	0.976		0.190			
Satd. Flow (perm)	1683	0	358	1883	1883	1570
Satd. Flow (RTOR)	85					128
Confl. Peds. (#/hr)	6	4				
Peak Hour Factor	0.90	0.77	0.63	0.96	0.93	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	4%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	71	563	901	128
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Total Split (s)	24.0		32.5	32.5	32.5	32.5
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effct Green (s)	8.4		32.4	32.4	32.4	32.4
Actuated g/C Ratio	0.17		0.66	0.66	0.66	0.66
v/c Ratio	0.49		0.30	0.45	0.73	0.12
Control Delay	14.8		11.1	7.9	14.6	1.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	14.8		11.1	7.9	14.6	1.8
LOS	B		B	A	B	A
Approach Delay	14.8			8.2	13.0	
Approach LOS	B			A	B	
Queue Length 50th (m)	6.7		2.6	23.8	51.3	0.0
Queue Length 95th (m)	19.1		6.8	53.8	#136.8	4.2
Internal Link Dist (m)	181.0			223.9	232.1	
Turn Bay Length (m)			35.0			60.0
Base Capacity (vph)	673		236	1241	1241	1078
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	0.26		0.30	0.45	0.73	0.12

Intersection Summary

Cycle Length: 56.5

Actuated Cycle Length: 49.2

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 11.6

Intersection LOS: B

Intersection Capacity Utilization 63.6%

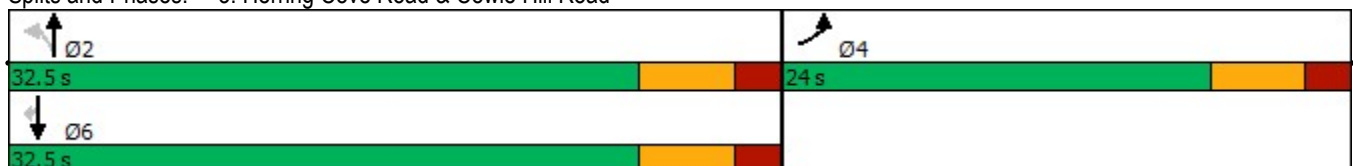
ICU Level of Service B

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Herring Cove Road & Cowie Hill Road



3: Herring Cove Road & Cowie Hill Road Existing Network

AM Peak - 2028 Background Traffic



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	108	30	34	648	316	63
Future Volume (vph)	108	30	34	648	316	63
Satd. Flow (prot)	1762	0	1789	1847	1830	1601
Flt Permitted	0.963		0.547			
Satd. Flow (perm)	1753	0	1030	1847	1830	1601
Satd. Flow (RTOR)	28					86
Confl. Peds. (#/hr)	4	2				
Peak Hour Factor	0.76	0.72	0.84	0.99	0.88	0.73
Heavy Vehicles (%)	1%	2%	2%	4%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	184	0	40	655	359	86
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Total Split (s)	24.0		32.5	32.5	32.5	32.5
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effct Green (s)	9.7		32.1	32.1	32.1	32.1
Actuated g/C Ratio	0.19		0.64	0.64	0.64	0.64
v/c Ratio	0.51		0.06	0.55	0.31	0.08
Control Delay	19.7		6.4	10.1	7.2	2.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	19.7		6.4	10.1	7.2	2.2
LOS	B		A	B	A	A
Approach Delay	19.7			9.9	6.3	
Approach LOS	B			A	A	
Queue Length 50th (m)	11.8		1.4	33.4	14.7	0.0
Queue Length 95th (m)	20.2		5.0	74.5	32.5	3.0
Internal Link Dist (m)	181.0			223.9	232.1	
Turn Bay Length (m)			35.0			60.0
Base Capacity (vph)	652		660	1185	1174	1058
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	0.28		0.06	0.55	0.31	0.08

Intersection Summary

Cycle Length: 56.5

Actuated Cycle Length: 50.1

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 10.0

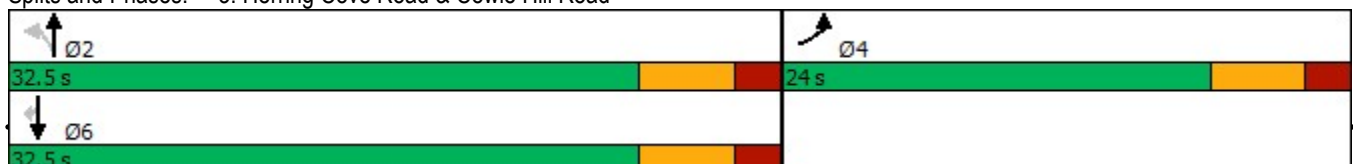
Intersection LOS: B

Intersection Capacity Utilization 52.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Herring Cove Road & Cowie Hill Road



3: Herring Cove Road & Cowie Hill Road Existing Network

PM Peak - 2028 Background Traffic



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	87	75	50	594	922	114
Future Volume (vph)	87	75	50	594	922	114
Satd. Flow (prot)	1689	0	1789	1883	1883	1570
Flt Permitted	0.976		0.159			
Satd. Flow (perm)	1679	0	299	1883	1883	1570
Satd. Flow (RTOR)	67					141
Confl. Peds. (#/hr)	6	4				
Peak Hour Factor	0.90	0.77	0.63	0.96	0.93	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	4%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	194	0	79	619	991	141
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Total Split (s)	24.0		47.5	47.5	47.5	47.5
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effct Green (s)	10.6		45.2	45.2	45.2	45.2
Actuated g/C Ratio	0.16		0.67	0.67	0.67	0.67
v/c Ratio	0.61		0.40	0.49	0.79	0.13
Control Delay	24.6		14.2	8.1	15.7	1.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	24.6		14.2	8.1	15.7	1.5
LOS	C		B	A	B	A
Approach Delay	24.6			8.8	14.0	
Approach LOS	C			A	B	
Queue Length 50th (m)	13.8		3.7	31.6	71.7	0.0
Queue Length 95th (m)	30.7		8.8	67.3	#183.3	4.3
Internal Link Dist (m)	181.0			223.9	232.1	
Turn Bay Length (m)			35.0			60.0
Base Capacity (vph)	499		199	1255	1255	1093
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	0.39		0.40	0.49	0.79	0.13

Intersection Summary

Cycle Length: 71.5

Actuated Cycle Length: 67.8

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 13.2

Intersection LOS: B

Intersection Capacity Utilization 68.8%

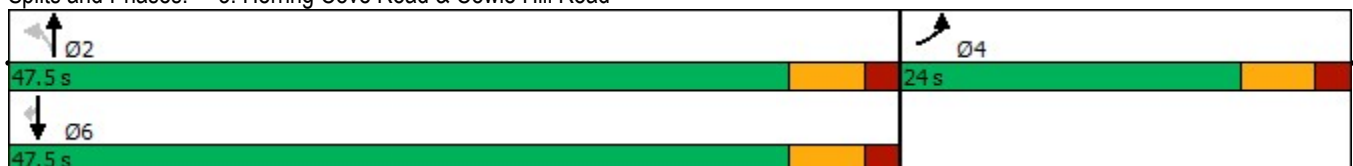
ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 3: Herring Cove Road & Cowie Hill Road



3: Herring Cove Road & Cowie Hill Road Existing Network

AM Peak - 2028 Total Traffic

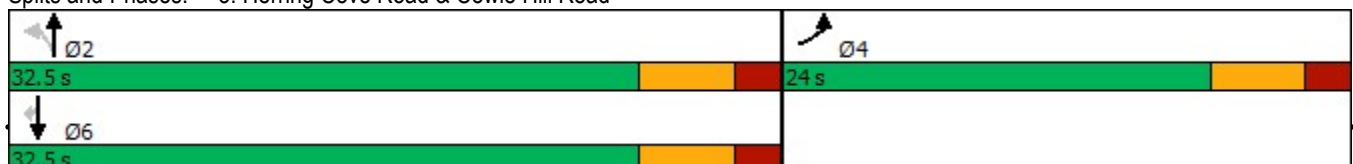


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	↑	↑	↑
Traffic Volume (vph)	108	30	34	648	316	63
Future Volume (vph)	129	36	37	648	316	69
Satd. Flow (prot)	1762	0	1789	1847	1830	1601
Flt Permitted	0.963		0.547			
Satd. Flow (perm)	1753	0	1030	1847	1830	1601
Satd. Flow (RTOR)	28					95
Confl. Peds. (#/hr)	4	2				
Peak Hour Factor	0.76	0.72	0.84	0.99	0.88	0.73
Heavy Vehicles (%)	1%	2%	2%	4%	5%	2%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	220	0	44	655	359	95
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Total Split (s)	24.0		32.5	32.5	32.5	32.5
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effct Green (s)	11.0		29.8	29.8	29.8	29.8
Actuated g/C Ratio	0.21		0.56	0.56	0.56	0.56
v/c Ratio	0.57		0.08	0.63	0.35	0.10
Control Delay	21.1		7.1	12.5	8.3	2.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	21.1		7.1	12.5	8.3	2.4
LOS	C		A	B	A	A
Approach Delay	21.1			12.1	7.1	
Approach LOS	C			B	A	
Queue Length 50th (m)	14.8		1.6	35.8	15.7	0.0
Queue Length 95th (m)	23.9		5.7	79.9	34.9	3.3
Internal Link Dist (m)	181.0			223.9	232.1	
Turn Bay Length (m)			35.0			60.0
Base Capacity (vph)	621		579	1040	1030	942
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	0.35		0.08	0.63	0.35	0.10

Intersection Summary

Cycle Length: 56.5
 Actuated Cycle Length: 52.9
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.63
 Intersection Signal Delay: 11.9
 Intersection Capacity Utilization 52.4%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 3: Herring Cove Road & Cowie Hill Road



3: Herring Cove Road & Cowie Hill Road Existing Network

PM Peak - 2028 Total Traffic



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	87	75	50	594	922	114
Future Volume (vph)	97	84	59	594	922	135
Satd. Flow (prot)	1689	0	1789	1883	1883	1570
Flt Permitted	0.976		0.149			
Satd. Flow (perm)	1679	0	281	1883	1883	1570
Satd. Flow (RTOR)	68					167
Confl. Peds. (#/hr)	6	4				
Peak Hour Factor	0.90	0.77	0.63	0.96	0.93	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	4%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	217	0	94	619	991	167
Turn Type	Prot		Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases			2			6
Total Split (s)	24.0		47.5	47.5	47.5	47.5
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effect Green (s)	11.5		44.8	44.8	44.8	44.8
Actuated g/C Ratio	0.17		0.66	0.66	0.66	0.66
v/c Ratio	0.64		0.51	0.50	0.80	0.15
Control Delay	25.9		21.6	8.6	17.0	1.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	25.9		21.6	8.6	17.0	1.5
LOS	C		C	A	B	A
Approach Delay	25.9			10.4	14.7	
Approach LOS	C			B	B	
Queue Length 50th (m)	16.4		5.1	33.4	75.6	0.0
Queue Length 95th (m)	34.8		12.1	71.6	#189.7	4.8
Internal Link Dist (m)	181.0			223.9	232.1	
Turn Bay Length (m)			35.0			60.0
Base Capacity (vph)	496		184	1234	1234	1087
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	0.44		0.51	0.50	0.80	0.15

Intersection Summary

Cycle Length: 71.5

Actuated Cycle Length: 68.3

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 14.4

Intersection LOS: B

Intersection Capacity Utilization 68.8%

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: Herring Cove Road & Cowie Hill Road

