

June 2023

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# Traffic Impact Assessment

## Aquila Development

Sterling Pacific Properties, West Vancouver, BC

### FINAL REPORT: Rev 1

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Howes Technical Advantage Ltd.

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# 1. Introduction

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Sterling Pacific Developments (Sterling) is proposing to redevelop a 4.45-acre site on District Lot 1374, 5619 Daffodil Drive, in West Vancouver. The project is referred to as Aquila. As part of the rezoning approval process, the District of West Vancouver (the District) requires a traffic impact assessment (TIA) for the project. Terms of reference for the traffic study were based on the District Transportation Impact Assessment (TIA) Procedures<sup>1</sup> and the scope of this assessment is a Level 1 based on the afternoon peak period site generated trips.

Howes Technical Advantage Ltd. has been commissioned by Sterling to undertake the TIA. This study is based on information provided by Sterling and the District as of April 30, 2023.

## 1.1. Project Description

The development is located north of Marine Drive and west of Westport Road, near Eagle Harbour in West Vancouver.

**Figure 1** shows the study area the site location. The study area intersection is Marine Drive at Daffodil Drive.

A summary of the proposed development is as following:

- **Land Use:** The proposed development will consist of 36 homes. There will be 34 semi-detached homes and two single family detached homes. All the units are 3-bedroom and there are no suites. The proposed site plan and access points are shown in **Figure 2**.
- **Parking:** On-site parking is being provided consistent with the Zoning Bylaw. No variance for parking is being requested.
- **Access:** The site is accessed through two existing driveways. There is one connection to Daffodil Drive to the south and another to Westport Road to the east. Each driveway serves a portion of the site and there will be no connection between the driveways through the site. There is an adjoining lot to the north, 5565 Daffodil Drive, which has a cross access agreement for the property.
- **Off-site improvements:**
  - Possible new pedestrian crosswalks, with push button activated flashing beacons, have been proposed by the developer in the vicinity of the development. Further discussion with the District will follow in this regard.
  - A public trail will be built as part of the proposed development on the eastern side of the property connecting Westport Road to Daffodil Drive.

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<sup>1</sup> Transportation Study, Transportation Impact assessment guidelines for development projects, DWV

The scope of this assessment includes the following:

- *Capacity Analysis*: Existing traffic operations
- *Trip generation*: The trips generated from the site have been calculated using current methodologies.
- *Trip Distribution and Traffic Assignment*: Site trips are distributed via the driveways and assigned to the existing road network.
- *Traffic Forecasting*: Traffic analysis will be undertaken for opening year operations.
- *Trip Comparison*: Comparison of current zoning versus proposed zoning.
- *Conclusions*

## 1.2. Assumptions

The following assumptions have been made for this report:

- **Reference Plans**: Site Plan provided by Sterling, May 3, 2023.
- **Trip Generation**: Trip generation rates were determined using data provided by the 11<sup>th</sup> Edition of the ITE Trip Generation Manual.

## 1.3. Public Consultation

Sterling Pacific Developments hosted three public information meetings on July 27, 2020; December 10, 2020; and April 11, 2023. Neighbourhood residents asked a number of questions about the traffic assessment, including traffic data collection, assumptions regarding development-generated trips, and the analysis process. Where applicable, information has been included in this report to address these questions.





Figure 1: Study Area





Figure 2: Proposed Site Plan

## 2. Existing Conditions

### 2.1. Road Network

Daffodil Drive is a two-lane local road with a rural cross section. The road connects from Marine Drive and has a 90 degree turn at the existing driveway to the proposed development. The pavement width varies from 5.3m at the laurel hedge (at the north end) to 5.8m closer to Marine Drive. The grade is relatively flat and there are no sidewalks. The speed limit is 50km/h.

Photographs of the driveway are referenced in **Figure 3**, **Figure 4**, **Figure 5**, and **Figure 6**.



Figure 3: Existing Driveway - Looking south



Figure 4: Daffodil Drive - Looking south





**Figure 5: Daffodil Drive - Looking north**



**Figure 6: Daffodil Drive - Looking west**

Daffodil Drive connects at Marine Drive at a T-intersection. Marine Drive is an arterial road with a two-lane cross section. There is a sidewalk on the south side of Marine Drive. The grade on Marine Drive in this section is relatively flat. There are numerous driveway connections. Photographs of the intersection are referenced in **Figure 7**, **Figure 8** and **Figure 9**.





Figure 7: Daffodil Drive at Marine Drive - Looking south



Figure 8: Daffodil Drive at Marine Drive - Looking southeast



Figure 9: Daffodil Drive at Marine Drive - Looking west



Westport Road is a two-lane collector road with curbs on both sides and a pavement width of approximately 7m. There is a sidewalk on the east side. The road curves both horizontally and vertically and the grade is approximately 8%. There are many driveway connections to this road both north and south of the site access. In this section of the roadway, the speed limit is 50km/h.

The proposed driveway access on Westport will be aligned in roughly the same position as the existing driveway, located just south of the railway bridge. Photographs of the access point are shown in **Figure 10** and **Figure 11**.



**Figure 10: Existing Driveway on Westport Road - Looking north**



**Figure 11: Existing Driveway on Westport Road - Looking south**



## 2.2. Transit

There is bus service on Marine Drive connecting Horseshoe Bay to Dundarave, Park Royal and downtown (route #250). The bus service is 30-minute frequency during the day with ~15-minute frequency in peak periods. There are bus stops with shelters eastbound and westbound near Cranley Drive. These bus stops are approximately 400m walking distance from the centre of the new development.

## 2.3. Active Modes

**Walking:** There are sidewalks on the south side of Marine Drive and on the east side of Westport Road, both of which are 1.5m wide. There is a marked and signed crosswalk on Marine Drive at Cranley Drive.

**Bicycling:** There are no designated bicycle facilities on Westport Road or Marine Drive.

## 2.4. Existing Traffic Data

Traffic counts are undertaken to determine existing traffic volumes and provide a basis for estimating future background traffic volumes as well as to provide a relative comparison with neighbouring streets. The typical procedure for a traffic impact study is to conduct a count on a regular weekday, avoiding holidays, school breaks and other times when traffic volumes might not represent typical conditions. In most cases, a single traffic count is sufficient. A second traffic count might be undertaken at a different time of the year to confirm the validity of the first count and to average the results of the two counts.

In the case of the proposed Aquila development, three traffic counts were undertaken as described below. Historical counts from the District of West Vancouver (the District) were also sourced to validate the reasonableness of the traffic counts. Additional traffic counts were undertaken in May 2023 to double check traffic volumes in the area.

Traffic data were collected as follows:

- March 11, 2020 - at the intersection of Marine Drive and Daffodil Drive: This count was undertaken before the March school break and before the public health restrictions were imposed in response to the COVID-19 pandemic. The AM and PM peak hour volumes are shown in **Figure 12**.
- September 22, 2020 - at the intersections of Marine Drive and Daffodil Drive, Cranley Drive and Marine Drive, and Primrose Place and Marine Drive: These counts were undertaken as a follow up from the Open House. These counts were undertaken during the COVID-19 pandemic but at a time when schools had reopened and there were few public health restrictions. The data counted showed that the total traffic count was slightly higher than that taken before the restrictions. The AM and PM peak hour volumes for Marine Drive at Daffodil Drive is shown in **Figure 13**. The three intersections are shown in **Figure 15**.

- May 16, 2023: Additional traffic data were collected in May 2023 to double check that the volumes used for the analysis was appropriate. It was established that the overall AM and PM peak hour volumes for Marine Drive at Daffodil Drive and at Cranley Drive were less than the data collected in 2020. The higher volumes from 2020 were therefore retained in the report for the analysis.

The existing lot is a greenfield site with no dwellings. As such there is no traffic entering or exiting the site at present and therefore the existing driveways were not counted.

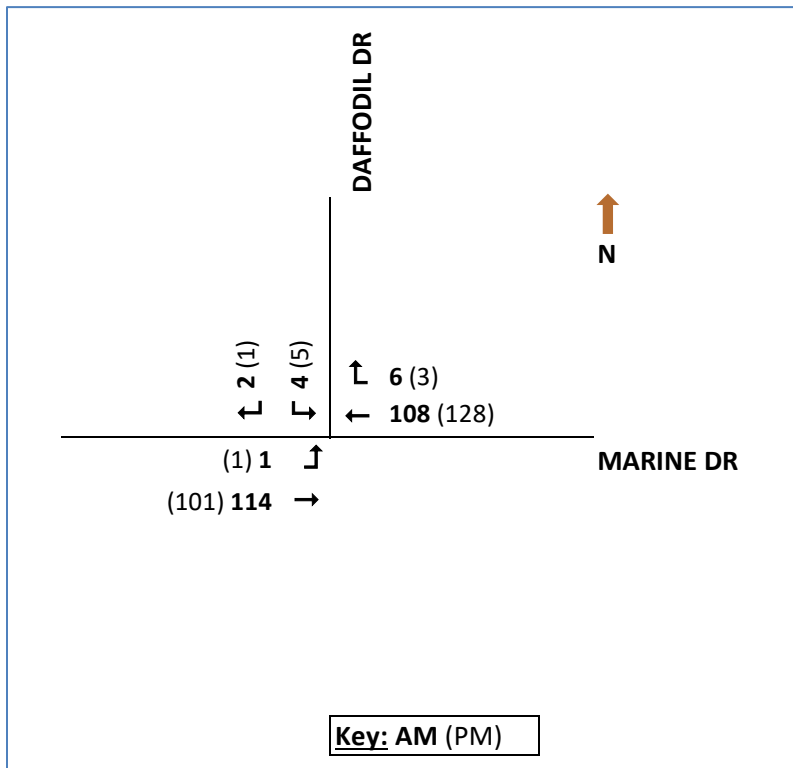
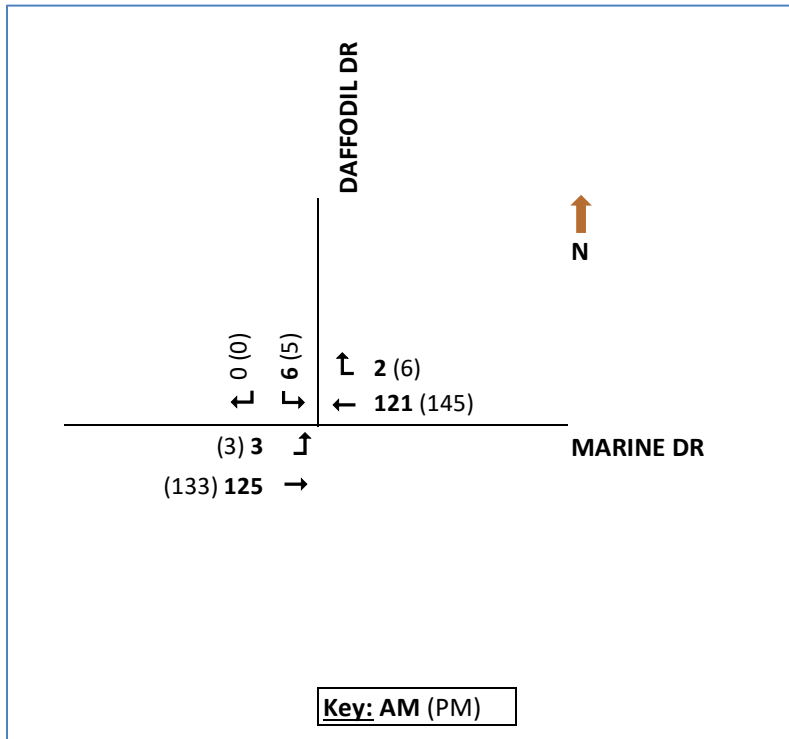


Figure 12: March 2020 - Existing Traffic Volumes at Marine Drive and Daffodil Drive.

The AM peak hour is between 8:15 and 9:15 AM and the PM peak hour is between 4:00 and 5:00 PM. The total traffic in the AM is 236 two-way trips and in the PM is 239 two-way trips.

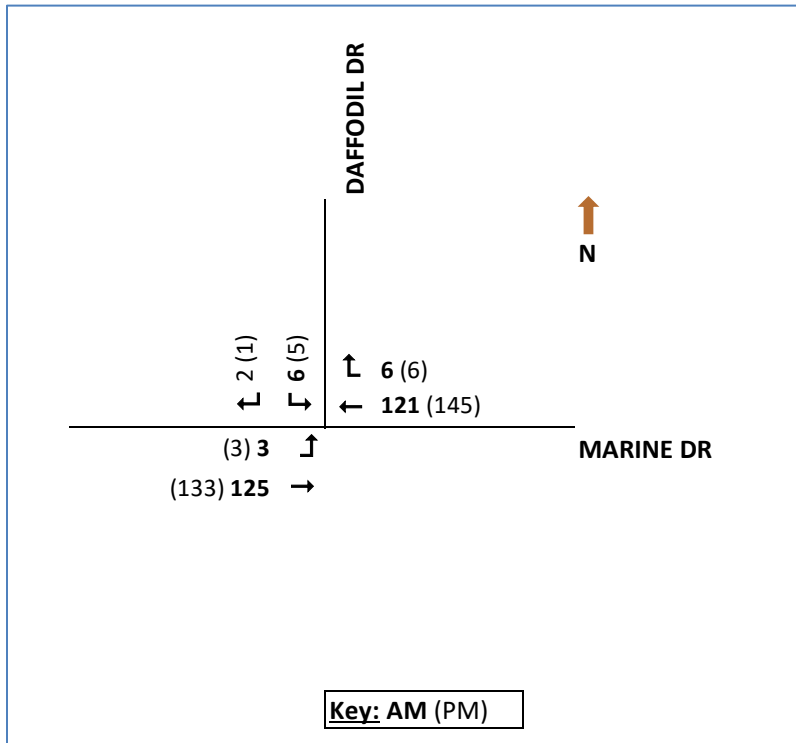


**Figure 13: Sept 2020 - Existing Traffic Volumes at Marine Drive and Daffodil Drive.**

The AM peak hour is between 8:00 and 9:00 AM and the PM peak hour is between 3:00 and 4:00 PM. The total traffic is slightly higher than the March 2020. In the AM there are 249 two-way trips and in the PM there are 292 two-way trips.

The existing traffic volumes used for the analysis were developed as a blend of the March and September 2020 volumes. The highest traffic count for each turning movement was used to be conservative. These adjusted peak hour volumes are shown in **Figure 14**.





**Figure 14: Adjusted 2020 - Existing Traffic Volumes at Marine Drive and Daffodil Drive.**

The Marine Drive corridor between Daffodil Drive and Primrose Place was counted in September 2020. This included the intersections of Daffodil Drive, Cranley Drive and Primrose Place. These volumes and the adjusted existing volumes for Daffodil Drive are shown in **Figure 15**. This additional data collection was undertaken to review traffic volumes on Primrose Place and Cranley Drive in comparison to Daffodil Drive.

There are a total of 109 properties in this neighbourhood with access to Primrose Place, Cranley Dr., and Daffodil Dr. As can be seen, the highest street volumes are on Cranley Drive with 49 two-way vehicles in the AM peak hour and 35 two-way vehicles in the PM peak hour.

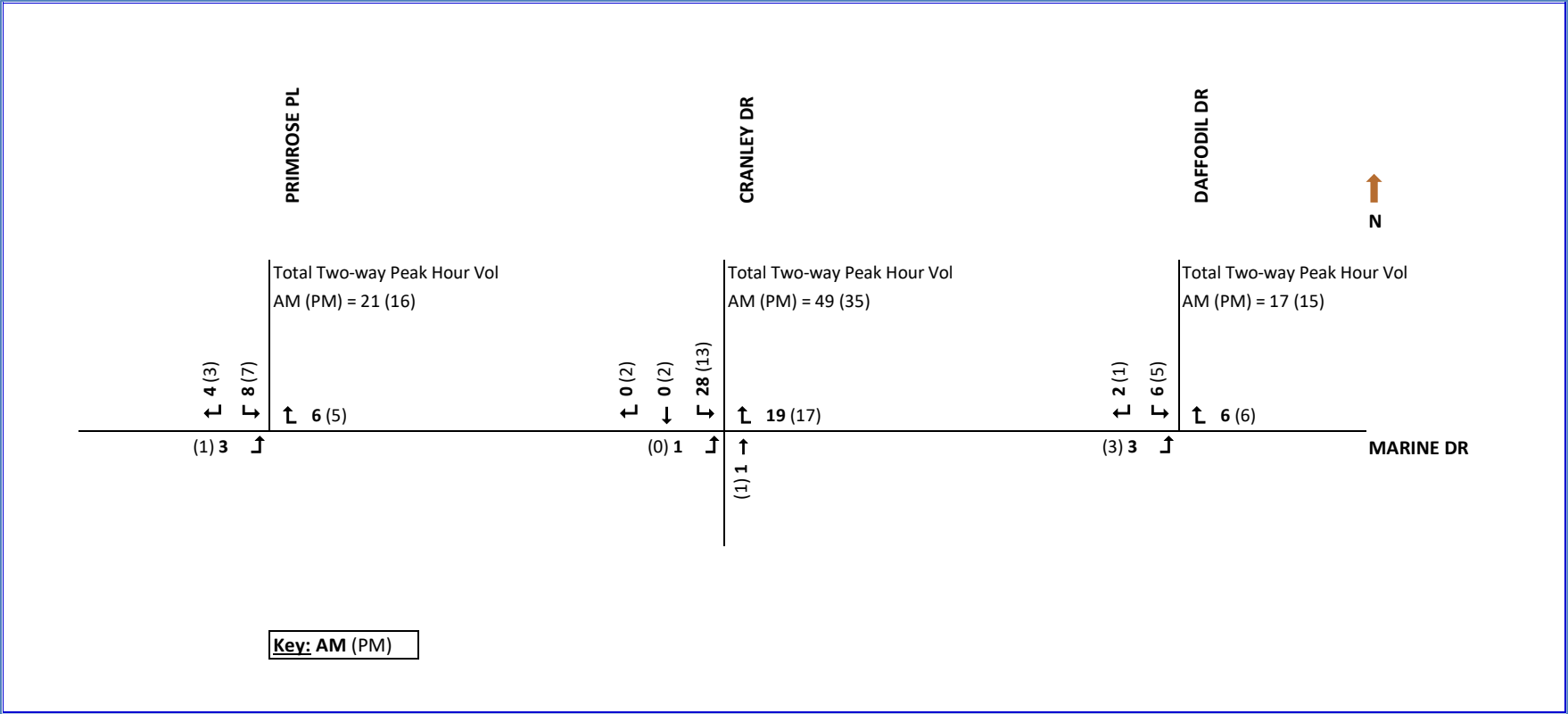


Figure 15: Existing Traffic Volumes in Marine Drive Corridor, 2020

## 3. Project Traffic

### 3.1. Trip Generation

New traffic that would be generated by the proposed development was calculated using the trip generation rates developed by the Institute of Transportation Engineers (ITE)<sup>2</sup>. This is a reference document and an industry standard used for all traffic impact studies in North America. The general “urban suburban” rate was used as it represents a conservative approach and is the highest trip rate for a category.

The trip generation rate estimates the trips made to and from the proposed development during the AM and PM peak hours, as a rate per dwelling unit. Only the trips made during the peak hours are calculated, as these trips would occur when traffic volumes are highest on adjacent roads, and therefore would have the greatest potential impact. Trips made at other times of the day are not included in the analysis as they would have less impact on adjacent roads.

Two trip generation categories were referenced. The Single Family category (#210) for single lot standard single family residences, and the Multi-family category (Low Rise 1-2 levels) (#220) which includes townhouse and duplexes. A summary of the trip rates for these categories follows in **Table 1** below.

**Table 1: ITE Trip Rates**

DESCRIPTION	ITE Ref #	ITE Description			AM PEAK HOUR			PM PEAK HOUR		
					RATE IN	RATE OUT	TOTAL RATE	RATE IN	RATE OUT	TOTAL RATE
Single family	210	Gen Urban Suburban	Detached	Street Peak	0.18	0.52	0.70	0.59	0.35	0.94
				Directional dist.	26%	74%		63%	37%	
Multifamily Housing (Low Rise)	220	Gen Urban Suburban	Semi-detached	Street Peak	0.10	0.30	0.40	0.32	0.19	0.51
				Directional dist.	24%	76%		63%	37%	

A review of traffic data collected for the existing neighbourhood indicates that the existing single-family residences generate an AM peak hour rate of 0.80 trips per unit, slightly higher than the ITE rate of 0.70 trips, and a PM peak hour rate of 0.61 trips per unit, significantly lower than the ITE rate of 0.94 trips. This indicates that ITE trip rates are similar or higher than existing trip rates in the neighbourhood.

A conservative approach was used to estimate trips generated by the proposed development. Although the form of the development will be semi-detached housing, a blended rate of the Single Family and the Multi-family (Low Rise) rates was used, rather than just using the Multi-family rate. The result is a higher trip rate than the standard Multi-family rate, which means that the estimated trips are likely higher than the actual trips that the development will generate, thus being more conservative. This blended rate is shown in **Table 2**.

<sup>2</sup> Institute of Transportation Engineers (ITE), 11<sup>th</sup> Edition



**Table 2: Blended Trip Rate for Site Trips**

DESCRIPTION	AM PEAK HOUR			PM PEAK HOUR		
	RATE IN	RATE OUT	TOTAL RATE	RATE IN	RATE OUT	TOTAL RATE
Single family	0.18	0.52	0.70	0.59	0.35	0.94
	26%	74%		63%	37%	
Blended Single Family/Multifamily	0.13	0.42	0.55	0.46	0.27	0.73
	24%	76%		63%	37%	

The site trips for the AM and PM peak hour were developed by applying the trip generation rate to the number of units. **Table 3** provides the details.

**Table 3: New Site Trips**

DESCRIPTION	UNITS	AM PEAK HOUR			PM PEAK HOUR		
		TRIPS IN	TRIPS OUT	TRIPS	TRIPS IN	TRIPS OUT	TRIPS
Single Family	2	1	1	2	1	1	2
Duplex	36	5	14	19	16	9	25
<b>Total</b>		<b>6</b>	<b>15</b>	<b>21</b>	<b>17</b>	<b>10</b>	<b>27</b>

The estimated two-way trips site trips for the whole development are 21 vehicle trips in the AM peak hour and 27 vehicle trips in the PM peak hour.

### 3.2. Existing Site Traffic

There is no existing traffic on the Site and therefore no trip reduction was made from the background traffic.

### 3.3. Project Traffic Distribution

Access to the site is through two existing driveways, as described previously, located at Westport Road and at Daffodil Drive. The site design is such that, because of the terrain and terracing, units have access to only one of these driveways. The split is as follows:

- Westport Road - access for 12 units.
- Daffodil Drive - access for 24 units.

This equates to the trips per driveway as shown in **Table 4**.

Table 4 -New Site Trips per Driveway

DESCRIPTION	UNITS	AM PEAK HOUR			PM PEAK HOUR		
		TRIPS IN	TRIPS OUT	TOTAL TRIPS	TRIPS IN	TRIPS OUT	TOTAL TRIPS
WESTPORT RD	12	2	5	7	6	3	9
DAFFODIL DR	24	4	10	14	11	7	18
Total	36	6	15	21	17	10	27

The Westport Road access will have 7 two-way trips for the AM peak hour and 9 two-way trips for the PM peak hour. The Daffodil Drive access will have 14 two-way trips for the AM peak hour and 18 two-way trips for the PM peak hour.

### 3.4. Traffic Assignment

This analysis will focus on the site trips as destined for the intersection of Daffodil Drive and Marine Drive. It is anticipated that the majority of the trips will be destined to and from the east. The splits from the existing traffic were used as a basis.

The distribution is as follows:

- AM Peak Hour: 70% to the east; 85% from the east
- PM Peak Hour: 80% to the east; 75% from the east

The site traffic is shown in **Figure 16**.

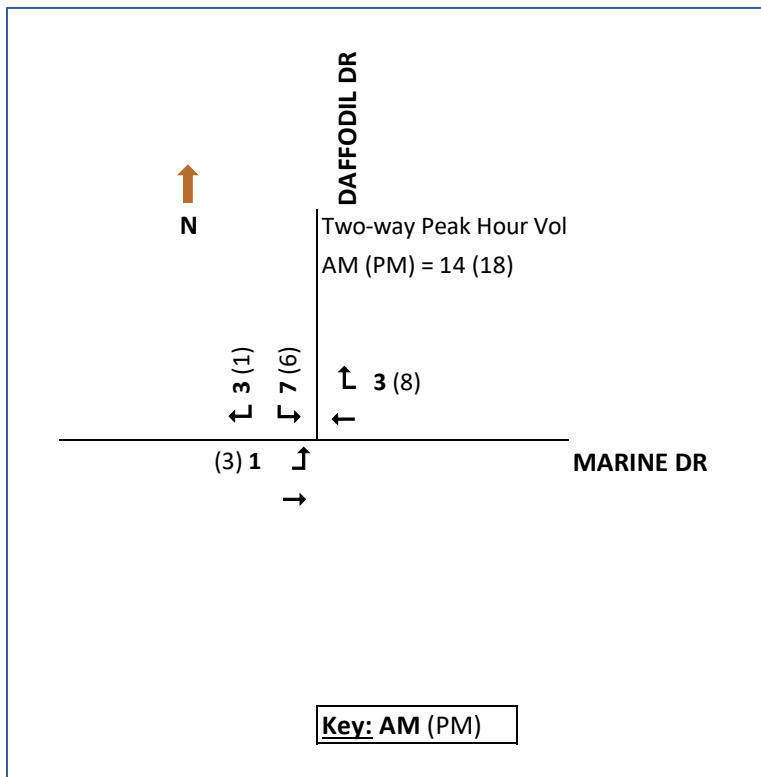


Figure 16: Site Trips at Daffodil Dr / Marine Dr

## 4. Future Traffic Volumes

### 4.1. Assumptions

The following assumptions were used to estimate future traffic volumes:

- The future forecast year is Opening Day in 2025.
- The background growth for traffic on Marine Drive used for analysis is 1% per year. This reflects similar growth rates on major arterials in West Vancouver.
- No growth was added to Daffodil Drive except for the proposed Aquila development.

### 4.2. Opening Day: Background Traffic Year 2025

For this project, the existing traffic volumes were increased by the assumed background growth to reflect the Background Traffic for Opening Day in 2025. These volumes are the starting point for calculating future volumes.

To develop the future background traffic volumes for 2025 the following process was followed:

- This existing traffic on Marine Drive was increased by 5%, a growth of 1% per year for 5 years (as the counts were done in 2020). This accounts for development growth within the District in this vicinity, other than this development.
- The Background Traffic volumes for the year 2025 volumes are shown in **Figure 17**.

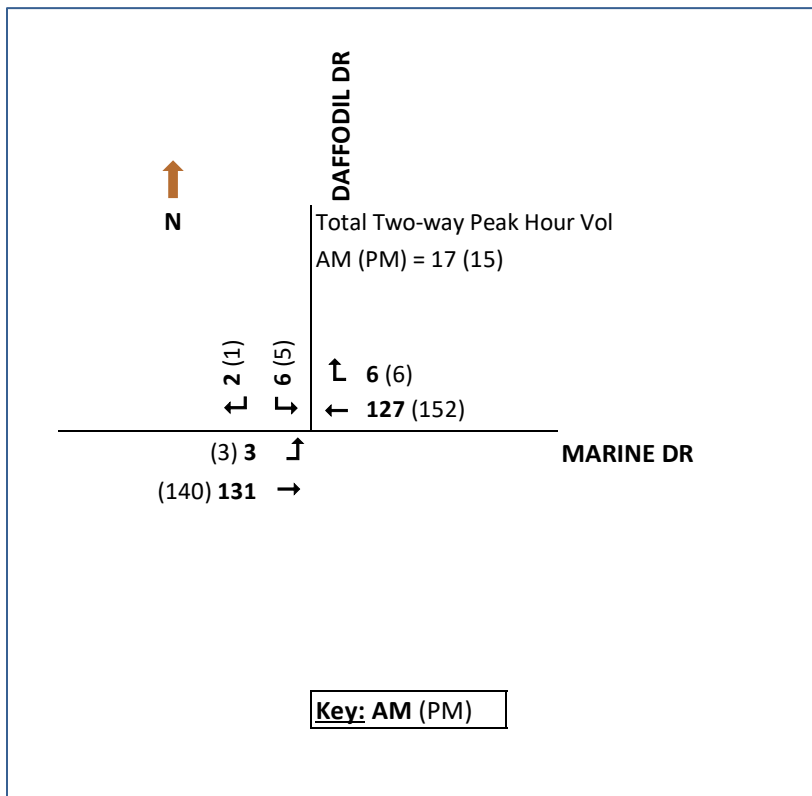


Figure 17: 2025 Background Traffic Volumes



### 4.3. Opening Day: Total Traffic Year 2025

To develop the future traffic volumes for 2025 the following process was followed:

- The Background Traffic Volumes for 2025 were used as a base.
- The Site traffic was added to produce the resultant total traffic for year 2025 volumes as shown in **Figure 18**.

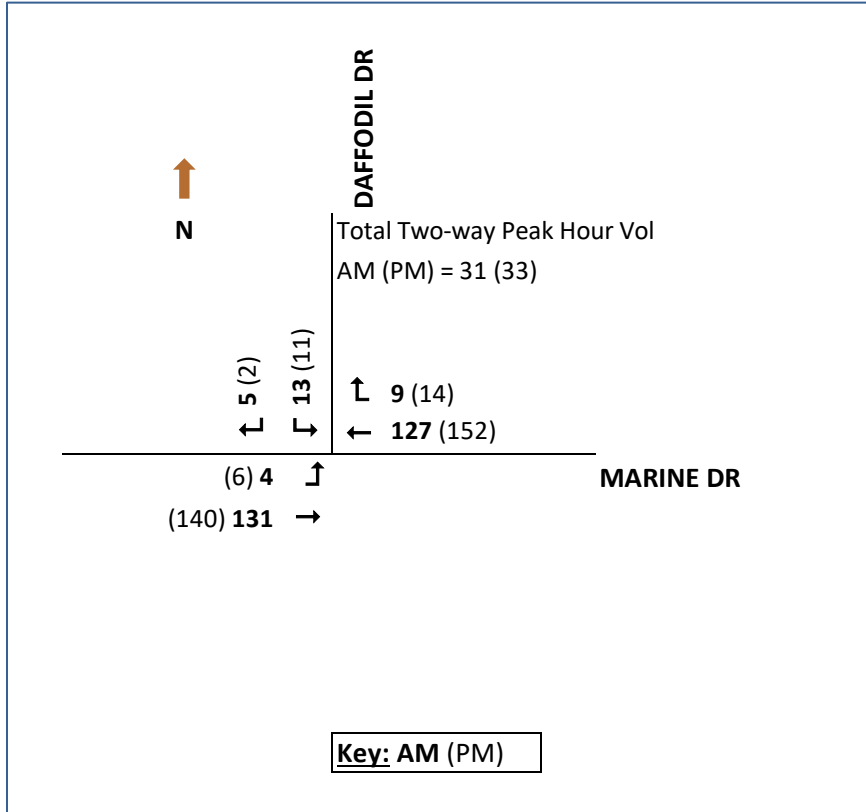


Figure 18: 2025 Total Traffic Volumes

### 4.4. Trip Comparison

A comparison was undertaken of the development trips between the current single-family zoning and the proposed zoning.

With the updated single-family zoning in the District, single family lots may redevelop in this area to include a suite and a coach house.<sup>3</sup>

The current site is zoned for 10 single family lots. The trip generation was adjusted to reflect a single-family house with a suite (added 5% to the trip generation rate) and a coach house (added an apartment rate). The increased trip generation rate was used as a comparison with the proposed development. This comparison is shown in **Table 5**.

<sup>3</sup> District of West Vancouver Bylaw Update, February 1, 2022.

The comparison shows that it is estimated that there will be an additional 9 two-way vehicle trips in the AM peak hour and 13 in the PM peak hour. The additional trips for each driveway were also calculated.

**Table 5 -Comparison of Vehicle Trips between Proposed Zoning and Current SF Zoning**

	<b>AM Peak Total Two-way Trips</b>	<b>PM Peak Total Two-way Trips</b>
Current Zoning – 10 single family units, plus suite and coach house	12	14
Aquila Proposal – 2 Single family and 34 multi-family units (low rise)	21	27
Additional trips to Current Zoning	9	13
Aquila Proposal - Additional trips at Driveway/ Westport Rd	2	3
Aquila Proposal - Additional trips at Daffodil Dr / Marine Dr	7	10

#### 4.5. Future Traffic Volume Comparison

The total future traffic on Daffodil Drive was compared with the existing traffic on Cranley Drive in 2020 and 2023. In the future, with the new development, the estimated total two-way traffic volume on Daffodil Drive will be 31 trips in the AM peak hour and 33 trips in the PM peak hour. These trips are less than the current two-way traffic volumes on Cranley Drive.

These future traffic volumes are at the low end of the typical range of traffic volumes on local roads in this type of neighbourhood.

## 5. Analysis

### 5.1. Assessment Assumptions

The SYNCHRO capacity analysis program<sup>4</sup> was used to assess intersection performance. This is an industry standard software application. The results represent a synthesis of 60 minutes' worth of data and as such there may be periods within the 60 minutes when conditions are better or worse than noted by the output parameters. As a comparative tool, the analysis results of existing conditions versus future conditions do provide a good measure of the changes in conditions relative to changes in traffic volumes.

Operations of roadway facilities are described in terms of Level of Service (LoS). LoS is a qualitative description of traffic flow based on factors such as speed, travel time, delay, and freedom to manoeuvre. Six service levels are defined ranging from LOS A, the best operating conditions, to LOS F, the worst operating conditions. LOS E corresponds to "at or near capacity" operations. When volumes exceed capacity, stop-and-go conditions result and operations are designated LoS F. The volume to capacity ratio ( $v/c$ ) is referenced as well as the calculated 95th percentile queue length has also been reported in terms of length (m), where the space for a car is approximately 7m.

### 5.2. Analysis Assumptions

The following assumptions were made for the analysis:

- Heavy vehicles - 2% (an average of traffic counts which observed 3% heavy vehicles in March and 0.8% in September 2020)
- Grade - 0%
- Speed limit - 50km/h

### 5.3. Analysis Output

The SYNCHRO results are summarized in the tables below. The results shown are the approach leg Level of Service (LoS), the volume-capacity ratio ( $v/c$ ) and the 95% queue expressed in metres (m).

#### Existing Scenario - 2020

The existing volumes were analyzed with the existing laning and stop control for Daffodil Drive at Marine Drive. The results are shown in **Table 6**.

**Table 6: Existing Volumes, Existing Laning and Control**

Approach Movement	AM			PM		
	LoS	$v/c$	Queue(m)	LoS	$v/c$	Queue (m)
EB	A	0.00	1	A	0.00	1
WB		0.09	0		0.10	0
SB	B	0.02	1	B	0.01	1

<sup>4</sup> Synchro Software - Version 10

This is a low volume operation, and the intersection operates well within the overall capacity.

**Opening Day - Background Traffic: Year 2025**

The background Traffic 2025 volumes have been analyzed using the existing laning and control and the results are shown in **Table 8**.

**Table 7: Opening Day Background Traffic for 2025 - existing laning and control**

Approach Movement	AM			PM		
	LoS	v/c	Queue(m)	LoS	v/c	Queue (m)
EB	A	0.00	1	A	0.00	1
WB		0.10	0		0.10	0
SB	B	0.02	1	B	0.01	1

The operation of the background traffic for 2025 is similar to the existing scenario.

**Opening Day - Total Traffic: Year 2025**

The Total Traffic 2025 volumes (the background traffic plus the development traffic) have been analyzed using the existing laning and control. The results are shown in **Table 8**.

**Table 8: Opening Day 2025 - Total Traffic - existing laning and control**

Approach Movement	AM			PM		
	LoS	v/c	Queue(m)	LoS	v/c	Queue (m)
EB	A	0.00	1	A	0.01	1
WB		0.10	0		0.11	0
SB	B	0.03	1	B	0.02	1

All movements will operate at level of service B or better.

The estimated additional traffic generated by the proposed development would not impact the future traffic operations of the intersection. The highest volume movement for the development traffic is the westbound right turn with 9 vehicles in the PM peak hour. This equates to an additional vehicle every 6 or 7 minutes. The increase in two-way traffic on Daffodil Drive close to this intersection is estimated to be 14 vehicles in the AM peak hour (one vehicle every 4 minutes) and 18 vehicles in the PM peak hour (one vehicle every 3 minutes).

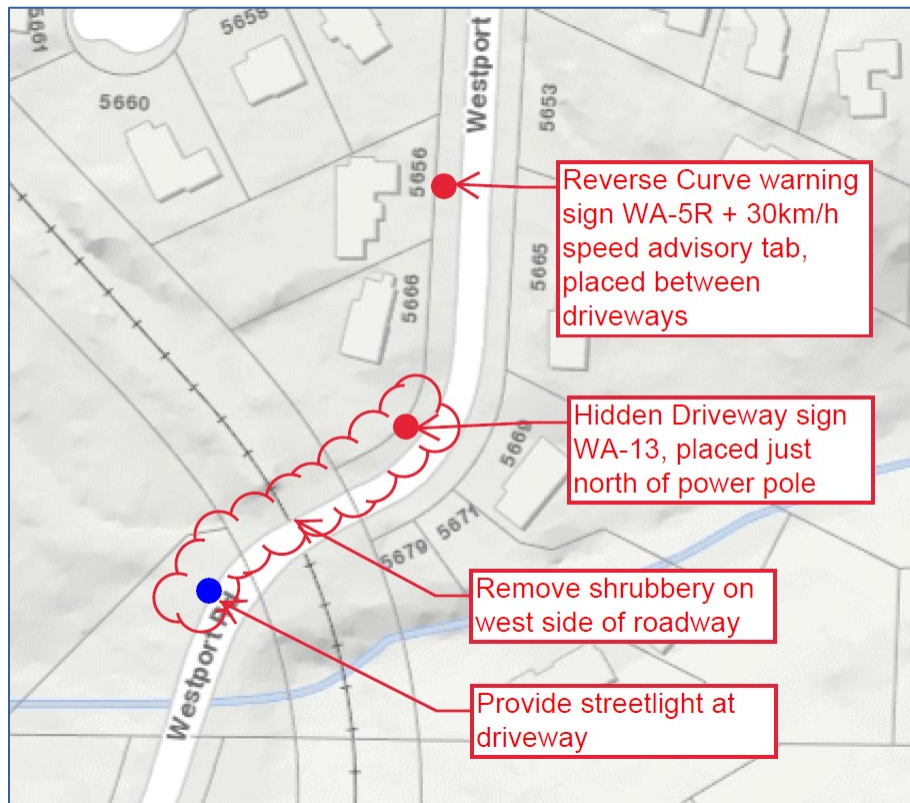
The total two-way site traffic volumes as a result of the proposed development, in the AM and PM peak hours, represents a small increase to the overall traffic volume at the intersection and is well within the operating capacity of the intersection.



## 5.4. Access Review

Sightlines at the existing driveway accesses were reviewed to ensure that they meet guidelines and to identify any necessary safety improvements.

The driveway on Westport Road was located further south than originally proposed to improve and meet the standards for sightlines. Additional mitigation measures have been identified to maximize sightlines, including removing shrubbery from the west boulevard, installing a southbound curve warning sign (30km/h) and adding a hidden driveway sign on Westport Road. In addition, the proposed illumination of the driveway would improve visibility at night. This is shown in Error! Reference source not found..



**Figure 19: Westport Road Access - mitigation measures**

The proposed driveway at Daffodil Drive should include a three-way stop for traffic control. Mitigation measures for sightlines include the removal of shrubs on the northwest corner of the intersection and part of hedge in the southwest corner. This is shown in **Figure 20**.

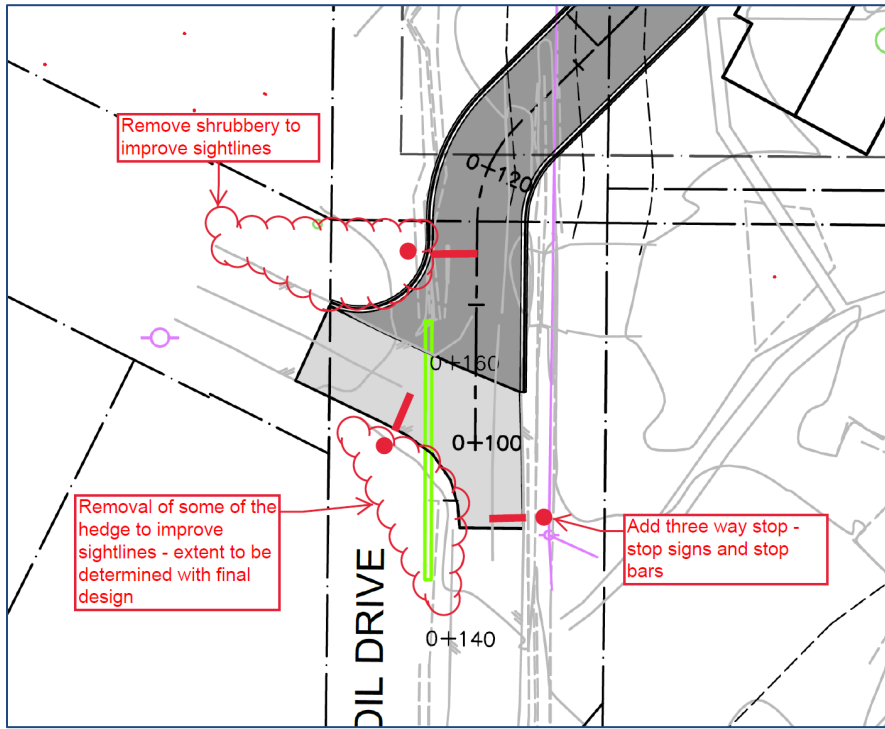


Figure 20: Daffodil Drive Access - mitigation measures

## 6. Conclusions

The following conclusions have been made based on the assessment and analyses documented herein:

1. The existing traffic volumes at the Daffodil Dr / Marine Dr intersection are well below the capacity of the intersection.
2. The estimated two-way trips for the proposed development are 21 vehicle trips in the AM peak hour and 27 vehicle trips in the PM peak hour.
3. The proposed development two-way traffic is split between the two access points, namely: at Westport Rd – there would be 7 vehicle trips in the AM peak hour and 9 vehicle trips in the PM peak hour; and at Daffodil Dr – there would be 14 vehicle trips in the AM peak hour and 18 vehicle trips in the PM peak hour.
4. Based on the trip distribution, the increase in two-way traffic on Daffodil Drive close to Marine Drive is 14 vehicles in the AM peak hour (one vehicle every 4 minutes) and 18 vehicles in the PM peak hour (one vehicle every 3 minutes).
5. The total two-way site traffic volumes as a result of the proposed development, in the AM and PM peak hours, represents a small increase to the overall volume at the intersection and is well within the operating capacity of the intersection.
6. The total future estimated traffic on Daffodil Drive is lower than the current two-way traffic on Cranley Drive.
7. The estimated development traffic will have no noticeable impact on current traffic operations at the Daffodil Rd/Marine Dr intersection. Therefore, it is concluded that no upgrades are needed at this intersection as a result of the development.
8. The access points at Daffodil Dr and Westport Rd are at existing locations. Proposed improvements to the accesses include stop signage, warning signage, shrub removal, and lighting.
9. The location and design of proposed pedestrian crosswalks in the vicinity of the development requires further discussion with the District.

Respectfully submitted,



June 11, 2023

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Howes Technical Advantage Ltd.

Permit to Practice # 1000164

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