

Clyde Avenue Residential Development Transportation Impact Assessment

Draft Report

Prepared for
EXECUTIVE GROUP

Date
May 2, 2018

Prepared by
Bunt & Associates

Project No.
04-17-0191



May 2, 2018
04-17-0191

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Dear Greg:

**Re: 660 Clyde Avenue & 657 and 675 Marine Drive – Residential Mixed Use Development
Transportation Impact Assessment – Draft Report**

Please find attached our Draft Report of Bunt & Associates' Transportation Impact Assessment (TIA) report for the proposed residential and commercial mixed-use development at 660 Clyde Avenue and 657/675 Marine Drive in the District of West Vancouver.

The purpose of this study was to assess the potential off-site impacts of the proposed development as an update to the TIA prepared by Bunt & Associates Engineering Ltd. (Bunt) for Executive Group in 2016 of an earlier and larger development proposal (130 dwelling units compared to the 89 units proposed with the new plan), including application of more up to date traffic count data collected by Bunt in October and November 2017.

We trust that the information provided in this report will be of assistance. Please contact us should you have any questions.

Yours truly,
Bunt & Associates


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1. INTRODUCTION

1.1 Background and Purpose

Executive Group is proposing to construct a mixed-use residential and commercial development with 89 multi-family residential units and approximately 293 square metres of commercial space at 660 Clyde Avenue, 657 and 675 Marine Drive in the District of West Vancouver, BC.

In 2016, Bunt & Associates Engineering Ltd. (Bunt) prepared a traffic study for this same site to evaluate an earlier and considerably larger development proposal by Executive Group with 130 residential units planned. This development was put on hold in 2017 pending the completion of the Marine Drive Local Area Plan and Guidelines OCP Amendment. This Plan has since been completed and the OCP Amendment was adopted by West Vancouver Council in June 2017.

Executive Group has retained Bunt once again to update the previous transportation impact assessment with the current development proposal (89 units and 293 square metres of commercial space) and with updated traffic counts collected in October and November 2017 at key intersection in the area.

1.2 Development Proposal

Exhibit 1.1 illustrates the proposed development site context. The development site occupies parcels 660 Clyde Avenue, 657 and 675 Taylor Way with frontage along both Marine Drive to the south and Clyde Avenue to the north. The site is located within the Park Royal – Clyde Avenue Sub-Area of the Marine Drive Local Area Plan as identified in Exhibit 1.1.

The development site includes the narrow strip of land on the south side of the existing Park Royal Shopping Centre parkade, and the land east of the parkade (presently developed with an older two-storey commercial building with a collection of small shops and services) and surface parking lots.

A total of 112 parking stalls and two (2) car-share vehicles available for use by residents are proposed for the development. Driveway access to the underground parking will be provided via the existing cul-de-sac off 6th Street.

1.3 Key Issues

The key issue for the proposed development is the limited vehicular access to this area from only a single intersection (Clyde Avenue at Taylor Way) which is further pressured by the periodic traffic congestion accessing the nearby Lions Gate Bridge. While vehicular access is pressured at times, the Clyde Avenue neighbourhood is very well accessed by other travel modes including walking and cycling, and excellent transit service along the adjacent Marine Drive corridor.



Exhibit 1.1
Site Context

04-17-0191

Clyde Avenue TIA
April 2018



On account of the traffic congestion in the area, particularly on southbound Taylor Way, the westbound left-turn movement from Clyde Avenue to southbound Taylor Way is prohibited during the weekday morning (7-9am) and afternoon (4-6pm) peak traffic periods. Left-turns from Taylor Way (onto Clyde Avenue) and right-turn entry / exit movements are permitted at all times.

As has been the case for many years, some motorists traveling westbound along Clyde Avenue toward the Clyde Avenue intersection currently use the internal ramp and driveway network of the Park Royal Shopping Centre parking structure (east of Taylor Way) for access to Marine Drive and other routes in the area.

1.4 Transportation Impact Assessment (TIA) Methodology

As previously shown on Exhibit 1.1, this development is located adjacent to the Park Royal Shopping Centre. Bunt has been involved with several development projects in this area – most recently, the proposed 752 Marine Drive mixed-use residential/commercial development. For consistency purposes, the analysis performed in this traffic study has been based on the same methodologies utilized in those previously published traffic studies. For documentation purposes, the parameters for the TIA have been presented below:

1.4.1 Study Area Intersections

Exhibit 1.2 illustrates the three (3) study area intersections evaluated in this study and the existing driveways currently serving the site. As shown, the study area covers the intersections of Taylor Way with (i) Keith Road, (ii) Clyde Avenue, and (iii) Marine Drive. It is noted these three analysis locations were the same intersections evaluated in Bunt's 2016 traffic study of the previous development proposal for this site.

1.4.2 Traffic Periods of Analysis

The traffic analysis considers the weekday PM and the Saturday peak hours which are typically the highest volume traffic periods in the area. Analysis of the weekday PM and Saturday afternoon peak traffic periods is consistent with Bunt's recent Transportation Impact Assessment study/report for the nearby 752 Marine Drive mixed-use development on the Park Royal South site.

1.4.3 Horizon Years

The traffic analysis evaluates three (3) scenarios, which are listed below:

1. Existing Conditions Year 2018;
2. Year 2021 (Opening Day) Total Traffic Conditions with the proposed Clyde Ave development;
3. Year 2026 (Opening Day plus Five Years) Future Horizon.

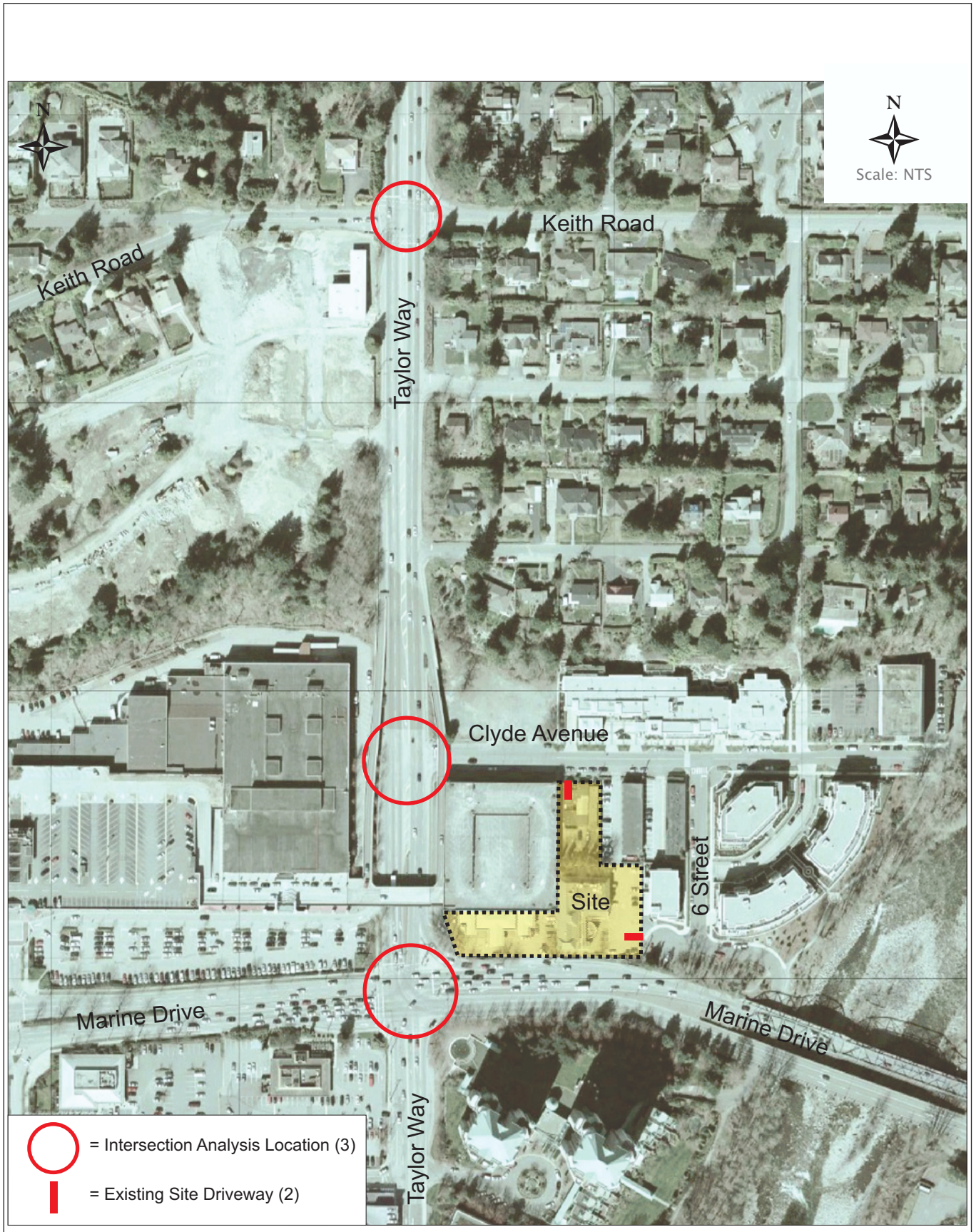


Exhibit 1.2 Study Area - Key Intersections

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Clyde Avenue TIA
April 2018



2. EXISTING CONDITIONS

2.1 Traffic Operations

The most significant influence to traffic operation in the study area is the progression of traffic to / from the Lions Gate Bridge, particularly the segment of Marine Drive between the Lions Gate Bridge and Taylor Way. The 3-lane Lions Gate Bridge has been operating with a “counter-flow” system for many years, generally providing for two southbound lanes during the weekday morning peak period and two northbound lanes during the weekday afternoon peak period. During off-peak conditions, the counter-flow operates based on prevailing traffic conditions.

Since September 2013, MoTI moved the Lions Gate Bridge operation to its Regional Transportation Management Centre (RTMC). With this improved operation centre, the counter-flow lane switch has been taking place more frequently, including during the weekday afternoon peak traffic period when the two lane southbound operation serves to reduce vehicle queuing and congestion on the southbound approaches to the Bridge from both the West and North Vancouver sides.

When the Bridge operates with a single southbound lane during peak traffic periods, vehicle queues regularly extend back from the Lions Gate Bridge to upstream segments of Marine Drive (on both the West Vancouver and North Vancouver sides). On the West Vancouver side, queues extend beyond Taylor Way at Marine Drive and as a result, southbound Taylor Way experiences backups that intermittently extend to the Upper Levels Highway (over a kilometer north of Marine Drive); such queues are more apparent when a surge of traffic associated with BC Ferry arrivals (from the Horseshoe Bay ferry terminal) arrive at Taylor Way.

Due to the close proximity of Clyde Avenue to the ‘Taylor Way at Marine Drive’ intersection (100 metres), southbound queues on Taylor Way will typically extend upstream past Clyde Avenue. This stacking condition affects westbound vehicles traveling along Clyde Avenue and attempting to turn left onto southbound Taylor Way, giving rise to the aforementioned morning and afternoon westbound to southbound left-turn prohibition at the Clyde/Taylor intersection.

2.2 Off-Site Intersection Traffic Counts and Observations

The traffic volumes that were used in this analysis were developed from the turning movement counts conducted by Bunt on Thursday, October 26, 2017 from 3pm to 6pm and Saturday November 28, 2017 from 1pm to 4pm. The overall weekday PM peak hour was 3pm to 4pm and the overall Saturday peak hour was 1pm to 2pm.

The observed traffic volumes from late 2017 were factored up by 1% to represent 2018 conditions, assuming an area traffic general growth rate of 1% per year which is discussed in more detail later in Section 5.3.

Exhibit 2.1 summarizes the resulting 2018 traffic volumes in the study area. The traffic volume summary includes observed illegal left-turn traffic (25 to 30 vehicles per hour) completing the westbound Clyde to southbound Taylor left-turn during the prohibited times through the weekday AM and PM peak traffic periods.

Exhibit 2.1 also identifies the volume of existing weekday PM and Saturday afternoon peak hour period traffic using the Park Royal parkade access to Clyde Avenue. As indicated, the westbound to southbound left-turn from Clyde Avenue into the parkade ranges from fewer than 15 vehicles per hour (one every four minutes) during the weekday AM peak period on up to 20-30 vehicles per hour during the weekday and Saturday PM peak periods, or on average one vehicle every two to three minutes.

2.3 On-Site Driveway Counts and Observations

The site is currently occupied by a dental office on the northerly portion and commercial uses on the southerly portions of the site. On Wednesday November 18, 2015, counts were performed at the site’s two (2) existing driveways to determine the number of vehicular trips currently being generated; the counts were performed during the AM and PM peak hours. **Table 2.1** summarizes the overall trip generation observed at the site. As shown, the existing uses on the project site currently generate 6 vph in the AM and 25 vph in the PM. The Saturday peak hour trip generation was estimated by using the PM peak hour trip generation and multiplying in by the ratio of Saturday peak hour to PM peak hour trip generation for office buildings in the Institute of Transportation Engineers Trip Generation Manual, 10th Edition which equates to 0.37.

Table 2.1 Existing Site Traffic

Access Location	AM PEAK HOUR			PM PEAK HOUR			SAT PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
Clyde Avenue	1	5	6	7	1	8	3	0	3
6th Street Cul-de-sac	0	0	0	8	9	17	3	3	6
Total Volumes	1	5	6	15	10	25	6	3	9

2.4 Traffic Analysis

The traffic analysis methodologies utilized in this traffic analysis is consistent with the methods used in the 2015 traffic study. The Synchro traffic operations analysis software package (Version 9) was used to assess the Existing (2018) PM and Saturday peak hour traffic volumes at the three (3) key intersections.

The analysis is based on the intersection capacity analysis procedures outlined in the Highway Capacity Manual (HCM) via Level of Service (LOS) and volume-to-capacity (v/c) ratio analyses.

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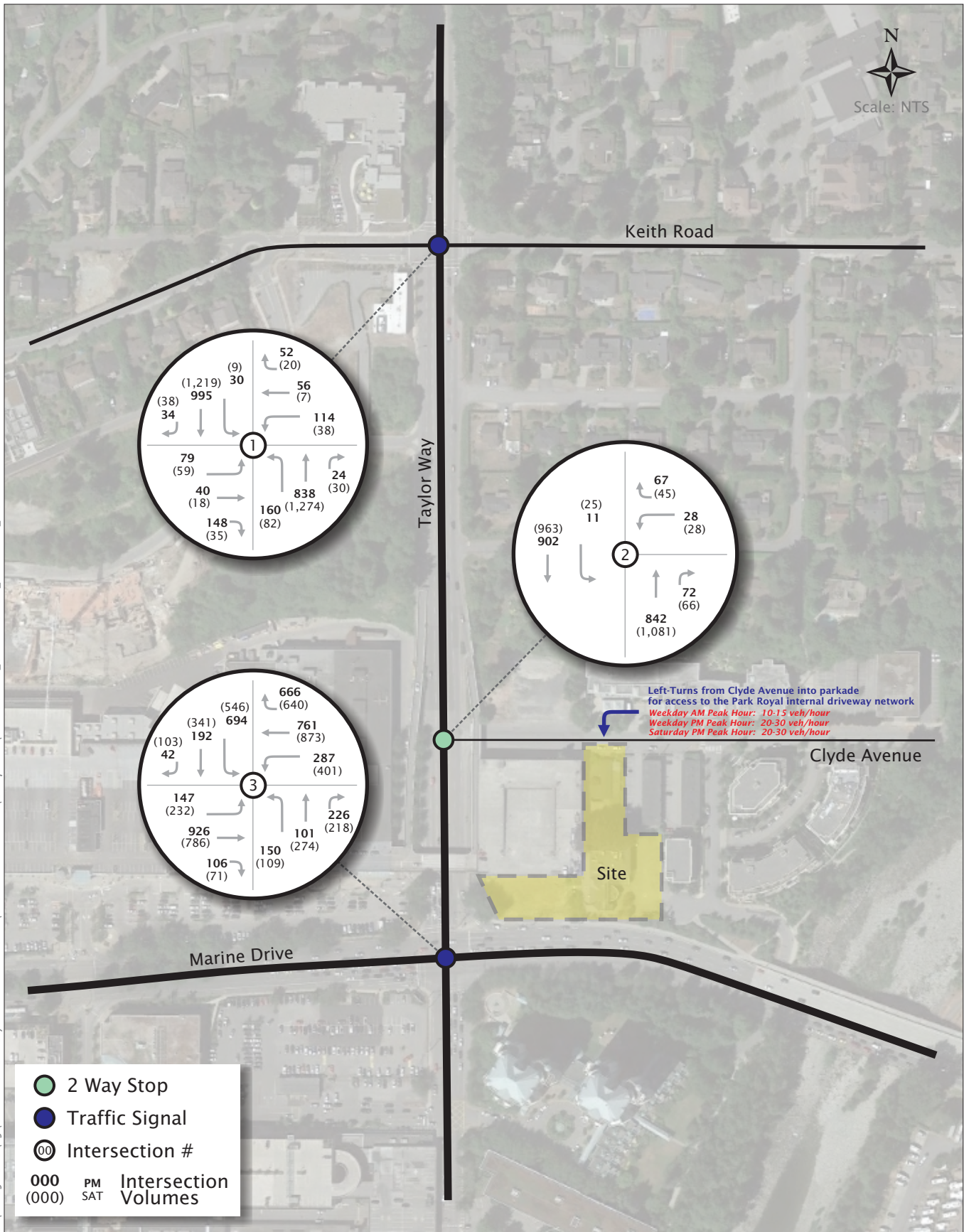


Exhibit 2.1 2018 Existing Peak Hour Traffic Volumes

04-17-0191

Clyde Avenue TIA
April 2018



For the LOS indicator, the following summarizes the range of delays (in seconds per vehicle) for signalized and unsignalized intersections:

- For signalized intersections, the Level of Service ranges from LOS 'A' conditions with minimal delay (< 10 sec per vehicle) through to LOS 'E' 'near capacity' conditions (> 55 sec to ≤ 80 sec per vehicle) and LOS 'F' 'over-saturated' conditions (> 80 sec per vehicle).
- For unsignalized intersections, the Level of Service ranges from LOS 'A' conditions with minimal delay (< 10 sec per vehicle) through to LOS 'E' 'near capacity' conditions (> 35 sec to ≤ 50 sec per vehicle) and LOS 'F' 'over-saturated' conditions (> 50 sec per vehicle).
- The calculated maximum vehicle queue lengths (95th percentile traffic volume conditions) in this analysis have been reported in terms of metres (m), where one vehicle length is typically in the range of 6-7m. It is noted the 95th percentile is a very conservative approach to evaluating degrees of stacking requirements and identifying queuing deficiencies; 85th percentile is typically used. However, due to the project's proximity to the Lions Gate Bridge and the levels of traffic congestion along Marine Drive (in the vicinity of the bridge), the 95th percentile queuing results were considered to be appropriate for this analysis.

Table 2.2 on the following page summarizes the Existing (2018) traffic operations for the study area. The HCM analysis worksheets have been included in this report as **Appendix "A"**.

Traffic performance for each individual traffic movement and the intersection's overall operation has been reported. It is important to note that the Synchro software does not take into account the extensive queues related to the Lions Gate Bridge.

As shown on Table 2.2, the intersection of Taylor Way at Marine Drive currently operates near capacity with LOS "D" for both the PM and Saturday peak hours. Furthermore, the analysis indicates some of the individual lane movements, particularly in the northbound and southbound lanes, are at capacity and experiencing extensive delays and queues. For example, the southbound left movement operates at LOS "E" with a corresponding 95th percentile vehicle queue of 135-140m during both peak hours; this is likely attributable to the number of motorists headed towards the Lions Gate Bridge. Additionally, the northbound shared left-through lane also operates at LOS 'F' during the Saturday peak hour. This is triggered by a high demand from the Park Royal Shopping Centre coupled with a relatively short northbound signal phase.

Table 2.2 – Capacity Analysis – Existing (2018) Intersection Operations

(i) Taylor Way at Keith Road; Taylor Way at Clyde Avenue

Intersection	Move-ment	PM Peak Hour			Saturday Peak Hour		
		V/C	HCM LOS	95 th % Queue (m)	V/C	HCM LOS	95 th % Queue (m)
Taylor Way (NS) at Keith Road (EW)	EBL	0.40	C	25	0.49	D	20
	EBT	0.11	C	15	0.11	C	10
	EBR	0.10	C	15	0.02	C	5
	WBT/L	0.61	D	50	0.37	D	15
	WBR	0.03	C	5	0.01	C	0
	NBL	0.49	A	20	0.29	A	5
	NBT/R	0.44	B	80	0.57	A	95
	SBL	0.09	A	5	0.04	A	0
	SBT/R	0.59	B	105	0.59	A	95
Overall		0.59	B	--	0.56	A	--
Taylor Way (NS) at Clyde Avenue (EW)	WBR/L	0.26	E	10	0.21	E	5

(ii) Taylor Way at Marine Drive

Intersection	Move-ment	PM Peak Hour			Saturday Peak Hour		
		V/C	HCM LOS	95 th % Queue (m)	V/C	HCM LOS	95 th % Queue (m)
Taylor Way (NS) at Marine Drive (EW)	EBL	0.52	D	35	0.75	D	55
	EBT	0.90	E	125	0.80	E	100
	EBR	0.07	D	0	0.05	D	0
	WBL	0.78	D	110	0.90	E	175
	WBT	0.40	C	70	0.45	C	90
	WBR	0.43	C	30	0.42	C	35
	NBT/L	0.70	E	50	0.97	F	100
	NBR	0.14	D	25	0.14	E	25
	SBL	0.85	E	135	0.83	E	140
	SBT/R	0.70	D	95	0.83	E	125
	Overall		0.84	D	--	0.92	D

Notes: V/C – Volume to Capacity Ratio, where 1.00 represents at-capacity
 LOS – Level of Service, where A is best with minimal delays and E/F is worst with long delays
 Queue – 95th Percentile Queue Length in metres, where 1 vehicle is assumed to be 6-7metres
 NBT/L – Northbound Shared Thru-Left Lane, etc.

As also shown on Table 2.2, the other study intersections along Taylor Way (north of Marine Drive) presently operate within capacity during the peak hours, provided that there are no southbound vehicle queues extending back from the Lions Gate Bridge. Furthermore, Taylor Way at Keith Road operates at LOS “B” and LOS “A” in the PM and Saturday peak hours, respectively.

3. PROPOSED DEVELOPMENT

3.1 Site Plan

The proposed development will consist of 89 residential suites (104,500 square feet of floor area) and 3,156 square feet of commercial space. The revised development proposal is considerably reduced in scale from the previous plan in 2015/16 with 130 units proposed.

The proposed Clyde Avenue development will provide a total of 112 parking stalls and two car-share spaces beneath the site. The underground parking will be accessed from the existing cul-de-sac located off 6th Street which connects to Clyde Avenue. There will be no direct access to Clyde Avenue.

3.2 Transit Access

The Park Royal area is very well serviced by public transit with several bus routes connecting West Vancouver, North Vancouver, Horseshoe Bay Ferry Terminal, and Downtown Vancouver. The approximate walking distance from the proposed development to the transit stops is as follows:

- Lions Gate Bridge on-ramp (Downtown service): 430 metres, or 6 minutes;
- Lions Gate Bridge off-ramp on Marine Drive (West Vancouver, Horseshoe Bay service): 280 metres, or 4 minutes;
- Park Royal North (West Vancouver, Horseshoe Bay service): 380 metres, or 5 minutes; and,
- Park Royal South (North Vancouver, Downtown service): 410 metres, or 6 minutes.

3.3 Pedestrian and Bike Access

District of West Vancouver conceptual plans for pedestrian and bike infrastructure improvements to the intersection of Marine Drive and Taylor Way identify a raised and separated bike lane along the north side of Marine Drive fronting the Clyde Avenue development and the east side of Taylor Way north to Clyde Avenue (buffered from adjacent traffic lanes with a railing). Adjacent to the raised bike lane and directly fronting the proposed development will be a widened sidewalk, typically 2.1 metres wide but ranging from 1.8 metres to as much as 5.0 metres.

In addition, improved pedestrian and bike crossing treatment is planned across the Taylor Way north leg of the Marine Drive intersection to increase the safety and awareness of this important connection for pedestrian and bike traffic.

4. PARKING

The following section of the report summarizes the project’s parking supply strategy as it relates to the District of West Vancouver’s Zoning Bylaws.

4.1 Zoning Bylaw Minimum Parking Requirements

For multi-family residential developments, the District of West Vancouver Zoning Bylaw requires the greater of 1 parking stall per unit or 1 parking stall per 83.6 square metres (900 square feet) of gross residential floor area. The residential floor area for the development is 104,500 square feet which yields a minimum parking supply requirement of 116 stalls for the 89 dwelling units. The existing site zoning requires 1 parking stall per 400 square feet of commercial gross floor area which equals a requirement of 8 stalls for the proposed 3,156 square feet of commercial space. The combined minimum parking supply requirement for the residential and commercial components is 124 spaces which is 12 more than the 112 parking spaces proposed.

This information is summarized in **Table 4.1**.

Table 4.1: Parking Requirement and Supply

Proposed Use	Density	Rate	No. of Required Parking Stalls	
			Minimum	Proposed
Residential	89 suites, 104,500 sf	Greater of “1 per unit” or “1 per 904 sf”	116	-
Commercial	3,156 sf	1 per 400 sf	8	-
Total			124	112 stalls plus 2 car shares

4.2 Rationale for Parking Variance

While the number of proposed parking stalls is twelve (12) stalls short of the Zoning Bylaw requirement, the project proposes to supply the future residents of the development with two (2) car-share vehicles. While the District of West Vancouver Zoning Bylaw presently does not feature any parking reduction allowance for car-share vehicles, other municipalities do recognizing that car-share has proven to be effective at reducing vehicle ownership in Metro Vancouver. The City of Vancouver, for instance, allows for a reduction of five (5) bylaw-required parking stalls for every car-share vehicle provided, provided that the number of car-share vehicles does not exceed 2% of the overall parking supply. The application of this car-share supply reduction would decrease the required number of parking stalls to 114 parking stalls.

Furthermore, there is an opportunity for the visitors of the residential units and customers of the commercial space to share the same pool of parking stalls as these two groups of people typically have their peak parking demand at different times of day and day of the week. For example, if the development provides one (1) parking stall per residential unit, 13 stalls would be available for residential visitors and commercial customers.

The proximity of the proposed development to multiple frequent bus transit routes, and to the many shops and services of the Park Royal Shopping Centre either by walking or cycling trips will further reduce reliance on private automobile trips by the future residents of the development, and with that reduced vehicle ownership. As evident from the findings of the Metro Vancouver Apartment Parking Study published in 2012, vehicle ownership and residential parking demand across Metro Vancouver near frequent transit service ranges from 0.89 to 1.06 stalls per unit. The District of West Vancouver C2 Zone parking requirement as applied to the proposed develop yields a supply ratio of 1.3 stalls per unit which is well above the range of the parking demand rates determined in the Metro Vancouver study.

As such, the proposed supply of 112 parking stalls and 2 car-share vehicles would correspond to the anticipated parking demand for the site. This parking and car-share supply plan appropriately reflects changing travel behavior, particularly in response to improved public transit service and the ever increasing popularity of four (4) different car share programs (Modo, Zipcar, Evo and car2go).

Taking into account the convenient access to public transit, the walking distance proximity of numerous shops and services at Park Royal Shopping Centre, and the added value of providing two car-share vehicles, it is our opinion that the parking supply of 112 stalls, supplemented with a 2 vehicle car-share program, will be sufficient to satisfy the parking requirements of the proposed development.

5. TRAFFIC IMPACT ANALYSIS

5.1 Trip Generation

The assumed trip generation rates for the proposed development are summarized in **Table 5.1**. These trip rates are consistent with the trip rates recently applied to the 752 Marine Drive TIA (*prepared by Bunt & Associates and dated April 4, 2018*), and are representative of trip rates observed by Bunt at the nearby West Royal Towers residential development. As the trip rates were obtained through driveway counts at the nearby Park Royal Towers in February, 2017, these rates are considered appropriate for use in this analysis. Similarly the trip generation rate assumed for the commercial proponent is the same as was used for Bunt's TIA study for 752 Marine Drive.

Table 5.1: Vehicle Trip Generation Rates

Use	AM PEAK HOUR			PM PEAK HOUR			SAT PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
Multi-Family Residential Uses Near Frequent Transit & Park Royal Shopping Centre (trips/unit)	20%	80%	0.25	70%	30%	0.31	46%	54%	0.23
Commercial (trips/1,000 sf)	62%	38%	0.64	50%	50%	2.61	50%	50%	3.82

To more properly quantify the project’s traffic impact on the study area (if any), Bunt has also considered the existing traffic currently generated by the site (see **Table 5.2**).

Table 5.2: Estimated Peak Hour Site Trip Generation

Use	AM PEAK HOUR			PM PEAK HOUR			SAT PEAK HOUR		
	In	Out	Total	In	Out	Total	In	Out	Total
Future Residential	4	18	22	20	8	28	9	11	20
Future Commercial	1	1	2	4	4	8	6	6	12
- Existing Uses (see Section 2.3)	-1	-5	-6	-15	-10	-25	-6	-3	-9
Net Added Traffic	4	14	18	9	2	11	9	14	23

As reported on Table 5.2, the proposed development is anticipated to generate a net addition of approximately 11 to 23 vph during peak periods. This modest increase in vehicle traffic translates to approximately one vehicle added car every three to five minutes to the area road system.

Compared to the previous development proposal in 2015/16 with 130 dwelling units, the current plan with only 89 dwelling units will reduce the net traffic added to the area road system during peak traffic periods by 10-15 vehicles per hour.

5.2 Trip Distribution

Exhibit 5.1 illustrates the site traffic distribution to / from the site during the PM and SAT peak hours which are the two peak hours which the remainder of the study will focus on.

5.2.1 Outbound

The outbound trip distribution for the proposed development is based on the observed traffic patterns for the existing Clyde Avenue neighbourhood except that the analysis assumes that all added traffic leaving the site will right-turn from Clyde Avenue onto northbound Taylor Way (i.e., no violation of the existing peak period left-turn restrictions presently in place). This traffic assignment reflects a worst-case scenario where the added traffic is distributed to *public roads only*.

Much more likely is that a portion of the site traffic will turn left from westbound Clyde Avenue into the Park Royal parkade and access Marine Drive west of Taylor Way in much the same way as do a number of trips leaving the Clyde Avenue neighbourhood do today. Based on the predicted volume of outbound trips for the proposed development ranging from fewer than 5 trips during the weekday PM peak hour, to nearly 15 trips during the weekday AM and Saturday PM periods, the volume of added traffic using the Park Royal parkade routing to avoid the prohibited left-turn from Clyde at Taylor Way will likely be no more 5-10 vehicles per hour.

5.2.2 Inbound

As arriving traffic to the site will not have turn restrictions, we have assumed the most direct path into the site, with most traffic passing through the Marine Drive at Taylor Way intersection.

Exhibit 5.2 illustrates the anticipated net additional trips from the site, which is based on the site's existing counts and the aforementioned trip generation / distribution assumptions.

5.3 Future Traffic Conditions

Exhibit 5.3 illustrates the estimated peak hour Total traffic (background + site) during the proposed development's opening year of 2021. Similarly to previous work that Bunt & Associates has been involved with at Park Royal, we have applied a 1% per annum background growth rate. We have also applied our volume forecasts for 752 Marine Drive which is currently undergoing its rezoning process.

To confirm the suitability of the assumed 1% per year background traffic growth rate, Bunt examined Ministry of Transportation and Infrastructure traffic count data for both Taylor Way (Count Station 15-005NS on Taylor Way immediately south of the Upper Levels Highway interchange) and Marine Drive (Count Station 15-006NS) on Marine Drive at the west end of the Capilano River bridge structure.

For Taylor Way, the Annual Average Daily Traffic (AADT) measure in Year 2003 was 34,499 vehicles per day total both directions. In Year 2016, this AADT measure was 31,981 vehicles per day, a decrease of 7% over this 13 year period. Similarly for Marine Drive at the Capilano River Bridge crossing, the 2003 AADT measure was 50,324 vehicles per day, while in Year 2010, the measured AADT had decreased to 45,553 vehicles per day, a decrease of nearly 10% over just 7 years. With this evidence of decreasing rather than increasing daily traffic on both Taylor Way and Marine Drive, the assumption of a continuing 1% increase per year for background traffic is considered to a conservative assumption.

Table 5.3 presents the overall traffic volumes for the most congested intersection in the study area (Taylor Way at Marine Drive) for 2021 Total (Opening Day) conditions.

Table 5.3: 2021 Total (Opening Day) Traffic Volumes: Taylor Way at Marine Drive

Traffic Volume	Volume	% of Total	Volume	% of Total
	PM Peak Hour		SAT Peak Hour	
Existing (2018)	4,300	94.96%	4,594	95.37%
2021 Background Growth	220	4.88%	216	4.48%
Project	8	0.16%	7	0.15%
2021 Total (Opening Day)	4,528	100.00%	4,817	100.00%

As shown, for 2021 conditions, the proposed development will account for well less than 1% of the peak period traffic volumes at the Marine Drive/Taylor Way intersection.

Exhibit 5.4 illustrates the estimated peak hour total traffic (background + site) during the five year horizon of 2026. **Table 5.4** presents the overall traffic volumes for Taylor Way at Marine Drive for 2026 Total (Five-Year Horizon) conditions.

Table 5.4: 2026 Total (Opening Day) Traffic Volumes: Taylor Way at Marine Drive

Traffic Volume	Volume	% of Total	Volume	% of Total
	PM Peak Hour		SAT Peak Hour	
Existing (2018)	4,300	90.45%	4,594	90.81%
2026 Background Growth	446	9.40%	458	9.05%
Project	8	0.15%	7	0.14%
2026 Total (Five-Year Horizon)	4,754	100.00%	5,059	100.00%

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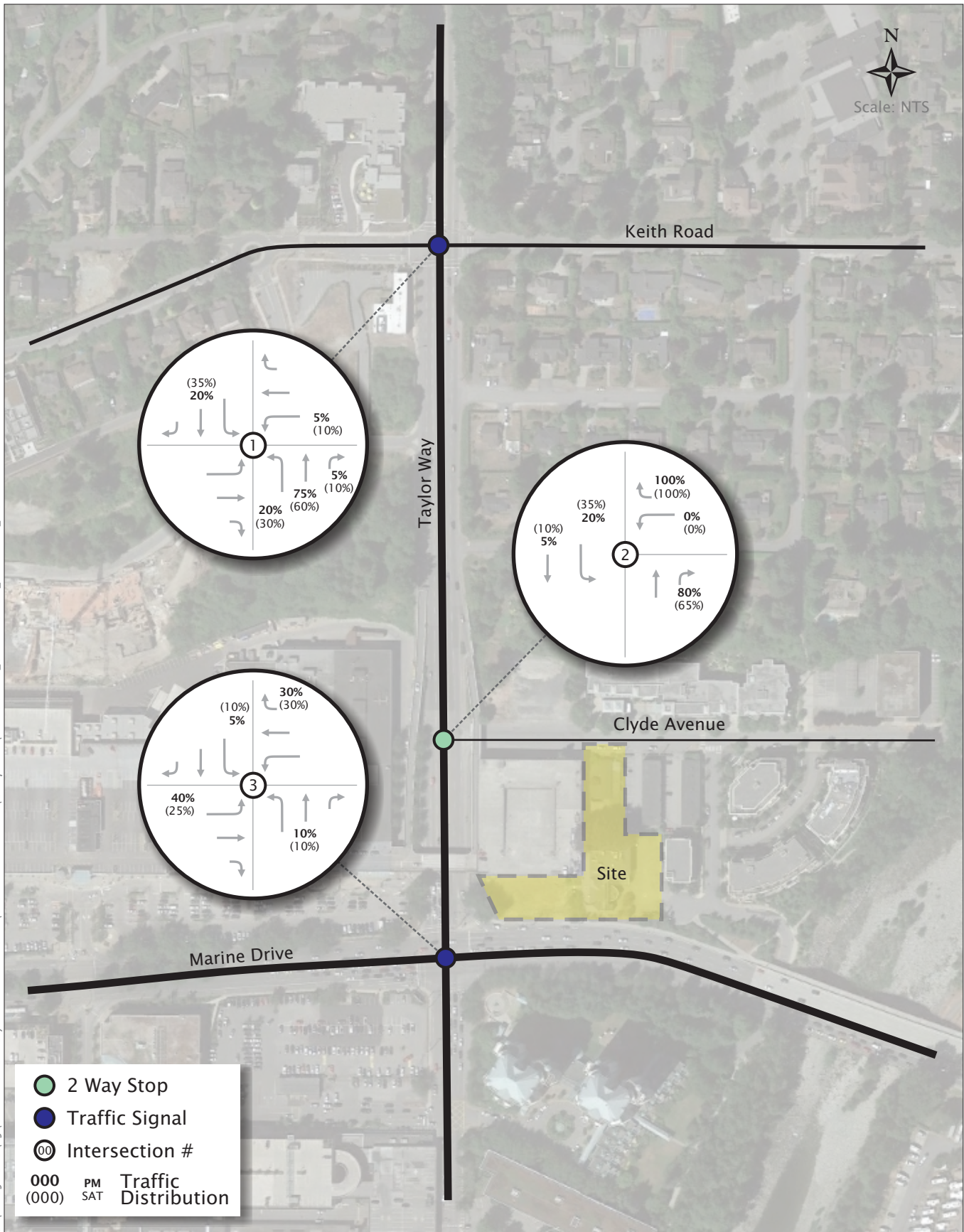


Exhibit 5.1 Site Traffic Distribution

Clyde Avenue TIA
April 2018

04-17-0191



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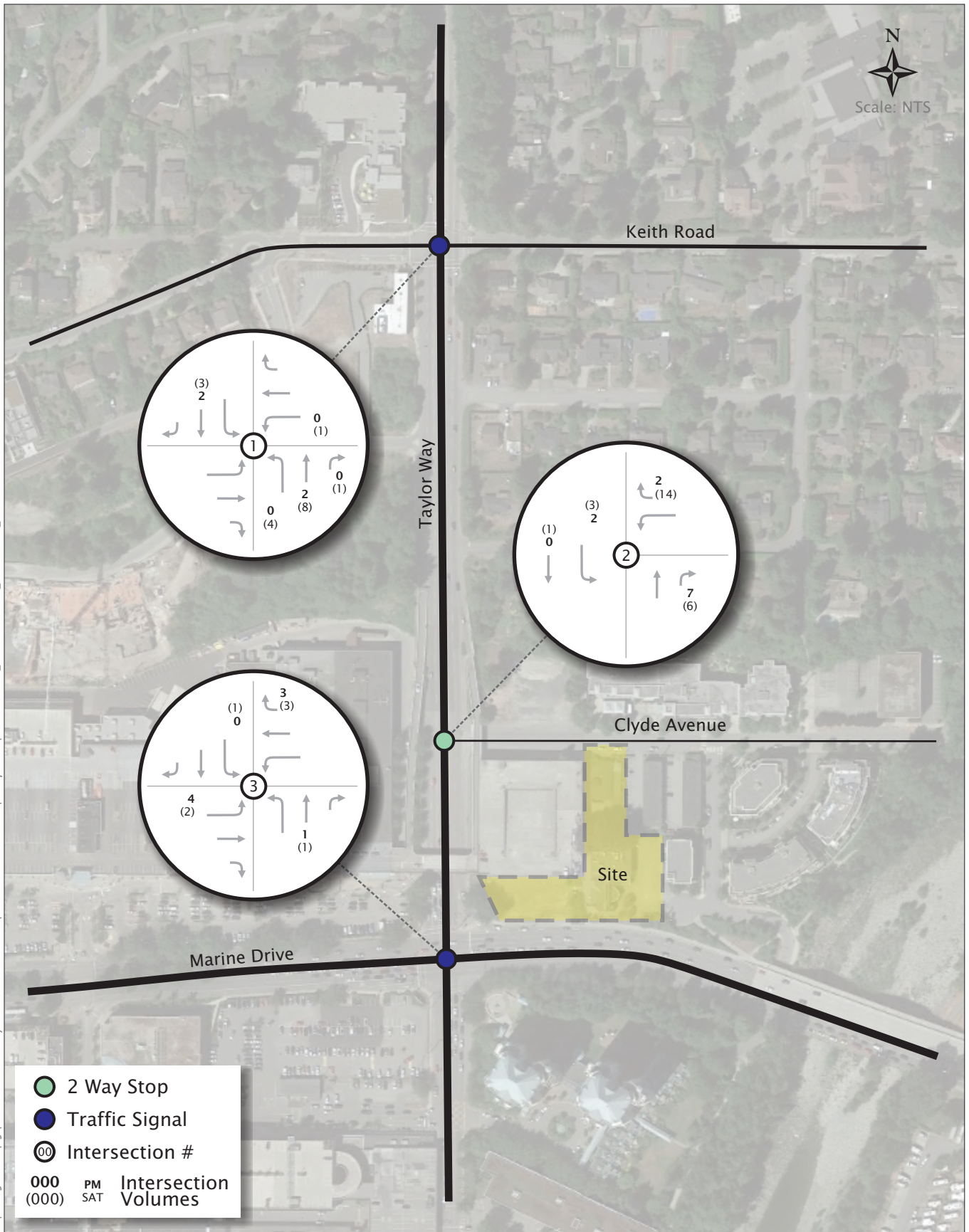


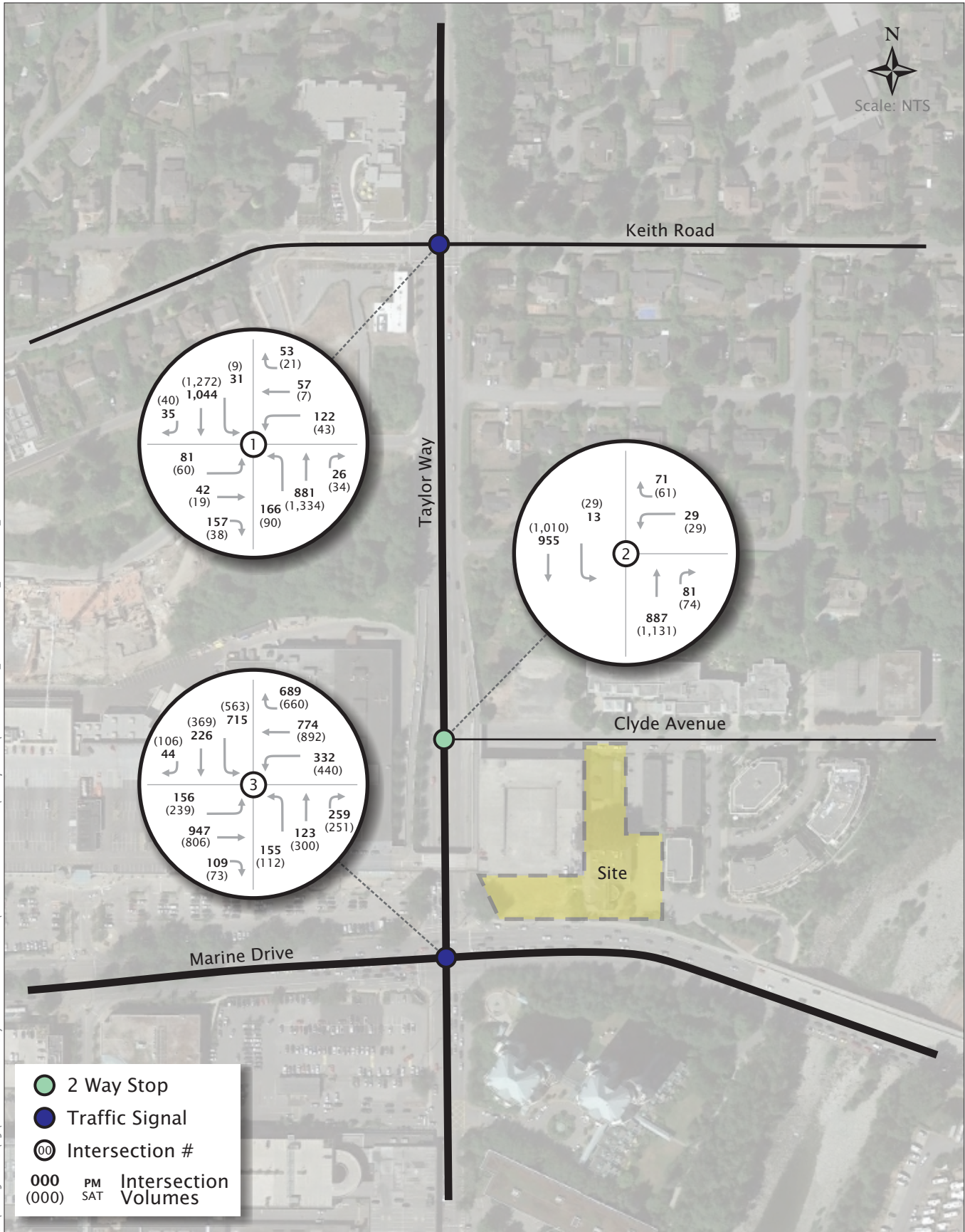
Exhibit 5.2 Project Added Peak Hour Traffic Volumes

04-17-0191

Clyde Avenue TIA
April 2018



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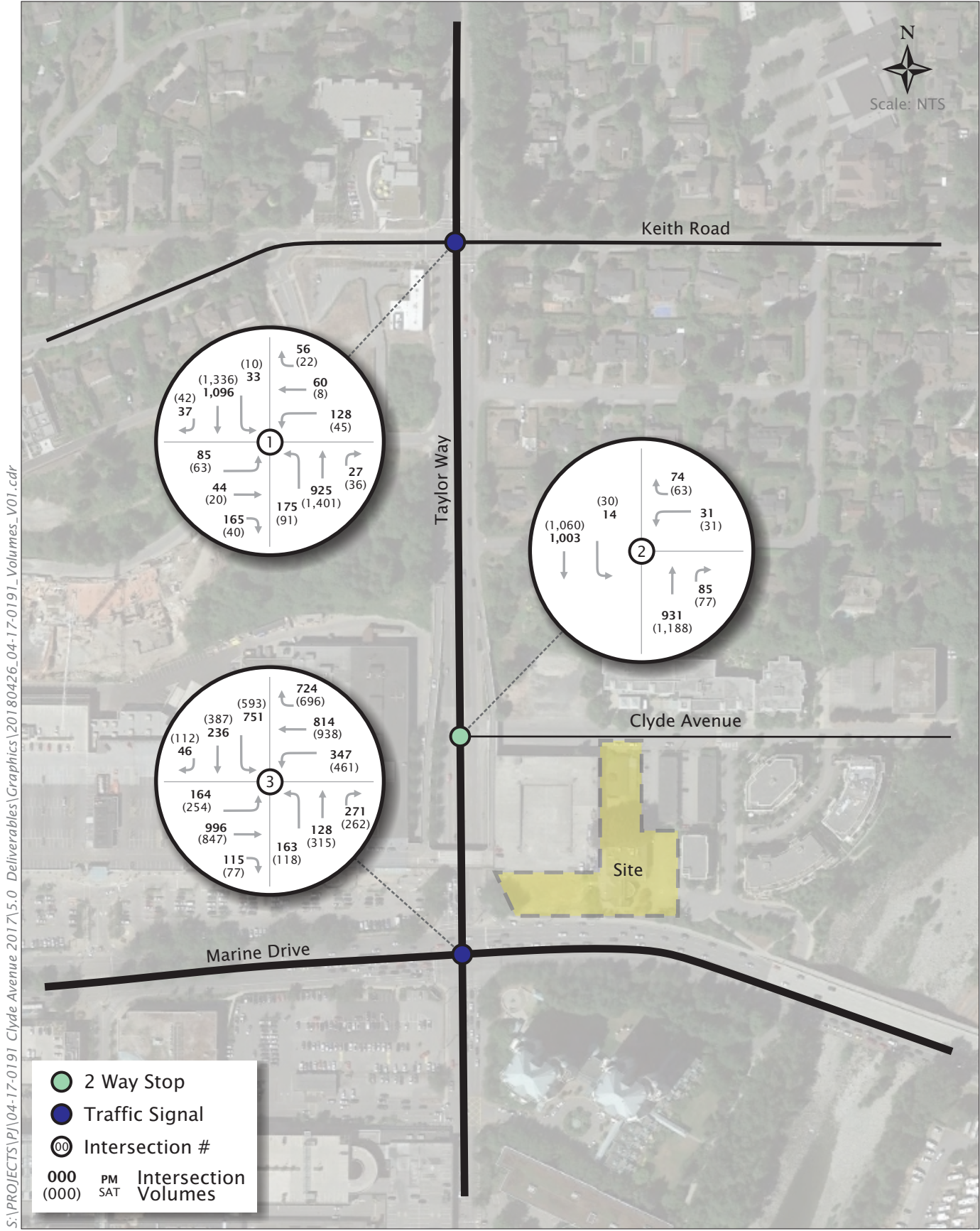
2021 Total (Opening Day) Peak Hour Traffic Volumes

Exhibit 5.3

04-17-0191

Clyde Avenue TIA
April 2018





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2026 Total (Five-Year Horizon) Peak Hour Traffic Volumes

Exhibit 5.4

5.4 Future Intersection Operations Analysis

Analysis has been performed to evaluate the 2021 Total (Opening Day) and 2026 Total (Five-Year Horizon) traffic operations for the study area. **Table 5.5** (next page) summarizes the intersection analysis results for the 2021 Total (Opening Day) scenario. As shown, all of the approach legs for the study area intersections are slightly busier, with similar or higher LOS, v/c ratios, and queues, when compared to the Existing (2018) analysis results. Traffic generated by the proposed development has a very little impact on the area road system, and the changes shown on Table 4.3 over Table 2.1 are predominantly due to the increase in background traffic volumes (1% per annum).

Table 5.6 summarizes the Synchro results for the 2026 Total (Five-Year Horizon) scenario for the PM and SAT peak hours.

In the 2026 Total (Five-Year Horizon) analysis, all of the approach legs for the study area intersections are slightly more pressured, with similar or higher LOS, v/c ratios, and queues, when compared to the Existing (2018) analysis results:

- Taylor Way at Keith Road intersection is still within capacity.
- The 2026 traffic operations for Taylor Way at Clyde Avenue are almost identical to the analysis results projected for 2021 conditions; the westbound right turn movement from Clyde Avenue to Taylor Way north is expected to operate at LOS "E" in both peak hours.
- The Taylor Way at Marine Drive intersection continues to operate at over capacity conditions. Vehicle routes in both West Vancouver and North Vancouver leading toward the Lions Gate Bridge routinely experience significant traffic congestion largely depending on whether the existing counter flow traffic operation on the Bridge is operating with a single southbound lane into Vancouver or with two lanes. The periodic arrival of traffic surges from the BC Ferries terminal at Horseshoe Bay can further exacerbate the congestion on the Lions Gate Bridge approach routes.

As previously described, the proposed development is anticipated to generate a net addition of 11 to 23 vph during peak hours is expected to have an insignificant impact to the operations of the surrounding intersections.

Table 5.5: Capacity Analysis – 2021 Total (Opening Day)

Intersection	Movement	PM Peak Hour			Saturday Peak Hour		
		V/C	HCM LOS	95 th % Queue (m)	V/C	HCM LOS	95 th % Queue (m)
Taylor Way (NS) at Keith Road (EW)	EBL	0.42	C	25	0.50	D	20
	EBT	0.11	C	15	0.12	C	10
	EBR	0.10	C	15	0.03	C	5
	WBT/L	0.64	D	50	0.41	D	15
	WBR	0.04	C	5	0.01	C	0
	NBL	0.53	B	20	0.33	A	5
	NBT/R	0.47	B	85	0.60	A	100
	SBL	0.10	A	5	0.05	A	0
	SBT/R	0.62	B	115	0.62	A	105
	Overall	0.62	B	--	0.59	A	--
Taylor Way (NS) at Clyde Avenue (EW)	WBR/L	0.30	E	10	0.23	E	5
Taylor Way (NS) at Marine Drive (EW)	EBL	0.56	D	35	0.76	D	55
	EBT	0.96	E	130	0.82	E	100
	EBR	0.07	D	0	0.05	D	0
	WBL	0.86	E	135	0.99	F	200
	WBT	0.41	C	75	0.46	C	95
	WBR	0.44	C	30	0.45	D	40
	NBT/L	0.75	E	55	1.06	F	110
	NBR	0.17	D	25	0.16	E	25
	SBL	0.86	E	140	0.86	E	155*
	SBT/R	0.75	D	105	0.85	E	130
	Overall	0.88	D	--	0.99	E	--

Notes: V/C – Volume to Capacity Ratio, where 1.00 represents at-capacity
 LOS – Level of Service, where A is best with minimal delays and E/F is worst with long delays
 Queue – 95th Percentile Queue Length in metres, where 1 vehicle is assumed to be 6-7metres
 NBT/L – Northbound Shared Thru-Left Lane, etc.

Table 5.6: Capacity Analysis – 2026 Total (Five-Year Horizon)

Intersection	Movement	PM Peak Hour			Saturday Peak Hour		
		V/C	HCM LOS	95 th % Queue (m)	V/C	HCM LOS	95 th % Queue (m)
Taylor Way (NS) at Keith Road (EW)	EBL	0.44	C	25	0.51	D	20
	EBT	0.12	C	15	0.12	C	10
	EBR	0.11	C	15	0.03	C	5
	WBT/L	0.66	D	55	0.43	D	20
	WBR	0.04	C	5	0.02	C	0
	NBL	0.59	B	30	0.36	A	5
	NBT/R	0.50	B	90	0.63	A	115
	SBL	0.11	A	5	0.06	A	0
	SBT/R	0.66	B	125	0.66	B	115
	Overall	0.65	B	--	0.61	B	--
Taylor Way (NS) at Clyde Avenue (EW)	WBR/L	0.36	E	10	0.27	E	10
Taylor Way (NS) at Marine Drive (EW)	EBL	0.63	D	40	0.78	D	60
	EBT	1.03	F	140	0.85	E	105
	EBR	0.08	D	0	0.05	D	0
	WBL	0.90	E	145	1.05	F	215
	WBT	0.43	C	75	0.50	D	100
	WBR	0.46	C	30	0.52	D	65
	NBT/L	0.88	E	60	1.14	F	115
	NBR	0.17	D	25	0.17	E	25
	SBL	0.88	E	160	0.89	E	170
	SBT/R	0.76	D	110	0.88	E	140
	Overall	0.92	E	--	1.04	E	--

*Notes: V/C – Volume to Capacity Ratio, where 1.00 represents at-capacity
 LOS – Level of Service, where A is best with minimal delays and E/F is worst with long delays
 Queue – 95th Percentile Queue Length in metres, where 1 vehicle is assumed to be 6-7metres
 NBT/L – Northbound Shared Thru-Left Lane, etc.*

5.5 Broader Regional Context – Traffic Impact

As discussed in Section 2.1, MoTI's Regional Transportation Management Centre (RTMC) has been improved the way the Lions Gate Bridge operates. The RTMC is linked to more cameras on the bridge and its north and south approaches, and has also connected to the City of Vancouver traffic cameras along Georgia Street, allowing operators to make better judgment when they need to switch the counter-flow lane direction.

With the RTMC, the counter-flow operation does no longer follow the typical AM and PM peak directions that favour Downtown Vancouver alone. Almost every afternoon during peak hour, the counter-flow lane is switched in favour of the North Shore, even for a few minutes, while causing the Downtown Traffic to queue.

This new change also goes hand in hand with the City of Vancouver's vision of reducing the number of vehicle trips into Downtown. Looking at the Lions Gate Bridge as truly a regional highway system, where both directions of traffic need to be given attention, is positive for the North Shore and especially traffic along Taylor Way. As described in Section 3.3, the densification of the Park Royal Area to provide more transit-related developments, in conjunction of a more efficient Lions Gate Bridge operation, will actually reduce the vehicle trips into Downtown Vancouver in the long run, which shall likely bring relief to the congestion we see today at the Taylor/Marine intersection.

6. SUMMARY

- (i) Executive Group is proposing a mixed used development consisting of 89 residential suites. A total of 112 parking stalls and two (2) car-shares available for use to residents are proposed for the development. Driveway access to the underground parking will be provided via the 6th Street cul-de-sac, southeast of the site.
- (ii) Taking into account the removal of vehicle trips associated with existing development on the site, the proposed development is anticipated to generate a net addition of 11 vehicles during the weekday PM peak hour and 23 vehicles during the Saturday peak hour. This increase in vehicular traffic translates to approximately one (1) added car every five minutes in the PM peak hour and one (1) added car every three minutes in the Saturday peak hour, which will have negligible impact to traffic operations on the area road network.
- (iii) Compared to the previous development proposed by Executive Group for this same site in 2015/16 with 130 dwelling units, the current plan with only 89 dwelling units will reduce the net traffic added to the area road system during peak traffic periods by 10-15 vehicles per hour.

- (iv) Left turns from westbound Clyde Avenue to southbound Taylor Way are restricted during the weekday AM and PM peak hours, limiting the accessibility to all residential developments and businesses along Clyde. However, some motorists have been observed to perform illegal left turns or use the eastern Park Royal parkade as an alternative route for access to the Marine Drive corridor.
- (v) The Taylor Way at Keith Road and the Taylor Way at Clyde Avenue intersections presently operate within capacity.
- (vi) The Taylor Way at Marine Drive intersection presently operates at capacity for all time periods analyzed (weekday PM and Saturday peak hours). The reduced vehicle throughput at the Taylor/Marine intersection due to the Lions Gate Bridge back-ups can result in extensive vehicle queues along southbound Taylor Way.
- (vii) The 2021 and 2026 analyses indicate the added trips by the proposed development are estimate to account for approximately 0.15% (i.e. less than one fifth of one percent) of the total traffic at Taylor Way and Marine Drive intersection. It is our opinion the added traffic to the study area (as a result of the proposed development) is considered to be insignificant. This is because the increase of traffic volumes (and resulting effect on the study area's traffic operations) for future 2021 and 2026 are primarily related to the increase in background traffic.