Cherry Lane Apartments Traffic Impact Study

February 2021

Prepared for

KWR Approvals Inc

JR consulting

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Prepared by

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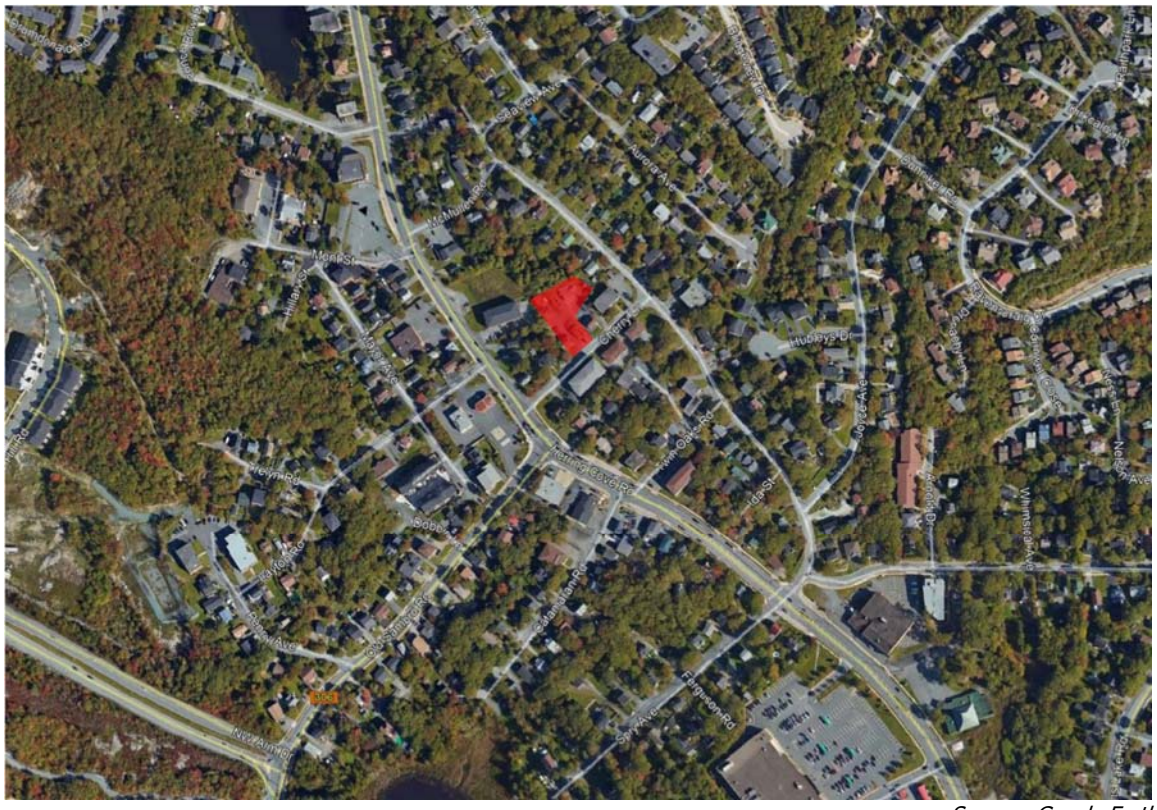
1 Introduction

1.1 Background

KWR Approvals Inc (KRWA), on behalf of the owner, is working on a proposal to develop their property located on Cherry Lane in Spryfield, Nova Scotia. Exhibit 1.1 shows the site in red in the context of the surrounding area.

Exhibit 1.1 – Proposed Cherry Lane Development in Spryfield, Nova Scotia

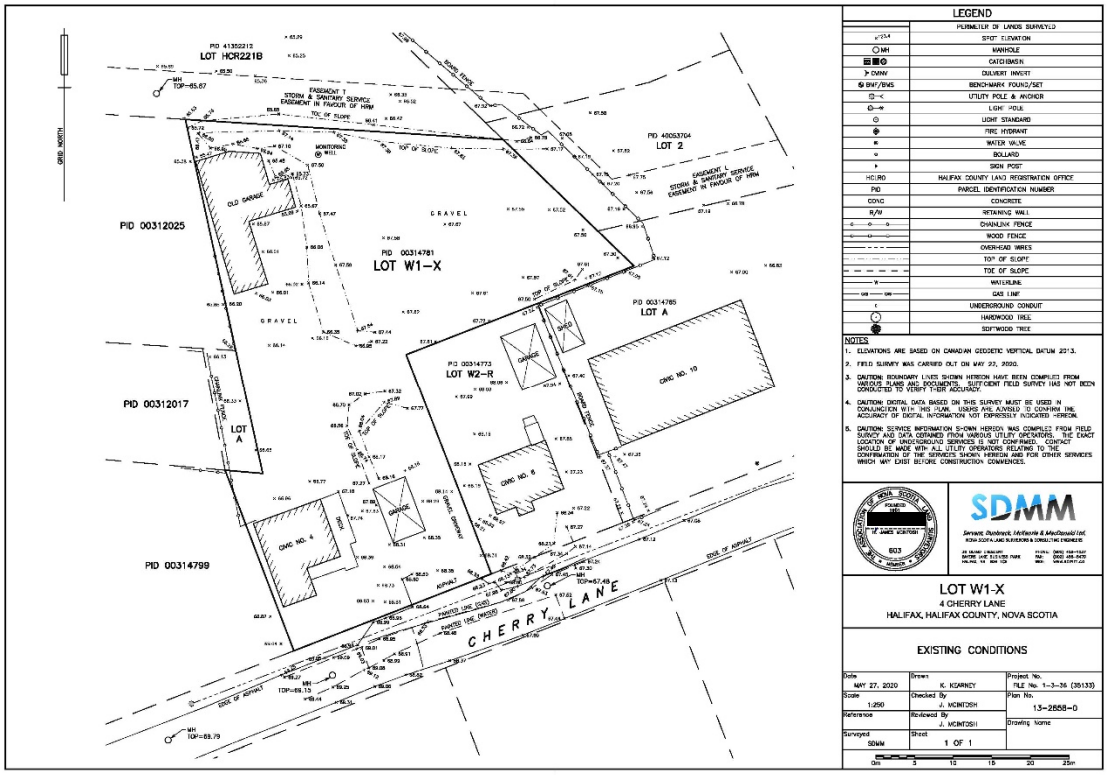


Source: Google Earth

The developer has proposed to redevelop this property at 4 Cherry Lane with a new 36-unit apartment building that will have a mixture of 1 and 2 bedroom units. It will replace an existing single family home with an adjacent garage. The rear portion of the property has an older garage and a gravel pile. Access to the property will be from an existing driveway on Cherry Lane.

Refer to the following Exhibit 1.2 for an existing property plan as provided by Servant Dunbrack McKenzie & MacDonald Ltd.

Exhibit 1.2 – Cherry Lane Apartments Property in Spryfield, Nova Scotia



JRL consulting inc. complekted a Traffic Impact Statement (TIS) in July 2020 which was reviewed by HRM and they provided the following comments in a letter dated January 28, 2021.

1. The diagram of Cherry Lane and Herring Cove Road as a four legged intersection with Old Sambro Road is inaccurate. Please provide an updated diagram which accurately depicts the existing conditions.

2. The TIS also does not comment on operations at the existing Cherry Lane/Herring Cove Road intersection, specifically due to impacts from the traffic signals at Old Sambro Road. Although additional volumes are expected to below, there will be an increased level of negative impact. The spacing between Old Sambro Road and Cherry Lane does not meet HRM standards for intersection spacing, and the additional traffic resulting from this development will increase the impact of the proximity of the two intersections. Please provide additional comments regarding the impacts of the proposed development on these two intersections.

3. The TIS must comment on the adequacy of existing pedestrian facilities, and recommend any necessary upgrades to provide adequate pedestrian facilities on Cherry Lane.

We are pleased to submit this report which summarizes our findings and provides the additional information requested by HRM for review.

1.2 Study Area

The study area defined for this Traffic Impact Study consists of the transportation network in the immediate vicinity of the proposed Cherry Lane Apartments development. It includes Herring Cove Road as well as the following key intersections:

- Herring Cove Road at Old Sambro Road
- Herring Cove Road at Cherry Lane

1.3 Objectives

Given the background set out above, the objective of this Traffic Impact Study is to assess the impacts of the proposed development on the surrounding transportation network.

Recommendations and solutions will then be provided to allow the traffic generated by the proposed development to be introduced to the existing transportation network safely and efficiently.

We have assumed that the proposed development will be completed within the next 5 years so we have set 2026 as the horizon period for future analysis. Detailed objectives are presented below:

- Complete a Site Review
- Use HRM provided Turning Movement counts from the Herring Cove Road/Old Sambro Road/Cherry Lane intersection completed in 2017 to estimate 2021 background traffic on Herring Cove Road at the development (with 2% annual growth)
- Estimate the amount of traffic to be generated by the proposed development of 36 new apartment units using Trip Generation Rates and equations published by the Institute of Transportation Engineers (10th Edition)
- Distribute new site generated traffic based on HRM Turning Movement counts at the Herring Cove Road/Old Sambro Road/Cherry Lane
- Analyze the future performance of the Herring Cove Road/Old Sambro Road intersection and Herring Cove Road/Cherry Lane intersection using Synchro plus SimTraffic Version 10 and the procedures outlined in the Highway Capacity Manual and by the Transportation Association of Canada (TAC)
- Develop and list existing, potential and future problems or concerns
- Prepare a final stamped report summarizing the project activities and findings

2 Existing Traffic Conditions

2.1 Description

The principal routes affected by this development are Herring Cove Road and Cherry Lane. Exhibit 2.1 summarizes HRM's Characteristics of Street Classes from HRM's Municipal Service Systems Design Guidelines.

Exhibit 2.1 - HRM Characteristics of Street Classes

Characteristic	Arterial Street	Major Collector	Minor Collector	Local Industrial	Local Street
1. Traffic Service Function	First Consideration	Traffic movement primary consideration, land access secondary consideration, some parking	Traffic movement of equal importance with land access, parking permitted	Traffic movement secondary consideration with land access primary consideration, parking permitted	Traffic movement secondary consideration with land access primary consideration, parking permitted
2. Land Access Function	Limited Access with no parking				
3. Range of design traffic average daily volume	More than 20,000	12,000 to 20,000 or more	Up to 12,000	Less than 3,000	Less than 3,000
4. Characteristics of traffic flow	Uninterrupted flow except at signals; w/ pedestrian overpass	Uninterrupted flow except at signals and crosswalks	Interrupted flow	Interrupted flow	Interrupted flow
5. Average running speed in off-peak conditions	50-70 km/hr	40-60 km/hr	30-50 km/hr	15-30 km/hr	15-30 km/hr
6. Vehicle types	All types	All types but trucks may be limited	All types with truck limitation	All types	Passenger and service vehicles, transit buses; large vehicles restricted
7. Connects to	Expressways, arterials, major collectors, minor collectors	Expressways, arterials, major collectors, minor collectors, some locals	Arterials, major collectors, minor collectors, locals	Some major collectors, minor collectors, locals	Some major collectors, minor collectors, locals

Herring Cove Road is an arterial road that runs in a general north-south direction from the Armdale Rotary to Sambro and is also known as Route 349. It has one northbound lane and two southbound lanes at Cherry Lane in the area of the proposed development. There are concrete sidewalks on both sides of Herring Cove Road south of Cherry Lane and a concrete sidewalk on the west side of Herring Cove Road north of Cherry Lane. The posted speed limit in the area is 50 km/hr.

Cherry Lane is short local road that runs between Herring Cove Road and Circle Drive. It provides access to existing residential dwelling and apartments. There are no sidewalks on Cherry Road. The posted speed limit in the area is 50 km/hr.

Refer to Exhibit 2.2 for photos of the Study Area around the proposed development.

Exhibit 2.2 – Study Area Photos

Cherry Lane looking east with proposed development on left

Cherry Lane looking west at Herring Cove Road

Cherry Lane looking east at Herring Cove Road

Herring Cove Road at Old Sambro Road

Cherry Lane at Herring Cove Road looking north

Cherry Lane at Herring Cove Road looking south

2.2 Existing Traffic Volumes

We completed a site review on June 6, 2020. Cherry Lane is located just north of the signalized Herring Cove Road at Old Sambro Road intersection. HRM completed turning movement counts this intersection on July 25, 2017 that also included counts at Cherry Lane. We applied an annual background growth rate of 2% to estimate traffic in 2021 as summarized below

Exhibit 2.3 – Herring Cove Road at Cherry Lane Estimated Existing Traffic 2021

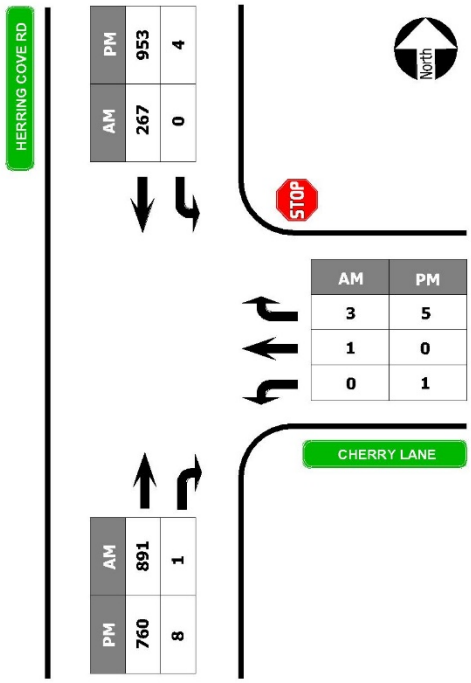
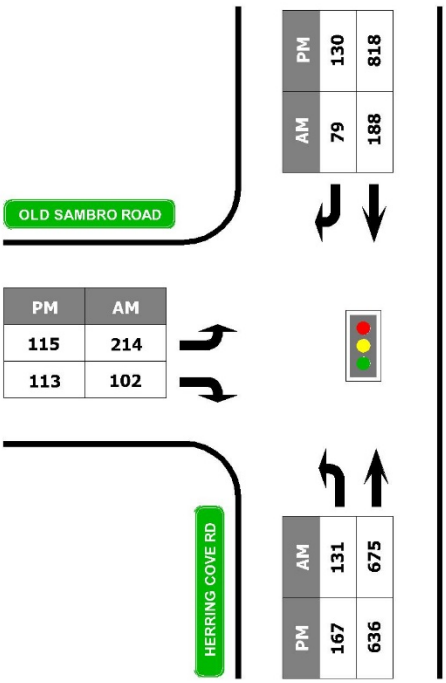


Exhibit 2.4 – Herring Cove Road at Old Sambro Road Estimated Existing Traffic 2021



2.3 Background Changes in Traffic Conditions

For this study, we have applied an annual background traffic volume growth rate of 2% to establish baseline traffic volumes for analysis. Existing traffic volumes at the Herring Cove Road/Old Sambro Road/Cherry Lane intersection were increased by a total of 2% per year to establish baseline background traffic volumes for the 2026 horizon year. This is consistent with other Traffic Impact Studies completed in the area.

2.4 Transit and Pedestrians

The area around the proposed development is well serviced by Halifax Transit on Route 9 Herring Cove, Route 14 Leiblin Park and Express Route 32 Cowie Hill that provide regular service 7 days a week with connections to the rest of the transit network in Halifax.

There are concrete sidewalks on both sides of Herring Cove Road south of Cherry Lane and a concrete sidewalk on the west side of Herring Cove Road north of Cherry Lane. There are no existing sidewalks on Cherry Lane but this short local road does have a graveled shoulder in some areas.

3 Site Generated Traffic

3.1 Trip Generation

The proposed development will have a total of 36 apartment units with a mixture of 1 and 2-bedroom units. We completed trip generation estimates using equations provided in Institute for Transportation Engineer's Trip Generation Manual Tenth Edition.

- ITE Land Use 221 Multifamily Housing (Mid-Rise)

"Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors)." The unit of measurement for average vehicle trip ends is dwelling units.

Exhibit 3.1 – Estimated Site Generated Traffic Volumes for Cherry Lane Apartments

LAND USE	QUANTITY	AM PEAK			PM PEAK		
		TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Apartment (ITE Land Use 221)	36	13	26%	74%	17	61%	39%
			3	9		10	6
TOTAL		**13**	**3**	**10**	**17**	**11**	**6**

3.2 Trip Distribution

HRM's counts at the Herring Cove Road/Old Sambro Road/Cherry Lane intersection provide an indication of trip distribution in the area and we expect that traffic generated by the proposed residential development will follow the same patterns. The majority of vehicles in the AM peak hour are heading north towards Halifax and this reverses in the PM peak as people return home.

3.3 Total Traffic

The distributed site-generated traffic from the proposed Cherry Lane Apartments was added to the calculated 2026 estimated background traffic volumes (with an annual growth factor of 2%) to obtain the estimated total traffic volumes at the Herring Cove Road/Old Sambro Road intersection and Herring Cove Road/Cherry Lane intersection.

Please refer to drawings below for a summary of total estimated future traffic volumes in 2026 and the Appendix for a detailed breakdown of the calculation of total traffic.

Exhibit 3.2 – Herring Cove Road at Cherry Lane Estimated Total Traffic 2026

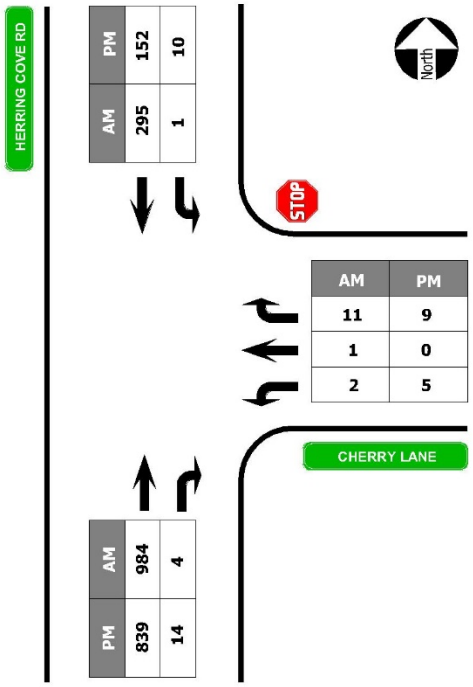
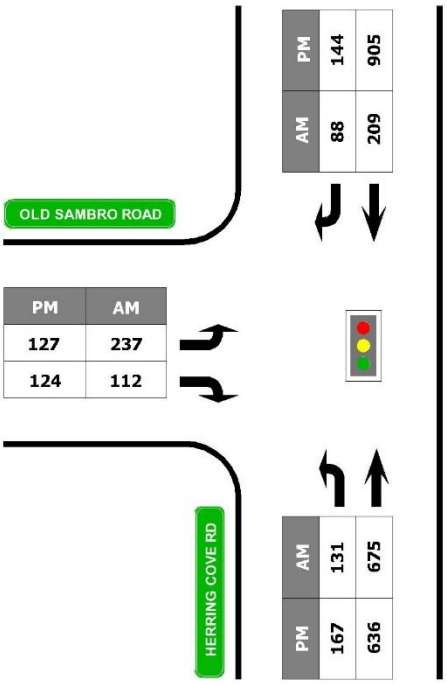


Exhibit 3.3 – Herring Cove Road at Old Sambro Road Estimated Total Traffic 2026



4 Evaluation of Impacts

4.1 Level of Service Analysis

As described in the Highway Capacity Manual *"the concept of levels of service used qualitative measures that characterize operational conditions within a traffic stream and their perception by motorists and passengers. The descriptions of individual levels of service characterize these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.*

Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst."

As stated in the Highway Capacity Manual, *"analysis of signalized intersections focuses on the capacity and level of service of intersection approaches and the intersection as a whole. Capacity is evaluated in terms of the ratio of demand flow rate (volume) to capacity (v/c ratio) while the level of service is evaluated on the basis of average control delay per vehicle (in seconds per vehicle)."* Exhibit 4.1 defines Level of Service for signalized intersections.

The Highway Capacity Manual also states that *"the level of service is determined by the computed or measured control delay and is defined for each minor movement. Level of Service is not defined for the intersection as a whole."* LOS criteria for unsignalized intersections are summarized in Exhibit 4.2.

Exhibit 4.1 - Level of Service Criteria for Signalized Intersections

Level of Service	Description	Control, Delay Per Vehicle (Seconds)
A	Very low delay; most vehicles do not stop (Excellent)	$\leq$ 10
B	Higher delay; more vehicles stop (Very Good)	$\geq$ 10 and $\leq$ 20
C	Higher number of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping (Good)	$\geq$ 20 and $\leq$ 35
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; Many vehicles stop (Satisfactory)	$\geq$ 35 and $\leq$ 55
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of acceptable delay	$\geq$ 55 and $\leq$ 80
F	This level is considered to be unacceptable for most drivers; occurs when arrival flow rates exceed the capacity of the intersection (Unacceptable)	$\geq$ 80

Exhibit 4.2 - Level of Service Criteria for Unsignalized Intersections

Level of Service	Delay Range (Seconds)
A	≤ 10
B	≥ 10 and ≤ 15
C	≥ 15 and ≤ 25
D	≥ 25 and ≤ 35
E	≥ 35 and ≤ 50
F	≥ 50

Traffic volumes are at their highest during the AM and PM peak periods so the impact of the trips generated by the proposed development during these hours will provide a worst case assessment of their impacts on the existing transportation network.

HRM's Guidelines for the Preparation of Transportation Impact Studies states that all "*intersections and individual traffic movements must be identified where:*

- *The volume/capacity ratio of an overall intersection exceeds 0.85*
- *The volume/capacity ratio of an individual through movement or shared through/turning movement exceeds 0.85*
- *The volume/capacity ratio of an exclusive turning movement exceeds 1.0"*

Level of Service (LOS), Volume-to-Capacity ratios (v/c) and 95% Queue Length in meters (95%) results from all key movements at all study area intersections are summarized in Exhibits 4.3 and 4.4.

Exhibit 4.3 – Herring Cove Road at Cherry Lane Level of Service Results Total Traffic 2026

	Herring Cove	Cherry Lane	Total
	SB-L	WB-LR	
AM PEAK HOUR – 2026 ESTIMATED TOTAL TRAFFIC			
Delay	25.3	11.2	0.3
LOS	D	B	
v/c	0.075	0.002	
95% Queue	1.12 (m)	-	
PM PEAK HOUR – 2026 ESTIMATED TOTAL TRAFFIC			
Delay	31.6	10.5	0.4
LOS	D	B	
v/c	0.103	0.017	
95% Queue	1.68 (m)	0.56 (m)	

All movements at this the Herring Cove Road/Cherry Lane intersection will operate with acceptable LOS during the AM and PM peak hour periods in 2026.

Exhibit 4.4 – Herring Cove Road at Old Sambro Road Level of Service Results Total Traffic 2026

	Old Sambro Road		Herring Cove Road			Total
	EB-L	EB-R	NB-L	NB-T	SB-TR	
AM PEAK HOUR – 2026 ESTIMATED TOTAL TRAFFIC						
Delay	26.6	5.6	9.7	19.8	5.2	16.0
LOS	C	A	A	B	A	B
v/c	0.47	0.22	0.30	0.80	0.18	
95% Queue	44.4 (m)	10.0 (m)	22.2 (m)	152.3 (m)	13.0 (m)	
PM PEAK HOUR – 20 ESTIMATED TOTAL TRAFFIC						
Delay	43.3	13.1	25.7	8.6	6.0	11.1
LOS	D	B	C	A	A	B
v/c	0.39	0.35	0.71	0.58	0.47	
95% Queue	40.6 (m)	18.0 (m)	69.4 (m)	103.5 (m)	59.5 (m)	

All movements at this the Herring Cove Road/Cherry Lane intersection will operate with acceptable LOS during the AM and PM peak hour periods in 2026.

In HRM's letter they noted that the spacing between Old Sambro Road and Cherry Lane does not meet HRM standards for intersection spacing. Even with the additional traffic generated but the proposed Cherry Lane Apartments our detailed analysis has shown that both of these intersections will operate well under HRM thresholds for LOS. We also note that the two southbound lanes on Herring Cove Road provide an opportunity for vehicles to continue southbound if left turn vehicles are queuing to turn into Cherry Lane

4.2 Stopping Site Distance

As per the Transportation of Canada Geometric Design Guide for Canadian Roads, adequate stopping site distance *"is essential for safe operation that the vehicle operator be able to see far enough ahead to stop if necessary. Conditions that would force a vehicle operator to stop are for example, an object on the roadway, a culvert washout or other fault in the roadway.*

Adequate stopping site distance is required throughout the length of the roadway. Minimum stopping site distance is the sum of two distances namely:

- *Brake reaction distance*

  The distance travelled during the brake reaction time, that is the time that elapses from the instant an object, for which the driver decides to stop, comes into view to the instant the driver takes remedial action (contacts brake pedal).

- *Braking distance*

  The distance travelled from the time that braking begins to the time the vehicle comes to a stop."

For a design speed of 50 km/h, the minimum stopping site distance is 65 m. Cherry Lane is a short local road that is approximately 140 meters long. The driveway to the proposed apartments is located in the middle of Cherry Lane between Circle Drive and Herring Cove Road. Speeds would be low on this road due to its short length and we didn't observe any concerns with Stopping Site Distance during our site visit.

4.3 Pedestrians

As mentioned in Section 2.4 there are concrete sidewalks on both sides of Herring Cove Road south of Cherry Lane and a concrete sidewalk on the west side of Herring Cove Road north of Cherry Lane. In addition the nearby signalized Herring Cove Road at Old Sambro Road intersection provides a safe route to cross Herring Cove Road.

There are no existing sidewalks on Cherry Lane but it does have a graveled shoulder in some areas. There are a number of existing apartment buildings and single family homes on this road today. Cherry Lane is only 140 meters long so vehicle speeds are relatively slow. The entrance to the proposed Cherry Lane Apartments will be about 60 meters from Herring Cove Road where residents can access established pedestrian facilities and transit.

Even with the addition of the Cherry Lane Apartments traffic remains very low on Cherry Lane during the AM and PM peak hours and residents will have a short walk to Herring Cove Road so we don't see a need to upgrade pedestrian facilities on Cherry Lane.

This aligns with HRM's Planning comments in their letter under Section 9: Transportation that states *"The existing pedestrian movement pattern will not be altered by this application. Vehicular through traffic will not alter traffic routes and any new traffic volumes generated are considered to have insignificant impact on local and regional networks."*

5 Conclusions and Recommendations

- This Traffic Impact Study has provided a detailed update of the traffic impacts of the proposed Cherry Lane Apartments with 36 units on an existing property with access from Cherry Lane located just north of the Herring Cove Road/Old Sambro Road intersection.

- We estimate that the proposed development will generate **13** new vehicle trips in the AM Peak Hour and **17** new vehicle trips in the PM Peak Hour.

- The location is well served by Halifax Transit with connections to various key transit terminals and downtown Halifax.

- New site generated traffic will most likely follow existing trip distribution patterns along Herring Cove Road in the AM and PM peak hours.

- A detailed analysis of the performance of the Herring Cove Road/Old Sambro Road intersection and Herring Cove Road/Cherry Lane Road with new site generated traffic from the proposed Cherry Lane Apartments along with background traffic growth in 2026 determined that both intersections will operate with acceptable Level of Service.

- Existing pedestrian facilities and transit connections on Herring Cove Road are located a short distance from the entrance to the proposed Cherry Lane Apartments. Traffic volumes on Cherry Lane are low and the road is short which reduces vehicle speed so we don't see a need to upgrade pedestrian facilities on Cherry Lane.

- The close proximity to transit connections could reduce traffic generated by the proposed apartments.

- Traffic created by this proposed development is not significant so it can be introduced safely and efficiently into the existing transportation network.

6 Appendix

HRM TRAFFIC COUNTS

TRIP GENERATION

TRAFFIC DISTRIBUTION

SYNCHRO REPORTS

HALIFAX REGIONAL MUNICIPALITY
TRANSPORTATION & PUBLIC WORKS
TRAFFIC & RIGHT OF WAY

CODE NO. 17-TM-285

MANUAL TRAFFIC COUNTS

INTERSECTION: HERRING COVE ROAD AT CHERRY LANE

WEATHER: CLOUDY/RAINY
RECORDER: KS

DAY	DATE	MONTH	YEAR
TUES	25	JULY	2017

STREET:		CHERRY LANE			OLD SAMBRO ROAD			HERRING COVE ROAD			HERRING COVE ROAD			
TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
07:00:00 AM	07:15:00 AM	1	0	1	55	0	17	1	52	25	27	133	2	314
07:15:00 AM	07:30:00 AM	1	1	0	45	0	28	2	50	15	40	100	0	282
07:30:00 AM	07:45:00 AM	0	0	0	42	0	9	0	36	15	34	88	0	224
07:45:00 AM	08:00:00 AM	1	0	0	51	0	34	0	39	17	34	73	0	249
TOTAL		3	1	1	193	0	88	3	177	72	135	394	2	1069
PEAK			5			281			252			531		
15 MIN PEAK			8			340			312			648		
PEAK HOUR FACTOR			0.63			0.83			0.81			0.82		
TWO WAY TOTALS			10			489			840			799		FACTOR
														1.03
														1101

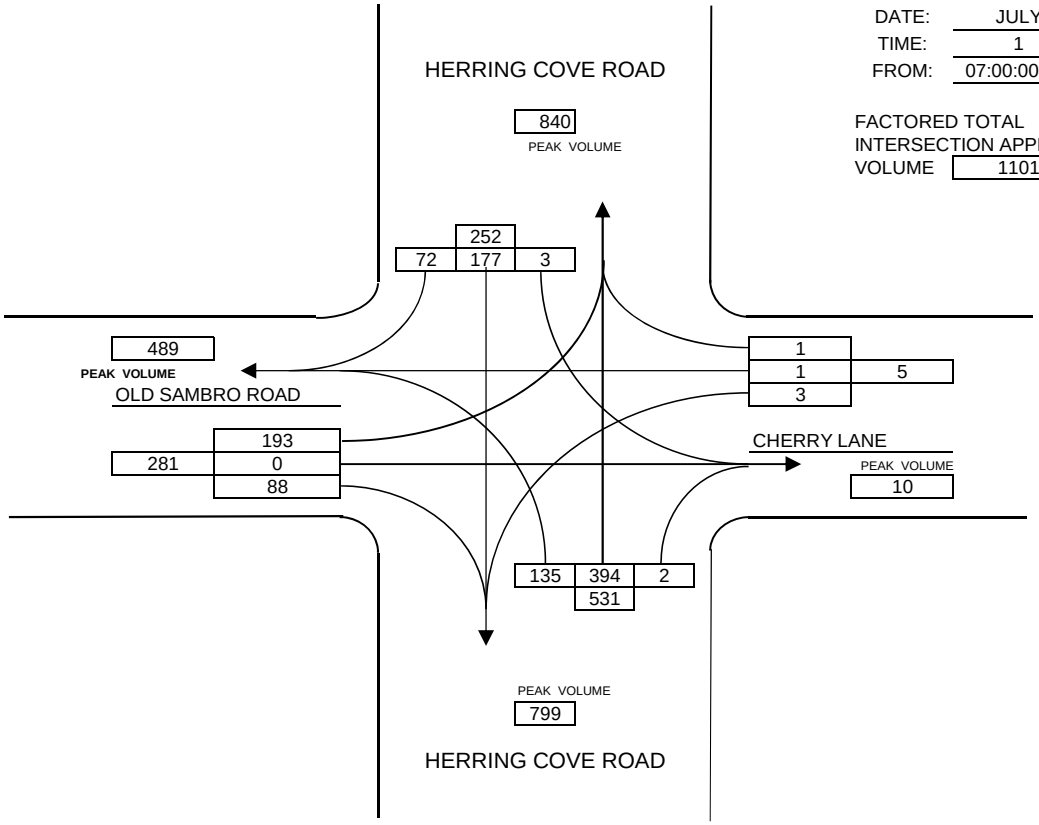
DAY	DATE	MONTH	YEAR
TUES	25	JULY	2017

TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
08:00:00 AM	08:15:00 AM	0	0	2	33	0	29	0	48	18	34	114	0	278
08:15:00 AM	08:30:00 AM	0	0	1	25	0	25	0	37	31	30	152	1	302
08:30:00 AM	08:45:00 AM	0	0	0	115	0	21	0	48	11	27	191	0	413
08:45:00 AM	09:00:00 AM	0	1	0	25	0	19	0	41	13	30	168	0	297
TOTAL		0	1	3	198	0	94	0	174	73	121	625	1	1290
PEAK			4			292			247			747		
15 MIN PEAK			8			544			272			872		
PEAK HOUR FACTOR			0.5			0.54			0.91			0.86		
TWO WAY TOTALS			5			487			1073			1015		FACTOR
														1.03
														1329

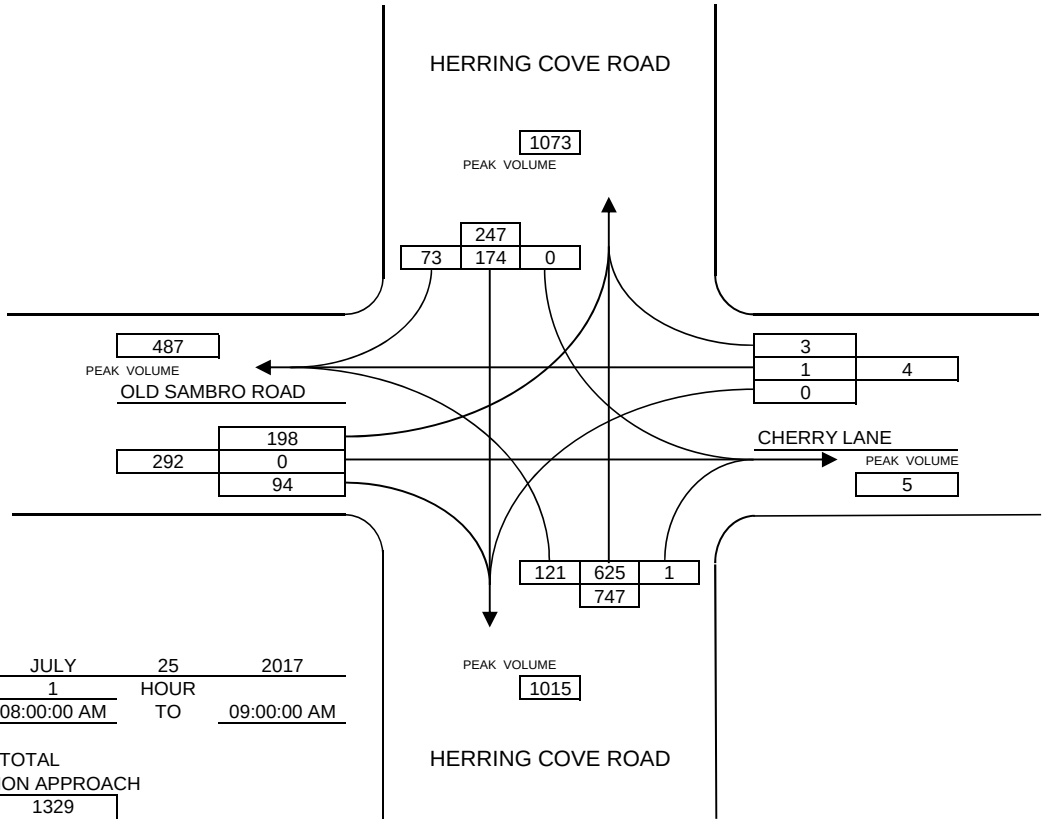
VEHICULAR GRAPHIC SUMMARY SHEET

INTERSECTION : HERRING COVE ROAD AT CHERRY LANE

DATE: JULY 25 2017
TIME: 1 HOUR
FROM: 07:00:00 AM TO 08:00:00 AM



FACTORED TOTAL INTERSECTION APPROACH VOLUME 1101



DATE: JULY 25 2017
TIME: 1 HOUR
FROM: 08:00:00 AM TO 09:00:00 AM

FACTORED TOTAL INTERSECTION APPROACH VOLUME 1329

HALIFAX REGIONAL MUNICIPALITY
TRANSPORTATION & PUBLIC WORKS
TRAFFIC & RIGHT OF WAY

CODE NO. 17-TM-295

MANUAL TRAFFIC COUNTS

INTERSECTION: HERRING COVE ROAD AT CHERRY LANE

WEATHER: CLOUDY
RECORDER: KS

DAY	DATE	MONTH	YEAR
TUES	25	JULY	2017

STREET:		CHERRY LANE			OLD SAMBRO ROAD			HERRING COVE ROAD			HERRING COVE ROAD			
TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
04:00:00 PM	04:15:00 PM	0	0	2	43	0	23	1	195	24	35	103	1	427
04:15:00 PM	04:30:00 PM	0	0	1	45	0	26	1	197	31	37	180	2	520
04:30:00 PM	04:45:00 PM	0	0	0	23	0	26	2	191	32	36	124	1	435
04:45:00 PM	05:00:00 PM	0	0	1	22	0	23	0	192	32	40	149	1	460
TOTAL		0	0	4	133	0	98	4	775	119	148	556	5	1842
PEAK			4			231			898			709		
15 MIN PEAK			8			284			916			876		
PEAK HOUR FACTOR			0.5			0.81			0.98			0.81		
TWO WAY TOTALS			13			498			1591			1582		FACTOR
														1.03
														1897

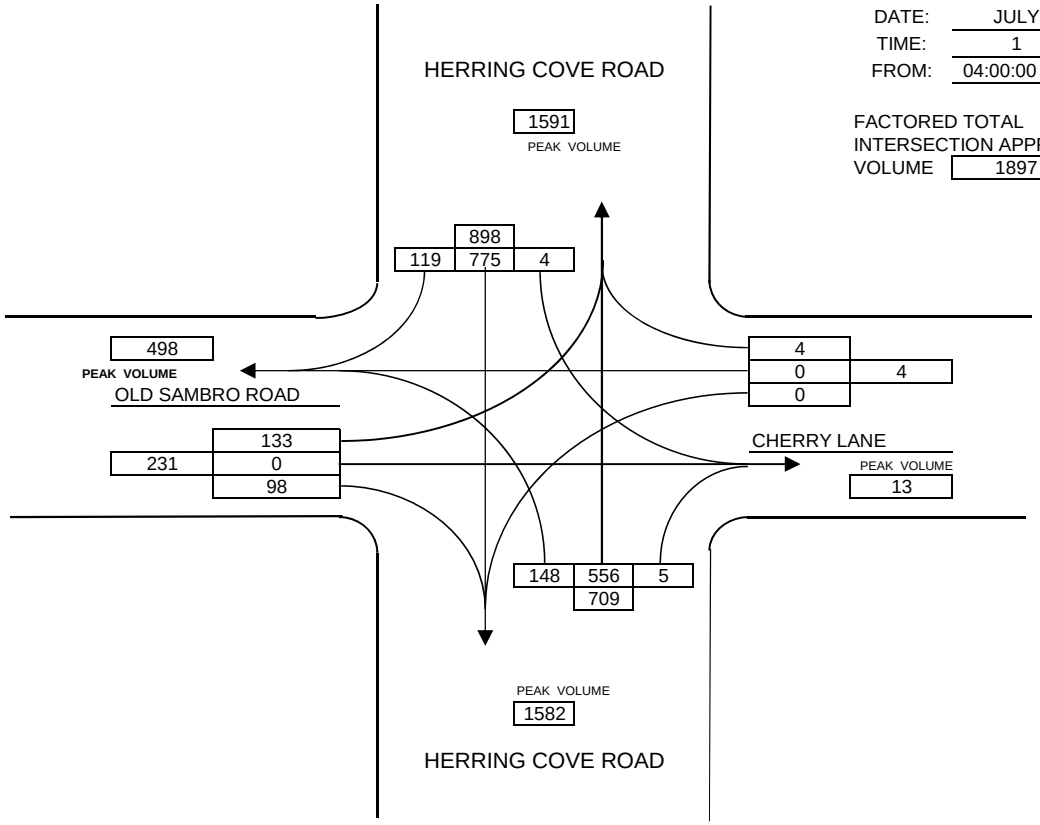
DAY	DATE	MONTH	YEAR
TUES	25	JULY	2017

TIME:		FROM THE EAST			FROM THE WEST			FROM THE NORTH			FROM THE SOUTH			TOTAL
15 MIN INTERVALS		L	S	R	L	S	R	L	S	R	L	S	R	
05:00:00 PM	05:15:00 PM	1	0	1	16	0	29	1	180	25	41	143	4	441
05:15:00 PM	05:30:00 PM	0	0	0	23	0	33	1	172	27	35	122	1	414
05:30:00 PM	05:45:00 PM	0	0	0	18	0	32	0	181	28	43	144	0	446
05:45:00 PM	06:00:00 PM	1	0	0	17	0	28	0	191	14	37	123	1	412
TOTAL		2	0	1	74	0	122	2	724	94	156	532	6	1713
PEAK			3			196			820			694		
15 MIN PEAK			8			224			836			752		
PEAK HOUR FACTOR			0.38			0.88			0.98			0.92		
TWO WAY TOTALS			11			446			1427			1542		FACTOR
														1.03
														1764

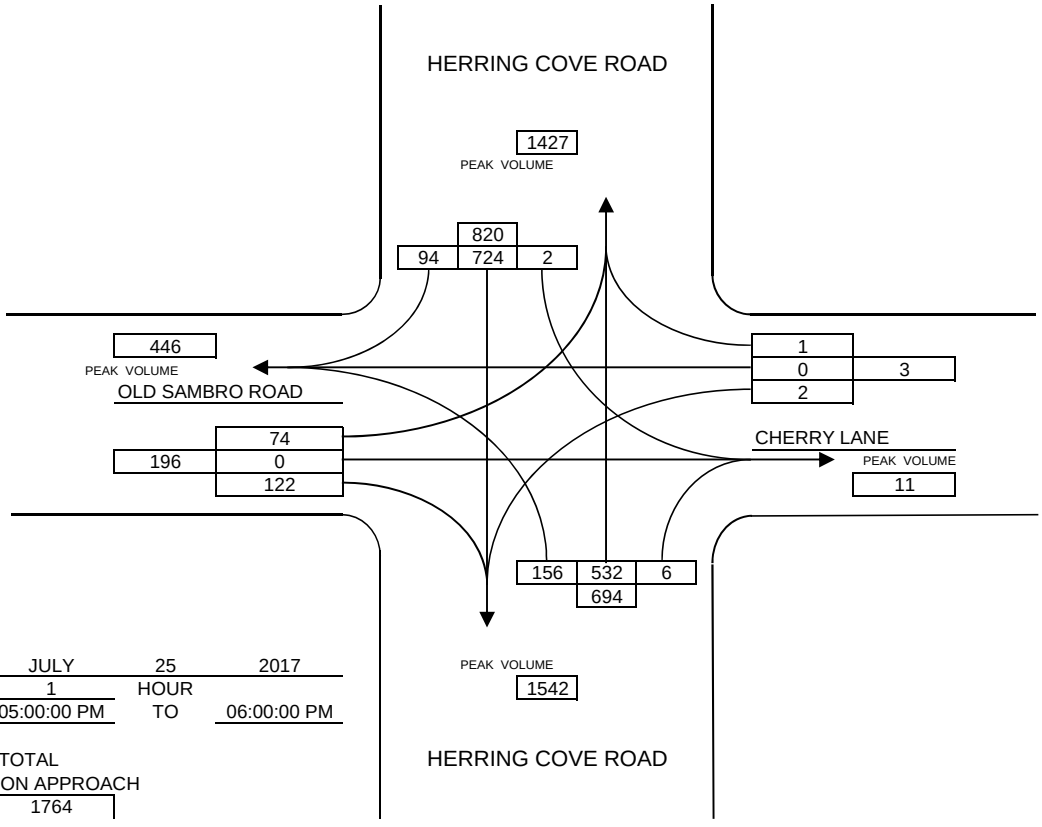
VEHICULAR GRAPHIC SUMMARY SHEET

INTERSECTION : HERRING COVE ROAD AT CHERRY LANE

DATE: JULY 25 2017
TIME: 1 HOUR
FROM: 04:00:00 PM TO 05:00:00 PM



FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1897



DATE: JULY 25 2017
TIME: 1 HOUR
FROM: 05:00:00 PM TO 06:00:00 PM

FACTORED TOTAL
INTERSECTION APPROACH
VOLUME 1764

CHERRY LANE APARTMENTS TRAFFIC IMPACT STUDY

EXISTING TRAFFIC ESTIMATES

HRM COUNTS COMPLETED ON TUESDAY JULY 25, 2017

AM PEAK		CHERRY LANE			OLD SAMBRO			HERRING COVE ROAD					
ENTER		WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND		
EXIT		L	T	R	L	T	R	L	T	R	L	T	R
2017													
08:00:00 AM	08:15:00 AM	0	0	2	33	0	29	0	48	18	34	114	0
08:15:00 AM	08:30:00 AM	0	0	1	25	0	25	0	37	31	30	152	1
08:30:00 AM	08:45:00 AM	0	0	0	115	0	21	0	48	11	27	191	0
08:45:00 AM	09:00:00 AM	0	1	0	25	0	19	0	41	13	30	168	0
2017												0	
08:00:00 AM	09:00:00 AM	0	1	3	198	0	94	0	174	73	121	625	1
2020													
08:00:00 AM	09:00:00 AM	0	1	3	210	0	100	0	185	77	128	663	1
2021													
08:00:00 AM	09:00:00 AM	0	1	3	214	0	102	0	188	79	131	677	1

PM PEAK		CHERRY LANE			OLD SAMBRO			HERRING COVE ROAD					
ENTER		WESTBOUND			EASTBOUND			SOUTHBOUND			NORTHBOUND		
EXIT		L	T	R	L	T	R	L	T	R	L	T	R
2017													
04:15:00 PM	04:30:00 PM	0	0	2	45	0	26	1	197	31	37	180	2
04:30:00 PM	04:45:00 PM	0	0	1	23	0	26	2	191	32	36	124	1
04:45:00 PM	05:00:00 PM	0	0	1	22	0	23	0	192	32	40	149	1
05:00:00 PM	05:15:00 PM	1	0	1	16	0	29	1	180	25	41	143	4
2017													
04:15:00 PM	05:15:00 PM	1	0	5	106	0	104	4	760	120	154	596	8
2020													
04:15:00 PM	05:15:00 PM	1	0	5	112	0	110	4	807	127	163	632	8
2021													
04:15:00 PM	05:15:00 PM	1	0	5	115	0	113	4	823	130	167	645	9

CHERRY LANE APARTMENTS TRAFFIC IMPACT STUDY

TRIP GENERATION ESTIMATES

Source - ITE Trip Generation Manual 10th Edition

Land Use 221 Multi Family Housing (Mid-Rise)
AM PEAK Ln(T) = 0.98Ln(X) -0.98
PM PEAK Ln(T) = 0.96Ln(X) -0.63

Land Use 210 Single Family Detached Housing

AM PEAK T = 0.71(X) + 4.80
PM PEAK Ln(T) = 0.96Ln(X) + 0.20

PROPOSED							
LAND USE	QUANTITY	AM PEAK			PM PEAK		
		TOTAL TRIPS	ENTER	EXIT	TOTAL	ENTER	EXIT
Apartment	36	13	26%	74%	17	61%	39%
			3	9		10	6
TOTAL		**13**	**3**	**9**	**17**	**10**	**6**

EXISTING							
LAND USE	QUANTITY	AM PEAK			PM PEAK		
		TOTAL TRIPS	ENTER	EXIT	TOTAL	ENTER	EXIT
Single Family Detached Housing	1	6	25%	75%	1	63%	37%
			1	4		1	0
TOTAL		**6**	**1**	**4**	**1**	**1**	**0**

DIFFERENCE							
LAND USE	QUANTITY	AM PEAK			PM PEAK		
		TOTAL TRIPS	ENTER	EXIT	TOTAL	ENTER	EXIT
TOTAL		**7**	**2**	**5**	**15**	**9**	**6**

CHERRY LANE APARTMENTS TRAFFIC IMPACT STUDY

TOTAL TRAFFIC ANALYSIS

HERRING COVE ROAD AT CHERRY LANE

HRM COUNTS COMPLETED ON TUESDAY JULY 25, 2017

AM PEAK		CHERRY LANE						HERRING COVE ROAD					
ENTER	3	WESTBOUND						SOUTHBOUND			NORTHBOUND		
EXIT	9	L	T	R	L	T	R	L	T	R	L	T	R
2017													
08:00:00 AM	08:15:00 AM	0	0	2				0	66			147	0
08:15:00 AM	08:30:00 AM	0	0	1				0	68			177	1
08:30:00 AM	08:45:00 AM	0	0	0				0	59			306	0
08:45:00 AM	09:00:00 AM	0	1	0				0	54			193	0
2017													
08:00:00 AM	09:00:00 AM	0	1	3				0	247			823	1
2020													
08:00:00 AM	09:00:00 AM	0	1	3				0	262			873	1
2021													
08:00:00 AM	09:00:00 AM	0	1	3				0	267			891	1
2026													
08:00:00 AM	09:00:00 AM	0	1	4				0	295			984	1
DISTRIBUTION													
08:00:00 AM	09:00:00 AM	23%		77%					23%			77%	
SITE GENERATED TRAFFIC													
08:00:00 AM	09:00:00 AM	2		7				1					2
TOTAL TRAFFIC 2026													
08:00:00 AM	09:00:00 AM	2	1	11				1	295			984	4

PM PEAK		CHERRY LANE						HERRING COVE ROAD					
ENTER	10	WESTBOUND						SOUTHBOUND			NORTHBOUND		
EXIT	6	L	T	R	L	T	R	L	T	R	L	T	R
2017													
04:15:00 PM	04:30:00 PM	0	0	2				1	228			225	2
04:30:00 PM	04:45:00 PM	0	0	1				2	223			147	1
04:45:00 PM	05:00:00 PM	0	0	1				0	224			171	1
05:00:00 PM	05:15:00 PM	1	0	1				1	205			159	4
2017													
04:15:00 PM	05:15:00 PM	1	0	5				4	880			702	8
2020													
04:15:00 PM	05:15:00 PM	1	0	5				4	934			745	8
2021													
04:15:00 PM	05:15:00 PM	1	0	5				4	953			760	9
2026													
04:15:00 PM	05:15:00 PM	1	0	6				5	1052			839	10
DISTRIBUTION													
04:15:00 PM	05:15:00 PM	56%		44%					56%			44%	
SITE GENERATED TRAFFIC													
04:15:00 PM	05:15:00 PM	3		3				6					4
TOTAL TRAFFIC 2026													
04:15:00 PM	05:15:00 PM	5	0	9				10	1052			839	14

CHERRY LANE APARTMENTS TRAFFIC IMPACT STUDY

TOTAL TRAFFIC ANALYSIS

HERRING COVE ROAD at OLD SAMBRO ROAD

HRM COUNTS COMPLETED ON TUESDAY JULY 25, 2017

AM PEAK					OLD SAMBRO			HERRING COVE ROAD					
ENTER	2				EASTBOUND			SOUTHBOUND			NORTHBOUND		
EXIT	2	L	T	R	L	T	R	L	T	R	L	T	R
2017													
08:00:00 AM	08:15:00 AM				33		29		48	18	34	114	
08:15:00 AM	08:30:00 AM				25		25		37	31	30	151	
08:30:00 AM	08:45:00 AM				115		21		48	11	27	191	
08:45:00 AM	09:00:00 AM				25		19		41	13	30	168	
2017												0	
08:00:00 AM	09:00:00 AM				198		94		174	73	121	624	
2020													
08:00:00 AM	09:00:00 AM				210		100		185	77	128	662	
2021													
08:00:00 AM	09:00:00 AM				214		102		188	79	131	675	
2026													
08:00:00 AM	09:00:00 AM				237		112		208	87	145	746	
DISTRIBUTION													
08:00:00 AM	09:00:00 AM				24%				70%	30%		76%	
SITE GENERATED TRAFFIC													
08:00:00 AM	09:00:00 AM				1				1	1		1	
TOTAL TRAFFIC 2026													
08:00:00 AM	09:00:00 AM				237		112		209	88	145	747	

PM PEAK					OLD SAMBRO			HERRING COVE ROAD					
ENTER	3				EASTBOUND			SOUTHBOUND			NORTHBOUND		
EXIT	4	L	T	R	L	T	R	L	T	R	L	T	R
2017													
04:15:00 PM	04:30:00 PM				45		26		196	31	37	178	
04:30:00 PM	04:45:00 PM				23		26		189	32	36	123	
04:45:00 PM	05:00:00 PM				22		23		192	32	40	148	
05:00:00 PM	05:15:00 PM				16		29		179	25	41	139	
2017													
04:15:00 PM	05:15:00 PM				106		104		756	120	154	588	
2020													
04:15:00 PM	05:15:00 PM				112		110		802	127	163	624	
2021													
04:15:00 PM	05:15:00 PM				115		113		818	130	167	636	
2026													
04:15:00 PM	05:15:00 PM				127		124		903	143	184	703	
DISTRIBUTION													
04:15:00 PM	05:15:00 PM				15%				86%	14%		85%	
SITE GENERATED TRAFFIC													
04:15:00 PM	05:15:00 PM				1				2	1		4	
TOTAL TRAFFIC 2026													
04:15:00 PM	05:15:00 PM				127		124		905	144	184	706	

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	11	984	4	1	295
Future Vol, veh/h	2	11	984	4	1	295
Conflicting Peds, #/hr	50	50	0	50	50	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	12	1093	4	1	328

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1361	1195	0	0	1147	0
Stage 1	1145	-	-	-	-	-
Stage 2	216	-	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219	-
Pot Cap-1 Maneuver	151	226	-	-	607	-
Stage 1	302	-	-	-	-	-
Stage 2	800	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	138	207	-	-	581	-
Mov Cap-2 Maneuver	138	-	-	-	-	-
Stage 1	289	-	-	-	-	-
Stage 2	765	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.3	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	192	581	-
HCM Lane V/C Ratio	-	-	0.075	0.002	-
HCM Control Delay (s)	-	-	25.3	11.2	0
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

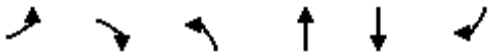
Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	9	839	14	10	1052
Future Vol, veh/h	5	9	839	14	10	1052
Conflicting Peds, #/hr	50	50	0	50	50	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	10	932	16	11	1169

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1647	1040	0	0	998	0
Stage 1	990	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219	-
Pot Cap-1 Maneuver	99	279	-	-	691	-
Stage 1	359	-	-	-	-	-
Stage 2	478	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	87	256	-	-	662	-
Mov Cap-2 Maneuver	87	-	-	-	-	-
Stage 1	344	-	-	-	-	-
Stage 2	436	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	31.6	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	151	662	-
HCM Lane V/C Ratio	-	-	0.103	0.017	-
HCM Control Delay (s)	-	-	31.6	10.5	0.2
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-



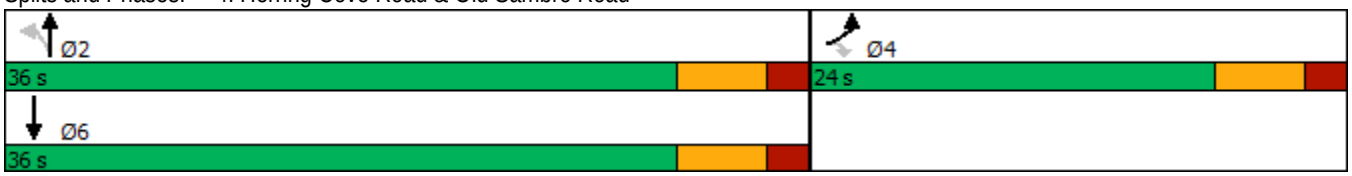
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	237	112	145	747	209	88
Future Volume (vph)	237	112	145	747	209	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0	35.0	0.0			0.0
Storage Lanes	0	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor	0.92	0.94	0.95		0.97	
Frt		0.850			0.955	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	3278	0
Flt Permitted	0.950		0.553			
Satd. Flow (perm)	1622	1487	976	1863	3278	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		124			98	
Link Speed (k/h)	50			50	50	
Link Distance (m)	228.4			149.3	35.2	
Travel Time (s)	16.4			10.7	2.5	
Confl. Peds. (#/hr)	50	50	50			50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	263	124	161	830	232	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	263	124	161	830	330	0
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	24.0	24.0	36.0	36.0	36.0	
Total Split (%)	40.0%	40.0%	60.0%	60.0%	60.0%	
Maximum Green (s)	18.0	18.0	30.0	30.0	30.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	Max	Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effct Green (s)	13.3	13.3	31.7	31.7	31.7	
Actuated g/C Ratio	0.23	0.23	0.56	0.56	0.56	
v/c Ratio	0.64	0.28	0.30	0.80	0.18	
Control Delay	26.6	5.6	9.7	19.8	5.2	

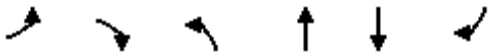
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	26.6	5.6	9.7	19.8	5.2	
LOS	C	A	A	B	A	
Approach Delay	19.9			18.1	5.2	
Approach LOS	B			B	A	
Queue Length 50th (m)	24.8	0.0	8.2	64.1	5.6	
Queue Length 95th (m)	44.4	10.0	22.2	#152.3	13.0	
Internal Link Dist (m)	204.4			125.3	11.2	
Turn Bay Length (m)	35.0	35.0				
Base Capacity (vph)	560	555	542	1036	1866	
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	0.47	0.22	0.30	0.80	0.18	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 57			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 16.0		Intersection LOS: B	
Intersection Capacity Utilization 64.0%		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: 4: Herring Cove Road & Old Sambro Road





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	127	124	184	706	905	144
Future Volume (vph)	127	124	184	706	905	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0	35.0	0.0			0.0
Storage Lanes	0	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95
Ped Bike Factor	0.88	0.91	0.98		0.98	
Frt		0.850			0.979	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	1863	3397	0
Flt Permitted	0.950		0.218			
Satd. Flow (perm)	1548	1448	399	1863	3397	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		122			42	
Link Speed (k/h)	50			50	50	
Link Distance (m)	228.4			149.3	35.2	
Travel Time (s)	16.4			10.7	2.5	
Confl. Peds. (#/hr)	50	50	50			50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	141	138	204	784	1006	160
Shared Lane Traffic (%)						
Lane Group Flow (vph)	141	138	204	784	1166	0
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	
Total Split (s)	24.0	24.0	66.0	66.0	66.0	
Total Split (%)	26.7%	26.7%	73.3%	73.3%	73.3%	
Maximum Green (s)	18.0	18.0	60.0	60.0	60.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	Max	Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effct Green (s)	12.2	12.2	62.9	62.9	62.9	
Actuated g/C Ratio	0.14	0.14	0.72	0.72	0.72	
v/c Ratio	0.57	0.45	0.71	0.58	0.47	
Control Delay	43.3	13.1	25.7	8.6	6.0	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	43.3	13.1	25.7	8.6	6.0	
LOS	D	B	C	A	A	
Approach Delay	28.4			12.1	6.0	
Approach LOS	C			B	A	
Queue Length 50th (m)	22.5	2.4	16.7	53.9	35.4	
Queue Length 95th (m)	40.6	18.0	#69.4	103.5	59.5	
Internal Link Dist (m)	204.4			125.3	11.2	
Turn Bay Length (m)	35.0	35.0				
Base Capacity (vph)	366	396	287	1345	2464	
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	0.35	0.71	0.58	0.47	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 87.1			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 11.1		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: 4: Herring Cove Road & Old Sambro Road