3536696 CANADA INC
BCIMC REALTY CORPORATION

THE LAKES DISTRICT AND SCHOONER COVE NEIGHBOURHOODS TRAFFIC IMPACT STUDY

NANOOSE BAY, BC

FINAL REPORT

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Opus International Consultants (Canada) Limited

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1 INTRODUCTION

1.1 Background

Opus International Consultants (Canada) Limited has been retained to conduct a Traffic Impact Study for the two Neighbourhood Plan areas being comprehensively planned by Ekistics Town Planning, being The Lakes District and Schooner Cove.

These two new neighbourhoods have historically been known to form part of the Fairwinds Community and Resort, a residential golf community located on the east coast of Vancouver Island in Nanoose Bay, B.C. The community of Nanoose Bay is located north of Highway 19 and is within the Electoral Area E of the Regional District of Nanaimo. A context map of the Fairwinds Community and Resort in relation to Nanoose Bay is provided in FIGURE 1.1. Opus previously prepared a Transportation Overview (August 2009) for Fairwinds which assessed the current road network, current traffic volumes and projected future growth to inform the future road network for Fairwinds, now analyzed in this report.

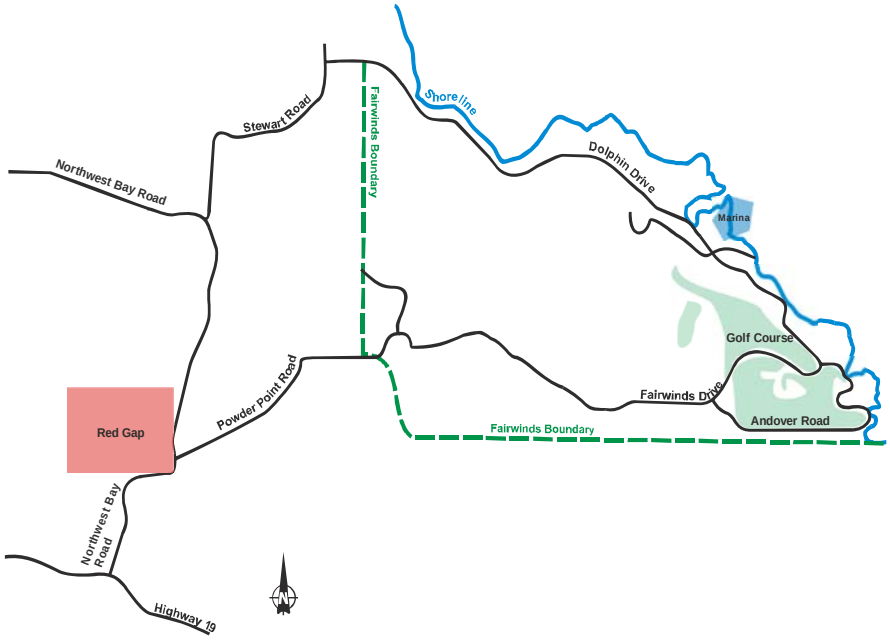


FIGURE 1.1 CONTEXT MAP

FIGURE 1.2 FAIRWINDS AND SCOONER COVE WITHIN URBAN CONTAINMENT BOUNDARIES

The existing Fairwinds Comomunity and Resort, as well as The Lakes District and Schooner Cove, are located within areas designated by the Regional District of Nanaimo (RDN) as an Urban Containment Boundaries (UCBs) in the Regional District's Regional Growth Strategy (RGS). As such, the Regional District has designated these areas for urban growth and the RDN's policy is to encourage the development of compact, complete communities within these boundaries in accordance with the wider Region's growth management objectives. The Neighbourhood Planning process for the Lakes District and Schooner Cove further ensures that planning and development for these growth areas will be completed in a coordinated and consistent manner.

The existing Fairwinds Community and Resort has, to date, been developed generally according to the original 1983 Master Plan and is composed of approximately 650 single family homes, 69 multi-family units, and an 18-hole golf course. Schooner Cove consists of a marina of 360 berths, as well as surrounding developable land. According to the current Nanoose Bay Official Community Plan

(OCP), the Fairwinds UCB has a current target for 2,500 residential units, while the Schooner Cove UCB has an existing allowance of 188 residential units. The Neighbourhood Plan seeks to better synchronize planning for the Lakes District and Schooner Cove with the RGS and, in doing so, proposes:

- A 25,000 sq. ft. commercial village plus 395 condominium/apartment residential units for Schooner Cove. This will establish the critical density needed to sustain a Neighbourhood Centre as designated by the RDN – a local serving maritime village with shops and services; and
- 1,675 residential units for The Lakes District, reflecting the undeveloped density for the Fairwinds UCB under the existing OCP (i.e. 2,500 total less 825 developed to date).

The planned residential development in The Lakes District and Schooner Cove is oriented towards a broad demographic seeking an active, healthy, maritime lifestyle within a sustainability-oriented community that provides recreational opportunities (golfing, boating, walking) as well as local access to day-to-day shopping conveniences within the community.

The current Neighbourhood Plans provide for development with a mix of residential, commercial, and retail uses developed over a period of the next 15 to 20 years. Given the proposed yields of the development, this report aims to determine road infrastructure requirements (e.g. turning lanes and road functions) and whether the Neighbourhood Plan concept can be supported by the proposed and existing area road network.

1.2 Overview of Transportation Issues

Opus International Consultants (Canada) Limited was retained to provide transportation planning services for the Neighbourhood Plans. Since the lands are currently vacant other than the hotel building at Schooner Cove, a network of public streets is required to provide the structure around which the proposed housing will be situated. Opus has worked extensively to develop a transportation network that can fulfill the needs of the Study Area as it develops to full build-out. The principal issues are summarized as follows:

- Limited Access Options to Highway 19 – It is recognized that access to and from Nanoose Bay is generally limited to the signalized intersection of Northwest Bay Road and Highway 19. As a result, the Neighbourhood Plans consider providing for a variety of housing types with neighbourhood-serving commercial to provide shopping options for daily needs of local residents and minimize the need for external travel.

- Construction of the Schooner Cove Drive Extension – With the build-out of The Lakes District, a new collector road with hillside standards is proposed. The Schooner Cove Drive Extension was previously identified in the Regional District of Nanaimo's and Ministry of Transportation and Infrastructure's (MoTI) Future Road Network Plan and will facilitate traffic flows for The Lakes District and Schooner Cove with a direct connection to Schooner Cove, providing for an alternative to Fairwinds Drive, which is currently the primary access to Schooner Cove.

- Traffic Impacts of Schooner Cove – While the increased intensity of land uses at Schooner Cove may lead to a higher traffic generation, it should be recognized that a majority of the trips to Schooner Cove are expected to be internal (i.e. generated by residents of The Lakes District, Schooner Cove, Fairwinds or other areas of Nanoose Bay). Furthermore, Transportation Demand Management measures and public transit to encourage alternative mode use can help limit discretionary automobile trips by residents to Schooner Cove.

1.3 Study Method

In order to determine the order of magnitude traffic impacts of the proposed development in the Study Area, a formal Traffic Impact Study (TIS) was completed. Since the planning application will be referred to the Ministry of Transportation and Infrastructure (MoTI), the study is intended to meet Ministry requirements. The Terms of Reference for the study were developed with the Ministry, after a formal meeting on October 8, 2009 and subsequent approval of the Terms of Reference on October 23, 2009 (included in Appendix B). The TIS generally adheres to the Ministry's Site Impact Analysis Requirements Manual.

Generally, to complete the study, the Opus team conducted the following tasks:

- Site visit and observations;
- Discussions with Ministry staff;
- Analysis of the development trip generation, distribution and assignment;
- Forecast future traffic volumes;
- Operational performance analysis of the area road network to build-out; and
- Recommend improvements necessary to accommodate the proposed development.

1.4 Analysis Parameters

The road network is best analyzed for the PM peak period, as this represents a balance between the highest background road volumes likely experienced on the road network and highest potential trip generation for the proposed uses at Schooner Cove and The Lakes District. In a meeting with the Ministry of Transportation on October 8, 2009, it was confirmed that analyzing the PM peak hour would be sufficient for planning purposes. The exception is the intersection of Highway 19 and Northwest Bay Road, where the Ministry has specified that analysis for the AM and PM peak hour of highway operations should be completed.

It is understood that the Ministry is primarily concerned with the analysis of full build-out conditions and road network requirements to support the level of

development as currently proposed for The Lakes District and Schooner Cove Neighbourhoods combined. While it is expected that the development will be constructed in phases, the report will address the phasing requirements generally with the understanding of the road network requirements for the build-out scenario. The following scenarios are analyzed, according to the Terms of Reference confirmed with the Ministry of Transportation on October 8, 2009:

- 2009 (Base Year); and
- 2025 (Projected Build-Out).

1.5 Report Outline

This report is structured so that the broad aspects of the Neighbourhood Plans for The Lakes District and Schooner Cove are discussed first, followed by the detailed technical analysis of traffic impacts upon the earliest possible build-out of the Neighbourhood Plans. The report ends by detailing site specific road improvement and traffic control requirements likely necessary to accommodate the build-out of the Neighbourhood Plan areas.

2 CONCEPT AND CONTEXT

2.1 Proposed Neighbourhood Plans

The proposed development will generally consists of residential development at The Lakes District and a mix of residential and commercial uses at Schooner Cove.

Schooner Cove
Schooner Cove has operated as a hotel, pub, restaurant/café, liquor store, and marina since the early 1980s. There is a 360-slip marina, vacant 31-room hotel, former 152-seat restaurant and pub, 54-seat café, and a 230 square foot liquor store currently on-site, although the hotel ceased to operate in 2008.

The following vision is being proposed for the redevelopment of Schooner Cove:

- 395 residential condominium and apartment units;
- Approximately 2,300 square metres (25,000 square feet) of commercial, retail and office space for The Village component of the Schooner Cove Neighbourhood Plan; and
- A marina with 360 operable slips, and support facilities (office, washrooms, etc.).

The marina upgrades will not see a change in the area of the existing marina or number of berths. It is important to note that only the land uses associated with the upland village will be changed and enhanced, thus it is assumed that there will still be the same number of users of the marina facilities in the future compared to the current situation. Further, traffic generation by the marina will in all likelihood decrease as some boaters will reside at Schooner Cove.

The Lakes District
The Lakes District will be lotted for housing, with nearly half of the land area given over as park. Generally, three types of housing forms will exist at The Lakes District:

- Traditional Single Family;
- Lakes District Compact/Duplex; and
- Multi-Family Housing (row townhome and low rise apartment).

It is expected that a total of 1,675 residential market units will be constructed within The Lakes District. Build-out of the site is planned to occur in the next 15 – 20 years, depending on the market conditions.

2.2 Site Context

The proposed land use plan for The Lakes District is presented in FIGURE 2.1 below.

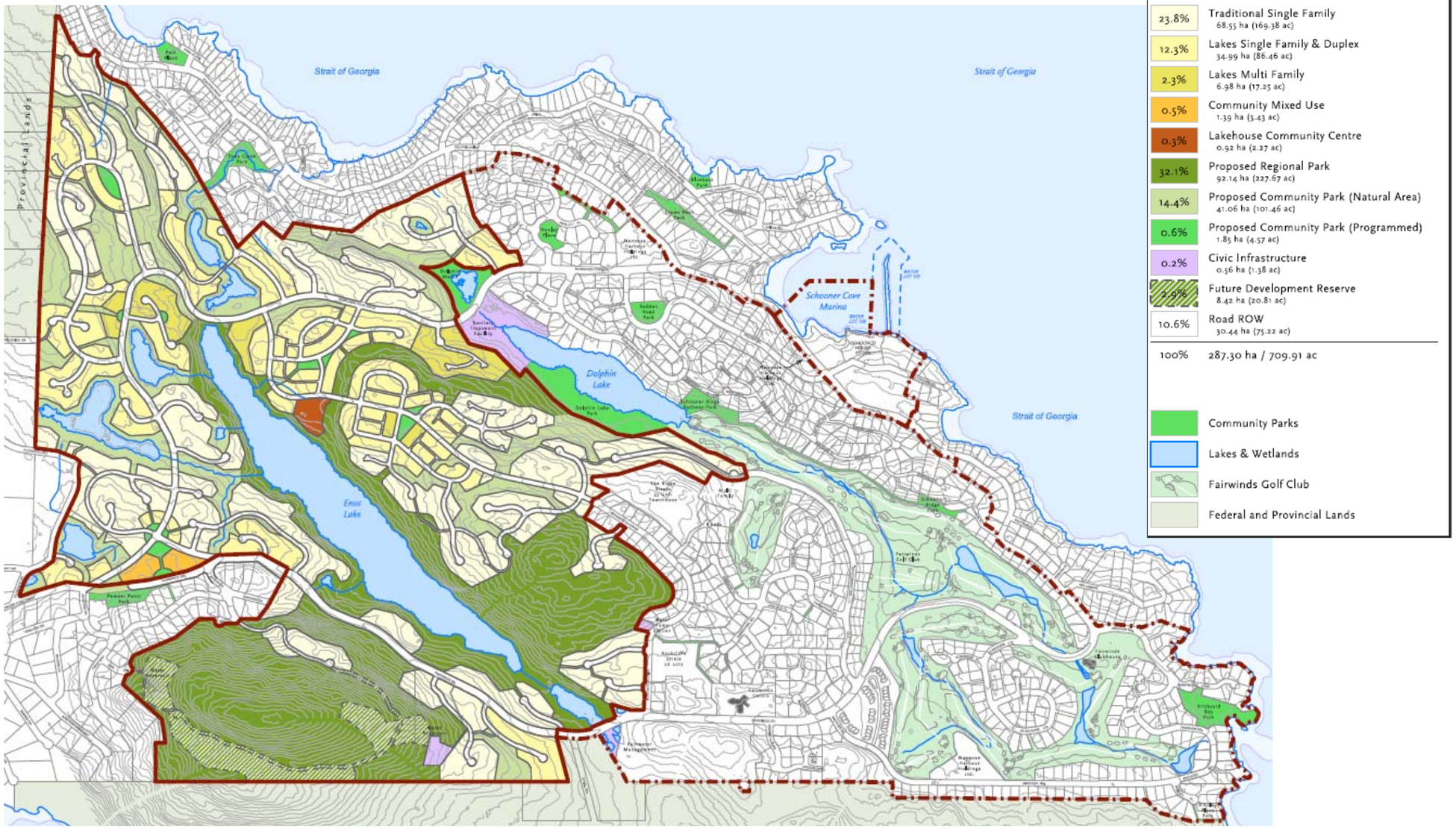


FIGURE 2.1 PROPOSED LAND USE PLAN FOR THE LAKES DISTRICT

The development of The Lakes District and Schooner Cove will provide significant opportunity to improve the overall road network connectivity for Nanoose Bay. The construction of a new collector road with the extension of Schooner Cove Drive will facilitate travel by formally connecting Schooner Cove to The Lakes District and subsequently the entrance gateway of Nanoose Bay, Highway 19 at Northwest Bay Road. This connection will provide an alternative to the existing Fairwinds Drive to arrive at Schooner Cove.

2.3 Transportation Planning Context

Generally, the objectives for transportation planning at The Lakes District and Schooner Cove are:

Street Network

- Create a street network to service the lands that match the intended function of the roads;
- Ensure that the road network connects logically to the existing Nanoose Bay Road network without overbuilding;
- Minimize the need to create long cul-de-sacs in The Lakes District;
- Provide sufficient street standards to provide sufficient capacity for the expected traffic loads without making cross-sections too wide; and,
- Create livable street standards, noting that The Lakes District presents a unique opportunity to realize a livable hillside community due to its topography and more urban standards are appropriate for application within a designated urban growth area.

Alternative Modes and Transit

- Provide opportunities to encourage and facilitate alternative modes and public transit; and
- Establish a system of public trails which connect The Lakes District and Schooner Cove Neighbourhoods, as well as, to the extent feasible, the Fairwinds Community and Resort as well as surrounding areas.

2.4 Proposed Transportation Plan

The proposed street network supports the proposed development at the Lakes District and Schooner Cove and will include:

- Schooner Cove Drive Extension – Schooner Cove Drive currently connects to Dolphin Drive as a T-intersection. The extension of Schooner Cove Drive will literally connect Schooner Cove at Dolphin Drive through the Lakes District with Fairwinds Drive to the south. Schooner Cove Drive is to function as a proposed multi-modal "Community Parkway", responsible for facilitating relatively higher traffic flows between Schooner Cove, The Lakes District, adjacent areas and Highway 19. The route is consistent with MoTI's planned alignment.

- Bonnington Drive Extension - Bonnington Drive will be extended to connect with the new Schooner Cove Drive Extension. Future sections of Bonnington Drive are proposed to be constructed to Neighbourhood Collector road standards.

- Terrace Drive Collector – the only other Neighbourhood Collector to be constructed within The Lakes District will be the Terrace Drive Collector to serve approximately 200 residential units.

- Transtide Emergency Access – to be consistent with the Ministry of Transportation's planned alignment of Transtide Road, an emergency access tying into the Lakes District will be provided for.

- Collingwood Emergency Access – to be consistent with the goals of minimizing long cul-de-sacs, emergency/alternative access can be provided between Collingwood Drive and Bonnington Drive.

The proposed street network hierarchy for Fairwinds is presented as FIGURE 2.2.

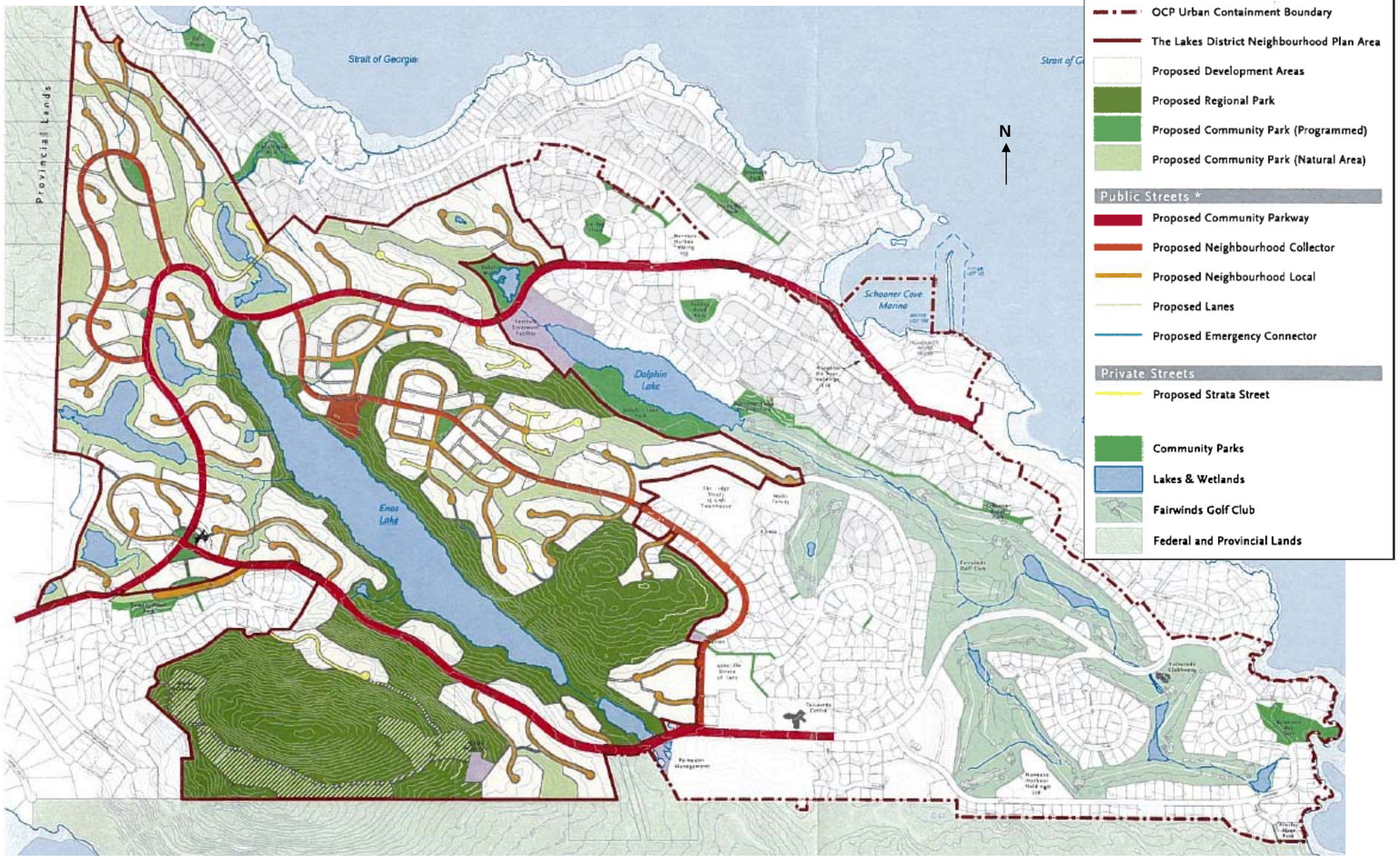


FIGURE 2.2 PROPOSED STREET NETWORK HEIRARCHY

3 EXISTING TRAFFIC CONDITIONS

3.1 Road Network

The Nanoose Bay road network is made up of several main roads that connect to the main Highway (Highway 19) allowing for access to communities north and south of the area. From the intersection of Highway 19 and Northwest Bay Road, travel to the City of Parksville and to the City of Nanaimo takes approximately 15 and 30 minutes respectively. Within Nanoose Bay, Dolphin Drive and Powder Point Roads are the two main roads that form a continuous loop, covering all of the existing Fariwinds' lands and providing access to Red Gap Village. Both Dolphin Drive and Powder Point Drive provide access to Highway 19.

Currently, all the roads within the above "Study Area" road network are two-lane roads. With the exception of the intersection of Highway 19 and Northwest Bay Road, all intersections within the study area road network are currently unsignazlied. Consideration of laning and intersection control in the study is shown in FIGURE 3.1, and consists of the following intersections, with the corresponding number assigned to identify the intersection:

- Highway 19 and Northwest Bay Road (signalized);
- Northwest Bay Road and Powder Point Road (unsignalized);
- Dolphin Drive/Fairwinds Drive and Andover Road (unsignalized);
- Dolphin Drive and Redden Road/Outrigger Road (unsignalized);
- Davenham Road and Stewart Road (unsignalized); and,
- Northwest Bay Road and Stewart Road (unsignalized).

From FIGURE 3.1, it can be seen that designated left-turn and right-turn lanes are provided on the eastbound and westbound approaches of Highway 19 respectively. The eastbound left-turn lane has a storage length of approximately 150 metres and the westbound channelized right-turn lane has a storage length of approximately 60 metres. On Northwest Bay Road, there is a southbound channelized right-turn lane that is approximately 20 metres long. It should also be noted that a rail line crosses Northwest Bay Road at approximately 100 metres north of the intersection.

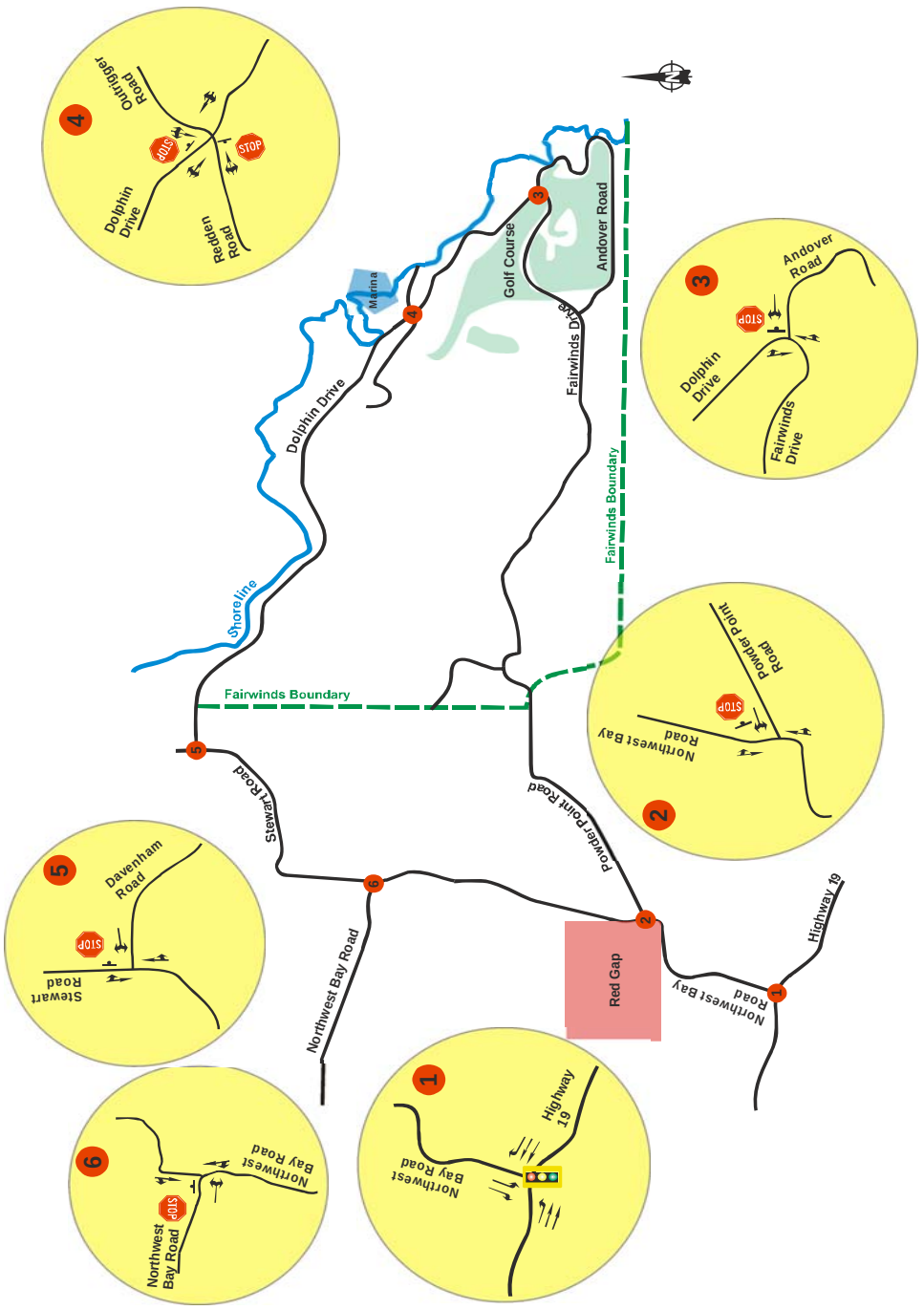


FIGURE 3.1 LANING AND INTERSECTION CONTROL

Highway 19

Highway 19, which is approximately 406 kilometres long and runs from the City of Nanaimo in the south to Port Hardy in the north, is the main route between most destinations on Vancouver Island. From Nanoose Bay, Highway 19 provides a major and efficient link to the two closest cities of Nanaimo and Parksville. The City of Parksville is approximately 15 kilometres to the northwest, and the City of Nanaimo is approximately 20 kilometers to the southeast.

Northwest Bay Road

Northwest Bay Road is approximately 10 kilometres long and provides access to the community of Nanoose Bay. The road begins in the south at Highway 19 and ends in the north at Franklin's Gull Road. In the Study Area, Northwest Bay Road also intersects with Powder Point Road and Stewart Road to form two intersections.

Stewart Road / Dolphin Drive

Stewart Road, approximately 3 kilometers long, begins at the intersection with Northwest Bay Road and continues along the northern coast of Nanoose Bay as Dolphin Drive for approximately 5 kilometers. Stewart Road serves as a connection between Northwest Bay Road and Dolphin Drive. It is believed that a significant portion of the traffic to Schooner Cove and to the residential units currently developed within the Fairwinds neighbourhood along the northern coast of Nanoose Bay uses Dolphin Drive.

Powder Point Road / Fairwinds Drive

Powder Point Road intersects with Northwest Bay Road near the Red Gap area and is about approximately 2 kilometers long before continuing as Fairwinds Drive. Typically, traffic to the Golf Course and residential units in the southern part of Fairwinds use Powder Point Road.

3.2 Intersection Volumes

For the intersections within Nanoose Bay, existing traffic volumes were derived based on 24-hour directional counts conducted at three main locations along Dolphin Drive between July 9, 2008 and July 28, 2008. The counts were conducted at this time as it was determined that the summer months generally represent the higher end of traffic typically generated by the area over the course of a year. As a review of the Ministry's count data over the five-year period between 2004 and 2008 indicated that August volumes are typically five percent higher than July volumes, the data obtained from the 24-hour July counts were increased by five percent to estimate maximums.

Based on the count data, afternoon peak period in Nanoose Bay was determined to be between 4:45 PM and 5:45 PM. The estimated turning movement volumes for the unsignalized intersections within the study area road network of Nanoose Bay are presented in FIGURE 3.2.

For the signalized intersection of Highway 19 and Northwest Bay Road, turning movement counts were conducted by the Ministry between September 26, 2006 and October 6, 2006. As October volumes have been approximately 15 percent lower than August volumes for the past few years, the turning movement counts at the intersection were also adjusted to reflect summer conditions. Based on the adjusted count data, the morning and afternoon peak hours for the intersection of Highway 19 and Northwest Bay Road were established to be between 7:30 AM and 8:30 AM and between 4:00 PM and 5:00 PM respectively. While the peak hour of the intersection is slightly earlier than the peak hour of traffic observed within Nanoose Bay, it is understood that the Highway is more subject to regular commuter traffic flows. The turning movement counts for the intersection of Highway 19 and Northwest Bay Road, reflecting adjusted volumes which represent the morning and afternoon peak hour for the intersection is presented in FIGURE 3.3.

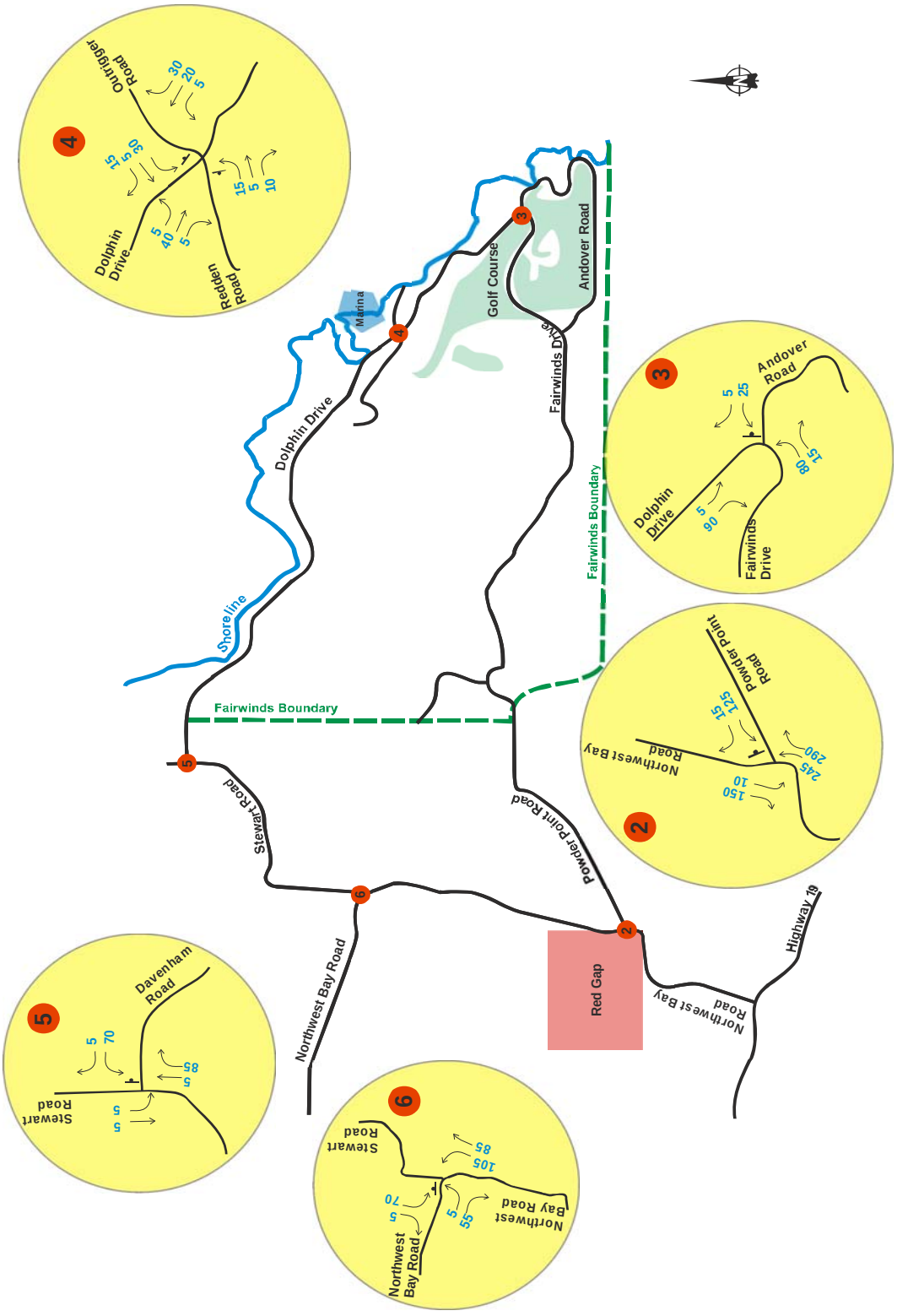


FIGURE 3.2 EXISTING PM PEAK HOUR TRAFFIC VOLUMES

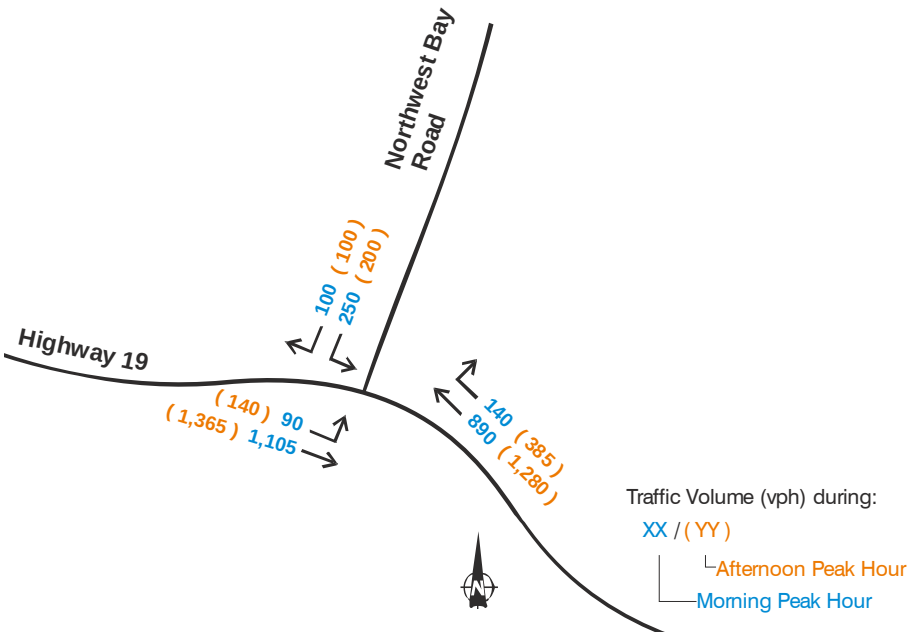


FIGURE 3.3 EXISTING HIGHWAY 19 AND NORTHWEST BAY ROAD VOLUMES – AM AND PM PEAK HOUR

3.3 Intersection Capacity

Capacity analysis was conducted for the subject intersections using Synchro 7.0 software. The software conforms to the methodologies outlined in the Highway Capacity Manual, which evaluates capacity in terms of levels of service (LOS) assigned on a scale of "A" to "F". A description of the levels of service corresponding to the delays experienced by drivers on the road is displayed in TABLE 3.1.

TABLE 3.1 LEVELS OF SERVICE RESULTS

LEVEL OF SERVICE	CONDITION
A B	Excellent
C D	Good to Satisfactory
E	Poor
F	Failure

Tabular summaries of the levels of service at the subject intersections within Nanoose Bay are provided in TABLE 3.2. The results of the capacity analysis for the intersection of Highway 19 and Northwest Bay Road during both peak hours are presented in TABLE 3.3. Note that Highway 19 is in an east-west orientation at Northwest Bay Road, although it is generally known as a north-south route. For purposes of keeping consistent with the Synchro capacity analysis results, Highway 19 is quoted in the tables as being oriented in the east-west direction. As such, the Highway 19 eastbound direction refers to movements toward Nanaimo while the Highway 19 westbound direction refers to movements toward Parksville. The other orientations quoted in the tables below refer to the true geographical orientation of the location and is consistent with the Synchro capacity reports.

TABLE 3.2 EXISTING – CAPACITY ANALYSIS (UNSIGNALIZED)

Intersection		Weekday PM Peak Hour			
	Lane Group	Adjusted Volume (vph)*	Movement Capacity (vph)	Control Delay	Level of Service
Northwest Bay Road and Powder Point Road	WBLR	154	464	16.6	C
	SBLT	177	992	0.7	A
Northwest Bay Road and Stewart Road	EBLR	63	1366	0.7	A
	SBLR	79	764	10.3	B
Davenham Road and Stewart Road	WBLR	79	939	9.2	A
	SBLT	11	1497	3.7	A
Redden Road / Outrigger Road and Dolphin Drive	EBLTR	35	867	9.3	A
	WBLTR	58	876	9.4	A
	NBLTR	62	1555	0.7	A
	SBLTR	57	1548	0.7	A
Andover Road and Fairwinds Drive / Dolphin Drive	WBLR	34	808	9.7	A
	SBLT	102	1489	0.4	A

*Adjusted volumes reported in the table are slightly higher than the turning movement volumes quoted in the figures. Synchro considers a peak hour factor in adjusting input volumes.

MOVEMENT : SB – SOUTHBOUND; NB – NORTHBOUND; EB – EASTBOUND; WB- WESTBOUND; LT – LEFT, THROUGH, RT – RIGHT, THROUGH, LTR – LEFT, THROUGH, AND RIGHT TURN MOVEMENTS

ADJUSTED VOLUME : VEHICULAR FLOW CALCULATED BY SYNCHRO MAKING THE RESPECTIVE TURNING MOVEMENT WITHIN THE HOUR, TAKING INTO ACCOUNT THE DEFAULT PEAK HOUR FACTOR

MOVEMENT CAPACITY – CALCULATED CAPACITY OF THE MOVEMENT BASED ON CONFLICTING VOLUMES

CONTROL DELAY – CALCUATED AVERAGE DELAY TO THE MOTORIST MAKING THE RESPECTIVE MOVEMENT BASED ON THE GENERAL CONFLICTING TRAFFIC FLOW

LOS – LEVEL OF SERVICE (LOS “E” and LOS “F” indicates movements at or exceeding capacity)

TABLE 3.3 EXISTING HIGHWAY 19 AND NORTHWEST BAY ROAD – CAPACITY ANALYSIS (SIGNALIZED)

Intersection	AM Peak Hour						PM Peak Hour					
	Average Control Delay (s)	LOS	Movement				Average Control Delay (s)	LOS	Movement			
			Lane	Delay (s)	V/C Ratio	LOS			Lane	Delay (s)	V/C Ratio	LOS
Highway 19 and Northwest Bay Road	12.0	B	EBL	50.0	0.80	D	14.1	B	EBL	42.1	0.78	D
			EBT	7.6	0.63	A			EBT	6.9	0.66	A
			WBT	13.5	0.73	B			WBT	18.7	0.87	B
			WBR	8.7	0.09	A			WBR	9.5	0.27	A
			SBL	14.6	0.56	B			SBL	21.2	0.57	C
			SBR	11.5	0.07	B			SBR	17.1	0.07	B

The results of the capacity analysis are summarized below:

- There are no capacity concerns at any of the unsignalized intersections.
- Under existing conditions, the intersection of Highway 19 and Northwest Bay Road operates at good levels of service “B” during both peak hours.
- An assessment of queue lengths at the signalized intersection shows that the eastbound queue does not exceed the storage length of the left-turn lane during either peak hour. The southbound left-turn queue is no greater than 40 metres from the intersection during both peak hours, which indicates that the queues do not extend beyond the railway tracks. Some anecdotal evidence indicates that queues occasionally extend beyond the railway tracks, but we understand this is not a regular occurrence. It is expected that the conditions accounted for in the modeling scenario are therefore reflective of more regular conditions.

4 FUTURE BACKGROUND TRAFFIC

Future background traffic volumes are future volumes present on the road network that would be expected without the development of the site. Based on discussion with the Ministry, the horizon year for the study was determined to be 2025, which corresponds to the full build-out of the development.

In order to determine an appropriate growth rate to apply to Highway 19, a historical traffic analysis was completed. The results are compiled in TABLE 4.1 below.

TABLE 4.1 HIGHWAY 19 HISTORICAL VOLUMES

Year	AADT	%Growth/year	Year	AADT	%Growth/year
1990	16,932	N/A	2000	24,262	-0.2%
1991	17,888	5.6%	2001	24,735	1.9%
1992	19,106	6.8%	2002	No data	N/A
1993	20,701	8.3%	2003	26,744	N/A
1994	22,081	6.7%	2004	27,460	2.7%
1995	22,404	1.5%	2005	27,523	0.2%
1996	22,001	-1.8%	2006	27,969	1.6%
1997	23,384	6.3%	2007	28,382	1.5%
1998	23,959	2.5%	2008	27,409	-3.4%
1999	24,305	1.4%	2009	No data	N/A
Overall Growth 1990-1999		**43.5%**	**Overall Growth 2000 - 2008**		**13.0%**
Avg 1990-1999		4.1%	Avg 2000 - 2008		1.50%
Avg 1994 -1999		1.9%	Avg 2003 - 2008		0.50%

The traffic volumes were extracted from a nearby Ministry permanent count station located approximately 2 kilometres south of Route 19A, south of Parksville and approximately 3 kilometres north of Northwest Bay Road. The results indicate that the annual growth in traffic volumes has consistently decreased from year to year. The average growth rate for the period analyzed between 1990 to 2008 is 3.25 percent per year, although most recently, the average growth for the last 5 years has been 0.5 percent. Given the information, the Ministry of Transportation agreed that applying a simple 2 percent per annum growth for future years would sufficiently address potential growth in volumes due to population increases along the Highway 19 corridor.

The Ministry also required a consideration of background growth within the Nanoose peninsula and surrounding area. In consideration that a majority of the growth to occur within the Fairwinds UCB will be realized with the neighbourhood plans, only a limited amount of growth may potentially occur between what is currently constructed and when the neighbourhood plans are completed (less than 2 percent for Fairwinds' development).

Thus, for completeness, a simple growth rate of 2 percent per annum was applied to existing volumes to account for future background traffic growth along the Highway and for growth to occur within the Nanoose peninsula for forecasting purposes to the 2025 timeframe.

According to the Road Network Plan in the Regional District of Nanaimo's (RDN) Nanoose Bay Official Community Plan, as further growth occurs in Nanoose Bay, several new roads will be constructed to service development. The new roads are highlighted in FIGURE 4.1 based on RDN's Road Network Plan.

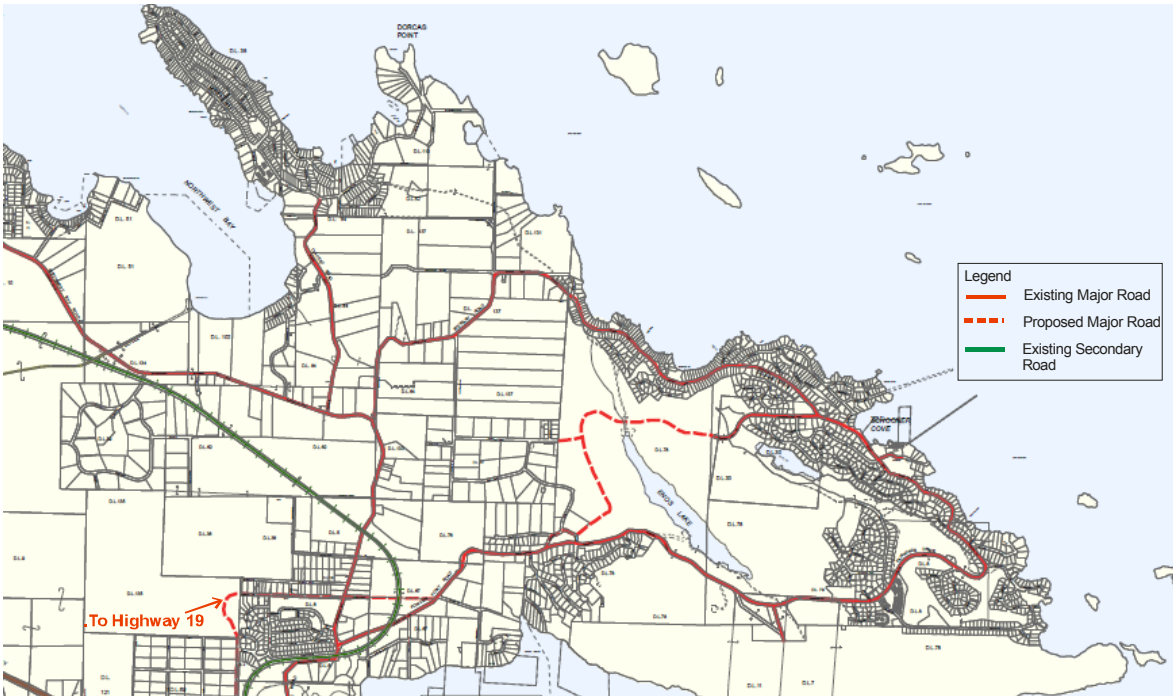


FIGURE 4.1 RDN AND MoTI ROAD NETWORK PLAN

The major planned road is the extension of Schooner Cove Drive which, as previously indicated in this report, is the main collector to serve the increased densities at The Lakes District. The proposed connection to Transtide Road has been confirmed by the Ministry of Transportation and Infrastructure as an emergency access only link. Other improvements indicated by the RDN and MoTI on the future road network plan include the realignment of Powder Point Road to form a formal 4-way intersection north of the current T-intersection of Powder Point Road and Northwest Bay Road, and a potential capacity upgrade (overpass / interchange) at Northwest Bay Road and Highway 19. Since evaluating future background conditions is done independent of development at Schooner Cove, no new links are considered in the future background traffic scenario.

4.1 Future Background Traffic – 2025

The turning movement counts of the study intersections within Nanoose Bay under future background conditions are shown in FIGURE 4.2. The turning movement counts for the intersection of Highway 19 and Northwest Bay Road during both the morning and afternoon peak periods are presented in FIGURE 4.3.

Capacity analysis on the subject intersections was performed assuming the existing laning does not change. The results of the analysis for the unsignalized intersections are summarized in TABLE 4.2. Tabular summaries of the signalized intersection with Highway 19 are presented in TABLE 4.3.

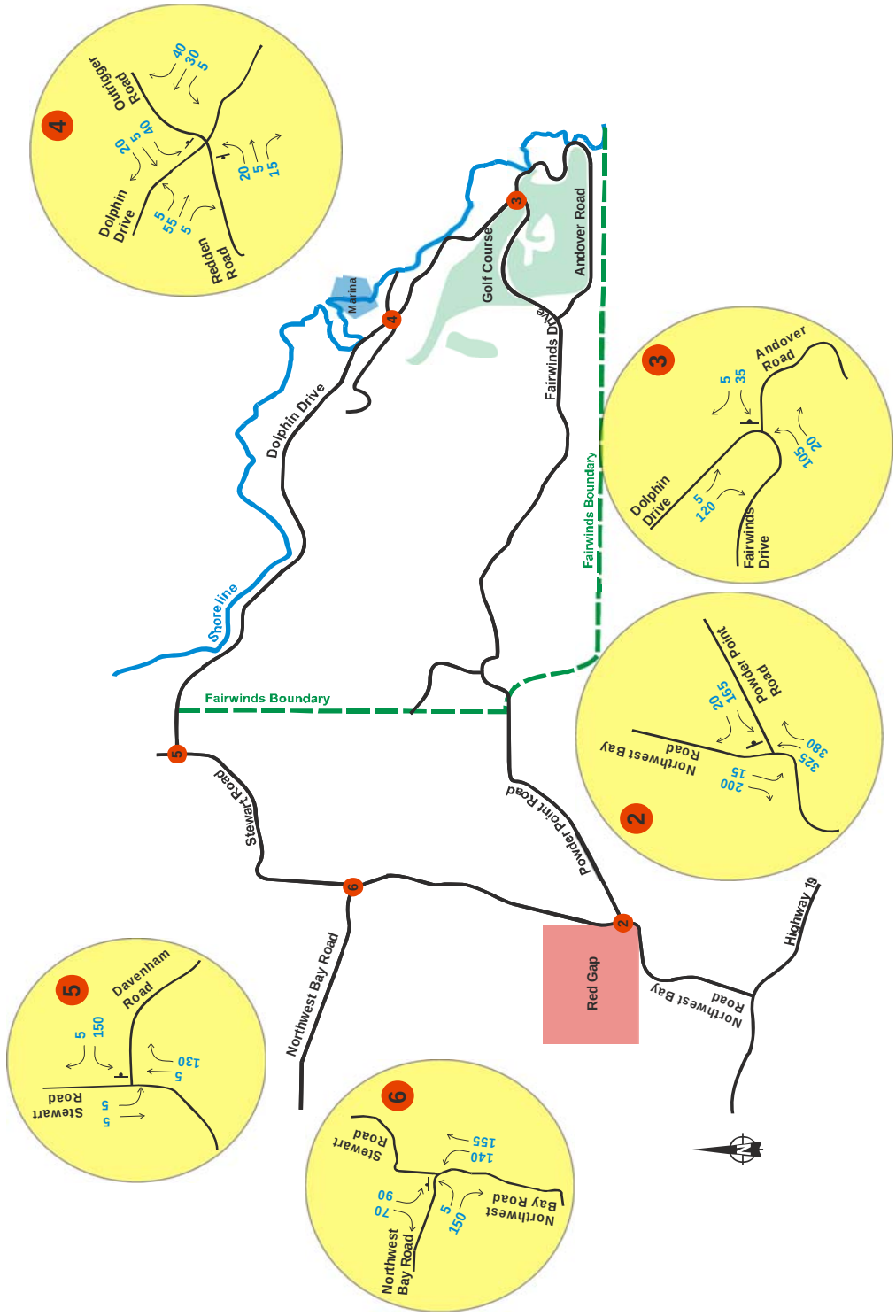


FIGURE 4.2 FUTURE BACKGROUND PM PEAK 2025 TRAFFIC VOLUMES

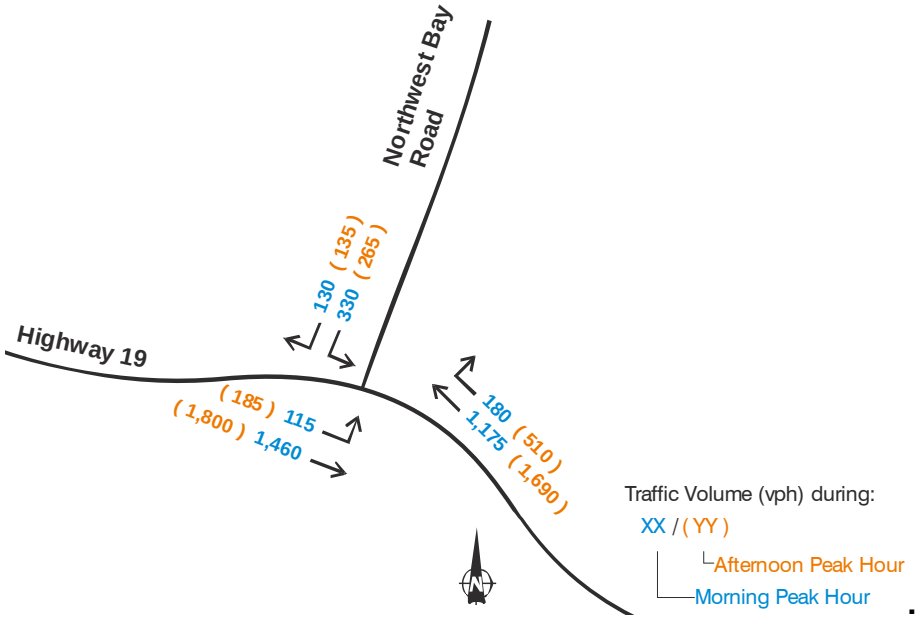


FIGURE 4.3 FUTURE BACKGROUND 2025 HIGHWAY 19 AND NORTHWEST BAY ROAD VOLUMES – AM AND PM PEAK HOUR

TABLE 4.2 FUTURE BACKGROUND 2025 TRAFFIC – CAPACITY ANALYSIS (UNSIGNALIZED)

Intersection	PM Peak Hour				
	Lane Group	Adjusted Volume (vph)	Movement Capacity (vph)	Control Delay	Level of Service
Northwest Bay Road and Powder Point Road	WBLR	203	357	27.6	D
	SBLT	234	846	0.8	A
Northwest Bay Road and Stewart Road	EBLR	83	1292	0.8	A
	SBLR	105	695	11.1	B
Davenham Road and Stewart Road	WBLR	105	911	9.5	A
	SBLT	15	1458	3.8	A
Redden Road / Outrigger Road and Dolphin Drive	EBLTR	46	817	9.7	A
	WBLTR	76	828	9.8	A
	NBLTR	84	1534	0.7	A
	SBLTR	75	1523	0.8	A
Andover Road and Fairwinds Drive / Dolphin Drive	WBLR	46	745	10.1	B
	SBLT	136	1448	0.5	A

*Adjusted volumes reported in the table are slightly higher than the turning movement volumes quoted in the figures. Synchro considers a peak hour factor in adjusting input volumes.

TABLE 4.3 FUTURE BACKGROUND 2025 – CAPACITY ANALYSIS (SIGNALIZED)

Intersection	AM Peak Hour						PM Peak Hour					
	Average Control Delay (s)	LOS	Movement				Average Control Delay (s)	LOS	Movement			
			Lane	Delay (s)	V/C Ratio	LOS			Lane	Delay (s)	V/C Ratio	LOS
Highway 19 and Northwest Bay Road	15.7	B	EBL	44.0	0.77	D	22.6	C	**EBL**	**62.7**	**0.86**	**E**
			EBT	9.7	0.75	A			EBT	8.9	0.76	A
			WBT	18.1	0.83	B			WBT	29.4	0.95	C
			WBR	9.6	0.13	A			WBR	12.1	0.42	B
			SBL	27.5	0.78	C			**SBL**	**59.2**	**0.89**	**E**
			SBR	16.3	0.18	B			SBR	31.9	0.30	C

The performance of the intersections under future background conditions for the year 2025 is summarized below:

- Compared to existing conditions, the unsignalized intersections are expected to operate with longer delays due to future background traffic growth. Added delays are anticipated; however, the overall intersection level of service should be considered acceptable.

- The intersection of Highway 19 and Northwest Bay Road can be expected to perform at an overall levels of service "B" and "C" during the morning and afternoon peak hours respectively. This is a slight drop in level of service, from "B" to "C", during the afternoon peak period as compared to existing conditions. It should be noted that background traffic growth may result in the eastbound and southbound left-turn movements to perform at a level of service E during the afternoon peak period.

- Background traffic growth will result in longer queue lengths at the turning movements of Highway 19 and Northwest Bay Road, than compared to existing conditions. However, the queue lengths for both peak hours are not expected to cause a concern as the eastbound left-turn queue is less than 75 metres during both peak hours and the southbound left-turn queue is less than 100 metres during both peak hours. Therefore, the storage length of the eastbound left-turn lane will be sufficient to accommodate the demand and the southbound left-turn queue will not extend to the railway tracks.

- The southbound left turn from Northwest Bay Road to Highway 19 deteriorates from Level of Service "C" with a volume-to-capacity ratio of 0.57 to Level of Service "E" with a volume-to-capacity ratio of 0.89. Generally, Level of Service E is unacceptable to the Ministry and based on background traffic growth, potential improvements to the southbound approach of Northwest Bay Road may be necessary to mitigate this capacity constraint. The sole improvement that would be beneficial to the approach would be the implementation of a dual southbound left turn lane.

5 DEVELOPMENT TRAFFIC

5.1 Trip Generation Rates

To forecast the number of trips generated by each of the proposed land uses within The Lakes District and Schooner Cove in addition to the traffic already accounted for by the existing uses within the Study Area, trip generation rates, which are shown in TABLE 5.1, were obtained from Trip Generation (8th Edition, 2008) by the Institute of Transportation Engineers (ITE) and matched to the most likely land use proposed for the Study Area. The owners intend to market homes in The Lakes District and Schooner Cove to broad demographic seeking an active, healthy, maritime lifestyle within a sustainability-oriented community. To reflect historic uptake to the present, the trip generation considers that a proportion of housing will be generating traffic at "traditional" rates and an older demographic will be generating traffic at "adult oriented" rates. It is generally accepted that the older demographic will have slightly lower trip generation characteristics.

While the actual mix in the demographic expected at Fairwinds cannot be determined, the Ministry has agreed with an assumption which allocates up to 25 percent of housing in The Lakes District to the lower generation rate of "adult oriented" housing and up to 50 percent at Schooner Cove based on the prevailing attractiveness to seniors and retirees. It is generally understood that accounting for a slightly lower generation rate is an attempt to reflect the likelihood that trip generation for The Lakes District and Schooner Cove as a whole, will be less compared to similar-sized communities in more traditional suburban settings.

TABLE 5.1 EFFECTIVE FACILITY TRIP GENERATION RATES

LAND USE	HOUR	Source	TRIP GENERATION RATE (vehicles/hour)	IN	OUT
Market	AM PM	Land Use Code 850 – Supermarket	10.05 vehicles per 1000 sq. ft 11.85 vehicles per 1000 sq. ft	49% 53%	51% 47%
Post Office	AM PM	Land Use Code 732 – US Post Office	12.19 vehicles per 1000 sq. ft 14.67 vehicles per 1000 sq. ft	49% 51%	51% 49%
Specialty Retail	AM PM	Land Use Code 814 – Specialty Retail	6.84 vehicles per 1000 sq. ft 5.02 vehicles per 1000 sq. ft	48% 56%	52% 44%
General Office Building	AM PM	Land Use Code 710 – General Office Building	1.55 vehicles per 1000 sq. ft 1.49 vehicles per 1000 sq. ft	88% 17%	12% 83%
Medical-Dental Office Building	AM PM	Land Use Code 720 – Medical-Dental Office Building	3.62 vehicles per 1000 sq. ft 4.45 vehicles per 1000 sq. ft	66% 40%	34% 60%
Restaurant	AM PM	Land Use Code 931 – Quality Restaurant	5.57 vehicles per 1000 sq. ft 9.02 vehicles per 1000 sq. ft	82% 62%	18% 38%
Marina	AM PM	Land Use Code 420 – Marina	0.17 vehicles per berth 0.21 vehicles per berth	64% 51%	36% 49%
Residential - Single Family	AM PM	Land Use Code – 210 Single-Family Detached Housing	0.77 vehicles per unit 1.02 vehicles per unit	26% 64%	74% 36%
Residential - Single Family (Senior)	AM PM	Land Use Code 251 -- Senior Adult Housing (Detached)	0.29 vehicles per unit 0.11 vehicles per unit	43% 53%	57% 47%
Residential - Townhouse	AM PM	Land Use Code 230 – Residential Condominium / Townhouse	0.44 vehicles per unit 0.52 vehicles per unit	18% 64%	82% 36%
Residential – Townhouse (Senior)	AM PM	Land Use Code 252 – Senior Adult Housing (Attached)	0.06 vehicles per unit 0.11 vehicles per unit	50% 53%	50% 47%
Residential – Multi-Family	AM PM	Land Use Code 230 – Residential Condominium / Townhouse	0.44 vehicles per unit 0.52 vehicles per unit	18% 64%	82% 36%
Residential – Multi-Family (Senior)	AM PM	Land Use Code 252 – Senior Adult Housing (Attached)	0.06 vehicles per unit 0.11 vehicles per unit	50% 53%	50% 47%

To account for the fact that Fairwinds is a sustainability-oriented community that provides recreational opportunities as well as local access to day-to-day shopping conveniences within the community, trip generation is divided into potential internal trips made within the Study Area and external trips to/from locations outside the Study Area by applying factors to the trip generation rates. The internal and external factors, which have been approved by the Ministry, are shown in TABLE 5.2 and are discussed in greater detail below.

TABLE 5.2 INTERNAL AND EXTERNAL FACTORS FOR FAIRWINDS COMMUNITY AND RESORT

LAND USE	INTERNAL	EXTERNAL
Retail	70%	30%
Restaurant	50%	50%
Marina	20%	80%
Office	40%	60%
Residential	25%	75%

Retail Commercial

A high proportion of trips to the retail uses are expected to be generated by residents of the Study Area. The retail component of Schooner Cove is not significant and will likely not generate primary trips from Parksville or Nanaimo. That said, 30 percent of trips were considered from these "external" sources, which we consider to reflect the upper range of likely travel from outside the Study Area.

Restaurant

A conservative 50/50 split was conservatively assumed for the restaurant. It is likely that many externally-sourced trips to the restaurant are also linked trips from the marina's externally-sourced traffic.

Marina

Current data on boat moorage at the Schooner Cove Marina shows that more than half of the occupied berths are used by residents of Nanoose Bay, including within the existing Fairwinds Community and Resort. Despite this, our analysis conservatively assumes that 80 percent of trips are external.

Office

The office components are considered with a 40/60 internal/external split respectively. It should be mentioned that the office components are minor, and that some staff may actually reside in the Study Area. A majority of the traffic is expected to be external to the Study Area, and while the percentage may be greater than the 60 percent currently assumed, traffic numbers are relatively insensitive to the estimated split due to the low amount of office space currently proposed at Schooner Cove.

Residential

The residential components are considered with a 25/75 internal/external split respectively. Residential trips are likely comprised of home-to-work trips and home-to-shopping trips. Most home-to-work trips will be external (i.e. work office is based at locations other than Fairwinds) whereas home-to-shopping trips could be internal or external to Fairwinds. The vision for Schooner Cove is to sustain retail developments that are also able to cater its residents sufficiently, thus reducing residents' need to go elsewhere to shop.

Ultimately the sourcing of trips (allocation of internal and external trips) will aid in determining impacts at Highway 19, which is the Ministry's main concern. Internal trips will still be distributed along The Lakes District and Schooner Cove / Nanoose Bay community road network, which will allow for informed site planning; however, only external trips will likely end up at the main intersection of Highway 19 and Northwest Bay Road. It should also be noted that there are alternative routes for externally-oriented traffic, such as travelling Dolphin Drive northbound to Parksville. This traffic will not have any impact on Ministry operations at Highway 19 whatsoever.

5.2 Development Site Trips

Based on the proposed land uses for The Lakes District and Schooner Cove, trip generation using the rates and internal/external factors presented in TABLE 5.3 and TABLE 5.4 was conducted to determine the number of site trips that can be expected from the proposed developments in Schooner Cove and The Lakes District.

The proposed Schooner Cove Neighbourhood Plan has four separate zones:

- The Village – Commercial services and other amenities to satisfy the daily needs of nearby Nanoose residents, as well as residential uses;
- The Marina – There is no intended change to the number of operable slips at the Marina, and this component should be considered as a continued operation on the existing water lot for commercial marina purposes;
- The Commons – residential use; and
- The Waterfront – residential use.

The above proposed commercial uses and residential uses are the only portions of the Schooner Cove Neighbourhood Plan anticipated to generate new trips. The Marina will be a continued operation on the existing water lot for commercial marina purposes, and a jib crane is intended to replace the boat ramp and some supporting uses (administration office, marine store, washrooms, showers, etc.) will be provided. As such, the site trip generation for the Schooner Cove Neighbourhood Plan considers marina operations as separate.

- The existing counts indicate that the Marina generates approximately 70 trips at its peak operating time. The data was collected as part of the count program implemented to gather existing traffic information (from July 9 to July 28, 2008). This is consistent with the most recent ITE rate (Land Use Code 420 – Marina), which suggests that a 360-slip marina generates 68 two-way trips in the PM peak hour.
- The jib crane will replace the boat ramp. Based on indications received during the public consultation process, the owners believe this may decrease the number of externally-sourced trips generated to the marina by people with trailerable boats (from outside Nanoose and Fairwinds), and potentially lead to

a reduction in trips. No new trips are therefore expected as a result of this improvement.

- Since an increase in trip generation at the marina is not expected based on the factors described above the anticipated new net site traffic does not include a marina component, noting that the marina trips will be in line with ITE rates for a 360-slip marina.

To account for a broader demographic expected at The Lakes District and Schooner Cove, trip generation was separated by assessing conditions as "adult oriented" housing with the remaining uses assessed at "traditional" housing rates. By doing this, the analysis recognizes that there will be a broad demographic living at The Lakes District and Schooner Cove, and correspondingly have slightly different trip characteristics The trip generation for the proposal is summarized in TABLE 5.3 and TABLE 5.4 for the AM and PM peak hours respectively.

TABLE 5.3 FAIRWINDS TRIP GENERATION – AM PEAK HOUR

MORNING PEAK PERIOD			NUMBER OF TRIPS			INTERNAL			EXTERNAL		
LAND USE		NO. OF UNITS/ SQ. FT	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
SCHOONER COVE	Market	7,534 sq. ft	37	39	76	26	27	53	11	12	23
	Business Centre	1,6790 sq. ft	10	10	20	7	7	14	3	3	6
	Specialty Retail	6,586 sq. ft	22	23	45	15	16	31	6	7	13
	General Office Building	3,649 sq. ft	5	1	6	2	0	2	3	0	3
	Medical-Dental Office	1,098 sq. ft	3	1	4	1	1	2	2	1	3
	Restaurant	4,241 sq. ft	19	4	23	10	2	12	10	2	12
	Residential @ Schooner	395 units	22	77	99	5	19	24	16	58	74
LAKES DISTRICT	Residential @ Lakes	1,675 units	162	549	710	40	137	177	121	411	532
Schooner Cove Total (including residential)			118	155	273	66	71	137	51	83	134
Lakes District Total (residential only)			162	549	710	40	137	177	121	411	532
New Fairwinds Two-Way Trips			**280**	**704**	**984**	**106**	**208**	**314**	**172**	**494**	**666**

*NOTE: Traffic generation is derived considering the actual quoted floor areas based on the most recent plans, although generally the approximate floor area of The Village commercial uses is 25,000 square feet.

TABLE 5.4 FAIRWINDS TRIP GENERATION – PM PEAK HOUR

AFTERNOON PEAK PERIOD			NUMBER OF TRIPS			INTERNAL			EXTERNAL		
LAND USE		NO. OF UNITS/ SQ. FT	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
SCHOONER COVE	Market	7,534 sq. ft	47	42	89	33	29	62	14	13	27
	Business Centre	1,6790 sq. ft	13	12	25	9	8	17	4	4	8
	Specialty Retail	6,586 sq. ft	19	15	34	13	10	23	6	4	10
	General Office Building	3,649 sq. ft	1	5	6	0	2	2	1	3	4
	Medical-Dental Office	1,098 sq. ft	2	3	5	1	1	2	1	2	3
	Restaurant	4,241 sq. ft	24	15	39	12	7	19	12	7	19
	Residential @ Schooner	395 units	77	47	124	19	12	31	58	35	93
LAKES DISTRICT	Residential @ Lakes	1,675 units	547	315	862	137	79	216	410	237	647
Schooner Cove Total (including residential)			183	139	322	87	71	158	96	68	164
Lakes District Total (residential only)			547	315	862	137	79	216	410	237	647
New Fairwinds Two-Way Trips			**730**	**454**	**1184**	**224**	**150**	**374**	**506**	**305**	**811**

*NOTE: Traffic generation is derived considering the actual quoted floor areas based on the most recent plans, although generally the approximate floor area of The Village commercial uses is 25,000 square feet.

The general findings based on TABLE 5.3 and TABLE 5.4 are described below:

- During the morning peak period, the proposed uses within Schooner Cove and the Lakes District generate a total of 984 two-way trips. Of the 984 two-way trips, there 314 and 666 internal and external two-way trips respectively.

- During the afternoon peak period, the proposed uses within Schooner Cove and the Lakes District generate a total of 1,199 two-way trips. Of the 1,184 two-way trips, 374 and 811 are internal and external two-way trips respectively.

- A large portion of internal outbound trips assumed to be generated by the residential components would in fact be internal inbound trips to the Schooner Cove retail components. Internal inbound trips to the residential components are generally assumed to be internal outbound trips generated from Schooner Cove.

- The variance between the number of internal outbound trips and internal inbound trips for the Lakes District and Schooner Cove may reflect trips to/from other areas within the Nanoose peninsula, such as schools, Red Gap, and the golf course to name a few locations.

5.3 Traffic Distribution and Assignment

Site traffic distribution and assignments were derived to determine how site trips will access and egress Fairwinds. As already presented in TABLE 5.3 and TABLE 5.4, site trips are categorized into "internal" and "external" trips. Internal trips occur within Fairwinds generally, while external trips originate or are destined to other communities outside of Nanoose Bay. It is recognized that inbound and outbound external trips will generally be utilizing Northwest Bay Road to access Fariwinds to/from the Highway; however, there are alternative scenic routes connecting Nanoose Bay to Parksville and beyond. As such, it was agreed that an "all-or-nothing" assignment to Highway 19 was not necessary, and it is assumed that 80 percent of all external trips will use Northwest Bay Road as the primary point of access into Fairwinds.

As Fairwinds consists of both Schooner Cove and The Lakes District include new uses are proposed to both neighbourhoods, the distribution and assignment for each is discussed separately.

Schooner Cove Traffic Distribution and Assignment
Internal trips to and from Schooner Cove are mostly generated by the residential uses of The Lakes District, with some trips generated by the other areas of Fairwinds and Nanoose Bay.

Trip generation analysis indicates that the following internal inbound and outbound trips to and from Schooner Cove are projected to be generated by The Lakes District during the Nanoose Bay afternoon peak period:

- 87 internal inbound trips entering Schooner Cove, of which 79 are from The Lakes District.

- There are 71 internal outbound trips exiting Schooner Cove, all of which are assumed to be outbound to The Lakes District.

The assignments of the internal trips are based on the planned densities at the Lakes District.

The Lakes District Traffic Distribution and Assignment
Internal trips to and from The Lakes District are mostly generated by Schooner Cove, with some trips generated by the other areas of Fairwinds and Nanoose Bay outside of The Lakes District.

Trip generation analysis indicates that the following internal inbound and outbound trips to and from The Lakes District would be generated by Schooner Cove during the Nanoose Bay afternoon peak period:

- There are 137 internal inbound trips entering The Lakes District, of which 68 are from Schooner Cove.

- There are 79 internal outbound trips exiting The Lakes District, all of which are assumed to be to The Lakes District.

The assignments of the internal trips are based on the planned densities at The Lakes District.

5.4 Total Development Site Traffic

Based on the traffic distributions and assignments, site traffic was derived for the study area road network. The total site traffic is shown in FIGURE 5.1.

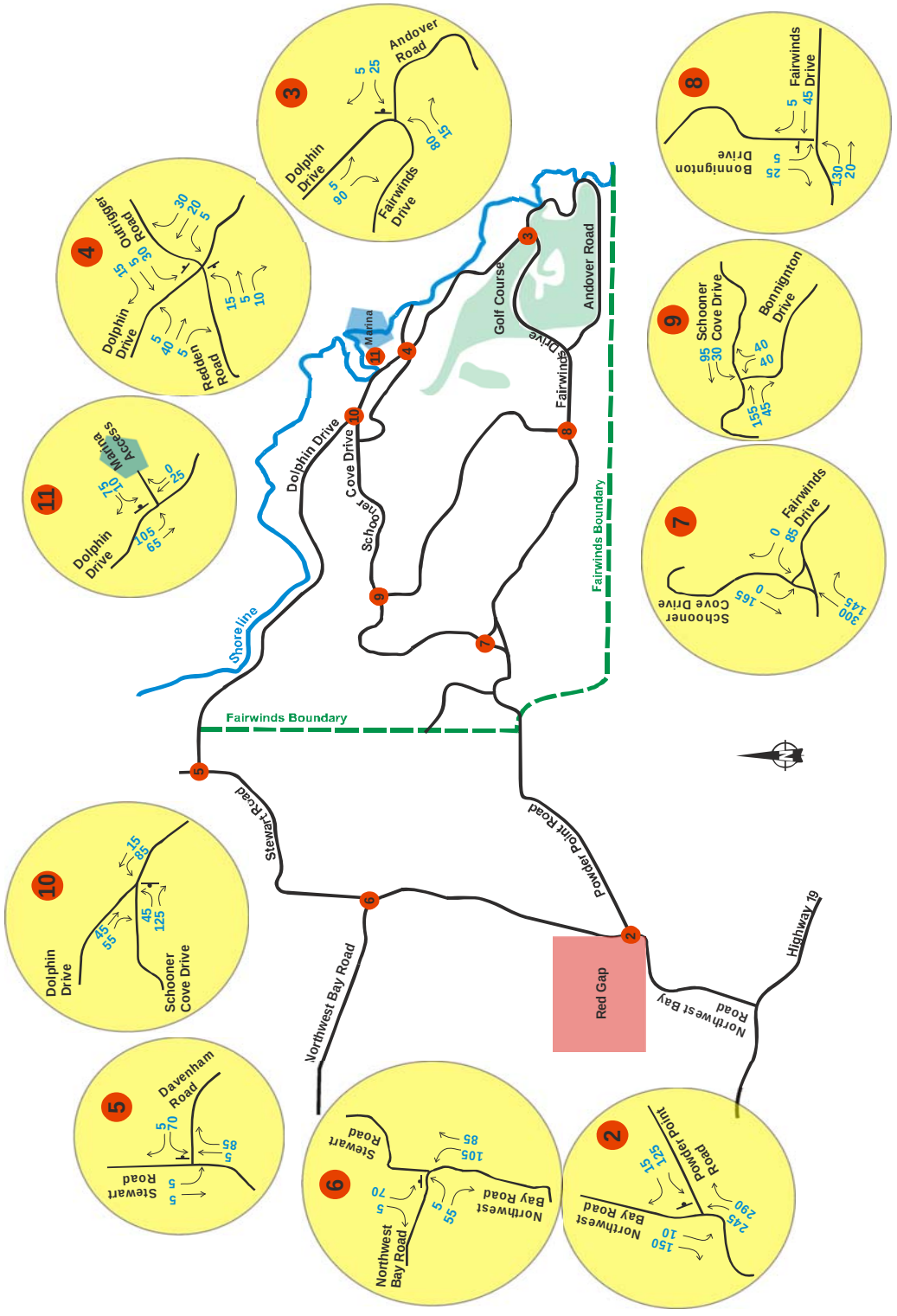


FIGURE 5.1 SITE TRAFFIC – PM PEAK HOUR

6 FUTURE TOTAL TRAFFIC CONDITIONS

Future total traffic volumes are future volumes present on the road network combined with site traffic (reflecting the aggregate of existing and new site traffic).

6.1 Future Total 2025 Traffic

As discussed previously (Section 2.4), the residential development at The Lakes District will involve the full development of the Neighbourhood Plan road network. To facilitate travel, the extension of Schooner Cove Drive and Bonnington Drive are planned as part of the development of the Lakes District. With the extension of these roadways, the road network under future total conditions features the following four additional study intersections:

- Schooner Cove Drive Extension and Fairwinds Drive (unsignalized) (Intersection ID #7);
- Bonnington Drive and Fairwinds Drive (unsignalized) (Intersection ID #8);
- Bonnington Drive and Schooner Cove Drive Extension (unsignalized) (Intersection ID #9); and,
- Schooner Cove Drive and Dolphin Drive (unsignalized) (Intersection ID #10).

In addition to extending Schooner Cove Drive and Bonnington Drive, the intersection of Redden Road / Outrigger Road and Dolphin Drive will become a formal access to Schooner Cove. To facilitate the increase in site traffic resulting from the redevelopment of Schooner Cove, designated left turn lanes on Dolphin Drive may be recommended at the Schooner Cove access and at Outrigger Road.

The turning movement counts of the subject intersections within Nanoose Bay, and of the intersection of Highway19 and Northwest Bay Road under future total conditions, based on the assignment of new site traffic, for the year 2025 are presented in FIGURE 6.1 and FIGURE 6.2 respectively.

Tabular summaries of the intersection levels of service for the unsignalized intersections are provided in TABLE 6.1. The capacity analysis results for the signalized intersection at Highway 19 are provided in TABLE 6.2. As the results show that certain movements marginally exceed capacity at the intersection of

Highway 19 and Northwest Bay Road, improvement options were evaluated. The capacity analysis results of the improved intersection are summarized in TABLE 6.3.

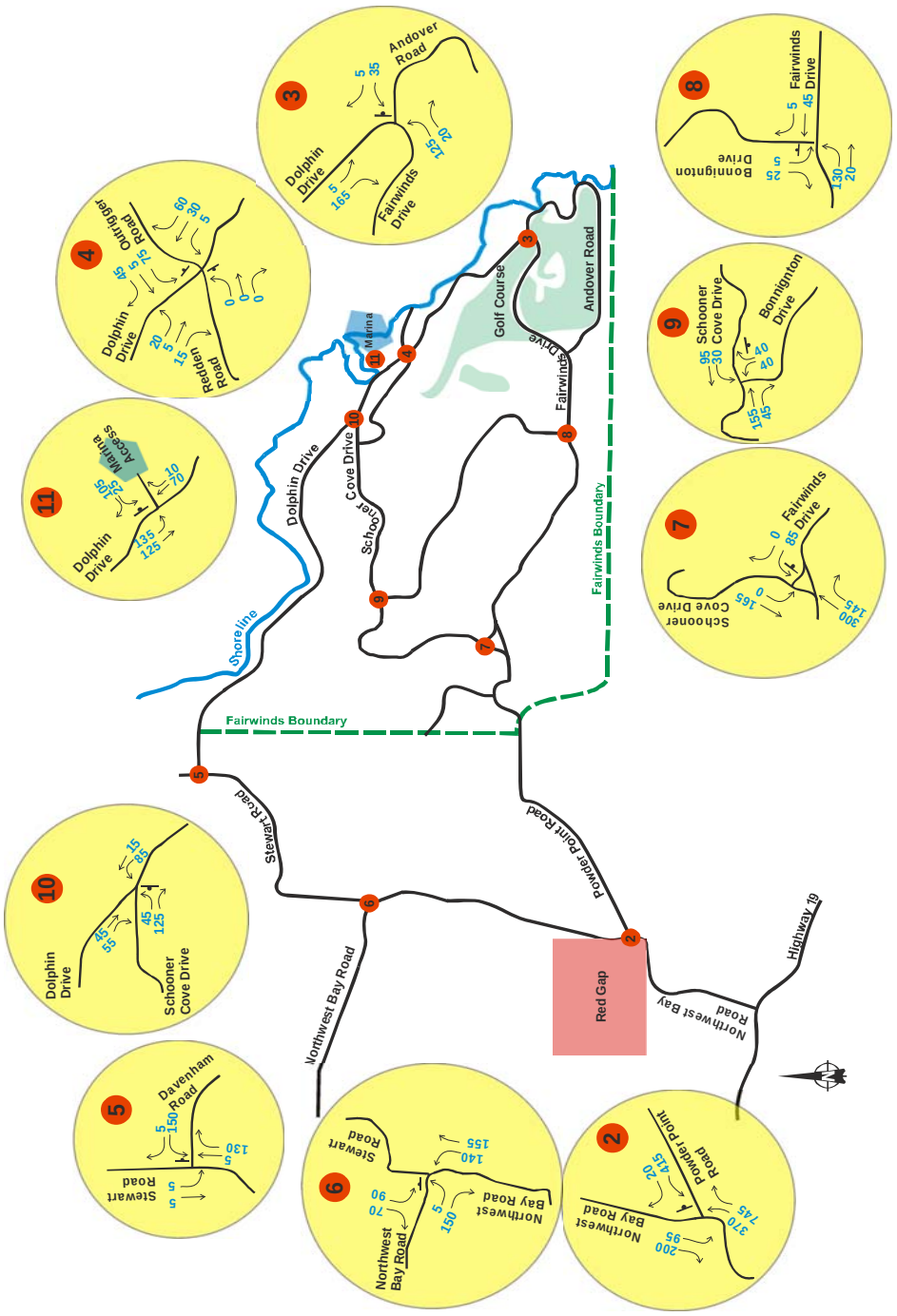


FIGURE 6.1 FUTURE TOTAL 2025 TRAFFIC VOLUMES – PM PEAK HOUR

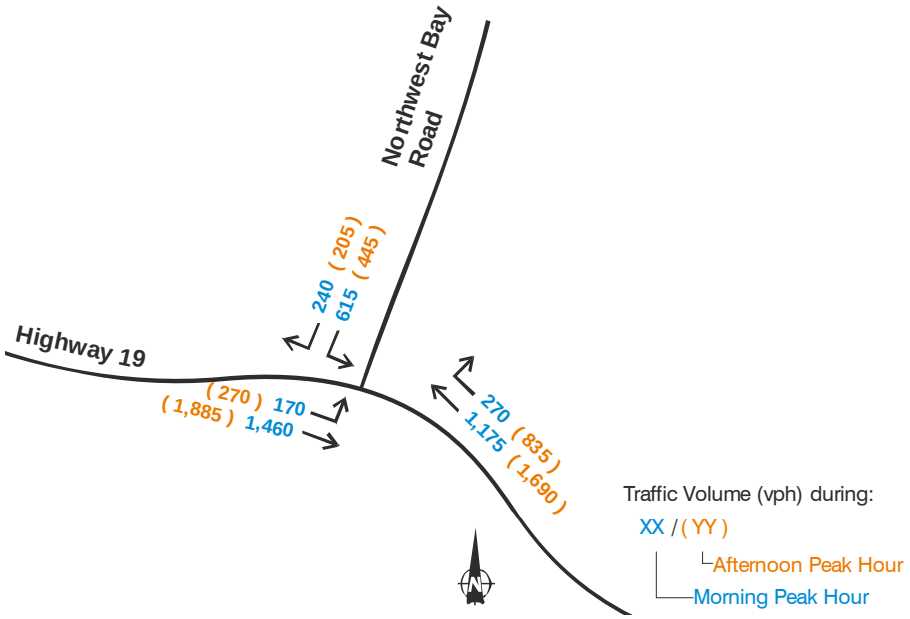


FIGURE 6.2 FUTURE TOTAL 2025 HIGHWAY 19 AND NORTHWEST BAY ROAD VOLUMES

TABLE 6.1 FUTURE TOTAL 2025 – CAPACITY ANALYSIS (UNSIGNALZED)

Intersection	PM Peak Hour				
	Lane Group	Adjusted Volume (vph)	Movement Capacity (vph)	Control Delay	Level of Service
Northwest Bay Road and Powder Point Road	**WBLR**	**473**	**164**	**906.0**	**F**
	SBLT	323	575	5.9	A
Northwest Bay Road and Powder Point Road (improved with 3-way stop)	WBLR	473	553	32.3	D
	NBTR	402	555	16.7	C
	SBLT	323	528	17.9	C
Northwest Bay Road and Powder Point Road (improved with roundabout)	WBLR	0.47 volume-to-capacity ratio**			
	NBTR	0.95 volume-to capacity ratio			
	SBLT	0.33 volume-to-capacity ratio			
Northwest Bay Road and Stewart Road	EBLT	172	1240	0.4	A
	SBLR	173	667	12.3	B
Davenham Road and Stewart Road	WBLR	173	896	10.0	A
	SBLT	15	1431	3.8	A
Redden Road / Outrigger Road and Dolphin Drive (Schooner Cove Access 1)	EBLTR	46	642	11.0	B
	WBL	84	595	12.0	B
	WBTR	58	921	9.2	A
	NBLTR	84	1520	0.7	A
	SBL	52	1523	7.5	A
	SBTR	104	1523	2.2	A
Schooner Cove Access 2	SBL	149	1509	7.6	A
	WBL	138	1195	9.9	A
Andover Road and Fairwinds Drive / Dolphin Drive	WBLR	46	685	10.6	B
	SBLT	185	1422	0.4	A
Schooner Cove Drive Extension and Fairwinds Drive	WBLR	91	474	14.4	B
Bonnington Drive and Fairwinds Drive	EBLT	161	1555	6.7	A
	SBLR	34	875	9.3	A
Bonnington Drive and Schooner Cove Drive Extension	WBLT	138	1355	2.1	A
	NBLR	87	717	10.7	B
Schooner Cove Drive and Dolphin Drive	EBLT	202	1345	2.5	A
	SBLR	222	627	13.8	B

*Adjusted volumes reported in the table are slightly higher than the turning movement volumes quoted in the figures. Synchro considers a peak hour factor in adjusting input volumes.
**HCM Output of the Roundabouts report from Synchro only reports volume-to-capacity ratio for the subject approach.

TABLE 6.2 FUTURE TOTAL 2025 – LEVELS OF SERVICE (SIGNALIZED)

Intersection	AM Peak Hour						PM Peak Hour					
	Average Control Delay (s)	LOS	Movement				Average Control Delay (s)	LOS	Movement			
			Lane	Delay (s)	V/C Ratio	LOS			Lane	Delay (s)	V/C Ratio	LOS
Highway 19 and Northwest Bay Road	38.0	D	**EBL**	**887**	**0.95**	**F**	52.7	D	**EBL**	**120.1**	**1.06**	**F**
			EBT	22.6	0.86	C			EBT	16.5	0.82	B
			WBT	48.8	0.98	D			**WBT**	**76.0**	**1.07**	**E**
			WBR	20.0	0.25	B			WBR	38.4	0.87	D
			SBL	**54.4**	**0.97**	**D**			**SBL**	**103.1**	**1.06**	**F**
			SBR	19.9	0.35	B			SBR	38.1	0.45	D

TABLE 6.3 FUTURE TOTAL 2025 – LEVELS OF SERVICE (SIGNALIZED – IMPROVED INTERSECTION)

Intersection	AM Peak Hour						PM Peak Hour					
	Average Control Delay (s)	LOS	Movement				Average Control Delay (s)	LOS	Movement			
			Lane	Delay (s)	V/C Ratio	LOS			Lane	Delay (s)	V/C Ratio	LOS
Highway 19 and Northwest Bay Road	15.1	B	EBL	14.8	0.65	B	23.4	C	EBL	47.7	0.87	D
			EBT	10.2	0.76	B			EBT	8.5	0.76	A
			WBT	18.3	0.83	B			WBT	32.4	0.96	C
			WBR	10.0	0.18	B			WBR	17.5	0.69	B
			SBL	21.8	0.73	C			SBL	41.5	0.79	D
			SBR	17.0	0.30	B			SBR	33.4	0.42	C

The performance of the intersections under future total conditions for the year 2025 is summarized below:

- No critical movements are expected at any other intersections, except for the intersection of Northwest Bay Road and Powder Point Road.
- At Northwest Bay Road and Power Point Road, the added site traffic results in a high volume of traffic desiring the westbound left-turn movement and the northbound right turn movement. With the resulting level of service, improvement options should be considered for the intersection.
- Two potential traffic control scenarios that would achieve acceptable results were analyzed in Synchro. One option is to provide a roundabout at the intersection under yield control. The intersection presents a good opportunity

to implement such a gateway feature, noting that all approach volumes are roughly equal and this is the major intersection nearest to the Red Gap Village and entrance to Fairwinds. Should this option be considered for implementation, the grades at the intersection should be evaluated to ensure that minimum guidelines are met. Another option is to implement a 3-way stop at the intersection, with a channelized northbound right turn lane to facilitate high Fairwinds inbound traffic volumes during the PM peak hour. Both options evaluated in Synchro provide acceptable results.

- The RDN and MoTI Future Road Network Plan discussed in Section 4 indicates the potential realignment of Powder Point Road to form a formal 4-way intersection north of the current T-intersection of Powder Point Road and Northwest Bay Road. Should this upgrade occur, the upgrade would sufficiently address capacity constraints identified in the previous bullet point.

- To facilitate better traffic operations and to enable the proposed roads to achieve their intended function, potential locations for left turn and right turn lanes were also considered. As the northbound right-turn volume on Schooner Cove Drive to eastbound Fairwinds Drive is expected to generate sufficient demand, a northbound right-turn lane is recommended at the intersection of Schooner Cove Drive and Fairwinds Drive to optimize the performance of the intersection.

- While the intersection of Highway 19 and Northwest Bay Road operates at an acceptable level of service D during both peak hours upon the build-out horizon of the proposed development, the increase in inbound traffic results in the eastbound left-turn movement to marginally exceed capacity (volume-to-capacity greater than 1.0) during both peak periods.

- It should be noted, however, that considering that the volumes are forecasted to the 2025 year timeframe and also reflect a summer condition, should traffic growth be less than forecasted for Highway 19 or considers a regular month of the year, operating conditions may be better than those quoted in the report even in the 2025 horizon year. Thus, it is recommended that the Ministry continue to monitor traffic growth along Highway 19 and that no improvements along Highway 19 are necessary as a result of the build-out of Fairwinds.

- However, to mitigate the capacity concern at the southbound approach, it is recommended that dual southbound left-turn lanes on Northwest Bay Road be provided. While this is already recommended under future background conditions, there will be even more demand for the southbound left turn movement at Northwest Bay Road resulting from the development of Fairwinds. It is understood that the property across the Petro Canada station is still undeveloped, and protecting for a dual left turn lane on the approach from Northwest Bay Road is prudent given the expected demand to Nanaimo for an increased residential intensity of over 1,800 units at Fairwinds. With dual left-turn lanes, the left-turn 95th percentile queues are reduced to just over 60 metres long, which indicates that queues will not back up to the rail tracks.

- Implementing the southbound left turn lanes in conjunction with changing the existing eastbound protected-only left turn phasing to protected-permissive left turn phasing improves the performance of the intersection significantly. When both improvements are implemented, no critical movements are expected during either peak hour in the 2025 planning horizon. Furthermore, the operations of the intersection can be expected to improve from a level of service D for both peak hours to a level of service B and C for the morning and afternoon peak hours respectively.

6.2 Linking the Proposed Street Standards to Forecasted Traffic

Based on the traffic forecasts for the new neighbourhood streets within The Lakes District, the proposed street classifications are appropriate. From the link volumes, the highest directional flow rate (DDHV) for each street in The Lakes District was used to determine the average annual daily traffic (AADT). The AADT is a factor in determining the classification of a road within the road network hierarchy. A summary of the AADT and whether or not each corridor meets the classic determination in the road network hierarchy is provided in TABLE 6.4.

TABLE 6.4 AADT AND ROAD CLASSIFICATION COMPARISON

STREET	AADT	DESIGNATION	CRITERIA (vehicles per day)	MEETS CRITERIA?
Schooner Cove Drive	5,100	Community Parkway*	< 8,000	Yes
Fairwinds Drive	2,200	Community Parkway*	< 8,000	Yes
Bonnington Drive	1,700	Collector	< 8,000	Yes

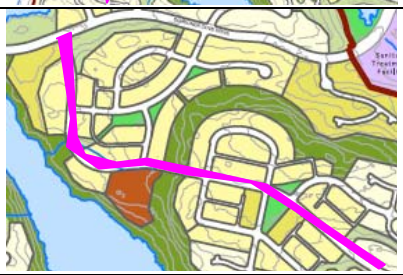
*While the Transportation Association of Canada does not actually have a "Community Parkway" Designation, it is assumed that this road functions as a collector, and can accommodate traffic at the higher end of the collector classification.

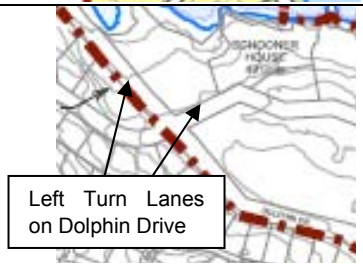
According to the analysis, most link volumes for the respective streets are within typical volumes experienced by their respective proposed classifications. The operational analysis also indicates that traffic during the peak AM and PM hours will be modest and there will be no need to insert left turn lanes along Schooner Cove Drive. This will improve the ability to keep one consistent multi-modal cross-section along Schooner Cove Drive from Schooner Cove to Fairwinds Drive.

6.3 Traffic Summary

A summary of the recommended mitigation measures, some of which are already identified in the RDN and MoTI future Road Network Plan, and the expected timing of the road improvements are summarized in TABLE 6.5 below.

TABLE 6.5 SUMMARY OF RECOMMENDED IMPROVEMENTS

IMPROVEMENT	LOCATION	TIMING
Schooner Cove Drive Extension*		Immediately upon initial development of The Lakes District properties – approximately 2011
Bonnington Drive Extension		Coincidentally with the development of Bonnington Drive properties (Schooner Cove Drive Extension would already be completed) – approximately 2015 – 2025

IMPROVEMENT	LOCATION	TIMING
Terrace Drive Collector		Coincidentally with the development of Terrace Collector properties (Schooner Cove Drive Extension would already be completed) – approximately 2015 – 2025
Dolphin Drive left turn lanes at Schooner Cove access and Outrigger Road		Coincidentally with the development of Schooner Cove and the upgrade of Dolphin Drive resulting from development – approximately 2015 – 2025. This is a discretionary improvement which can be revisited at the detailed design stage.
Schooner Cove Drive northbound right turn lane at Fairwinds Drive or Gateway Roundabout (Fairwinds Drive stop controlled)		Can be developed coincidentally with the construction of Schooner Cove Drive extension
Intersection of Powder Point Drive and Northwest Bay Road should be a 3-way stop with a northbound channelized right turn or can operate with a Gateway roundabout*		When volumes on Fairwinds Drive trigger improvement (when site traffic increases demand for the movement by approximately 250 vehicles), likely coinciding with a build-out of Schooner Cove or 850 units at The Lakes District – approximately 2018.

IMPROVEMENT	LOCATION	TIMING
Intersection of Highway 19 and Northwest Bay Road potential dual southbound left turn lanes.*		This improvement is already triggered under future background conditions regardless of development. However, the trigger is highly dependent on when Fairwinds intends to build-out. As such, it is accepted that the improvement is necessary regardless of the development.

***** Already identified as requiring improvement in the RDN and MoTI future Road Network Plan (Nanoose Bay Official Community Plan) if RGS is recognized.

7 CONCLUSIONS AND RECOMMENDATIONS

In summary, this transportation assessment finds that:

- The proposed Neighbourhood Plans for The Lakes District and Schooner Cove feature a mix of residential, commercial, and retail uses over a period of the next 15 to 20 years. To that end, Schooner Cove is intended to function as a self-sustaining village with a variety of complimenting retail, commercial, and office uses, catered primarily to residents of Fairwinds.

- A total of 1,675 residential units of various housing types (traditional single family, duplex, and multi-family) are proposed for The Lakes District. At Schooner Cove, up to 395 multi-family units will be added. Trip generation considers that up to 25 percent of housing in The Lakes District, and up to 50 percent at Schooner Cove will be "adult-oriented", for an older demographic.

- The Village at Schooner Cove will also include a retail, commercial, and office component, totaling approximately 25,000 square feet of floor area. The existing 360-slip marina will have new marina support space (office, washrooms, etc.), but with the same number of operable berths. It is important to note that only the upland land uses associated with The Village will be changed, thus there will still be the same number of users of the marina facilities in the future compared to the current situation.

- Under existing conditions, the main intersection of Highway 19 and Northwest Bay Road generally operates at acceptable levels of service, with the analysis completed with summer count data. Anecdotal evidence indicates that southbound left turn queues from Northwest Bay Road occasionally backs up past the rail tracks, although this is understood not be a regular condition.

- In a meeting with the Ministry of Transportation on October 8, 2009, it was confirmed that analyzing the PM peak hour would be sufficient for planning purposes. The exception is the intersection of Highway 19 and Northwest Bay Road, where the Ministry has specified that the report include analysis for the AM and PM peak hour of highway operations should be completed.

- Subsequently, analysis of operations at the intended build-out horizon (2025) was completed. Under future background traffic conditions, Highway 19 and Northwest Bay Road will experience some operational constraints. This is due to the consistent 2 percent per annum growth rate assumed, as requested by the Ministry applied to the approach volumes along Highway 19 for a 15-year period. Should growth in the surrounding communities of Nanaimo and Parksville be less, operations may be better than those quoted in this report. Should traffic growth be less than forecasted for Highway 19 or considers a regular month of the year, operating conditions may be better than those quoted in the report, even in the 2025 horizon year. Thus, it is recommended that the Ministry continue to monitor traffic growth along Highway 19 and that no improvements along Highway 19 are necessary as a result of the build-out of Fairwinds.

- To mitigate the capacity concern at the southbound approach of Highway 19 at Northwest Bay Road in 2025, it is recommended that dual southbound left-turn lanes be provided. It is understood that the property across from the Petro Canada station is still undeveloped, and protection for a dual left turn lane on the approach from Northwest Bay Road is prudent given the expected demand to Nanaimo for an increased residential intensity of over 1,800 units at the Lakes District and Schooner Cove Neighbourhoods. With dual left-turn lanes, the left-turn 95th percentile queues are reduced to just over 40 metres long from the intersection, which indicates that queues will not back up to the rail tracks.

- The dual southbound left turn lanes are likely not required until at least half of the residential properties proposed for both Neighbourhood Plans are developed at Fairwinds. While operations may still be possible upon full build-out with a single southbound left turn lane, this condition is not recommended, as the likelihood of vehicles backing up past the rail line may be more than an occasional occurrence upon full build-out, especially in the AM peak hour.

- In particular, the southbound left turn from Northwest Bay Road would deteriorate from Level of Service "C" with a volume-to-capacity ratio of 0.57 to Level of Service "E" with a volume-to-capacity ratio of 0.89 under future background conditions. Generally, Level of Service E is unacceptable to the Ministry and based on background traffic growth, potential improvements to the southbound approach of Northwest Bay Road may be necessary to mitigate this capacity constraint, regardless of development. The sole improvement that would be beneficial to the approach would be the implementation of a dual southbound left turn lane.

- At build-out during the morning peak period, the proposed uses within Schooner Cove and The Lakes District would generate a total of 984 two-way trips. Of the 984 two-way trips, there 314 and 666 internal and external two-way trips respectively.

- At build-out during the afternoon peak period, the proposed uses within Schooner Cove and The Lakes District would generate a total of 1,184 two-way trips. Of the 1,184 two-way trips, 374 and 811 are internal and external two-way trips respectively.

- A large portion of internal outbound trips generated by the residential components are assumed to be destined as internal inbound trips to the Schooner Cove retail components whereas internal inbound trips to the residential components are generally assumed to be internal outbound trips generated from Schooner Cove.

- At Northwest Bay Road and Powder Point Road, the added site traffic results in a high volume of traffic desiring the westbound left-turn movement and northbound right turn movement. With the resulting level of service, improvement options should be considered for the intersection. One option is to implement a roundabout to act as a gateway between Red Gap Village and Fairwinds, if the grades allow. Another option is to implement a 3-way stop at the intersection with a channelized northbound right turn lane to facilitate traffic to Red Gap and Fairwinds. The timing of the improvement can coincide with the build-out of the residential components at The Lakes District and Schooner Cove, likely at 50 percent (840 units). The Regional District of Nanaimo identifies the Northwest Bay Road and Powder Point Road intersection as

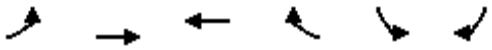
needing review for improvement in the Nanoose Bay Official Community Plan already (Section 5.3, Policy 4).

- The RDN and MoTI Future Road Network Plan discussed in Section 4 indicates the potential realignment of Powder Point Road to form a formal 4-way intersection north of the current T-intersection of Powder Point Road and Northwest Bay Road. Should this upgrade occur, the upgrade would sufficiently address capacity constraints identified in the previous bullet point.

- To facilitate better traffic operations and to enable the proposed roads to achieve their intended function, potential locations for left turn and right turn lanes were also considered. As the northbound right-turn volume on Schooner Cove Drive to eastbound Fairwinds Drive is expected to generate sufficient demand, a northbound right-turn lane is recommended at the intersection of Schooner Cove Drive and Fairwinds Drive to optimize the performance of the intersection. This improvement can coincide with the full construction of Schooner Cove Drive.

APPENDIX A SYNCHRO MODEL OUTPUTS

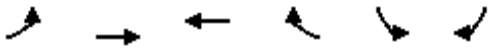
EXISTING



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	96	1202	968	150	271	107
v/c Ratio	0.54	0.65	0.72	0.22	0.55	0.21
Control Delay	37.3	9.7	16.8	3.7	18.3	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.3	9.7	16.8	3.7	18.3	4.4
Queue Length 50th (m)	7.9	29.7	34.2	0.0	19.2	0.0
Queue Length 95th (m)	#28.5	59.0	#71.1	9.2	36.3	7.7
Internal Link Dist (m)		592.0	796.0		572.8	
Turn Bay Length (m)	130.0			60.0		15.0
Base Capacity (vph)	177	2214	1505	759	753	735
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.54	0.64	0.20	0.36	0.15

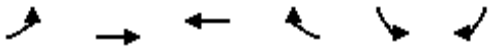
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	88	1106	891	138	249	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	96	1202	968	150	271	107
RTOR Reduction (vph)	0	0	0	94	0	78
Lane Group Flow (vph)	96	1202	968	56	271	29
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	2.9	22.9	16.0	16.0	11.7	11.7
Effective Green, g (s)	2.9	22.9	16.0	16.0	11.7	11.7
Actuated g/C Ratio	0.07	0.54	0.38	0.38	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	120	1902	1329	595	486	435
v/s Ratio Prot	0.05	c0.34	0.27		c0.15	
v/s Ratio Perm				0.04		0.02
v/c Ratio	0.80	0.63	0.73	0.09	0.56	0.07
Uniform Delay, d1	19.6	6.9	11.4	8.6	13.2	11.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	30.5	0.7	2.0	0.1	1.4	0.1
Delay (s)	50.0	7.6	13.5	8.7	14.6	11.5
Level of Service	D	A	B	A	B	B
Approach Delay (s)		10.7	12.8		13.7	
Approach LOS		B	B		B	

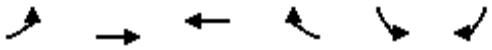
Intersection Summary			
HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	42.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	152	1483	1393	420	220	112
v/c Ratio	0.78	0.66	0.87	0.44	0.57	0.26
Control Delay	56.1	8.7	22.7	3.1	25.3	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.1	8.7	22.7	3.1	25.3	6.0
Queue Length 50th (m)	15.9	41.5	64.4	0.0	20.7	0.0
Queue Length 95th (m)	#47.2	79.5	#123.8	14.2	38.2	9.7
Internal Link Dist (m)		592.0	796.0		572.8	
Turn Bay Length (m)	130.0			60.0		15.0
Base Capacity (vph)	195	2277	1626	955	553	572
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.65	0.86	0.44	0.40	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



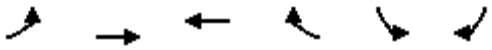
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	140	1364	1282	386	202	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	1483	1393	420	220	112
RTOR Reduction (vph)	0	0	0	230	0	88
Lane Group Flow (vph)	152	1483	1393	190	220	24
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	6.0	34.8	24.8	24.8	11.9	11.9
Effective Green, g (s)	6.0	34.8	24.8	24.8	11.9	11.9
Actuated g/C Ratio	0.11	0.64	0.45	0.45	0.22	0.22
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	194	2252	1605	718	385	344
v/s Ratio Prot	0.09	c0.42	c0.39		c0.12	
v/s Ratio Perm				0.12		0.02
v/c Ratio	0.78	0.66	0.87	0.27	0.57	0.07
Uniform Delay, d1	23.7	6.2	13.5	9.3	19.1	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.4	0.7	5.3	0.2	2.0	0.1
Delay (s)	42.1	6.9	18.7	9.5	21.2	17.1
Level of Service	D	A	B	A	C	B
Approach Delay (s)		10.2	16.6		19.8	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	54.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	126	16	247	289	11	152
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	137	17	268	314	12	165
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	615	426			583	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	615	426			583	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	70	97			99	
cM capacity (veh/h)	449	629			992	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	154	583	177
Volume Left	137	0	12
Volume Right	17	314	0
cSH	464	1700	992
Volume to Capacity	0.33	0.34	0.01
Queue Length 95th (m)	11.5	0.0	0.3
Control Delay (s)	16.6	0.0	0.7
Lane LOS	C		A
Approach Delay (s)	16.6	0.0	0.7
Approach LOS	C		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	45.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	53	105	84	68	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	58	114	91	74	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	205				228	160
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	205				228	160
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	99
cM capacity (veh/h)	1366				757	885

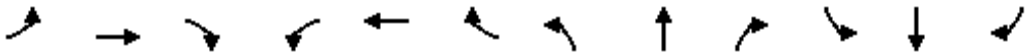
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	63	205	79
Volume Left	5	0	74
Volume Right	0	91	5
cSH	1366	1700	764
Volume to Capacity	0.00	0.12	0.10
Queue Length 95th (m)	0.1	0.0	2.8
Control Delay (s)	0.7	0.0	10.3
Lane LOS	A		B
Approach Delay (s)	0.7	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	68	5	5	84	5	5
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	5	5	91	5	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	67	51			97	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	67	51			97	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	99			100	
cM capacity (veh/h)	934	1017			1497	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	79	97	11
Volume Left	74	0	5
Volume Right	5	91	0
cSH	939	1700	1497
Volume to Capacity	0.08	0.06	0.00
Queue Length 95th (m)	2.2	0.0	0.1
Control Delay (s)	9.2	0.0	3.7
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	3.7
Approach LOS	A		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	16.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	16	5	11	32	5	16	5	21	31	5	42	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	5	12	35	5	17	5	23	34	5	46	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	130	127	48	124	112	40	51			57		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	130	127	48	124	112	40	51			57		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	99	98	100			100		
cM capacity (veh/h)	820	759	1020	831	772	1032	1555			1548		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	35	58	62	57
Volume Left	17	35	5	5
Volume Right	12	17	34	5
cSH	867	876	1555	1548
Volume to Capacity	0.04	0.07	0.00	0.00
Queue Length 95th (m)	1.0	1.7	0.1	0.1
Control Delay (s)	9.3	9.4	0.7	0.7
Lane LOS	A	A	A	A
Approach Delay (s)	9.3	9.4	0.7	0.7
Approach LOS	A	A		

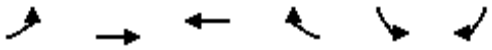
Intersection Summary				
Average Delay	4.5			
Intersection Capacity Utilization	15.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	26	5	79	16	5	89
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	5	86	17	5	97
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	202	95			103	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	202	95			103	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	99			100	
cM capacity (veh/h)	783	962			1489	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	34	103	102
Volume Left	28	0	5
Volume Right	5	17	0
cSH	808	1700	1489
Volume to Capacity	0.04	0.06	0.00
Queue Length 95th (m)	1.0	0.0	0.1
Control Delay (s)	9.7	0.0	0.4
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	0.4
Approach LOS	A		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

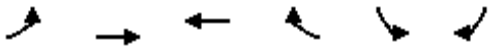
FUTURE BACKGROUND 2025



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	126	1586	1278	198	357	140
v/c Ratio	0.56	0.76	0.82	0.25	0.77	0.29
Control Delay	37.3	11.6	21.0	3.0	33.4	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.3	11.6	21.0	3.0	33.4	9.6
Queue Length 50th (m)	14.2	60.5	67.9	0.0	37.8	4.2
Queue Length 95th (m)	#34.6	84.9	#108.0	10.0	#75.2	16.1
Internal Link Dist (m)		592.0	796.0		572.8	
Turn Bay Length (m)	130.0			60.0		15.0
Base Capacity (vph)	233	2395	1664	849	532	541
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.66	0.77	0.23	0.67	0.26

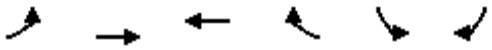
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	116	1459	1176	182	328	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	126	1586	1278	198	357	140
RTOR Reduction (vph)	0	0	0	112	0	68
Lane Group Flow (vph)	126	1586	1278	86	357	72
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	5.2	33.5	24.3	24.3	14.5	14.5
Effective Green, g (s)	5.2	33.5	24.3	24.3	14.5	14.5
Actuated g/C Ratio	0.09	0.60	0.43	0.43	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	164	2117	1536	687	458	410
v/s Ratio Prot	0.07	c0.45	c0.36		c0.20	
v/s Ratio Perm				0.05		0.05
v/c Ratio	0.77	0.75	0.83	0.13	0.78	0.18
Uniform Delay, d1	24.8	8.2	14.0	9.5	19.3	16.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.2	1.5	4.0	0.1	8.2	0.2
Delay (s)	44.0	9.7	18.1	9.6	27.5	16.3
Level of Service	D	A	B	A	C	B
Approach Delay (s)		12.2	16.9		24.3	
Approach LOS		B	B		C	

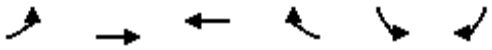
Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	56.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	201	1957	1839	554	289	148
v/c Ratio	0.86	0.76	0.95	0.52	0.88	0.42
Control Delay	70.8	10.2	31.6	4.8	64.6	21.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.8	10.2	31.6	4.8	64.6	21.1
Queue Length 50th (m)	36.3	97.6	156.8	10.7	51.4	11.7
Queue Length 95th (m)	#75.0	125.7	#220.1	31.3	#96.3	29.8
Internal Link Dist (m)		592.0	796.0		572.8	
Turn Bay Length (m)	130.0			60.0		15.0
Base Capacity (vph)	239	2586	1950	1063	338	361
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.76	0.94	0.52	0.86	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



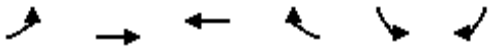
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	185	1800	1692	510	266	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	3539	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	201	1957	1839	554	289	148
RTOR Reduction (vph)	0	0	0	193	0	60
Lane Group Flow (vph)	201	1957	1839	361	289	88
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	11.8	64.6	48.8	48.8	16.4	16.4
Effective Green, g (s)	11.8	64.6	48.8	48.8	16.4	16.4
Actuated g/C Ratio	0.13	0.73	0.55	0.55	0.18	0.18
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	235	2569	1940	868	326	292
v/s Ratio Prot	0.11	c0.55	c0.52		c0.16	
v/s Ratio Perm				0.23		0.06
v/c Ratio	0.86	0.76	0.95	0.42	0.89	0.30
Uniform Delay, d1	37.8	7.5	18.9	11.8	35.4	31.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	24.9	1.4	10.5	0.3	23.8	0.6
Delay (s)	62.7	8.9	29.4	12.1	59.2	31.9
Level of Service	E	A	C	B	E	C
Approach Delay (s)		13.9	25.4		50.0	
Approach LOS		B	C		D	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	166	21	326	381	14	201
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	180	23	354	414	15	218
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	810	561			768	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	810	561			768	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	47	96			98	
cM capacity (veh/h)	343	527			846	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	203	768	234
Volume Left	180	0	15
Volume Right	23	414	0
cSH	357	1700	846
Volume to Capacity	0.57	0.45	0.02
Queue Length 95th (m)	27.0	0.0	0.4
Control Delay (s)	27.6	0.0	0.8
Lane LOS	D		A
Approach Delay (s)	27.6	0.0	0.8
Approach LOS	D		

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	7	69	139	111	90	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	75	151	121	98	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	272				302	211
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	272				302	211
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				86	99
cM capacity (veh/h)	1292				686	829

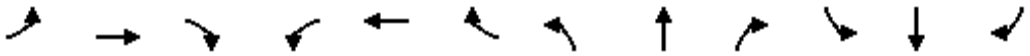
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	83	272	105
Volume Left	8	0	98
Volume Right	0	121	8
cSH	1292	1700	695
Volume to Capacity	0.01	0.16	0.15
Queue Length 95th (m)	0.1	0.0	4.3
Control Delay (s)	0.8	0.0	11.1
Lane LOS	A		B
Approach Delay (s)	0.8	0.0	11.1
Approach LOS			B

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	90	7	7	111	7	7
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	8	8	121	8	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	91	68			128	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	91	68			128	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	99			99	
cM capacity (veh/h)	905	995			1458	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	105	128	15
Volume Left	98	0	8
Volume Right	8	121	0
cSH	911	1700	1458
Volume to Capacity	0.12	0.08	0.01
Queue Length 95th (m)	3.1	0.0	0.1
Control Delay (s)	9.5	0.0	3.8
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	3.8
Approach LOS	A		

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	7	14	42	7	21	7	28	42	7	55	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	8	15	46	8	23	8	30	46	8	60	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	174	170	64	166	151	53	67			76		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	174	170	64	166	151	53	67			76		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	99	98	94	99	98	100			100		
cM capacity (veh/h)	759	716	1001	774	733	1014	1534			1523		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	46	76	84	75
Volume Left	23	46	8	8
Volume Right	15	23	46	8
cSH	817	828	1534	1523
Volume to Capacity	0.06	0.09	0.00	0.00
Queue Length 95th (m)	1.4	2.4	0.1	0.1
Control Delay (s)	9.7	9.8	0.7	0.8
Lane LOS	A	A	A	A
Approach Delay (s)	9.7	9.8	0.7	0.8
Approach LOS	A	A		

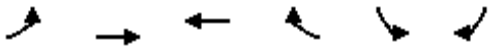
Intersection Summary				
Average Delay	4.6			
Intersection Capacity Utilization	17.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	35	7	104	21	7	118
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	8	113	23	8	128
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	268	124			136	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	268	124			136	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	718	926			1448	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	46	136	136
Volume Left	38	0	8
Volume Right	8	23	0
cSH	745	1700	1448
Volume to Capacity	0.06	0.08	0.01
Queue Length 95th (m)	1.6	0.0	0.1
Control Delay (s)	10.1	0.0	0.5
Lane LOS	B		A
Approach Delay (s)	10.1	0.0	0.5
Approach LOS	B		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	21.9%	ICU Level of Service	A
Analysis Period (min)	15		

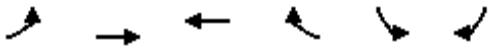
FUTURE TOTAL 2025



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	187	1586	1278	292	667	262
v/c Ratio	0.65	0.76	0.84	0.34	0.73	0.47
Control Delay	19.6	11.9	21.1	2.9	24.5	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	11.9	21.1	2.9	24.5	9.4
Queue Length 50th (m)	8.8	63.8	65.6	0.0	35.1	6.8
Queue Length 95th (m)	#22.8	89.5	#94.6	11.7	51.3	23.5
Internal Link Dist (m)		592.0	796.0		572.8	
Turn Bay Length (m)	130.0			60.0		15.0
Base Capacity (vph)	288	2198	1633	888	1036	606
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.72	0.78	0.33	0.64	0.43

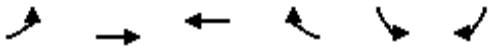
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	172	1459	1176	269	614	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.14	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	261	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	187	1586	1278	292	667	262
RTOR Reduction (vph)	0	0	0	166	0	134
Lane Group Flow (vph)	187	1586	1278	126	667	128
Turn Type	pm+pt			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	33.6	33.6	24.6	24.6	15.2	15.2
Effective Green, g (s)	33.6	33.6	24.6	24.6	15.2	15.2
Actuated g/C Ratio	0.59	0.59	0.43	0.43	0.27	0.27
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	287	2093	1533	686	919	424
v/s Ratio Prot	0.06	c0.45	0.36		c0.19	
v/s Ratio Perm	0.33			0.08		0.08
v/c Ratio	0.65	0.76	0.83	0.18	0.73	0.30
Uniform Delay, d1	9.5	8.6	14.3	9.9	18.9	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.2	1.6	4.1	0.1	2.9	0.4
Delay (s)	14.8	10.2	18.3	10.0	21.8	17.0
Level of Service	B	B	B	B	C	B
Approach Delay (s)		10.7	16.8		20.4	
Approach LOS		B	B		C	

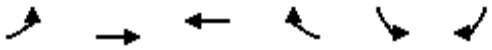
Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	56.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	296	1957	1839	905	484	223
v/c Ratio	0.87	0.76	0.96	0.77	0.79	0.58
Control Delay	47.4	9.8	34.3	9.2	45.2	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.4	9.8	34.3	9.2	45.2	21.2
Queue Length 50th (m)	36.3	97.6	161.4	21.1	43.1	15.2
Queue Length 95th (m)	#83.3	125.7	#224.1	78.9	60.5	38.3
Internal Link Dist (m)		592.0	796.0		572.8	
Turn Bay Length (m)	130.0			60.0		15.0
Base Capacity (vph)	343	2589	1912	1168	657	406
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.76	0.96	0.77	0.74	0.55

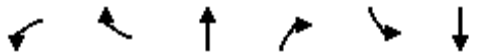
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	272	1800	1692	833	445	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	3539	3539	1583	3433	1583
Flt Permitted	0.08	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	143	3539	3539	1583	3433	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	296	1957	1839	905	484	223
RTOR Reduction (vph)	0	0	0	313	0	104
Lane Group Flow (vph)	296	1957	1839	592	484	119
Turn Type	pm+pt			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	65.0	65.0	48.0	48.0	15.9	15.9
Effective Green, g (s)	65.0	65.0	48.0	48.0	15.9	15.9
Actuated g/C Ratio	0.73	0.73	0.54	0.54	0.18	0.18
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	2588	1911	855	614	283
v/s Ratio Prot	c0.13	0.55	c0.52		c0.14	
v/s Ratio Perm	0.50			0.37		0.07
v/c Ratio	0.87	0.76	0.96	0.69	0.79	0.42
Uniform Delay, d1	27.9	7.2	19.6	15.0	34.9	32.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.8	1.3	12.8	2.4	6.7	1.0
Delay (s)	47.7	8.5	32.4	17.5	41.5	33.4
Level of Service	D	A	C	B	D	C
Approach Delay (s)		13.6	27.5		39.0	
Approach LOS		B	C		D	

Intersection Summary			
HCM Average Control Delay	23.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	88.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	414	21	370	746	96	201
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	450	23	402	811	104	218
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1235	808			1213	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1235	808			1213	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	94			82	
cM capacity (veh/h)	159	381			575	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	473	1213	323
Volume Left	450	0	104
Volume Right	23	811	0
cSH	164	1700	575
Volume to Capacity	2.88	0.71	0.18
Queue Length 95th (m)	341.9	0.0	5.3
Control Delay (s)	906.0	0.0	5.9
Lane LOS	F		A
Approach Delay (s)	906.0	0.0	5.9
Approach LOS	F		

Intersection Summary			
Average Delay	214.2		
Intersection Capacity Utilization	115.4%	ICU Level of Service	H
Analysis Period (min)	15		

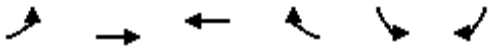
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	414	21	370	746	96	201
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	450	23	402	811	104	218

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	473	402	811	323
Volume Left (vph)	450	0	0	104
Volume Right (vph)	23	0	811	0
Hadj (s)	0.20	0.03	-0.57	0.10
Departure Headway (s)	6.3	6.2	3.2	6.4
Degree Utilization, x	0.83	0.70	0.72	0.58
Capacity (veh/h)	553	555	1120	528
Control Delay (s)	32.3	22.3	14.0	17.9
Approach Delay (s)	32.3	16.7		17.9
Approach LOS	D	C		C

Intersection Summary			
Delay	20.6		
HCM Level of Service	C		
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Right Turn Channelized						
Volume (veh/h)	414	21	370	746	96	201
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	450	23	402	811	104	218
Approach Volume (veh/h)	473		1213			323
Crossing Volume (veh/h)	402		104			450
High Capacity (veh/h)	1009		1276			971
High v/c (veh/h)	0.47		0.95			0.33
Low Capacity (veh/h)	822		1063			788
Low v/c (veh/h)	0.58		1.14			0.41

Intersection Summary			
Maximum v/c High	0.95		
Maximum v/c Low	1.14		
Intersection Capacity Utilization	115.4%	ICU Level of Service	H



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	7	151	139	155	90	69
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	164	151	168	98	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	320				415	235
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	320				415	235
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				83	91
cM capacity (veh/h)	1240				590	804

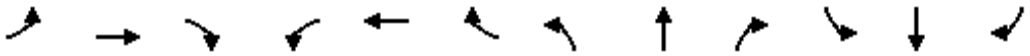
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	172	320	173
Volume Left	8	0	98
Volume Right	0	168	75
cSH	1240	1700	667
Volume to Capacity	0.01	0.19	0.26
Queue Length 95th (m)	0.1	0.0	8.3
Control Delay (s)	0.4	0.0	12.3
Lane LOS	A		B
Approach Delay (s)	0.4	0.0	12.3
Approach LOS			B

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	152	7	7	131	7	7
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	165	8	8	142	8	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	102	79			150	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	102	79			150	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	99			99	
cM capacity (veh/h)	892	982			1431	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	173	150	15
Volume Left	165	0	8
Volume Right	8	142	0
cSH	896	1700	1431
Volume to Capacity	0.19	0.09	0.01
Queue Length 95th (m)	5.7	0.0	0.1
Control Delay (s)	10.0	0.0	3.8
Lane LOS	A		A
Approach Delay (s)	10.0	0.0	3.8
Approach LOS	A		

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	7	14	77	7	46	7	28	42	72	65	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	8	15	84	8	50	8	30	46	78	71	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	353	322	74	315	303	53	78			76		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	353	322	74	315	303	53	78			76		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	99	98	86	99	95	99			95		
cM capacity (veh/h)	542	562	987	595	576	1014	1520			1523		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	46	84	58	84	52	104
Volume Left	23	84	0	8	52	26
Volume Right	15	0	50	46	0	8
cSH	642	595	921	1520	1523	1523
Volume to Capacity	0.07	0.14	0.06	0.01	0.05	0.05
Queue Length 95th (m)	1.8	3.9	1.6	0.1	1.3	1.3
Control Delay (s)	11.0	12.0	9.2	0.7	7.5	2.2
Lane LOS	B	B	A	A	A	A
Approach Delay (s)	11.0	10.9		0.7	3.9	
Approach LOS	B	B				

Intersection Summary				
Average Delay	6.4			
Intersection Capacity Utilization	26.3%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	35	7	124	21	7	163
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	38	8	135	23	8	177
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	339	146			158	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	339	146			158	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	99			99	
cM capacity (veh/h)	654	901			1422	

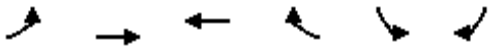
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	46	158	185
Volume Left	38	0	8
Volume Right	8	23	0
cSH	685	1700	1422
Volume to Capacity	0.07	0.09	0.01
Queue Length 95th (m)	1.7	0.0	0.1
Control Delay (s)	10.6	0.0	0.4
Lane LOS	B		A
Approach Delay (s)	10.6	0.0	0.4
Approach LOS	B		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	84	0	301	146	0	163
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	91	0	327	159	0	177
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	584	407			486	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	584	407			486	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	100			100	
cM capacity (veh/h)	474	644			1077	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	91	486	177
Volume Left	91	0	0
Volume Right	0	159	0
cSH	474	1700	1077
Volume to Capacity	0.19	0.29	0.00
Queue Length 95th (m)	5.6	0.0	0.0
Control Delay (s)	14.4	0.0	0.0
Lane LOS	B		
Approach Delay (s)	14.4	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	130	18	43	4	7	24
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	141	20	47	4	8	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	51				351	49
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	51				351	49
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				99	97
cM capacity (veh/h)	1555				588	1020

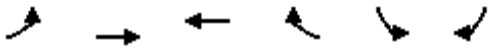
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	161	51	34
Volume Left	141	0	8
Volume Right	0	4	26
cSH	1555	1700	875
Volume to Capacity	0.09	0.03	0.04
Queue Length 95th (m)	2.4	0.0	1.0
Control Delay (s)	6.7	0.0	9.3
Lane LOS	A		A
Approach Delay (s)	6.7	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	153	45	32	95	40	40
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	166	49	35	103	43	43
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			215		364	191
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			215		364	191
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		93	95
cM capacity (veh/h)			1355		619	851

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	215	138	87
Volume Left	0	35	43
Volume Right	49	0	43
cSH	1700	1355	717
Volume to Capacity	0.13	0.03	0.12
Queue Length 95th (m)	0.0	0.6	3.3
Control Delay (s)	0.0	2.1	10.7
Lane LOS		A	B
Approach Delay (s)	0.0	2.1	10.7
Approach LOS			B

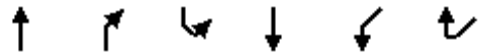
Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	54	132	99	107	143	61
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	59	143	108	116	155	66
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	224				427	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224				427	166
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				72	92
cM capacity (veh/h)	1345				559	879

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	202	224	222
Volume Left	59	0	155
Volume Right	0	116	66
cSH	1345	1700	627
Volume to Capacity	0.04	0.13	0.35
Queue Length 95th (m)	1.1	0.0	12.7
Control Delay (s)	2.5	0.0	13.8
Lane LOS	A		B
Approach Delay (s)	2.5	0.0	13.8
Approach LOS			B

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (veh/h)	69	11	137	127	23	104
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	75	12	149	138	25	113
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			87		517	81
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			87		517	81
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		95	88
cM capacity (veh/h)			1509		467	979

Direction, Lane #	NB 1	SB 1	SB 2	SW 1
Volume Total	87	149	138	138
Volume Left	0	149	0	25
Volume Right	12	0	0	113
cSH	1700	1509	1700	1195
Volume to Capacity	0.05	0.10	0.08	0.12
Queue Length 95th (m)	0.0	2.6	0.0	3.1
Control Delay (s)	0.0	7.6	0.0	9.9
Lane LOS		A		A
Approach Delay (s)	0.0	4.0		9.9
Approach LOS				A

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX B TERMS OF REFERENCE

From: OBrien, Debbie TRAN:EX [Debbie.OBrien@gov.bc.ca]
Sent: Friday, 23 October 2009 15:30
To: Marcus Siu
Cc: Sarah Rocchi; Thomas, Barbara R TRAN:EX
Subject: RE: Traffic Impact Study for Fairwinds - Schooner Cove and Lakes District

Hi, Marcus:

Thank you for forwarding the revised Terms of Reference for our review. The revised Terms of Reference accurately reflect the issues raised and the discussions that occurred at the meeting of
October 8, 2009, and therefore we are in agreement with the Terms of Reference as submitted on

October 21, 2009.

Please do not hesitate to contact me at (250) 751-3268 if you require anything further at this time.

Regards,

Debbie O'Brien
Senior District Development Technician
Vancouver Island District
Ministry of Transportation & Infrastructure
3rd Floor – 2100 Labieux Road
Nanaimo, BC V9T 6E9

From: Marcus Siu [mailto:Marcus.Siu@opusinternational.ca]
Sent: Wednesday, October 21, 2009 2:52 PM
To: OBrien, Debbie TRAN:EX
Cc: 'Sarah Rocchi'; Thomas, Barbara R TRAN:EX
Subject: Re: Traffic Impact Study for Fairwinds - Schooner Cove and Lakes District
Importance: High

Hi Debbie,

As per Sarah's meeting at the Ministry's office in Nanaimo on Oct 8, I've attached the revised Terms of
Reference as generally agreed upon at that meeting. Please review and inform if the Ministry is in
agreement and we will proceed with the work. I have also attached a map showing the main study
intersections and to provide some context to the intersections listed in the Terms of Reference. Do not
hesitate to contact myself or Sarah if there is any discrepancy with your understanding of the proposed
Terms of Reference. We look forward to your prompt response.

Best regards,
Marcus

Marcus Siu
Project Planner

Opus International Consultants (Canada) Limited
Marcus.Siu@opusinternational.ca
Tel 604 638 8890, Fax 604 684 5908
http://www.opusinternational.ca
#850 - 1185 W. Georgia Street, Vancouver, British Columbia, Canada, VANCOUVER BC V6E 4E6

PROPOSED TERMS OF REFERENCE
FAIRWINDS LAKES DISTRICT AND SCHOONER COVE TRAFFIC IMPACT STUDY

Meeting Time: 1:30 PM
Meeting Place: Ministry of Transportation, 3rd Flr, 2100 Labieux Road, Nanaimo BC
Present: Barb Thomas (MOT); Debbie O'Brien (MOT); Bob Wylie (MOT); Sarah Rocchi (Opus)

The following outlines the scope of the planned traffic and transportation study for Fairwinds. A meeting was held at the Ministry's District Office in Nanaimo on October 8, 2009. The following is Opus' understanding of the terms that were agreed upon at the meeting by Staff at the District Office.

Study Intersections:
The following intersections will be fully analyzed for capacity and traffic operations for the Weekday PM peak hour.

The following intersections will be analyzed under Existing Conditions:

- Highway 19 and Northwest Bay Road;
- Northwest Bay Road and Powder Point Road;
- Dolphin Drive/Fairwinds Drive and Andover Road;
- Dolphin Drive and Redden Road/Outrigger Road;
- Davenham Road and Stewart Road; and,
- Northwest Bay Road and Stewart Road.

The exception is that traffic conditions for the sole intersection of Highway 19 and Northwest Bay Road will also be analyzed for the Weekday AM peak hour.

The following intersections will be analyzed under Future Background and Future Total Conditions in addition to intersections before:

- Schooner Cove Drive Extension and Fairwinds Drive;
- Bonnington Drive and Fairwinds Drive; and,
- Bonnington Drive and Schooner Cove Drive Extension; and,
- Schooner Cove Drive and Dolphin Drive.

The main addition to the road network will be the Schooner Cove Drive Extension. It is expected that the extension will cause changes in traffic patterns at the intersections to be analyzed under future conditions, although under existing conditions, the intersections have no operational issues.

A map displaying the intersections to be analysed in their respective scenarios is attached. The approximate alignment of the new Schooner Cove Extension is also shown, connecting intersections to be analyzed under future traffic conditions.

Horizon Years
Traffic will be generated for the ultimate horizon year to assess the required improvements to accommodate the full build-out of the development:
• Current year – 2009
• Ultimate year – 2025

Phasing for the development at this time is unclear, although the timing of the proposed road network changes (i.e. extension of Schooner Cove Drive) will be discussed.

Traffic Growth Rates
The existing traffic volumes will be projected at a simple growth rate of 2% per year along Highway 19.

Generation Rates
Generation rates for each of the land uses will use the latest edition of the ITE manual or rates provided in the Ministry of Transportation traffic study guidelines. It is agreed that 25% of the units be classified as "seniors". At Schooner Cove, it was agreed that 50% of the units be classified as "seniors".

Trip Generation Assumptions
Trips will be categorized as "Internal" or "External", with "Internal" origin-destinations occurring within Fairwinds (i.e. no traffic impact to Highway 19) and "External" origin-destinations travelling to Highway 19.

The proposed "Internal" and "External" assumptions are listed below:

LAND USE	INTERNAL	EXTERNAL
Retail	70%	30%
Restaurant	50%	50%
Marina	20%	80%
Office	40%	60%
Residential	25%	75%

Retail Commercial
A high proportion of trips to the retail uses are expected to be generated by Fairwinds' residents. The retail portion at Schooner Cove is relatively small and will likely not generate primary trips from Parksville or Nanaimo. That said, 30 percent of trips were considered from these "external" sources, which many could argue is already at the upper range of likely travel from outside Fairwinds.

Restaurant
A conservative 50/50 split was assumed for the restaurant. It is likely that many externally-sourced trips to the restaurant are also linked trips from the marina's externally-sourced traffic.

Marina
A higher proportion of trips to the Marina are expected to be externally-sourced. That said, 80 percent of external traffic should be considered conservative for the marina.

Office
The office components are considered with a 40/60 internal/external split respectively. It should be mentioned that the office components are relatively minor, and that some staff may actually reside in Fairwinds. A majority of the traffic is expected to be external to Fairwinds, and while the percentage may be greater than the 60 percent currently assumed, traffic numbers are relatively insensitive due to the low amount of office space currently proposed at Schooner Cove.

Residential
The residential components are considered with a 25/75 internal/external split respectively. Residential trips are likely comprised of home-to-work trips and home-to-shopping trips. Most home-to-work trips will be external (i.e. work office is based at locations other than Fairwinds) whereas and home-to-shopping trips could be internal or external to Fairwinds. The vision for Schooner Cove is to sustain retail developments that are also able to cater its residents sufficiently, thus reducing residents' need to go elsewhere to shop.

Ultimately the sourcing of trips (allocation of internal and external trips) will aid in determining impacts at Highway 19, which is the Ministry's main concern. Internal trips will still be distributed along the Fairwinds road network, which will allow for informed site planning; however, only external trips will likely end up at the main intersection of Highway 19 and Northwest Bay Road. It should also be noted that there are alternative routes for externally-oriented traffic, such as travelling Dolphin Drive northbound to Parksville. This traffic will not have any impact on Ministry operations at Highway 19.

Trip Assignment and Distribution
It is recognized that the intersection of Highway 19 and Northwest Bay Road is not the only point of entry/exit to Fairwinds, 80 percent of the site trips will be allocated to the intersection. Distribution will follow general patterns already occurring at the intersection of Highway 19 and Northwest Bay Road, which is generally oriented to/from Nanaimo.

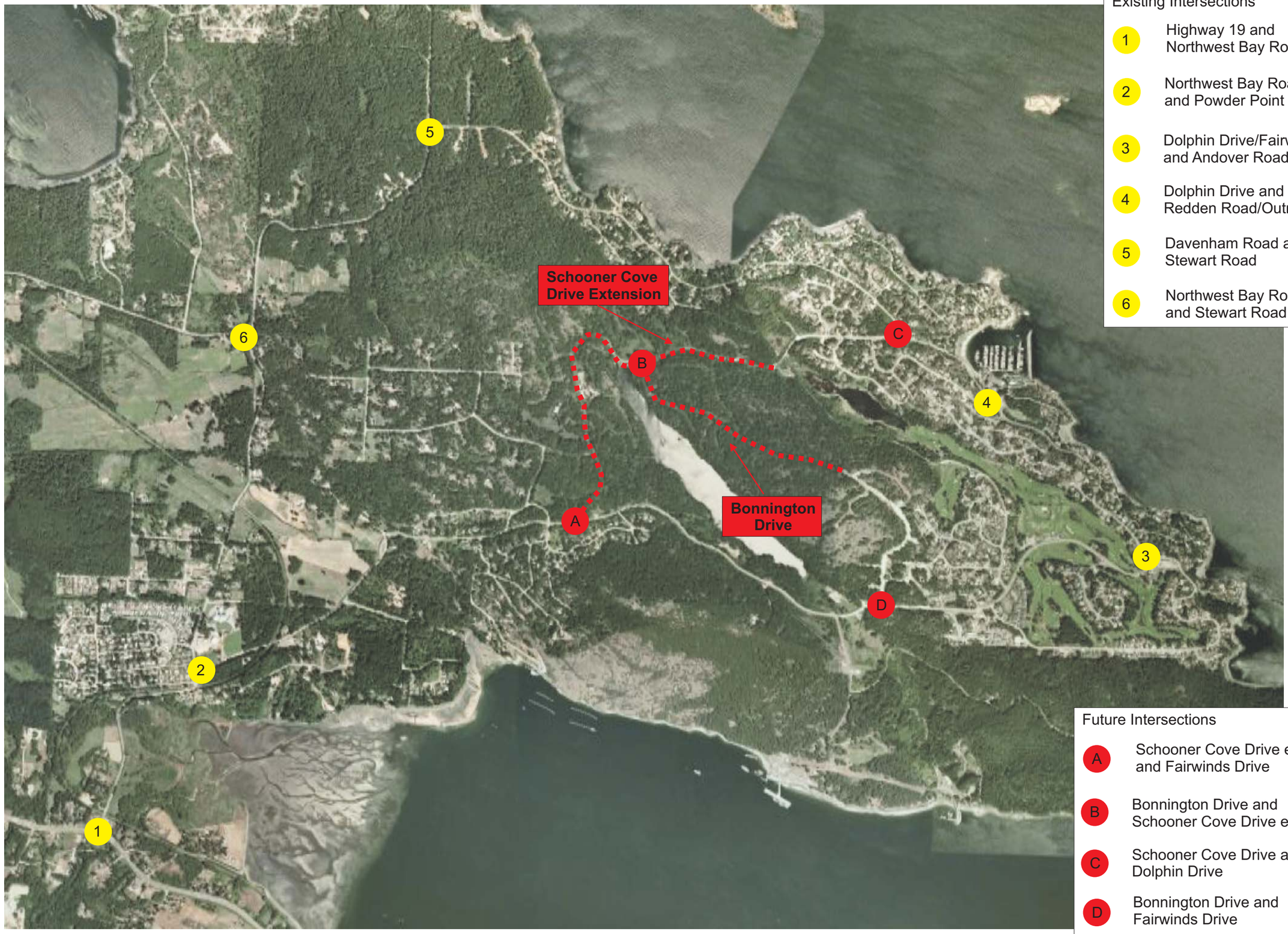
Traffic Rates
The observed volumes will be adjusted to reflect peak summer conditions, using the traffic data outputs from the permanent traffic counters along Highway 19. The turning movement counts were conducted in the month of July, and the most recent data (5 years) indicates that August volumes are on average 4.98% higher than July volumes. As such, the base traffic volumes for Highway 19 will be increased by 5%.

Adjacent Land Uses
Any planned developments and available traffic information from nearby properties in the Nanaimo Regional District will be reviewed and MOT notified if there are any significant changes in land use to advise of.

Study Process
The traffic study will follow accepted procedures outlined in the ITE *Traffic Generation Publications* and the Terms of Reference provided in the Ministry's *Site Impact Analysis Requirement Manual.*

Traffic Control for Internal Street Network
The study will review and comment on necessary traffic control measures for the internal street network based on the classification of the road, which is based on the expected future volumes resulting from the development.

Other Transportation Modes
The study will review and comment on any available information for facilities for other modes of transportation planned for the neighborhood such as bicycles, pedestrians and transit routes. Any safety issues identified for these modes will be noted. Particular attention will be paid to the documentation of new transit routes, which the Ministry understands will occur in the near future.



Existing Intersections

1 Highway 19 and Northwest Bay Road

2 Northwest Bay Road and Powder Point Road

3 Dolphin Drive/Fairwinds Drive and Andover Road

4 Dolphin Drive and Redden Road/Outrigger Road

5 Davenham Road and Stewart Road

6 Northwest Bay Road and Stewart Road

Future Intersections

A Schooner Cove Drive ext. and Fairwinds Drive

B Bonnington Drive and Schooner Cove Drive ext.

C Schooner Cove Drive and Dolphin Drive

D Bonnington Drive and Fairwinds Drive

- Traffic Operations
- Transportation Planning
- Road Safety Engineering
- Transit and Sustainability
- Asset Management
- Project Management