



**Attachment: F**

710 Caledonia Avenue  
**Transportation Impact  
Assessment**

Draft Report Version 1

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Prepared for

Caledonia Equity Limited Partnership c/o Chard Development Ltd.

Date

March 30, 2022

Project No.

04-21-0252

Permitted Practice No.

1000468



March 30, 2022  
04-21-0252

Byron Chard  
President & CEO  
Caledonia Equity Limited Partnership c/o Chard Development Ltd.  
Suite 500 – 509 Richards Street  
Vancouver, BC  
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Dear Byron:

**Re: 710 Caledonia Avenue  
Draft Traffic Impact Assessment Report**

Caledonia Equity Limited Partnership c/o Chard Development Ltd. retained Bunt & Associates to prepare a Traffic Impact Assessment (TIA) in support of the rezoning of proposed mixed-use development at 710 Caledonia Avenue and 1961 Douglas Street, Victoria, BC. Our Draft Report is provided herewith, it addresses the potential transportation impacts related to the proposed development.

We trust that our input with this TIA report will be of assistance. Please do not hesitate to contact us should you have any questions.

Yours truly,  
**Bunt & Associates**



Tyler Thomson, MCIP RPP PTP  
Associate | Senior Transportation Planner



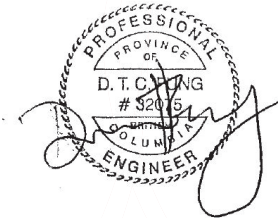
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cc: Mackenzie Biggar, Chard Development



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## EXECUTIVE SUMMARY

### Introduction

Caledonia Equity Limited Partnership c/o Chard Development Ltd. is proposing a mixed-use development with three residential towers: a condo (Building B), rental (Building C), and BC Housing (Building A) apartment towers with 21, 20, and 16 stories, respectively. The commercial use on the lower levels include office, retail, restaurant, grocery store, and daycare use. The site is located at 710 Caledonia Avenue and 1961 Douglas Street, Victoria in the southeast part of the Rock Bay portion of the Burnside-Gorge neighbourhood and is in close proximity to the Chinatown and the Downtown area. The location received a 'Walker's Paradise' walking score, 'Biker's Paradise' cycling score, and has great transit accessibility.

### Proposed Development Content

The development proposal calls for 451 residential units (145 condominium, 169 rental, and 137 Below Market Rental) and approximately 94,000ft<sup>2</sup> of commercial area (i.e., 32,376 ft<sup>2</sup> grocery store, 41,710 ft<sup>2</sup> office, 6,602 ft<sup>2</sup> restaurant/coffee shop, 6,915ft<sup>2</sup> retail and 5,9315 ft<sup>2</sup> daycare).

### Existing Traffic Conditions

Under existing conditions, the study intersections are shown to operate within acceptable performance thresholds in the AM and PM peak hours. In the PM peak hour, the eastbound movement at Douglas Street & Discovery Street intersection is noted to experience delays with LOS E but has low V/C ratio, and short queues. It is noted that southbound queues at the Douglas Street & Caledonia Avenue intersection may extend to/through Discovery Street at peak times.

### Site Traffic

The trip generation was based on a mix of locally observed rates, Institute of Transportation Engineers' (ITE) Trip Generation Manual rates, and ITE rates with Victoria mode split applied if sufficient dense multi-use urban data was not available. The proposed development is anticipated to generate approximately 180 and 300 vehicle trips in AM and PM peak hours, respectively. The site is likely to add significant traffic to the network, primarily on Discovery Street and Caledonia Street

### Future Traffic Conditions

Intersection operation analysis was completed for the existing and future total traffic conditions where the majority of movements are anticipated to operate within acceptable performance thresholds. The main problematic movement identified in the future scenario where the eastbound movement at the Douglas & Discovery Street intersection was experiencing LOS F in AM and PM peak hours, and high V/C ratio and lengthy queues in the PM peak hour. Signalization of this intersection was explored as a mitigation

measure. Resulting operations indicate that the Douglas & Discovery Street intersection will operate well within operation thresholds as a signalized traffic control.

A TAC signal warrant analysis was conducted to see whether the current two way stop control intersection at Douglas Street & Discovery Street would be warranted under existing, and/or future Total traffic conditions. The results of the analysis indicated that a full traffic signal would be warranted in the future Total traffic Conditions.

### Site Design Review

The development will meet the overall site minimum Bylaw requirements for bicycle parking provisions but are slightly deficient for vehicle parking in some specific land uses. Nonetheless, the parking provision is anticipated to meet market demands and TDM measures have been recommended to the developer to help address this variance. The loading vehicle provisions will meet the needs of the development. There are two parkades with one being accessed by Discovery Street and the other accessed by Caledonia Street. AutoTURN analysis confirmed that the site design and circulation is adequate for the anticipated design vehicles.

### TDM Measures

TDM measures including transportation marketing services, improved transit facilities, additional bike parking, bike maintenance facilities, end-of-trip facilities, and car share vehicles, spaces and memberships are recommended to support a reduction in vehicle trip and ownership and encourage more sustainable transportations modes.

### Recommendations

Based on the study findings, Bunt recommends the following:

- The Douglas & Discovery Street intersection traffic control be updated to a full signal to support future vehicle and pedestrian traffic in the area.
- Ensure TDM measures are in place to help support the Bylaw parking space variance.
- It is noted that some ramp grade transitions exceed 10%, it is requested that these grade transitions be reduced to a maximum of 10% to avoid vehicles from bottoming out. Convex mirrors are also recommended at the corners of the curved ramp.
- It is noted that the two loading vehicles located through the Discovery St access requires maneuvering across main parkade access area. It is recommended that the loading activity in this area be scheduled and monitored by the building manager and to avoid peak hours if possible.





## 1. INTRODUCTION

### 1.1 Study Purpose & Objectives

Caledonia Equity Limited Partnership c/o Chard Development Ltd. is proposing a mixed-use development at 710 Caledonia Avenue and 1961 Douglas Street in Victoria, BC, to replace the existing White Spot restaurant and Capital City Centre Hotel (currently used as social housing by BC Housing). The project will feature 3 high-rise mixed-use towers ranging from 16 to 21 stories, including a total of 451 residential units, and approximately 94,000 square feet of commercial space (including a grocery store, office, restaurant, etc.) and a daycare.

Bunt & Associates was retained by Caledonia Equity Limited Partnership c/o Chard Development Ltd. to assess the traffic and parking implications of the proposed development. This Transportation Impact Assessment (TIA) study will accompany Caledonia Equity Limited Partnership c/o Chard Development Ltd. rezoning application. The purpose of this study is to:

- Evaluate the transportation impacts of the proposed development on the adjacent road network;
- Review the development's parking strategy;
- Evaluate the proposed site plan, its proposed access and internal vehicle circulation; and,
- Present Transportation Demand Management (TDM) strategies for lowering the site's traffic and vehicle parking demands.

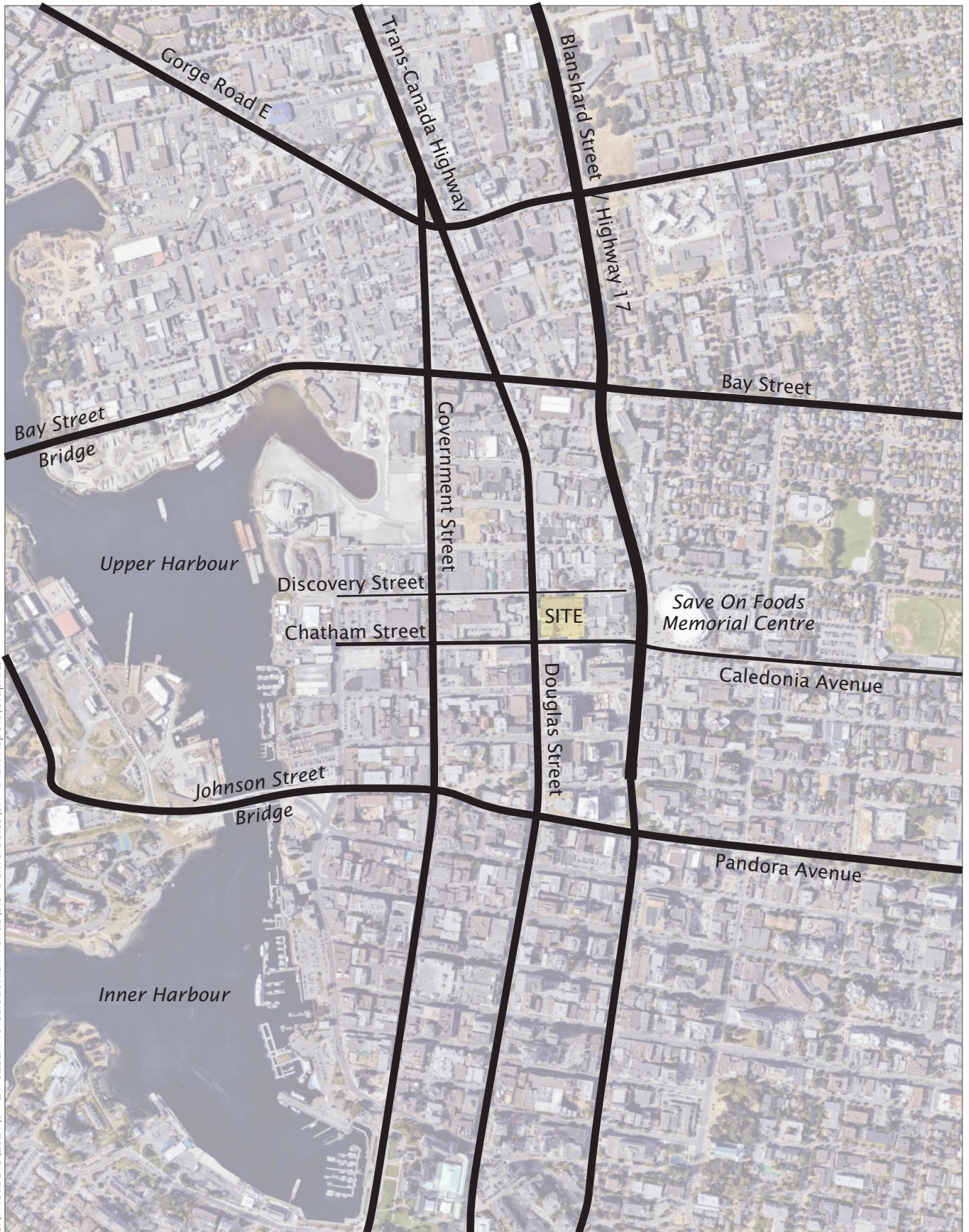
### 1.2 Study Scope & Area

The site location and corresponding study area are illustrated in **Exhibit 1.1**. The development site is bounded by Douglas Street to the west, Caledonia Avenue to the south, and Discovery Street to the north with adjoining commercial and office developments to the east. The study intersections are summarized in **Table 1.1**.

**Table 1.1: Study Intersections**

LOCATION	CONTROL
Discovery Street and Douglas Street	Unsignalized, stop control to Discovery Street
Chatham Street/Caledonia Avenue and Douglas Street	Signalized
Blanshard Street/Highway 17 and Caledonia Avenue	Signalized
Blanshard Street (Frontage Road) and Caledonia Avenue	Unsignalized, stop control to Blanshard Street (Frontage Road), Right-Turn Only
Blanshard Street (Frontage Road) and Discovery Street	Unsignalized, stop control to Discovery Street

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## Exhibit 1.1 Site Location

710 Caledonia Avenue TAMS  
04-21-0252 March 2022



### 1.3 Organization of Report

The report sections of the study have been organized as follows:

- **Section 1** presents the study purpose, study area, study scope, and details of the proposed development.
- **Section 2** describes the existing conditions at the site location, including current site characteristics, the existing road network, and existing traffic conditions on the adjacent street network.
- **Section 3** forecasts the future traffic volumes at the study area intersections with and without the proposed development and assesses the net impact of site-generated vehicle trips. A signal analysis was also completed.
- **Section 4** presents the parking and site plan analysis discussing the parking requirements & provisions along as site design.
- **Section 5** presents the TDM measures that can lower the site vehicle traffic and support the proposed parking supply by encouraging other modes of transportation such as transit, walking, and cycling.
- **Section 6** provides the summary of findings and recommendations of the study based on Bunt's analysis.

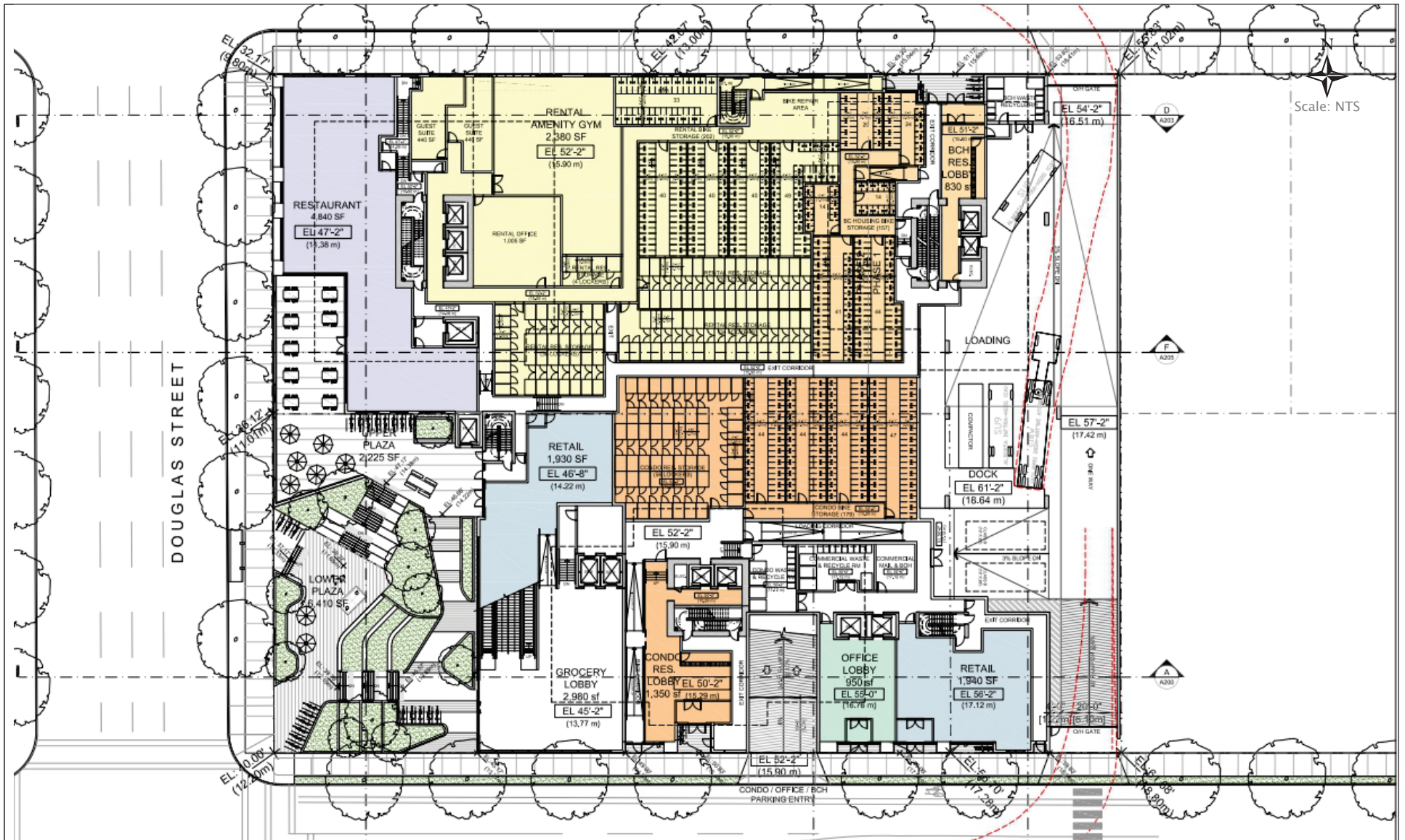
### 1.4 Proposed Development

The proposed development would consist of 3 residential towers over a shared podium with commercial use on the lower levels and two separate underground parkades. The three residential buildings consist of a condo, rental, and BC Housing tower, while the commercial components include Grocery, office, retail, restaurant/coffeeshop, retail, and daycare use. The proposed land uses are summarized in **Table 1.2**.

Vehicle access to the two separate parkades is on Caledonia Avenue and Discovery Street. The condominium, BC Housing, office, visitor, retail parking will be accessed by the Caledonia entrance. The rental apartment, grocery store, and daycare will be accessed by the Discovery entrance. The proposed site plan is shown in **Exhibit 1.2**.

**Table 1.2: Proposed Land Uses**

LAND USE	DENSITY (GSF)	DWELLING UNITS
Building B - Condo	140,375	145 units
Building C - Rental	145,440	169 units
Building A - Below Market Rental	107,057	137 units
Office	41,710	-
Retail	6,915	-
Restaurant/Coffee Shop	6,602	-
Grocery	32,376	-
Daycare	5,931	-
	<b>491,800</b>	<b>451 UNITS</b>



## Exhibit 1.2 Site Plan

710 Caledonia Avenue TAMS  
04-21-0252 March 2022



## 2. EXISTING CONDITIONS

### 2.1 Land Use

The development site is located at 710 Caledonia Avenue and 1961 Douglas Street adjacent to Chinatown and Downtown Victoria. The site is bordered to the west by Douglas Street, to the north by Discovery Street, to the east by commercial and office developments, and to the south by Caledonia Street. Today, the site has an existing White Spot restaurant and the Capital City Centre Hotel building. However, the restaurant has been permanently closed and the hotel is currently used as temporary housing. Nearby the site there are several land uses, such as mixed-use residential buildings, offices, and other commercial developments.

### 2.2 Existing Transportation Network

#### 2.2.1 Road Network

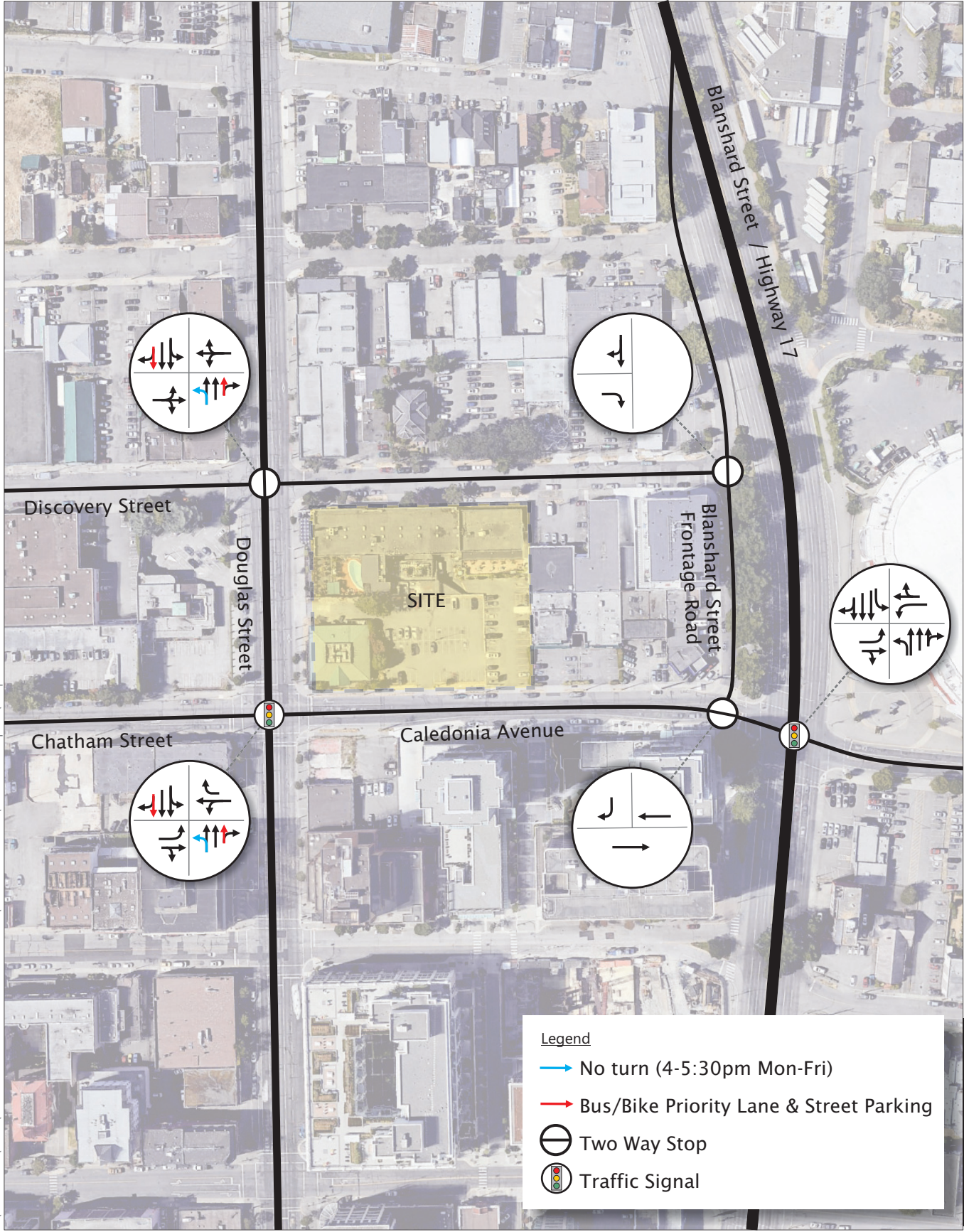
The site is located just outside the boundary of Downtown Victoria and the Central Business District. The study area as confirmed in consultation with City of Victoria Engineering Department (Transportation) staff, the adjacent road network and its laning configuration are illustrated in **Exhibit 2.1**. The Terms of Reference is attached of in **Appendix A** for reference.

Keys roads included in the study area include Discovery Street, Douglas Street, Chatham Street, Caledonia Avenue, Blanshard Street (Frontage Road), and Blanshard Street. Key characteristics of each of these roads are provided in **Table 2.1** below.

**Table 2.1: Existing Street Characteristics**

STREET	CLASSIFICATION	NUMBER OF TRAVEL LANES	POSTED SPEED	PARKING FACILITIES
Discovery Street	Local Road	2	50 km/h	2H parking
Douglas Street	Arterial Road	6	50 km/h	NB: No parking 3pm - 6pm, max 2H parking 9AM - 3PM (M-F); 9am - 6pm (Sat) SB: No parking 6am - 9am, max 2H parking 9AM - 6PM (M-S)
Chatham Street	Local Road	2	50 km/h	1H parking
Caledonia Avenue	Local Road	2	50 km/h	1H parking
Blanshard Street (Frontage Street)	Local Road	1	50 km/h	1H parking
Blanshard Street	Arterial Road	6	50 km/h	No on-street parking

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## Exhibit 2.1 Existing Road Laning and Control

710 Caledonia Avenue TAMS  
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## 2.2.2 Transit Network

The site has excellent public transit service. There are bus stops less than 100m from the site located at the Douglas Street and Discovery St intersection, along with numerous stops located within 400m (5-minute walk) and 800m (10-minute walk) from the site. The stops closest to the site service approximately eighteen bus routes which service all over Greater Victoria and the South Island region. The transit route and service details are provided in **Table 2.2** and **Table 2.3**.

The transit score for the site is 76/100, indicating that the site has “Excellent Transit”. **Exhibit 2.2** shows the existing bus stops, transit facilities, and bus routes located within 800m (10-minute walking distance) and 400m (5-minute walking distance). The closest bus stops to the site are located along Douglas Street.

**Table 2.2: Transit Stops within 800m Walking Distance of Site**

STOP LOCATION	DIRECTION	STOP #	ROUTES SERVICED	WALKING DISTANCE
Douglas at Discovery	Northbound/ Southbound	100146/ 100132	4, 11, 21, 22, 30, 31, 32, 44, 47, 48, 50, 53, 61, 65, 66, 70, 71, 72, 75, 99	<400m
Douglas at Herald/Fisgard	Northbound	100394	4, 11, 21, 22, 30, 31, 32, 47, 48, 50, 53, 61, 65, 70, 71, 72, 75	<400m
Douglas at Pandora - City Hall	Southbound	100082	4, 11, 21, 22, 30, 31, 32, 47, 48, 50, 53, 61, 65, 70, 71, 72, 75	<400m
Pandora at Blanshard	Westbound	100084	2, 27, 28	<400m
Quadra at Caledonia	Southbound	100145	6	<400m
Yates at Quadra	Westbound	100068	3, 6, 11, 14, 15, 22, 24, 25	<800m
Fort at Blanshard	Eastbound	100045	3, 6, 11, 14, 22	<800m
Douglas at View	Southbound	100042	4, 6, 7, 11, 22	<800m
Douglas at Pandora	Northbound	100076	4, 30, 31, 32, 44, 47, 48, 50, 53, 61, 65, 66, 70, 71, 72, 75, 99	<800m

**Table 2.3: Existing Transit Service Frequency**

ROUTE		STOP	WEEKDAY SERVICE SPAN		HEADWAY (MIN.)					
#	DIRECTION		START	END	AM	MID-DAY	PM	EVENING	WEEKEND	
4	Northbound/ Southbound	Douglas at Herald/ Fisgard	5:56 AM	12:10 PM	20	12	10-15	15	15	
11			6:12 AM	12:26 AM	12-16	15	11-15	19-20	15-16	
21			6:19 AM	12:24 AM	11-15	19-20	14-15	20-28	30	
22			6:10 AM	9:54 AM	30	30	25	30	30	
30/31			5:52 AM	1:03 AM	12-15	10-11	9-10	12	13	
32			6:45 AM	10:20 PM	40-60	65	20-30	90	60	
47			Douglas at Pandora - City Hall	6:16 AM	8:18 AM	30	-	-	-	-
48				6:19 AM	8:16 Am	30	-	-	-	-
50				5:31 AM	12:37 AM	15	15	17-18	14-15	15
53				6:18 AM	8:40 PM	40-80	80	60	80	120
61/65				5:13 AM	12:46 AM	30-50	40-60	15	60	60
70/71/ 72				5:30 AM	12:37 AM	14-30	13-30	3-15	20-40	10-30
75				5:06 AM	12:05 AM	20-22	30	14-30	60	60

**2.2.3 Cycling & Pedestrian Networks**

The site is optimally located to take advantage of the established bicycle and pedestrian facilities in and around Downtown Victoria. The City of Victoria is encouraging people to choose sustainable modes of transportation by providing accessible walking and cycling networks.

Cycling facilities in the City of Victoria, and specifically in Downtown Victoria, include All Ages and Abilities (AAA) facilities, signed bike routes, advisory bikes lanes, painted bike lanes, and buffered/painted bike lanes. AAA facilities are protected bike lanes, shared-use neighbourhood bikeways, and multi-use pathways. There exists AAA cycling facilities along Pandora Avenue, Vancouver Street, Fort Street, and Wharf Street within a comfortable cycling distance from the site. Additionally, there are painted bike lanes along Douglas Street, and Government Street.

The Galloping Goose Regional Trail is a popular regional multi-use path connecting pedestrians and cyclists from Downtown Victoria to neighbouring Saanich, and westward to View Royal, Colwood, Langford, Metchosin and Sooke. Further, the Galloping Goose also intersects the Lochside Regional Trail,

which travels north-south through the Saanich Peninsula. Both trails are popular amongst commuters and recreational cyclists and pedestrians. The site scored a 100/100 for cycling, indicating it is a “Biker’s Paradise” according to the Walk Score website.

In addition to the existing sidewalk network throughout Downtown Victoria, there is a variety of trails and pathways for pedestrian use in relative proximity to the site. Pathways and trails near Downtown include the Dallas Rd. Waterfront Pathway, E&N Regional Trail, Galloping Goose Regional Trail, Songhees Walkway, and Harbour Pathway. The location receives a 99/100 Walk Score, placing it in Walk Score’s “Walker’s Paradise” category. Walk Score is an on-line tool that assess the walkability of a location and assess how well a location is connected to bike lanes and trails (<https://www.walkscore.com/>). **Exhibit 2.3** illustrates the Active Transportation facilities in the area.



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## Exhibit 2.2 Active Transportation & Transit Amenities

710 Caledonia Avenue TAMS  
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## 2.3 Current Relevant Policies & Plans

The City of Victoria has developed sustainable mobility strategies presented in GO Victoria and the Victoria Strategic Plan, along with plans for improved transit with the Victoria Regional Rapid Transit Project. The following provides a high-level review of the relevant plans as they relate to the site.

### 2.3.1 Go Victoria

The GO Victoria sustainable mobility strategy provides a framework to guide transportation policies, priorities, and investments for the City's transportation networks. Solutions in the GO Victoria strategy include accessible mobility options, active transportation, high-occupancy modes like transit, and cleaner vehicles.

### 2.3.2 Victoria Strategic Plan – Sustainable Transportation

Sustainable transportation is the seventh strategic objective in Victoria's 2019-2022 Strategic Plan. Actions in the objective include increasing transit accessibility to the public, introducing a "floating" car share service to Victoria, and lowering speed limits on local neighbourhood streets.

### 2.3.3 BC Transit Victoria Regional Rapid Transit Project

The Victoria Regional Rapid Transit Project is a safe, reliable, attractive, and green alternative to traveling around the Capital Region. The rapid transit will be a higher level of transit service with improved travel times, frequency, and reliability compared to the regular bus service. Phase one of the rapid Bus is the Westshore line running from Downtown Victoria to Langford. The route will run along Douglas Street, the Trans-Canada Highway, Island Highway, and Goldstream Avenue. Phase 2 & 3 of the rapid transit project includes the McKenzie Line, which will connect Uptown and the University of Victoria, and the Peninsula Line, which connects Downtown Victoria to the Swartz Bay Ferry Terminal.

## 2.4 Existing Traffic Volumes

### 2.4.1 Traffic Data Collection Program

To document existing traffic volumes in the study area, Bunt conducted weekday AM (0700 – 0900), and PM (1500 – 1800) peak period traffic surveys and spot counts on Tuesday, September 28 and Wednesday, September 29, 2021, at the study intersections. It is noted that the traffic data was collected during the Covid-19 Pandemic and was important to determine if the data may have been suppressed by the pandemic's impact. Upon review of historical traffic volumes available in the area and discussion with the City staff, it was determined that a Covid adjustment factor was not necessary for this study given traffic volumes were within normal typical conditions on the network based on historic volumes. Table 2.4 summarizes the intersection traffic data collection dates and peak hours for the counts longer than one hour.

**Table 2.4: Summary of Available and Counted Traffic Data**

INTERSECTION	SOURCE	DATE OF COUNT	PEAK HOURS	
			AM	PM
Discovery Street / Douglas Street	Bunt	September 29 <sup>th</sup> 2021	07:00 – 09:00	15:00 – 18:00
Caledonia Avenue / Douglas Street	Bunt	September 28 <sup>th</sup> 2021	07:00 – 09:00	15:00 – 18:00
Caledonia Avenue / Blanshard Street	Bunt	September 28 <sup>th</sup> 2021	07:00 – 09:00	15:00 – 18:00
Discovery Street / Blanshard (Frontage) Street	Bunt <sup>(1)</sup>	September 29 <sup>th</sup> 2021	07:00 – 09:00	15:00 – 18:00
Caledonia Avenue / Blanshard (Frontage) Street	Bunt	September 28 <sup>th</sup> 2021	07:00 – 09:00	15:00 – 18:00
<b>OVERALL STUDY AREA PEAK HOUR</b>			<b>7:45 – 8:45</b>	<b>15:45 – 16:45</b>

(1) Volumes at the Discovery Street & Blanshard Street Frontage intersection were obtained through the balancing of volumes from the adjacent intersections. Hence, this is a conservative approach as some vehicle traffic source may be from the driveways in between.

The peak hours for the study area were determined to be from 7:45-8:45 AM and 3:45-4:45 PM.

#### 2.4.2 Peak Hour Traffic Volumes

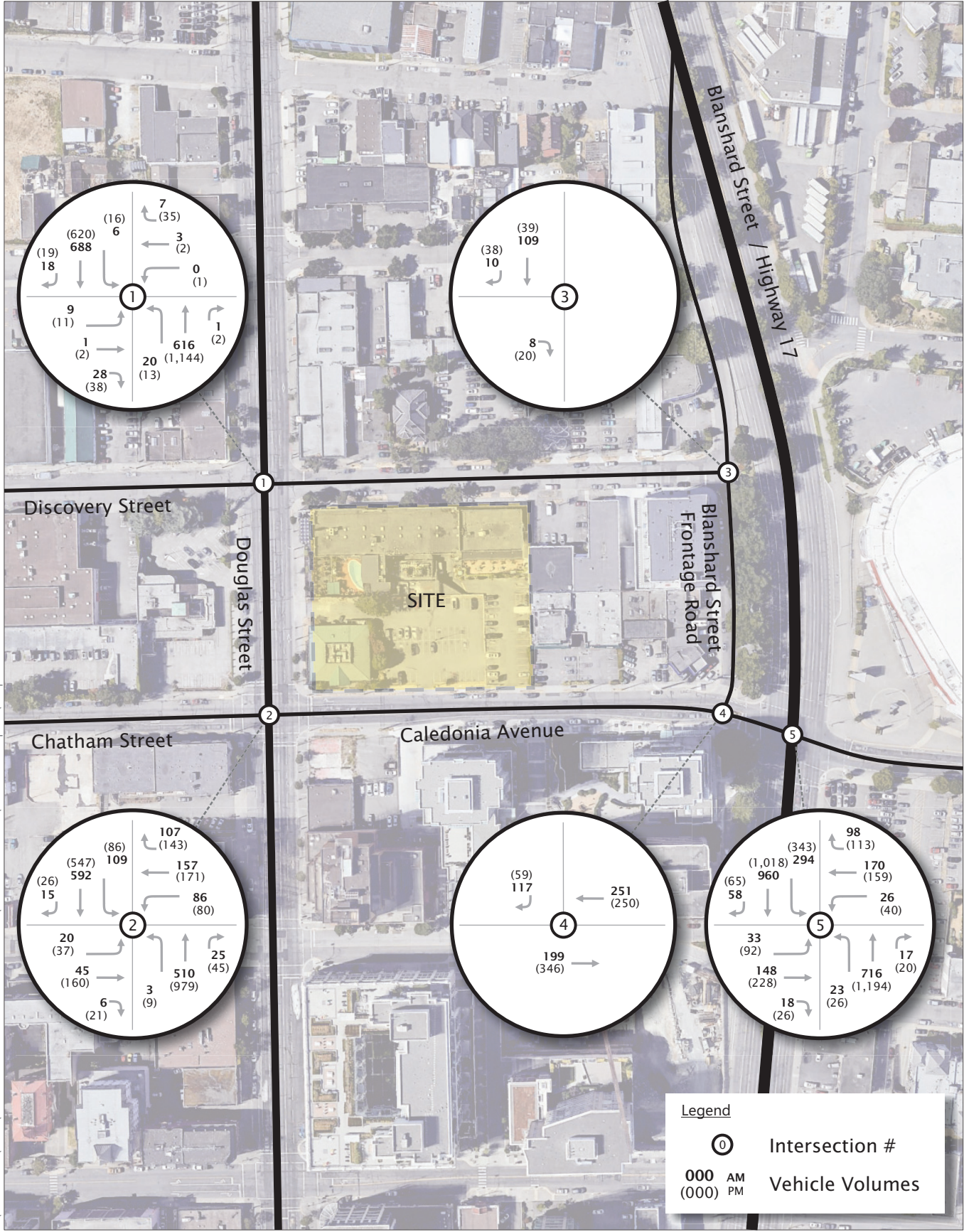
Table 2.5 presents a summary of the two-way peak-hour vehicle movements for the streets in the study area.

**Table 2.5: Existing Peak Hour Two-way Roadway Link Volumes**

ROAD LINK	PEAK LINK VOLUMES (VEH/HR)	
	AM	PM
Discovery Street	20	60
Douglas Street	1350	1850
Caledonia Avenue	570	690
Blanshard Street	2160	2830
Blanshard (Frontage) Street	120	80

The existing weekday AM and PM peak hour traffic volumes are presented in **Exhibit 2.3**.

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## Exhibit 2.3 Existing Peak Hour Vehicle Traffic Volumes



### 2.4.3 Existing Site Vehicle Trip Generation

As mentioned previously, the site is currently occupied by a White Spot restaurant that permanently closed during the Covid-19 pandemic and the Capital City Centre Hotel building which is now a temporary housing shelter for BC Housing. Based on this information, the existing site trips are likely very minimal with practically none captured in the existing volumes. However, it is important to consider the vehicle trips the site produced when the restaurant and hotel were operating simultaneously to get a sense of the change of trip generation and the magnitude of trips that the adjacent intersections were able to accommodate previously.

To estimate the vehicle trips that previously occurred at the site before the Covid-19 pandemic, the vehicle trips from the White Spot Restaurant and Capitol City Center Hotel were estimated using the Institute of Transportation Engineers (ITE) 11 Trip generation rates and local mode split data to be consistent with calculations for the anticipated future site trips (see section 3.12). Table 2.6 summarizes the previous existing site trip generation.

**Table 2.6: Previous Existing Site Trip Generation**

LAND USE	QUANTITY	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
White Spot Restaurant <sup>(1)</sup>	5,900 sq ft	11	10	20	12	7	19
Capitol City Center Hotel <sup>(2)</sup>	96 Rooms	23	18	41	27	26	53
<b>TOTAL</b>		<b>34</b>	<b>28</b>	<b>61</b>	<b>39</b>	<b>33</b>	<b>72</b>

(1) The quantity is estimated based on the building size on aerial GIS. Trip rates are based on ITE LUC 932 with Victoria Mode Split Applied to be consistent with future proposed restaurant trip generation calculations

(2) Trip Generation is based on ITE LUC 310 general urban/suburban setting.

Based on Table 2.6, the previous site trip generation was approximately 61 and 72 vehicle trips in AM and PM peak hours, respectively. This information is provided for context and is not accounted for in the future traffic analysis.

### 2.4.4 Existing Parking Demand & Supply

There exists on-street parking on Douglas Street, Discovery Street, Caledonia Street, and Chatham Street. Douglas Street has 2-hour parking restrictions from 9am to 6pm in the southbound direction, and 9am-3pm in the northbound direction. Discovery Street, between Blanshard Street and Douglas Street, has 24 on-street spaces with a 2-hour limit. The Discovery Street block between Douglas Street and Government Street has 28 on-street spaces with a 1-hour limit. South of the site, there exists 11 on-street spaces on Caledonia Street with a 1-hour limit. West of Douglas Street, Chatham Street has 17 on-street spaces until Government Street, also with a 1-hour limit.

No on-street parking demand counts were conducted as most customers, employees and residents will use the on-site parkade.

## 2.5 Existing Operations

### 2.5.1 Performance Thresholds

The existing operations of study area intersections and access points were assessed using the methods outlined in the Highway Capacity Manual (HCM) 6th edition, using the Synchro 11 analysis software (Version 11.1, Build 0, revision 8). The traffic operations were assessed using the performance measures of Level of Service (LOS) and volume-to-capacity (V/C) ratio.

The LOS rating is based on average vehicle delay and ranges from “A” to “F” based on the quality of operation at the intersection. LOS “A” represents optimal, minimal delay conditions while a LOS “F” represents an over-capacity condition with considerable congestion and/or delay. Delay is calculated in seconds and is based on the average intersection delay per vehicle.

**Table 2.7** below summarizes the LOS thresholds for the six Levels of Service, for both signalized and unsignalized intersections.

**Table 2.7: Intersection Level of Service Thresholds**

LEVEL OF SERVICE	AVERAGE CONTROL DELAY PER VEHICLE (SECONDS)	
	SIGNALIZED	UNSIGNALIZED
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: Highway Capacity Manual

The volume to capacity (V/C) ratio of an intersection represents ratio between the demand volume and the available capacity. A V/C ratio less than 0.85 indicates that there is sufficient capacity to accommodate demands and generally represents reasonable traffic conditions in suburban settings. A V/C value between 0.85 and 0.95 indicates an intersection is approaching practical capacity; a V/C ratio over 0.95 indicates that traffic demands are close to exceeding the available capacity, resulting in saturated conditions. A V/C ratio over 1.0 indicates a very congested intersection where drivers may have to wait through several signal cycles. In downtown and Town Centre contexts, during peak demand periods, V/C ratios over 0.90 and even 1.0 are common.

The performance thresholds that were used to trigger consideration of roadway or traffic control improvements to support roadway or traffic control improvements employed in this study are listed below:

#### Signalized Intersections:

- Overall intersection Level of Service = LOS D or better;
- Overall intersection V/C ratio = 0.85 or less;
- Individual movement Level of Service = LOS E or better; and,
- Individual movement V/C ratio = 0.90 or less.

#### Unsignalized Intersections and Roundabouts:

- Individual movement Level of Service = LOS E or better, unless the volume is very low in which case LOS F is acceptable.

In interpreting of the analysis results, note that the HCM methodology reports performance differently for various types of intersection traffic control. In this report, the performance reporting convention is as follows:

- For signalized intersections: HCM 6 output for overall LOS and V/C as well as individual movement LOS and V/C is reported. 95th Percentile Queues are reported as estimated by Synchro;
- For unsignalized two-way stop controlled intersections: HCM 6 LOS and V/C output is reported just for individual lanes as the HCM methodology does not report overall performance.

The performance reporting conventions noted above have been consistently applied throughout this document and the detailed outputs are provided in **Appendix B**.

#### 2.5.2 Existing Conditions Analysis Assumptions

The base synchro models were provided by the City along with the signal timings for the two existing traffic signals. Douglas Street was modelled as two lanes for both the northbound and southbound direction as the third lane is a bike/bus priority lane and parking. It is noted that vehicles will change to the third lane when making a right turn, however, our approach is conservative and this is anticipated to have very limited effect, if any. The Blanshard street frontage road was incorporated into the model and the peak hour factor (PHF), heavy vehicle percentages, and pedestrian/cyclist data was conservatively adjusted. The overall peak hour factor (PHF) for each intersection was calculated from the collected traffic data and applied to each movement if they were less than 0.92. The heavy vehicle percentages that were more than 2% were applied and numbers of crossing pedestrians and conflicting bicycles were also applied if higher than the existing model volumes.

### 2.5.3 Existing Operational Analysis Results

A summary of the existing traffic operations is presented in **Table 2.8**. For reference, detailed Synchro outputs are included in **Appendix B**.

**Table 2.8: Existing Traffic Operations**

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Douglas St & Discovery St (Two Way Stop Controlled)	OVERALL	A	-	-	A	-	-
	NB L	B	0.04	0	A	0.02	0
	NB TR	A	-	-	A	-	-
	EB LTR	D	0.22	5	E	0.39	10
	WB LTR	D	0.07	0	D	0.23	5
	SB LT	A	0.01	0	B	0.04	0
	SB TR	A	-	-	A	-	-
Douglas St & Caledonia Ave (Signalized)	OVERALL	C	-	-	B	-	-
	EB L	B	0.04	5	C	0.11	10
	EB TR	B	0.06	10	B	0.27	35
	WB LT	B	0.30	35	B	0.41	55
	WB R	B	0.15	5	B	0.26	25
	NB LT	B	0.39	45	B	0.61	85
	NB TR	B	0.42		B	0.64	
	SB LT	C	0.73	#80	C	0.73	60
SB TR	C	0.66	B		0.55		
Discovery St & Blanshard St Frontage (One Way Stop Controlled)	OVERALL	A	-	-	A	-	-
	EB R	A	0.01	0	A	0.02	0
	SB TR	-	-	-	-	-	-
Caledonia Ave & Blanshard St Frontage (One Way Stop Controlled)	OVERALL	A	-	-	A	-	-
	EB T	-	-	-	-	-	-
	WB T	-	-	-	-	-	-
	SB R	B	0.17	5	B	0.08	0
Blanshard St & Caledonia Ave (Signalized)	OVERALL	B	-	-	C	-	-
	EB L	C	0.12	10	D	0.45	25
	EB TR	B	0.31	30	C	0.53	60
	WB L	C	0.07	10	C	0.17	15
	WB TR	C	0.53	45	C	0.63	55
	NB L	B	0.10	10	B	0.10	10
	NB TR	C	0.51	40	C	0.61	70
	SB L	B	0.56	40	C	0.85	#95
	SB TR	A	0.38	35	A	0.37	35

Note:

For queue outputs in vehicle lengths, It is assumed 1 vehicle length is equal to 7m.

**Bolded** results indicate values that do not meet acceptable performance criteria.

"-" indicates a value not applicable to that particular intersection or movement.

"#" indicates that the 95<sup>th</sup> percentile volume exceeds capacity; therefore vehicle queue may be longer than reported.

Under existing conditions, the study intersections are shown to operate within acceptable performance thresholds in the AM and PM peak hours. In the PM peak hour, the eastbound movement at Douglas Street & Discovery Street intersection is noted to experience delays with LOS E but has low V/C ratio, and short queues. This is likely due to the heavy through vehicle volumes along Douglas Street and stop control configuration on Discovery Street requiring eastbound vehicles to wait until gaps are available. It is also noted that southbound queues at the Douglas Street & Caledonia Avenue intersection may extend to/through Discovery Street at peak times.

## 3. FUTURE TRAFFIC CONDITIONS

### 3.1 Traffic Forecasts

#### 3.1.1 Background Traffic Forecasts

Background traffic is traffic that would be present on the road network even if the site did not develop. Consistent with previous studies conducted in the area and as agreed upon with City staff, Bunt assumed a 0% annual growth rate to the existing traffic volumes. Since the background volumes are expected to be consistent with existing volumes with shifting travel behaviours (i.e., people switching to transit or cycling, and increased working from home), only include one future horizon year is analyzed: Opening Day Full Build-Out. The opening day background traffic forecasts are assumed to be consistent with existing volumes which was previously presented in Exhibit 2.3.

#### 3.1.2 Site Traffic

##### *Trip Generation*

The future site trip generation was estimated based on the Institute of Transportation Engineers (ITE) 11 Trip generation rates, previous Bunt survey data, and/or local mode split data. The following rates were utilized for the following land uses:

- Residential ITE LUC #231 Mid-rise Ground Floor Commercial to account for the residential units, retail, and coffee shop,
- Bunt Grocery Store Survey Data from the Save-on Foods on 1010 Pandora Avenue for the Grocery Use,
- Bunt Office/Retail Survey Data located at 1802 Douglas Street for the Office Use,
- Bunt Urban Daycare Survey Data for the Daycare use; and,
- Restaurant ITE LUC #932 casual high turnover sit down restaurant with City of Victoria mode split incorporated for the restaurant use.

It is noted that the proposed residential towers are considered high-rise buildings, however, the ITE 11 database for the high-rise ground floor commercial use has limited sample sizes while the mid-rise ground floor commercial use had a reasonable sample size for the urban setting. Typically, mid-rise residential towers also see higher trips rates than high-rise residential towers. For these reasons, utilizing ITE LUC #231 Mid-rise Ground Floor Commercial for the estimated site trips is considered an appropriate and more conservative approach. The retail and coffeeshop trips were assumed to be inclusive in the commercial ground floor component due to the downtown and walkable location and the high density mixed-use nature of the site. It is expected that the coffeeshop will be utilized primarily by residents, employees and local visitors of the development, and nearby pedestrian traffic as opposed to being a destination for vehicle traffic.

Survey data collected by Bunt in urban settings for grocery, office/retail, (both local data for sites within City of Victoria) and daycare use (Metro Vancouver locations) was utilized for the estimated trip rates as they are representative of the mode split of the proposed development.

The trips rates for the restaurant use utilized the ITE LUC #932 casual high turnover sit down restaurant trip rates with the City of Victoria mode split adjustment applied to reasonably estimate the trip rates in an urban setting in Victoria (high non-driver mode split). The Victoria mode split was based on the 2017 CRD Origin-Destination Survey presented in the *GoVictoria April 2019 Draft Mobility Profile*, as shown in **Figure 3.1**.

**Figure 3.1: Victoria Mode Split**

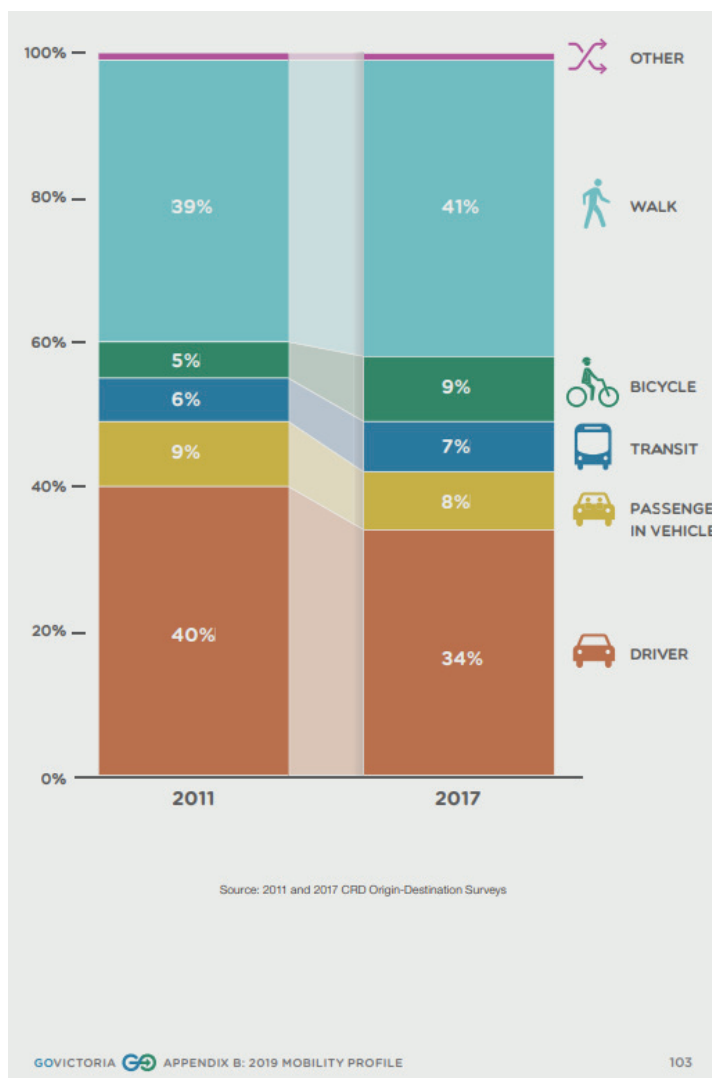


Table 3.1 summarizes the peak hour vehicle trip rates utilized for proposed development land uses.

**Table 3.1: Peak Hour Vehicle Trip Rates**

LAND USE	UNITS	AM PEAK HOUR RATES			PM PEAK HOUR RATES		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Rental Residential <sup>(1)</sup>	145	39%	61%	0.20	44%	56%	0.28
Market Residential <sup>(1)</sup>	169						
BC Housing <sup>(1)</sup>	137						
Office	41,710 GFA	95%	5%	0.18	5%	95%	0.37
Grocery	32,376 GFA	44%	56%	1.37	52%	48%	3.84
Daycare	37 Children	52%	48%	0.57	48%	52%	0.65
Restaurant <sup>(2)</sup>	4,840 GFA	55%	45%	3.43	61%	39%	3.24

(1) Residential trip rates include the estimated retail and coffee shop trip generation components of the development

(2) Restaurant trip rates were derived from ITE LUC 932 rates after applying Victoria mode split

Table 3.2 summarizes the anticipated future site generated vehicle trips for the proposed development based on the above rates.

**Table 3.2: Estimated Peak Hour Site Vehicle Trips**

LAND USE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Rental Residential	12	18	30	18	23	41
Market Residential	13	21	34	21	26	47
BC Housing	11	17	27	17	21	38
Office	7	0	7	1	14	15
Grocery	19	24	42	62	57	119
Daycare	11	10	21	12	13	24
Restaurant	9	8	17	10	6	16
<b>TOTAL TRIPS</b>	<b>81</b>	<b>98</b>	<b>179</b>	<b>140</b>	<b>161</b>	<b>301</b>
<b>PREVIOUS ESTIMATED SITE TRIPS</b>	<b>34</b>	<b>28</b>	<b>61</b>	<b>39</b>	<b>33</b>	<b>72</b>
<b>NET NEW TRIPS</b>	<b>47</b>	<b>70</b>	<b>118</b>	<b>101</b>	<b>128</b>	<b>229</b>

\*Totals may not add up exactly due to rounding

The proposed development is anticipated to generate approximately 180 and 300 vehicle trips in AM and PM peak hours, respectively. Considering the previous site trip generation, this would equate to net new vehicle increase of approximately 120 and 230 vehicle trips in AM and PM peak hours, respectively. As a conservative approach, the Total Site Trips were utilized for the future operations assessment given the existing uses on site have not been as active as they were previously.

### *Trip Distribution & Assignment*

The site trip distribution is based existing traffic patterns and engineering judgement. Based on the existing volumes, a high portion of trips go towards downtown: Blanshard South & Douglas South. However, since the site is located in close proximity to downtown, the likelihood of people driving to and from downtown is very low. People would likely walk, bike, or transit to the downtown core area on most occasions. Based on the regional map and transportation network, the majority of vehicle trips are anticipated to mostly be to and from the north (Douglas North, Blanshard North) which is consistent with the existing inbound AM and outbound PM trips. The trip distributions were adjusted based on these assumptions and is summarized in **Table 3.3** and **Exhibit 3.1 & Exhibit 3.2**. **Table 3.4** summarizes the net change in vehicle traffic volumes at the study intersections while **Exhibit 3.3** presents the site traffic forecasts.

**Table 3.3: Estimated Trip Distribution**

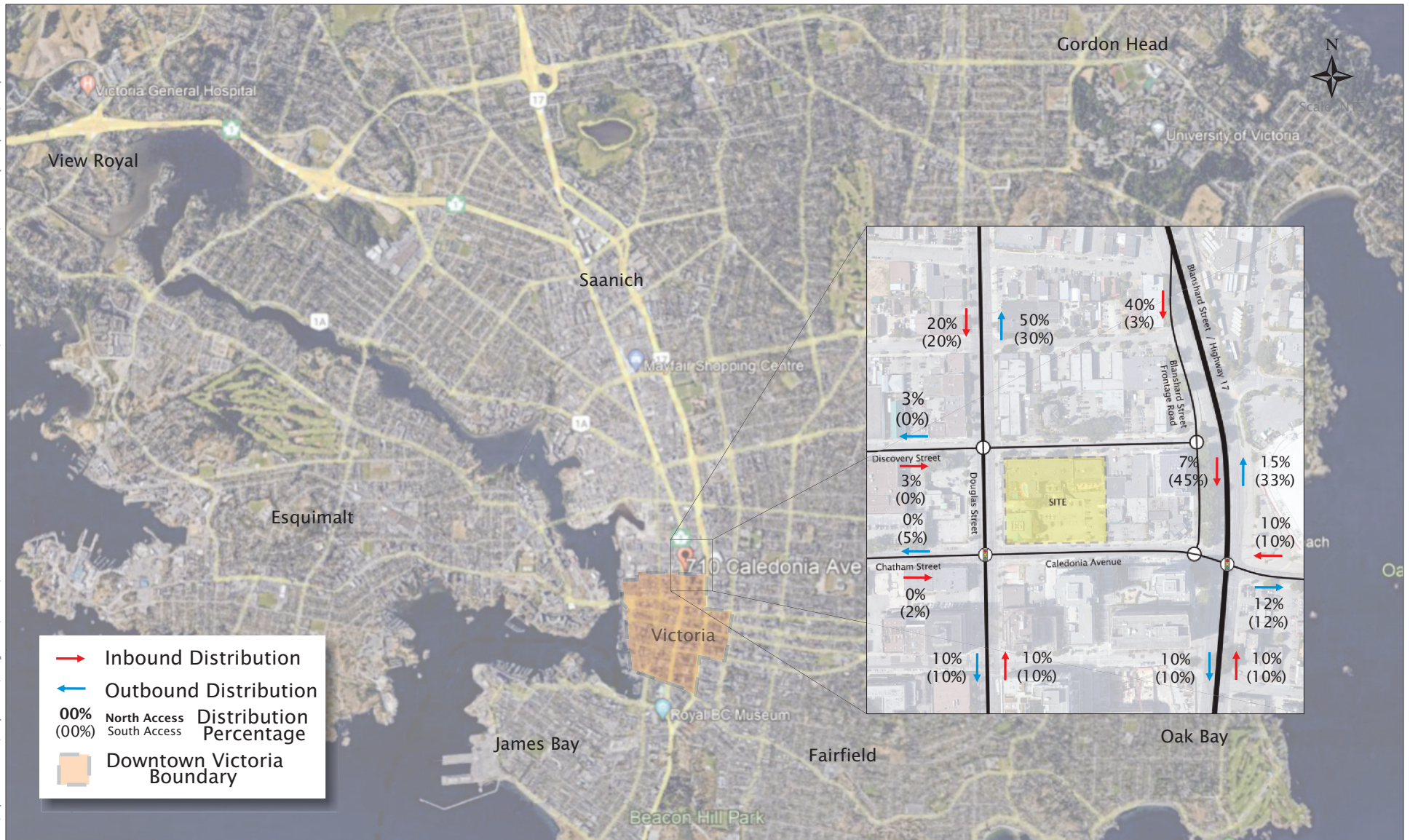
ORGIN/DESTINATION	AM PEAK HOUR		PM PEAK HOUR	
	IN (%)	OUT (%)	IN (%)	OUT (%)
	NORTH ACCESS/ SOUTH ACCESS	NORTH ACCESS/ SOUTH ACCESS	NORTH ACCESS/ SOUTH ACCESS	NORTH ACCESS/ SOUTH ACCESS
Douglas St (North)	20/20	50/30	20/20	50/30
Blanshard St Frontage	40/3	0/0	40/5	0/0
Blanshard St (North)	7/45	15/33	5/40	15/35
Discovery St	3/0	3/0	5/0	3/0
Chatham St	0/2	0/5	0/5	0/5
Caledonia St	10/10	12/12	10/10	12/10
Douglas St (South)	10/10	10/10	10/10	10/10
Blanshard St (South)	10/10	10/10	10/10	10/10
<b>TOTAL</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Table 3.4: Net Change in Future Intersection Vehicle Volumes with New Site Trips**

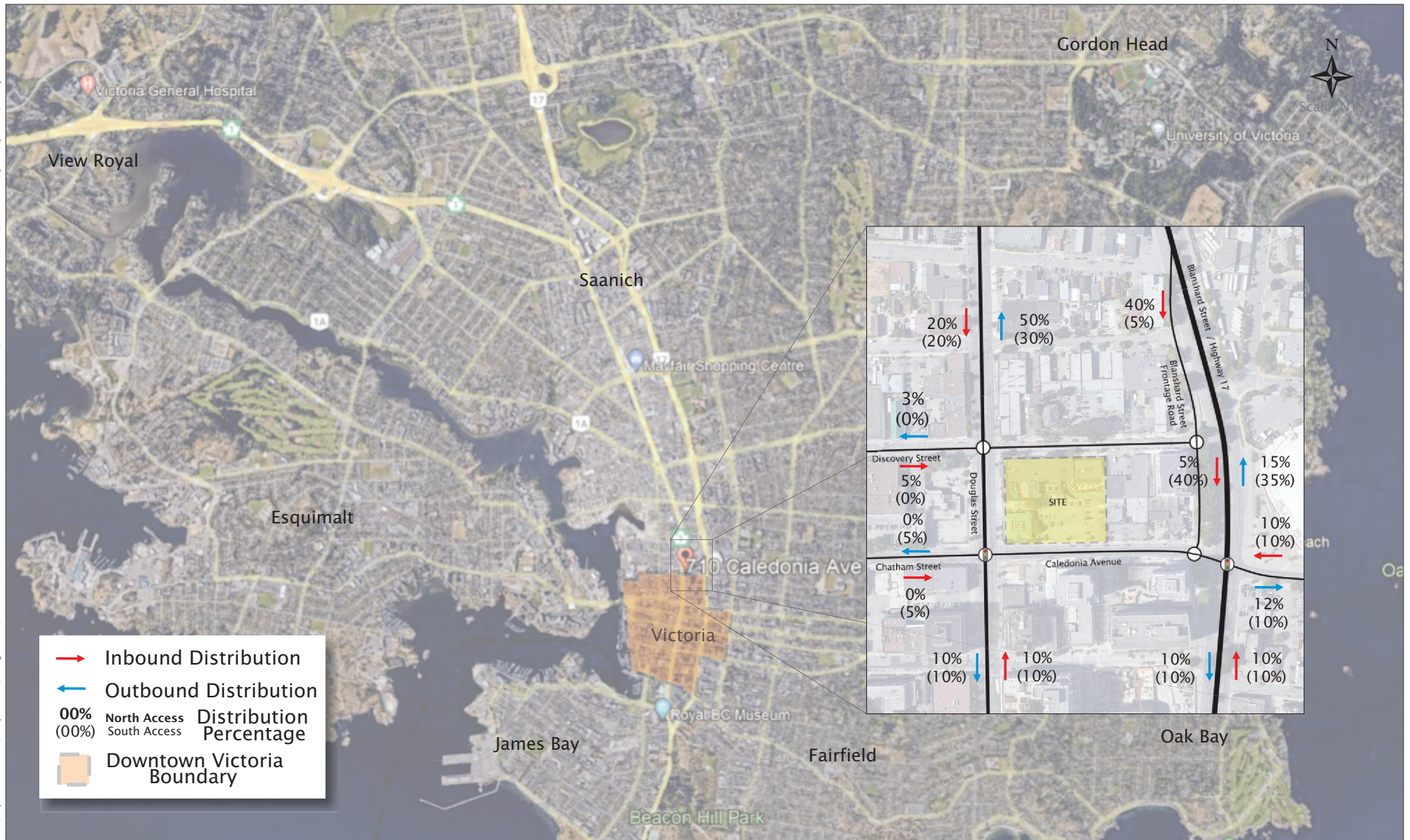
INTERSECTION	AM PEAK HOUR VOLUMES			PM PEAK HOUR VOLUMES		
	BACK-GROUND	SITE	% CHANGE	BACK-GROUND	SITE	% CHANGE
Douglas St & Discovery St	1,397	1,498	+7%	1,903	2,085	+10%
Douglas St & Caledonia St	1,675	1,748	+4%	2,304	2,427	+5%
Blanshard St & Caledonia Ave	2,561	2,641	+3%	3,324	3,446	+4%
Caledonia Ave & Blanshard St Frontage	567	648	+14%	655	779	+19%
Discovery St & Blanshard St Frontage	127	145	+14%	97	137	+41%

### 3.1.3 Total Traffic

The future Total traffic volumes were established by adding the site traffic to the existing traffic. The Total Traffic Forecast is provided in **Exhibit 3.4**.

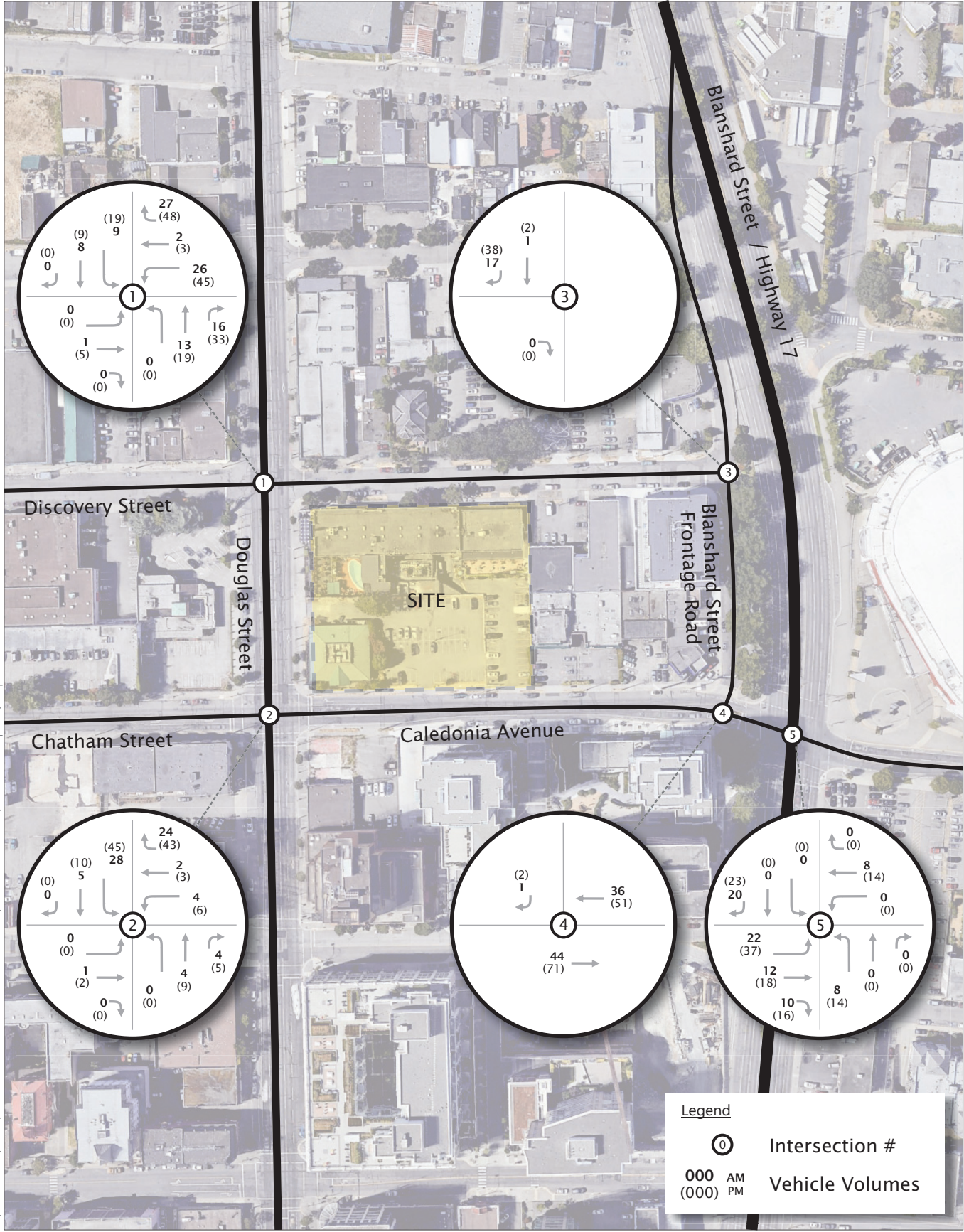


### Exhibit 3.1 AM Peak Hour Site Traffic Distribution



## Exhibit 3.2 PM Peak Hour Site Traffic Distribution

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**Legend**

① Intersection #

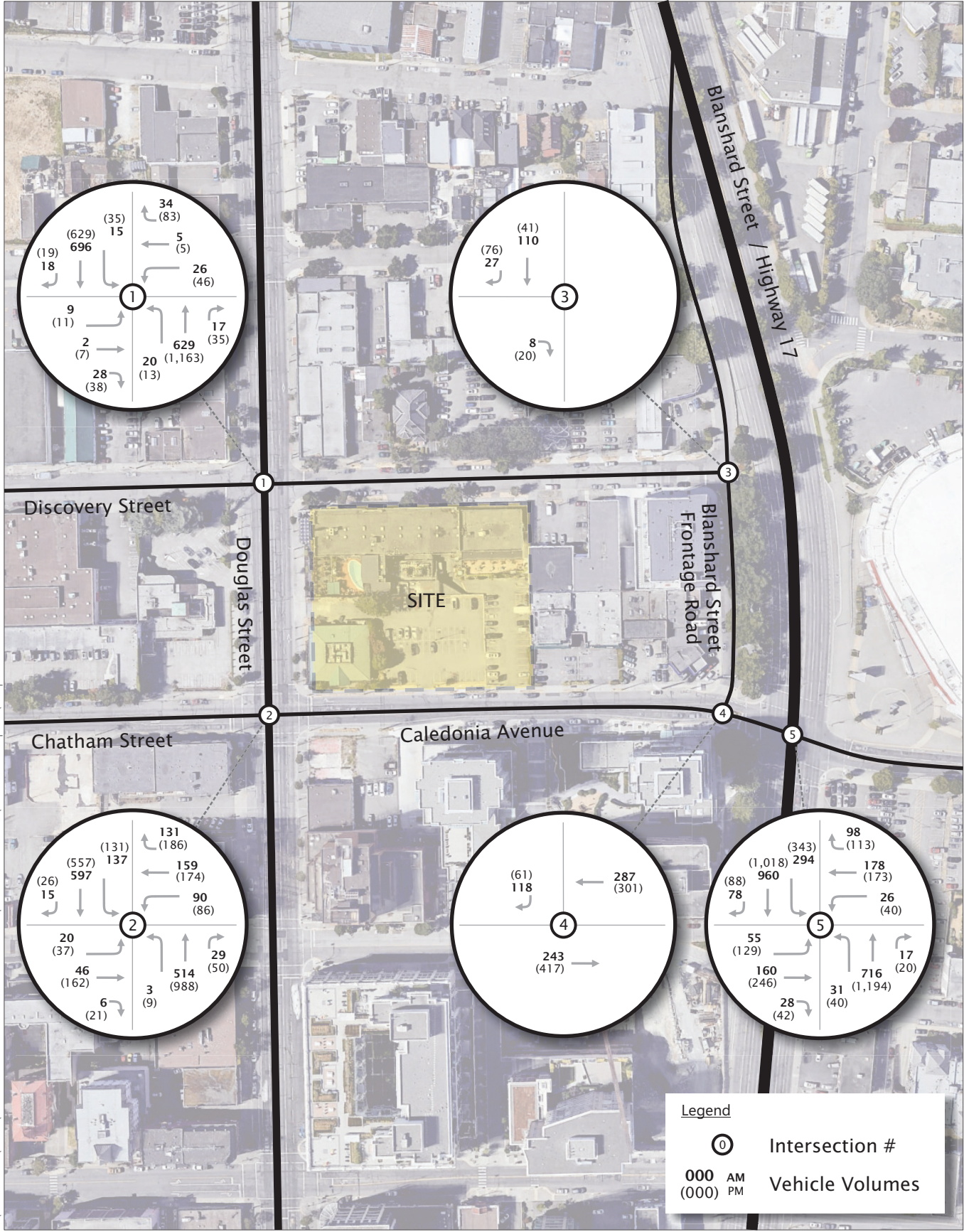
000 AM  
(000) PM Vehicle Volumes

### Exhibit 3.3 Site Traffic Forecasts

710 Caledonia Avenue TAMS  
04-21-0252 March 2022



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## Exhibit 3.4 Total Traffic Forecasts

710 Caledonia Avenue TAMS  
04-21-0252 March 2022



## 3.2 Future Traffic Operations

### 3.2.1 Future Conditions Analysis Assumptions

As per the assumptions described in **Section 2.5.2**, the same peak hour factors and heavy vehicle percentages were used for the future conditions analysis. Since the traffic signals are coordinated along the corridor, the signal cycle length was not modified but the signal splits were optimized.

### 3.2.2 Future Background Traffic Operations

It is anticipated that the future background traffic results are identical to the Existing 2021 scenario performances due to the 0% growth assumed for the background traffic. All study area intersections operate adequately under this scenario with LOS, v/c and 95<sup>th</sup> percentile queues all within performance thresholds during the AM and PM peak hours. 95<sup>th</sup> percentile queues are not anticipated to be of concern and are expected to remain clear of all adjacent intersections.

### 3.2.3 Future Total Traffic Operations

**Table 3.5** provides the traffic operations for the Opening Day scenario for the weekday AM and PM peak hours, respectively. The detailed Synchro outputs are included in Appendix B.

**Table 3.5: Opening Day Total Vehicle Operations**

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Douglas St & Discovery St (Two Way Stop Controlled)	OVERALL	A	-	-	F	-	-
	NB L	B	0.04	0	A	0.02	0
	NB TR	A	-	-	A	-	-
	EB LTR	D	0.27	5	F	0.85	30
	WB LTR	F	0.56	20	F	>>1.0	115
	SB LT	A	0.03	0	B	0.09	0
	SB TR	A	-	-	A	-	-
Douglas St & Caledonia Ave (Signalized)	OVERALL	B	-	-	B	-	-
	EB L	B	0.04	5	C	0.18	10
	EB TR	B	0.07	10	C	0.34	40
	WB LT	B	0.31	50	C	0.55	55
	WB R	B	0.19	10	C	0.42	30
	NB LT	A	0.40	30	B	0.54	70
	NB TR	A	0.43		B	0.56	
	SB LT	C	0.71	60	C	<b>0.73</b>	60
SB TR	C	0.72	B		0.57		
Discovery St & Blanshard St Frontage (One Way Stop Controlled)	OVERALL	A	-	-	A	-	-
	EB R	A	0.01	0	A	0.02	0
	SB TR	-	-	-	-	-	-
Caledonia Ave & Blanshard St Frontage (One Way Stop Controlled)	OVERALL	A	-	-	A	-	-
	EB T	-	-	-	-	-	-
	WB T	-	-	-	-	-	-
	SB R	B	0.18	5	B	0.09	0
Blanshard St & Caledonia Ave (Signalized)	OVERALL	B	-	-	C	-	-
	EB L	C	0.21	15	D	0.61	#40
	EB TR	B	0.35	35	C	0.59	60
	WB L	C	0.08	10	C	0.18	15
	WB TR	C	0.55	50	C	0.63	60
	NB L	C	0.14	10	C	0.18	15
	NB TR	C	0.56	45	C	0.77	80
	SB L	B	0.54	45	C	0.71	#75
SB TR	B	0.39	35	A	0.39	40	

Note:

For queue outputs in vehicle lengths, It is assumed 1 vehicle length is equal to 7m.

**Bolded** results indicate values that do not meet acceptable performance criteria.

"-" indicates a value not applicable to that particular intersection or movement.

"#" indicates that the 95<sup>th</sup> percentile volume exceeds capacity; therefore vehicle queue may be longer than reported.

As Table 3.5 indicates, the Douglas & Discovery Street intersection experiences long delays with LOS F in the AM and PM peak hours. The PM peak hour also experiences lengthy queues and high V/C ratio that exceed acceptable performance thresholds. The vehicle traffic on Discovery Street is not anticipated to be particularly high during peak hours, but due to the existing stop control on the minor street combined with relatively high vehicle traffic along Douglas Street, it is difficult for vehicles to make left turns or through movements from Discovery Street.

After signal split and offset optimization, the southbound left/through 95<sup>th</sup> percentile vehicle queues at Douglas Street & Caledonia Street intersection are not anticipated to extend to/through Discovery Street.

As a mitigation measure, the Douglas St & Discovery St intersection was modelled as a signalized intersection in the future Total scenario. The signal was assumed to be coordinated with the same cycle length and similar timing assumptions as the adjacent signals along Douglas Street. It was assumed that there are no changes to the laning at the intersection. Note that City of Victoria staff indicated to the development team that a signal may be required at this intersection with the development.

**Table 3.6** summarizes the traffic operations for the Mitigated Opening Day scenario for the Douglas & Discovery Street intersection weekday AM and PM peak hours, respectively. The detailed Synchro outputs are included in Appendix B.

**Table 3.6: Opening Day Total Vehicle Operations – Douglas & Discovery Signalized**

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Douglas St & Discovery St (Signalized)	OVERALL	<b>B</b>	-	-	<b>B</b>	-	-
	NB L	B	0.42	35	B	0.67	40
	NB TR	B	0.44		B	0.70	
	EB LTR	B	0.09	5	C	0.12	10
	WB LTR	B	0.14	10	C	0.29	25
	SB LT	B	0.45	40	B	0.48	45
	SB TR	B	0.47		B	0.44	

Note:

For queue outputs in vehicle lengths, It is assumed 1 vehicle length is equal to 7m.

**Bolded** results indicate values that do not meet acceptable performance criteria.

"-" indicates a value not applicable to that particular intersection or movement.

"#" indicates that the 95<sup>th</sup> percentile volume exceeds capacity; therefore vehicle queue may be longer than reported.

As Table 3.6 indicates, the Douglas & Discovery Street intersection is expected to operate well within operation thresholds as a signalized intersection.

### 3.3 Signal Warrant Analysis

A signal warrant analysis was conducted at the Douglas Street & Discovery Street intersection using the Transportation Association of Canada (TAC) signal warrant methodology to determine if this intersection would be warranted a full traffic signal given the existing, and future traffic conditions.

The Canadian Traffic Signal Warrant Procedure is a “cumulative factors methodology” (CFM) that includes a cross-product relationship of the vehicle-vehicle conflict and the vehicle-pedestrian conflict. It also considers various local factors such as pedestrian demographics, pedestrian exposure, and roadway characteristics. The TAC methodology uses the peak six hours of vehicle and pedestrian traffic data which typically occurs during weekday AM, mid-day, and PM peak periods. **Appendix C** presents the results of the signal warrant analysis for both the existing and future scenarios.

#### *Existing Conditions*

The existing conditions signal warrant requires six hours of traffic and pedestrian volumes where the AM and PM peak hours were collected on Wednesday, September 29, 2021. The mid day peak hour traffic was estimated based on the PM peak hour volumes by deriving a mid-day factor using the City of Victoria traffic counts near the study intersection. The analysis indicated that under current traffic volumes, a traffic signal is not warranted. The analysis indicated a ‘W’ warrant value of 27, whereas a threshold of 100 is required.

#### *Opening Day Total Conditions*

A signal warrant was again conducted for the future Opening Day Total traffic condition. The future background traffic volumes were assumed to be the same as the existing conditions due to the 0% per year growth rate to all six peak hours and then the estimated site trips were added to obtain the Total Conditions. To estimate the site trips for the four hours not included in the previous analysis (i.e., the hours outside the AM and PM peak hours estimated in Section 3.1.2), the peak hour site trip volumes were proportioned based on the relative intersection volumes in existing conditions. The analysis indicated that under the Total traffic volumes, a traffic signal would be warranted, with a ‘W’ warrant value of 136.

#### *Warrant Analysis Summary*

The key finding of the analysis is that this intersection appears to warrant a full traffic signal with the proposed development due to the increased site traffic volumes on the minor approach accessing the driveway on Discovery Street.

The vehicle traffic on Discovery Street will not be particularly high during peak hours, but due to the existing stop control on the minor street and relatively high vehicle traffic along Douglas Street, it is difficult for vehicles to make left turns or through movements from Discovery Street. Also, the anticipated pedestrian volume generated from the site crossing the Douglas Street & Discovery Street intersection to access nearby amenities and bus stops is a contributing factor for the signal.

## 4. SITE PLAN DESIGN REVIEW

### 4.1 Site Access Design

As noted earlier in the report, vehicular access to the development is planned via two separate access driveways with an additional back lane for loading. One driveway is located on the north side of the site on Discovery Street which provides access to the Grocery, retail, daycare, and rental residential parking. The second driveway is located on the south side of the site on Caledonia Street and provides access to the office, retail, residential condos and BC Housing units. The majority of the loading will take place in the north south back lane on the east side of the site.

The location of the proposed driveway access on Discovery Street is approximately 35m away from the Douglas Street intersection, while the Caledonia access and loading driveway are located approximately 25m apart. The parkade driveways are at least 6.0m wide and can accommodate two way passenger vehicle circulation. **Exhibit 4.1** successfully shows two-way flow for PTAC vehicles entering and exiting the parkade for the two driveway accesses.

### 4.2 Pedestrian Access

This mixed-use development has a public plaza on the south west corner of the site and provides access to the grocery store, restaurant, coffeeshop, and daycare. Store fronts of retail shops are located along Caledonia Avenue and Douglas Street, while the office and condo lobby are located off Caledonia, and the rental lobby off Caledonia Avenue.

As part of the Victoria Regional Rapid Transit Project, a rapid transit route is anticipated along Douglas Street with stops at the Douglas Street & Discovery Street intersection. This will be an added transportation benefit to the already highly convenient site location.

### 4.3 Parking Supply

#### 4.3.1 Vehicle Parking

**Table 4.1** summarizes the proposed off-street parking supply for the development in comparison to the City of Victoria's Zoning Bylaw minimum requirement.

**Table 4.1: Vehicle Parking Supply Requirement & Provision**

LAND USE		QUANTITY	BYLAW PARKING RATE	BYLAW TOTAL PARKING REQUIRED	PROVIDED
Residential - Condo	< 45m <sup>2</sup>	15 units	0.65 spaces/unit	151	107
	45m <sup>2</sup> - 70m <sup>2</sup>	75 units	0.8 spaces/unit		
	> 70m <sup>2</sup>	55 units	1.20 spaces/unit		
	Visitor	145 units	0.1 spaces/unit		
Residential - Rental	< 45m <sup>2</sup>	42 units	0.50 spaces/unit	117	93
	45m <sup>2</sup> - 70m <sup>2</sup>	119 units	0.60 spaces/unit		
	> 70m <sup>2</sup>	8 units	1.00 spaces/unit		
	Visitor	169 units	0.1 spaces/unit		
Residential - BC Housing	< 45m <sup>2</sup>	62 units	0.20 spaces/unit	71	74
	45m <sup>2</sup> - 70m <sup>2</sup>	45 units	0.50 spaces/unit		
	> 70m <sup>2</sup>	30 units	0.75 spaces/unit		
	Visitor	137 units	0.1 spaces/unit		
Office		41,710ft <sup>2</sup> (3875m <sup>2</sup> )	1 space/70m <sup>2</sup>	55	53
Retail		6,915ft <sup>2</sup> (642m <sup>2</sup> )	1 space/80m <sup>2</sup>	8	10
Restaurant/Coffee Shop		6,602ft <sup>2</sup> (613m <sup>2</sup> )	1 space/40m <sup>2</sup>	15	16
Grocery Store		28,114ft <sup>2</sup> (2,611 m <sup>2</sup> ) <sup>(1)</sup>	1 space/50m <sup>2</sup>	52	81
Daycare		5,931ft <sup>2</sup> (551m <sup>2</sup> )	1 space/100m <sup>2</sup>	6	6
<b>TOTAL</b>				<b>475</b>	<b>440</b>

(1) Density excludes grocery lower level vestibule

The minimum required vehicle parking for the entire development would be 475 spaces compared to the proposed supply of 440 spaces. The proposed total development parking supply variance of 35 stalls compared to the Bylaw requirement. Individually by land use, some uses are providing above the Bylaw requirements, while others are providing below. However, the vehicle provision is expected to meet market demands and the variance is supported through the provision of TDM measures proposed for the development as outlined in **Section 5**.

**4.3.2 Bicycle Parking**

The development will supply 600 long term bicycle parking spaces and 80 short term spaces. The Long Term parking spaces will be located in the upper ground level of the development for the residential uses with stair free access, while the commercial spaces are spread across the plaza and P1 level. The Short

Term parking are anticipated to be provided in a publicly accessible area on the ground floor level in a well lit and highly visible area.

The long term and short term bicycle parking requirements and provisions are presented in **Table 4.2** and **Table 4.3**, respectively.

**Table 4.2: Long Term Bicycle Parking Supply Requirement & Provision**

LAND USE		DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT	PROVIDED	DIFFERENCE
Residential	Units < 45m <sup>2</sup>	119 units	1 space per dwelling unit	119	538	+4
	Units > 45m <sup>2</sup>	332 units	1.25 spaces per dwelling unit	415		
Office		41,710ft <sup>2</sup> (3875m <sup>2</sup> )	1 space per 150m <sup>2</sup> floor area, or part thereof	26	26	0
Retail		6,915ft <sup>2</sup> (642m <sup>2</sup> )	1 space per 200m <sup>2</sup> floor area, or part thereof	3	6	+3
Restaurant/Coffee Shop		6,602ft <sup>2</sup> (613m <sup>2</sup> )	1 space per 400m <sup>2</sup> floor area, or part thereof	2	4	+2
Grocery		28,114ft <sup>2</sup> (2612 m <sup>2</sup> ) <sup>(1)</sup>	1 space per 200m <sup>2</sup> floor area, or part thereof	13	24	+11
Daycare		5,931ft <sup>2</sup> (551m <sup>2</sup> )	1 space per 700m <sup>2</sup> floor area, or part thereof	1	2	+1
				<b>579</b>	<b>600</b>	<b>+21</b>

(1) Density excludes grocery lower level vestibule

**Table 4.3: Short Term Bicycle Parking Supply Requirement & Provision**

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT	PROVIDED
Residential	451 units	0.1 spaces per dwelling unit	45	45
Office	41,710ft <sup>2</sup> (3875m <sup>2</sup> )	1 space per 400m <sup>2</sup> floor area, or part thereof	10	10
Retail	6,915ft <sup>2</sup> (642m <sup>2</sup> )	1 space per 200m <sup>2</sup> floor area, or part thereof	3	3
Restaurant/Coffee	6,602ft <sup>2</sup> (613m <sup>2</sup> )	1 space per 100m <sup>2</sup> floor area, or part thereof	6	6
Grocery	28,114ft <sup>2</sup> (2612 m <sup>2</sup> ) <sup>(1)</sup>	1 space per 200m <sup>2</sup> floor area, or part thereof	13	13
Daycare	5,931ft <sup>2</sup> (551m <sup>2</sup> )	1 space per 200m <sup>2</sup> floor area, or part thereof	3	3
			<b>80</b>	<b>80</b>

(1) Density excludes grocery lower level vestibule

Currently, the development meets the total long-term bicycle parking supply requirement by providing 600 spaces, an overall 21 stalls surplus. The development also meets the short term bicycle parking requirement by proposing 80 short-term parking.

#### 4.4 Parking Layout & On-Site Vehicle Circulation

A review of the proposed parkades were conducted using AutoTURN software. The passenger vehicle parkade circulation and parking maneuvers can be found in **Exhibits 4.2 to 4.4**. The parking stalls, aisles width design are compliant with the City of Victoria's Bylaw. The parking aisles are able to support two way passenger vehicle circulation and parking spaces are accessible by the design vehicles.

It is noted that some ramp grade transitions exceed 10%, it is requested that these grade transitions be reduced to a maximum of 10% to avoid vehicles from bottoming out. Convex mirrors are also recommended at the corners of the curved ramp and has been noted in the exhibit.

#### 4.5 Service Vehicle Operations

The City of Victoria Zoning Bylaw does not stipulate a requirement for off-street loading spaces for the land uses. To accommodate the anticipated loading demand of the site, 7 Class B spaces and 1 Class C space have been provided.

The majority of the loading is located on the 6.1 m wide north south back lane on the east side of the site. It is designed as a one-way lane to help improve access to the site for large loading trucks where vehicles enter through Caledonia Avenue and exist onto Discovery Street. 5 Class B loading spaces and 1 Class C

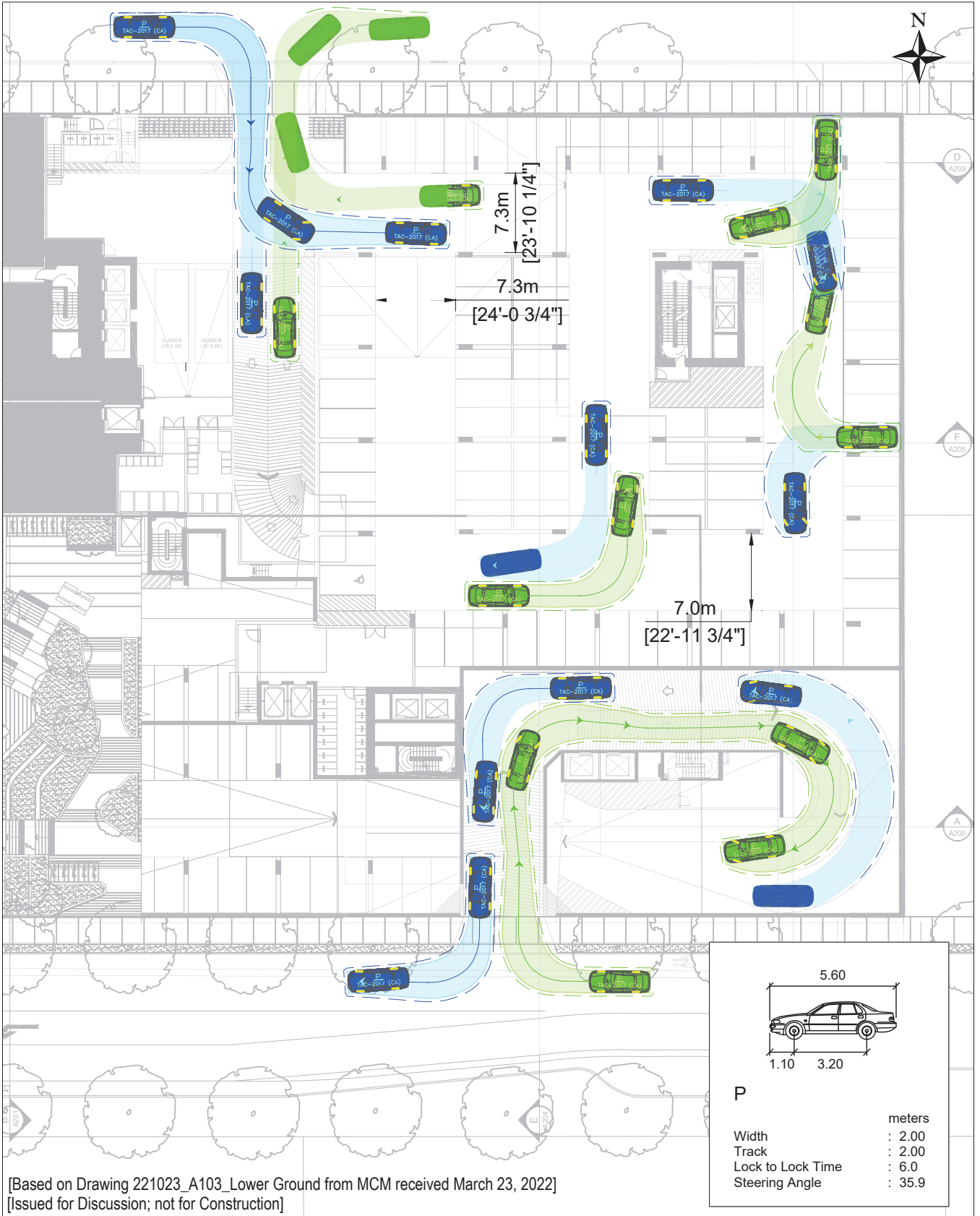
loading space is currently proposed in the back lane. The remaining two Class B loading spaces are located through the north parkade access on Discovery Street.

It is noted that the two loading vehicles located through the Discovery Street access requires maneuvering across main parkade access area. It is recommended that the loading activity in this area be scheduled and monitored by the building manager and to avoid peak hours if possible.

Note that the Class C space can accommodate up to a WB15 sized vehicle as determined through AutoTURN analysis in the loading area. Larger sized vehicles would likely require maneuvering back and forth across Discovery Street and the sidewalk outside the site property. Discussion with the architect determined that the maximum anticipated sized vehicle would be a WB15.

The loading maneuvers are presented in Exhibits 4.5 – 4.10.

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 2022/03/29 14:34, Plotted by Caitlyn Quach



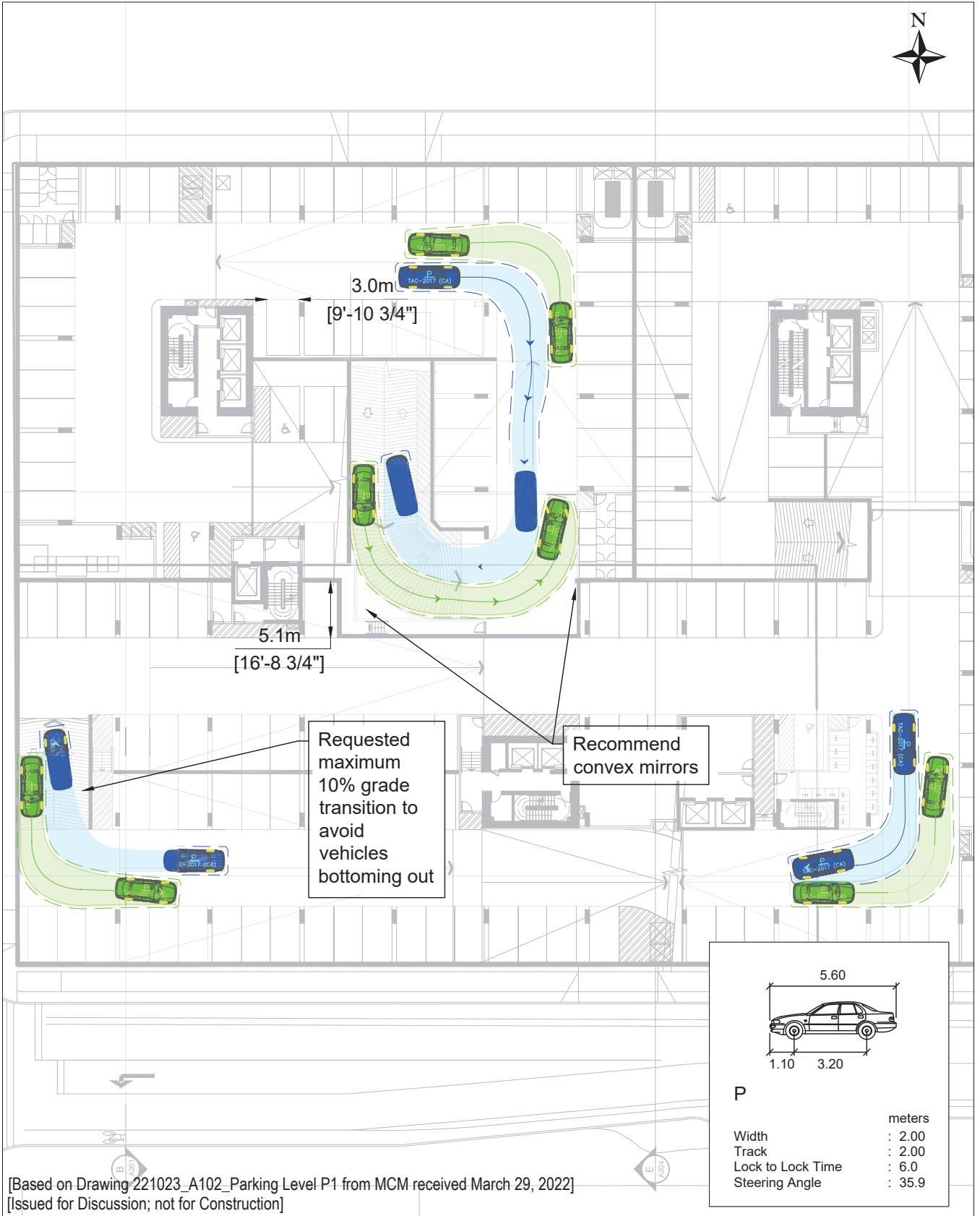
## Exhibit 4.1 Plaza Level - Passenger Vehicle Movements

04-21-0252 March 2022 Scale 1:500 on Letter

710 Caledonia Ave  
 Prepared by CQ/AJ



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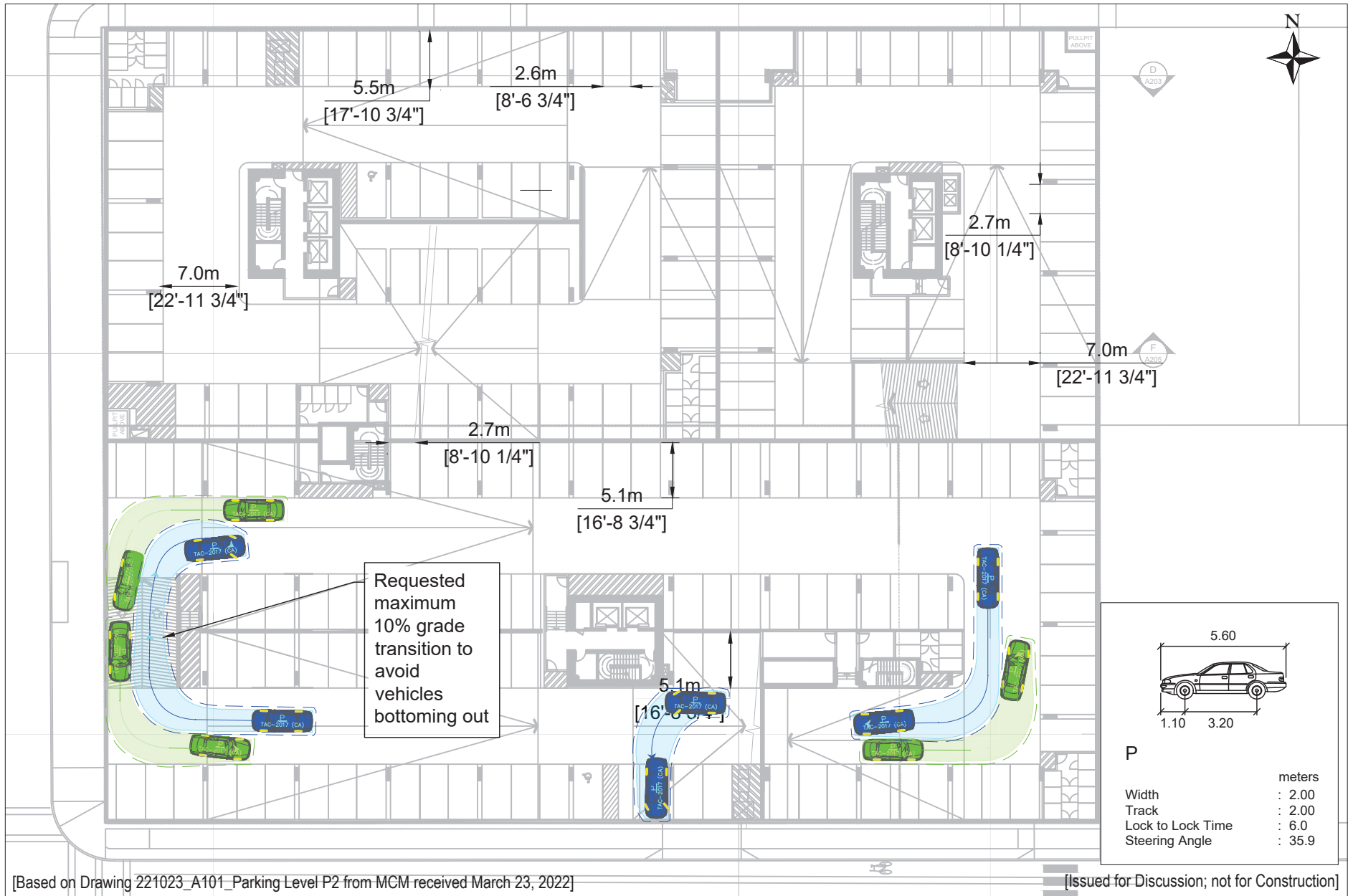
## Exhibit 4.2 P1 Level - Passenger Vehicle Movements

04-21-0252 March 2022 Scale 1:500 on Letter

710 Caledonia Ave  
 Prepared by CQ/AJ



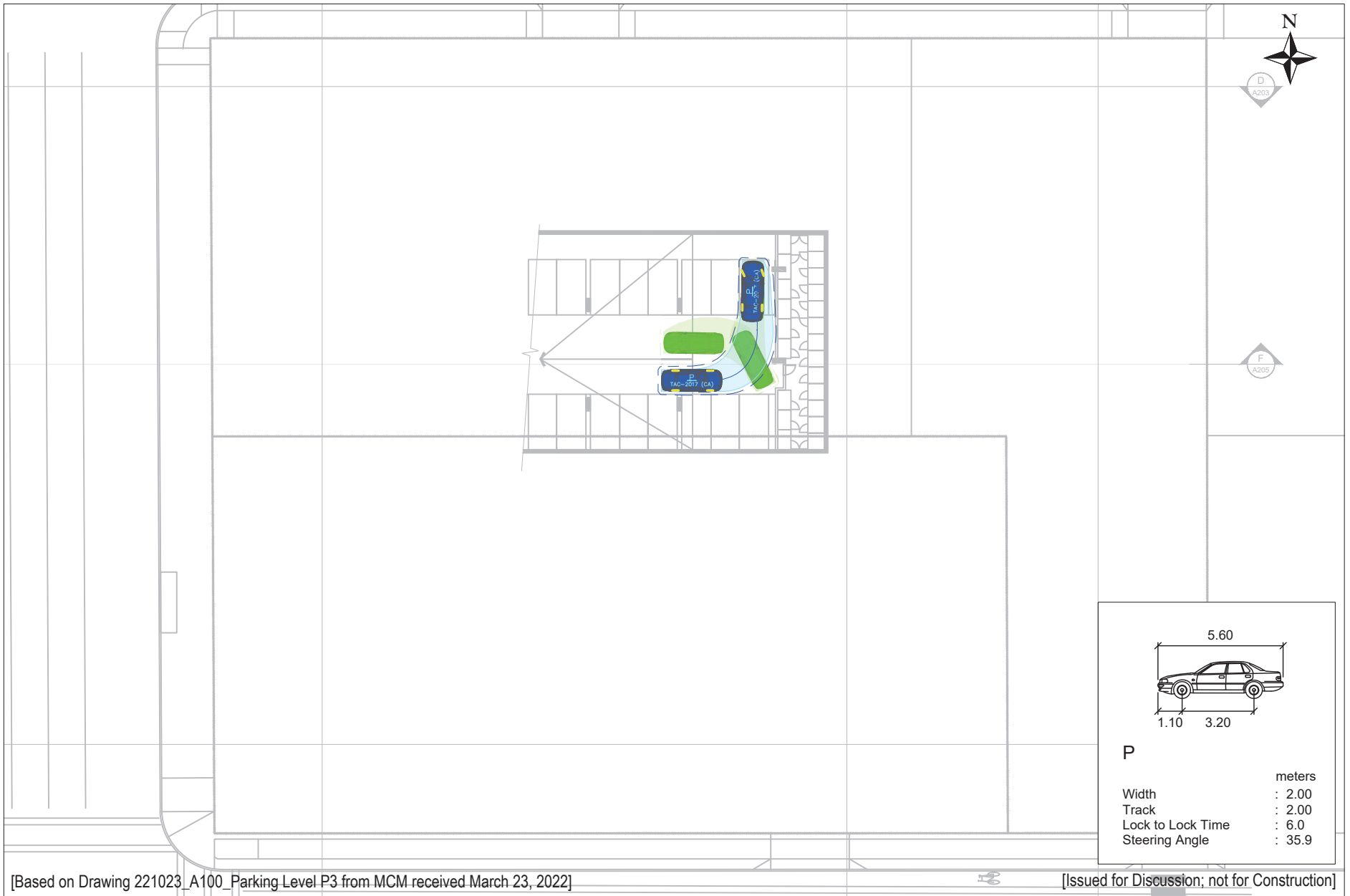
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## Exhibit 4.3 P2 Level - Passenger Vehicle Movements



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## Exhibit 4.4 P3 Level - Passenger Vehicle Movements

04-21-0252

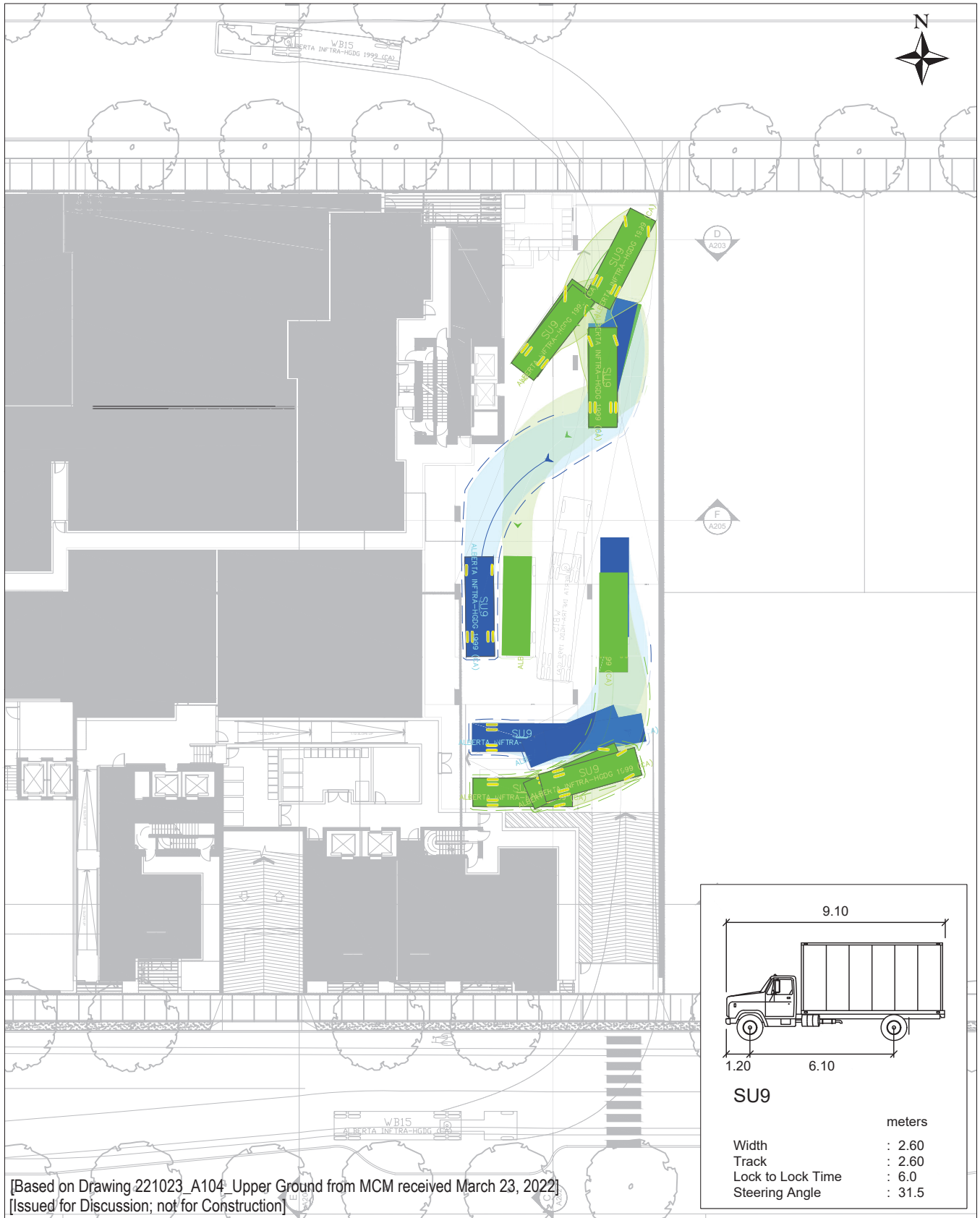
March 2022

Scale 1:500 on Letter

710 Caledonia Ave  
Prepared by CQ/AJ



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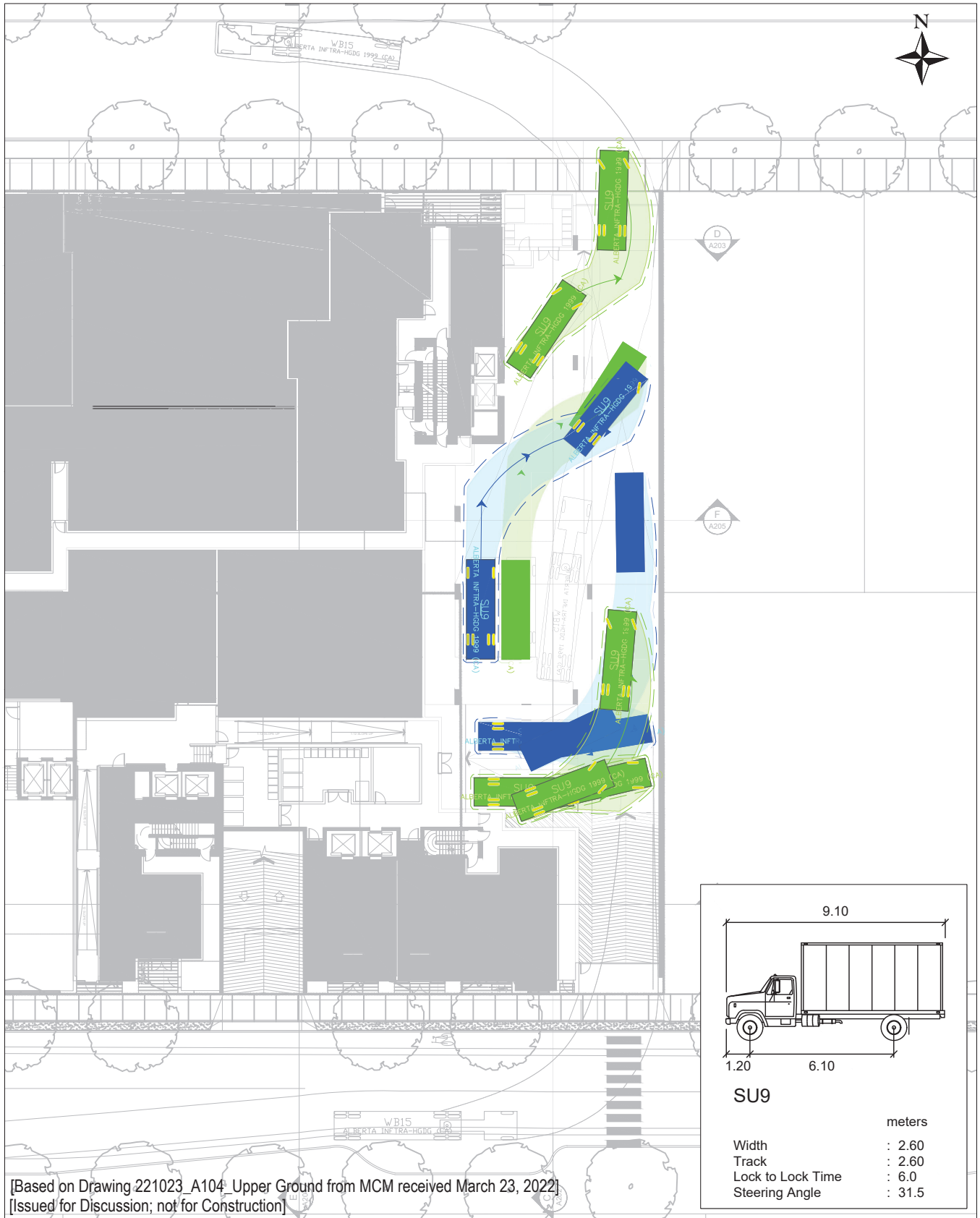
## Exhibit 4.5 Laneway Loading - Class B Entry Movements

04-21-0252 March 2022 Scale 1:500 on Letter

710 Caledonia Ave  
 Prepared by CQ/AJ



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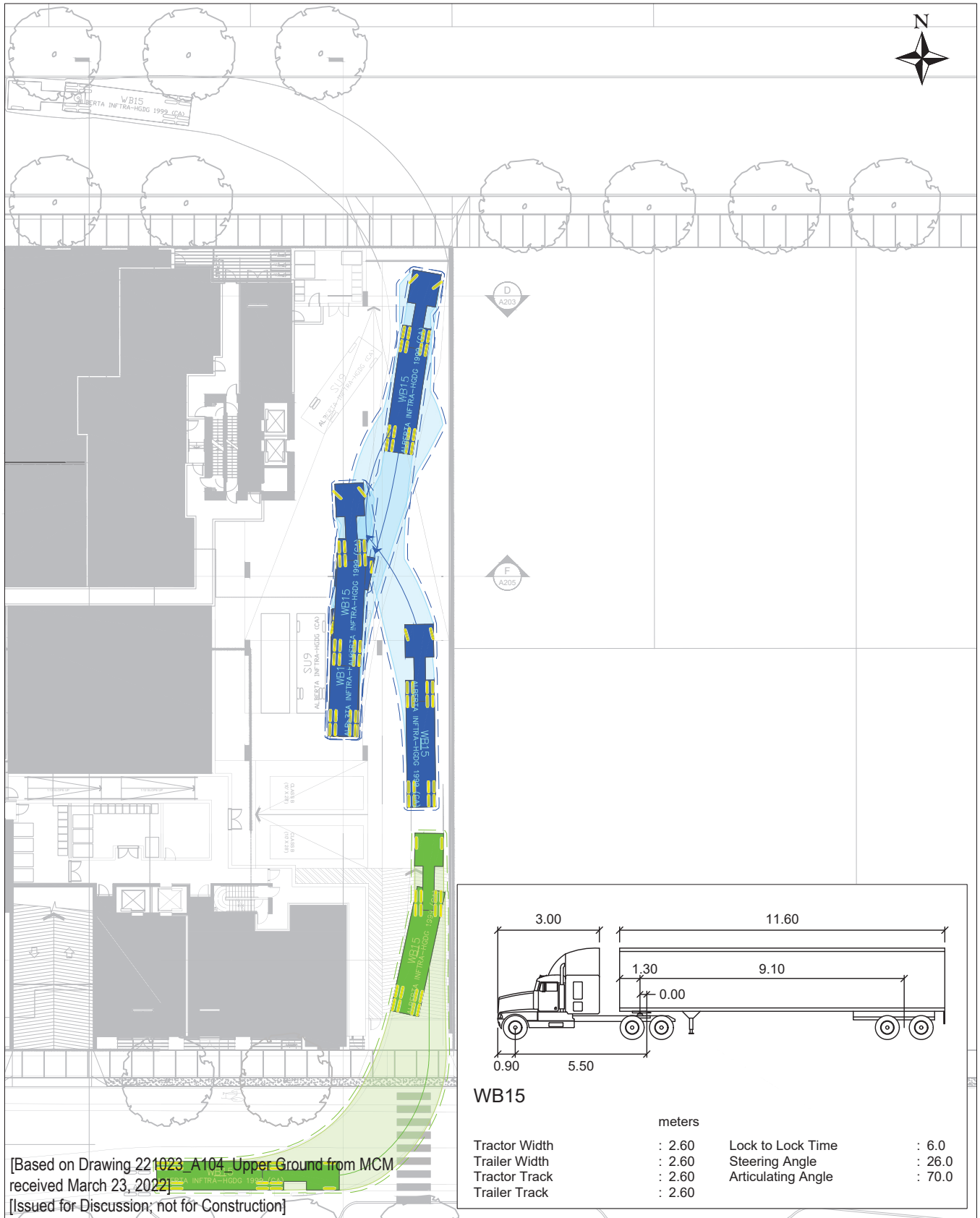
## Exhibit 4.6 Laneway Loading - Class B Exit Movements

04-21-0252 March 2022 Scale 1:500 on Letter

710 Caledonia Ave  
 Prepared by CQ/AJ



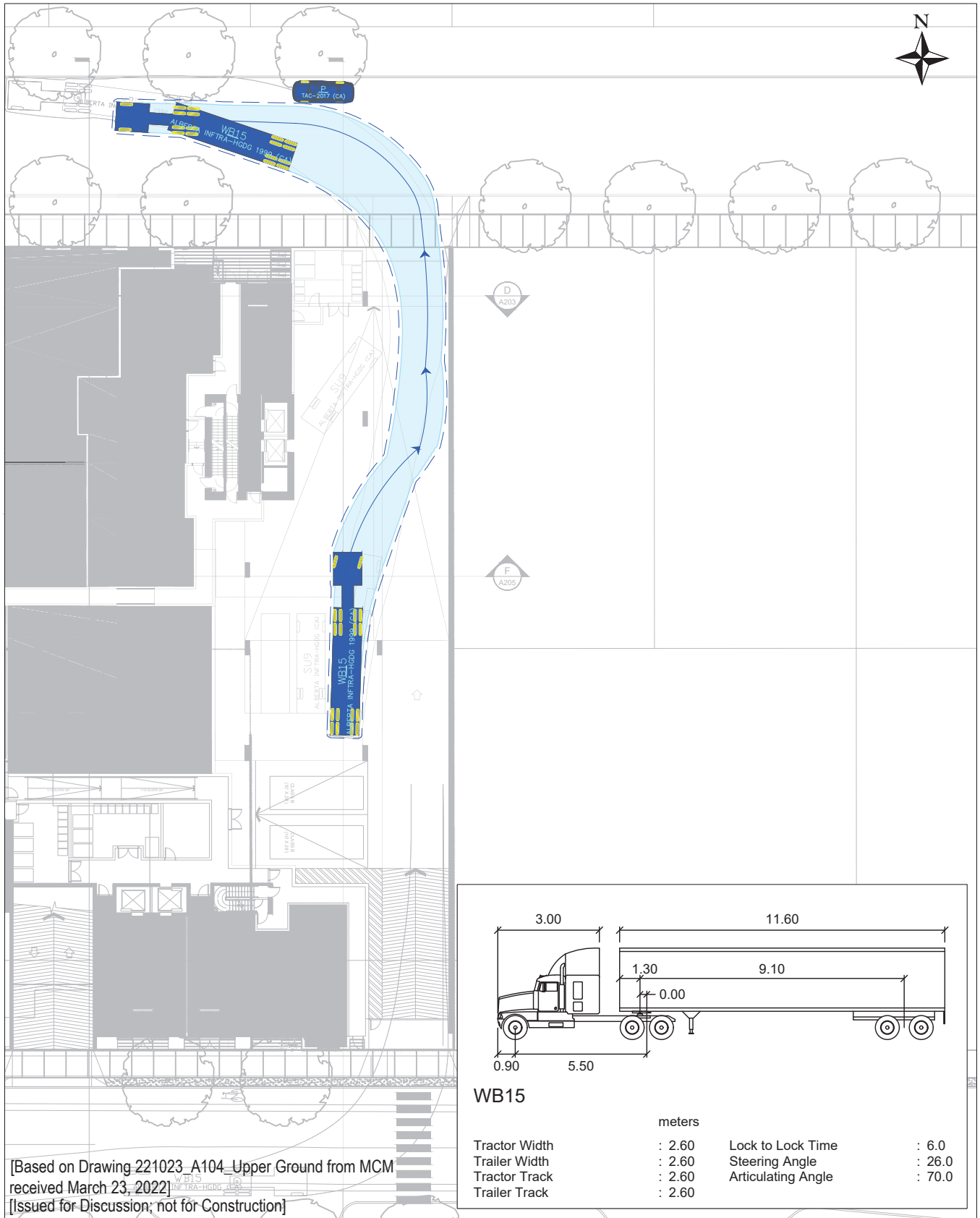
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## Exhibit 4.7 Laneway Loading - WB15 Entry Movements



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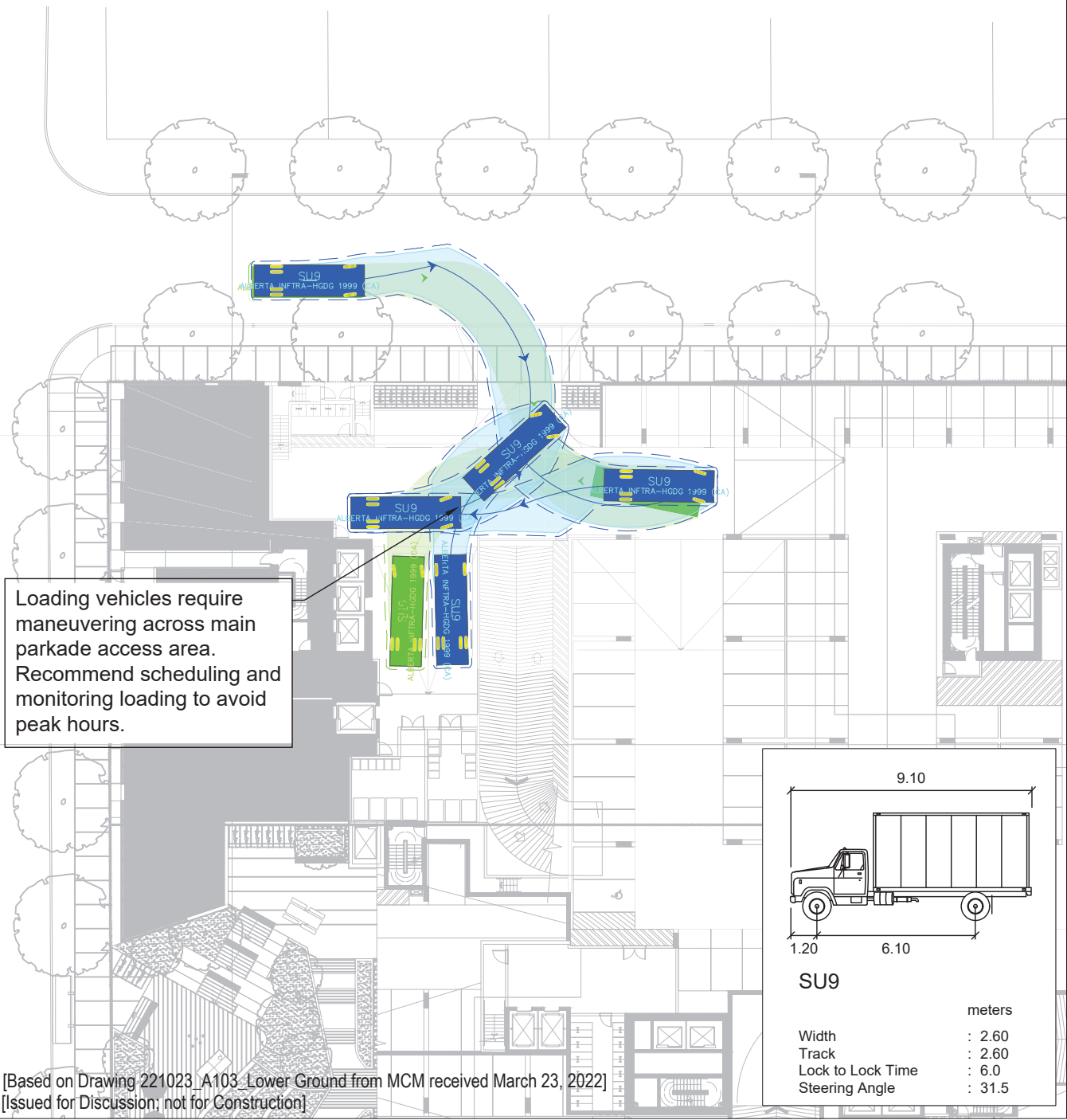
## Exhibit 4.8 Laneway Loading - WB15 Exit Movements

04-21-0252 March 2022

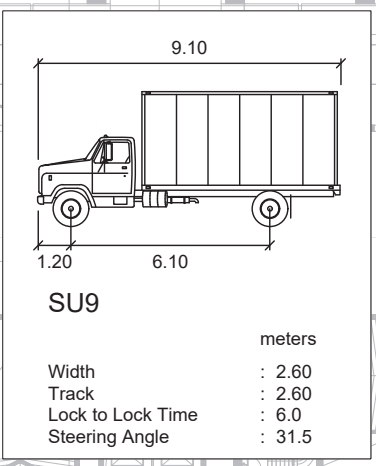
Scale 1:500 on Letter

710 Caledonia Ave  
 Prepared by CQ/AJ





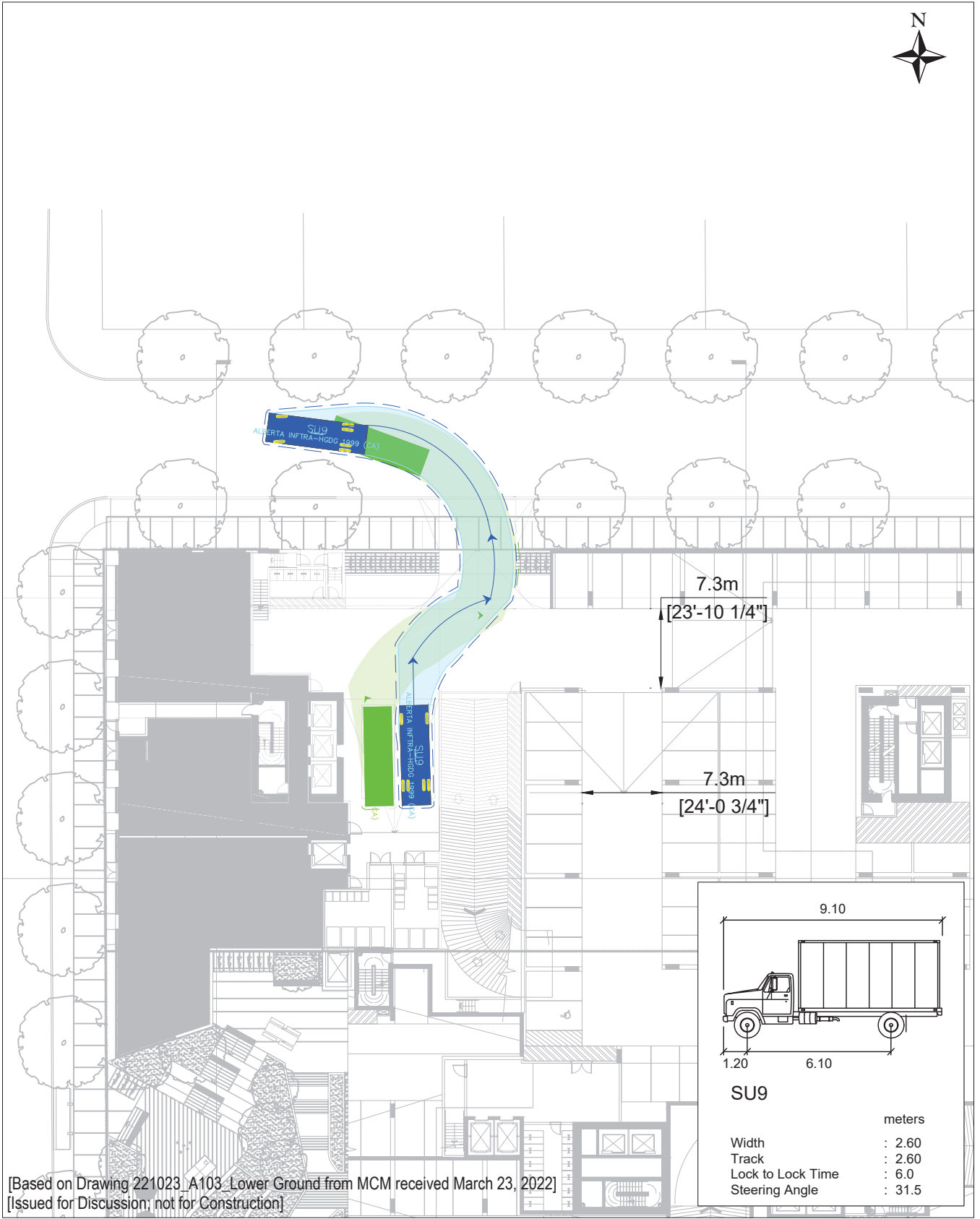
Loading vehicles require maneuvering across main parkade access area. Recommend scheduling and monitoring loading to avoid peak hours.



[Based on Drawing 221023\_A103\_Lower Ground from MCM received March 23, 2022]  
 [Issued for Discussion; not for Construction]

## Exhibit 4.9 Plaza Level Loading - Class B Entry Movements





[Based on Drawing 221023\_A103\_Lower Ground from MCM received March 23, 2022]  
 [Issued for Discussion; not for Construction]

## Exhibit 4.10 Plaza Level Loading - Class B Exit Movements

## 5. TDM & ACTIVE MODES

### 5.1 Definition

Transportation Demand Management (TDM) is defined as the “application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or in time”<sup>1</sup>. A successful TDM program can influence travel behaviour away from Single Occupant Vehicle (SOV) travel during peak periods towards more sustainable modes such as High Occupancy Vehicle (HOV) travel, transit, cycling or walking. The responsibility for implementation of TDM measures can range across many groups, including regional and municipal governments, transit agencies, private developers, residents/resident associations or employers.

### 5.2 Potential Measures

The following TDM measures have been identified as potential measures for this site based on the proposed development plan’s mix of uses and the location within the City of Victoria adjacent to the Downtown area.

#### 5.2.1 Transportation Marketing Services

Marketing services such as campaigns, incentives, and other strategies can be provided to encourage the use of sustainable transportation. Welcome packets can also be given to new residents and/or employees containing information about local transit routes and schedules, car sharing programs, and cycling routes amongst other transportation information.

#### 5.2.2 Improved Transit Facilities

Improved transit facilities can be provided, such as transit shelters and real-time transportation information. Shelters integrated into the building design will improve the transit experience for customers and encourage new riders to transit. Further, real-time transportation information can be provided on displays in prominent locations (transit shelter, entry/exit areas, lobbies) to highlight sustainable transportation options and support informed trip-making. Real-time information can be provided for arrivals and departures for the future RapidBus route on Douglas Street, walking times to these locations, and availability of car share vehicles, shared bicycles, and shuttles.

#### 5.2.3 Additional Bike Parking

Additional secure, long-term bicycle parking above the bylaw requirement can be provided to further encourage cycling to/from the site. Additionally, some stalls can be allocated for oversized bikes such as cargo bikes, longtail bikes, etc. to accommodate a variety of bike users, and electrical outlets should be provided in order to accommodate e-bikes throughout the bike parking facilities.

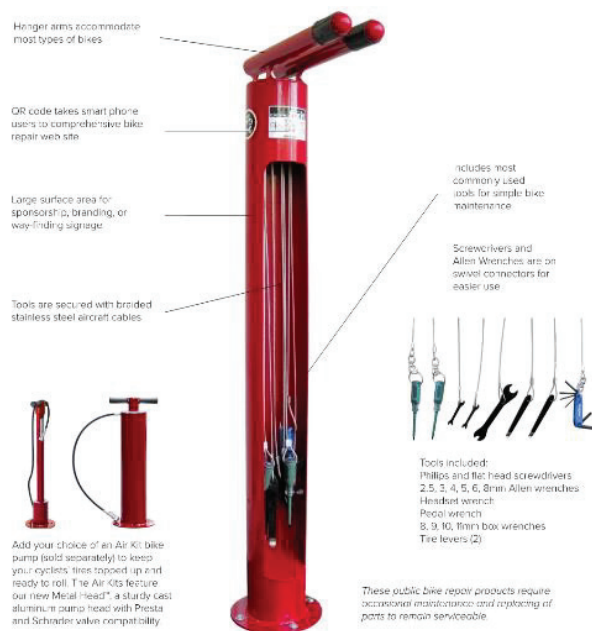
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<sup>1</sup> <http://ops.fhwa.dot.gov/tdm/index.htm> FHWA Travel Demand Management home page

### 5.2.4 Bike Maintenance Facilities

Bicycle maintenance facilities, such as those shown in **Figure 5.1**, can be provided for residents and/or employees to use. These tools are often provided in a standalone room and would require regular maintenance to ensure they remain in good operating conditions.

**Figure 5.1: Bike Maintenance Facilities**



### 5.2.5 End-of-Trip Facilities

Cycling end-of-trip facilities should be provided for employees at the development’s office, and retail uses and should include lockers, benches, showers, wash basins, toilets and counters with electrical outlets for hair dryers and razors.

### 5.2.6 Car Share Vehicles, Parking Spaces, and Memberships

Car share vehicles, and parking spaces dedicated to car share vehicles (i.e., Modo, Evo) can be provided. Additionally, car share membership subsidies can be offered to residents and/or employees. **Figure 5.2** shows an example of a car share vehicle.

**Figure 5.2: Car Share**



## 6. SUMMARY & RECOMMENDATIONS

### 6.1 Summary

1. Caledonia Equity Limited Partnership is proposing a mixed-use development at 710 Caledonia Avenue and 1961 Douglas Street in Victoria, BC, to replace the existing White Spot restaurant and Capital City Centre Hotel. The project will feature 3 high-rise mixed-use buildings, including 451 residential units, and approximately 94,000 square feet of commercial space. The site is located just outside the borderline of Downtown Victoria and the Central Business District and has excellent transit and active transportation amenities.
2. The trip generation was based on a mix of locally observed rates, Institute of Transportation Engineers' (ITE) Trip Generation Manual rates, and ITE rates with Victoria mode split applied if sufficient dense multi-use urban data was not available. The proposed development is anticipated to generate approximately 180 and 300 vehicle trips in AM and PM peak hours, respectively.
3. Intersection operation analysis was completed for the existing and future total traffic conditions where the majority of movements are anticipated to operate within acceptable performance thresholds. The main problematic movement identified in the future scenario where the eastbound movement at the Douglas & Discovery Street intersection was experiencing LOS F in AM and PM peak hours, and high V/C ratio and lengthy queues in the PM peak hour. Signalization of this intersection was explored as a mitigation measure. Resulting operations indicate that the Douglas & Discovery Street intersection will operate well within operation thresholds as a signalized traffic control.
4. A TAC signal warrant analysis was conducted to see whether the current two way stop control intersection at Douglas Street & Discovery Street would be warranted under existing, and/or future Total traffic conditions. The results of the analysis indicated that a full traffic signal would be warranted in the future Total traffic Conditions.
5. The developer is proposing to provide a total of 440 vehicle stalls, 600 long term bicycle spaces, 80 short term bicycle stalls, 7 Class B loading spaces, and 1 Class C loading spaces. The vehicle parking provisions are slightly deficient of the Bylaw requirement for some land uses, however, the reduced provisions are anticipated to meet the site demand and through supported with TDM measures.
6. Potential TDM measures for the site include transportation marketing service, improved transit facilities, additional bike parking, bike maintenance facilities, end of trip facilities, and car share vehicles/spaces/memberships.

## 6.2 Recommendations

1. The Douglas & Discovery Street intersection traffic control be updated to a full signal to support future vehicle and pedestrian traffic in the area.
2. Ensure TDM measures are in place to help support the Bylaw parking space variances.
3. It is noted that some ramp grade transitions exceed 10%, it is requested that these grade transitions be reduced to a maximum of 10% to avoid vehicles from bottoming out. Convex mirrors are also recommended at the corners of the curved ramp.
4. It is noted that the two loading vehicles located through the Discovery St access requires maneuvering across main parkade access area. It is recommended that the loading activity in this area be scheduled and monitored by the building manager and to avoid peak hours if possible.

# APPENDIX A

Terms of Reference



## MEMO

DATE: July 28, 2021  
PROJECT NO: 04-21-0252  
PROJECT: **710 Caledonia Avenue**  
SUBJECT: **Terms of Reference for Transportation Assessment and Management Study**

TO: Steve Hutchison, Transportation Planner  
City of Victoria

PREPARED BY: Raymond Ren, EIT  
REVIEWED BY: Tyler Thomson, MURB, MCIP, RPP, PTP

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Chard Development Ltd. (Chard) in partnership with BC Housing is proposing a mixed-use development at 710 Caledonia Avenue in Victoria, BC to replace the existing White Spot restaurant and Capital City Centre Hotel. The site is bounded by Douglas Street to the west, Caledonia Avenue to the south and Discovery Street to the north with adjoining commercial and office developments to the east. The site would be developed with 3 towers over a common underground parking facility over two phases with each tower containing different housing tenures. The ground floor would be composed of a mix of retail uses, including a grocery store, restaurant, and a coffee shop. There is also a daycare proposed for the ground floor along with some office uses above the ground floor in one of the towers. Vehicle access is proposed from Discovery Street which would include access to loading and waste/recycling facilities for the development.

Bunt & Associates has been engaged to prepare a Transportation Assessment and Management Study (TAMS) for the proposed development as part of the rezoning application process. The goals of the TAMS are:

- to review and summarize transportation and land use policy that is relevant to the site.
- to understand the existing operational challenges/opportunities in the study area concerning walking, cycling, transit and vehicle use.
- to estimate the number of new trips generated by the development and the operational impact on the study network.
- to assess how the anticipated 'net new' vehicle movements generated from development can be accommodated on the study network for future horizon years.
- to perform a detailed review of the parking supply on site for all proposed uses.
- to review on-site design access, loading, garbage, and accessibility of vehicles.

Bunt's proposed TAMS will include the following items as per the City's guidelines.

### 1. Introduction

- Background and purpose of the study.
- Description of the proposed development and phasing.
- Study area which includes the following intersections:
  - Douglas Street & Caledonia Avenue
  - Douglas Street & Discovery Avenue
  - Blanshard Street (mainline and frontage road) & Caledonia Avenue
  - Blanshard Street (frontage road) & Discovery Avenue
- Analysis time periods:
  - Weekday AM and PM peak hours as the expected new land use will generate the highest amount of traffic during these periods.  
*Note: Based on ITE Rates, it is expected that the peak volume in the network would be higher in the weekday PM compared to a Saturday peak hour.*
- Future horizon year analyzed:
  - Opening Day (Full Build-Out)

### 2. Existing Conditions

- A review of the study area characteristics and nearby roadway infrastructure.
- Summary of the available transit service, pedestrian and cycling facilities.
- Existing traffic volumes and intersection configurations at the study intersections.  
*Note: Volumes at signalized intersections (Douglas/Caledonia & Blanshard/Caledonia) will be provided by the City of Victoria in Synchro model output. Bunt will conduct traffic counts at the other study area intersections with the assumption that traffic volumes have returned to pre-COVID levels.*
- Current intersection operations to be analyzed using Synchro/SimTraffic software with HCM2010 or HCM6 outputs.

### 3. Proposed Development

- Summary of the proposed development density and site access configuration.
- Trip generations based on traffic counts conducted by Bunt at comparable sites, such as at The Hudson for residential rates and the Save-on-Foods at 1010 Pandora Avenue for the grocery component. Bunt will attempt to locate additional proxy sites for the other land

uses. These trip rates will be compared with the ITE rates listed below and Bunt will confirm with the City if these rates are acceptable to use.

- o ITE trip rates 10<sup>th</sup> Edition during the weekday AM and PM peak hours as summarized below:

LAND USE	VARIABLE	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
High-Rise Family Residential (ITE 222)	Per unit	0.07	0.24	0.31	0.22	0.14	0.36
Day Care Centre (ITE 565)	Per 1000 sf	5.83	5.17	11.00	5.22	5.89	11.12
General Office (ITE 710)	Per 1000 sf	1.00	0.16	1.16	0.18	0.97	1.15
Shopping Centre (ITE 820)	Per 1000 sf	0.58	0.36	0.94	1.83	1.98	3.81
Supermarket (ITE 850)	Per 1000 sf	2.29	1.53	3.82	4.71	4.53	9.24
High Turnover Sit Down Restaurant (ITE 932)	Per 1000 sf	5.47	4.47	9.94	4.57	2.80	7.37

4. Future Conditions

- Background traffic growth assumption for the area: **0.0% per year** based on other studies Bunt has conducted in the area.
- Analysis of future intersection operations with and without addition of the proposed development traffic.
- Any potential mitigation measures recommended to improve performance.

5. Site Design Review

- Confirmation of the site access feasibility for all modes, as well as garbage/recycling and emergency services accessibility.
- Review of loading, and vehicle and bicycle parking requirements based on the Bylaw.

6. Transportation Demand Management

- If a parking relaxation is sought, a summary of any proposed TDM measures to reduce single-occupancy vehicle trips and to promote the use of alternative transportation modes for trips to and from the site.

7. Conclusions and Recommendations

- Summary of the study methodology and findings.
- A list of improvement recommendations based on the study findings.



*The attached information is provided to support the agency's review process  
and shall not be distributed to other parties without written consent from  
Bunt & Associates Engineering Ltd.*

## APPENDIX B

Synchro Reports

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	1	28	0	3	7	20	616	1	6	688	18
Future Vol, veh/h	9	1	28	0	3	7	20	616	1	6	688	18
Conflicting Peds, #/hr	11	0	2	2	0	11	44	0	33	33	0	44
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	1	35	0	4	9	25	770	1	8	860	23

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1380	1786	488	1303	1797	430	927	0	0	804	0	0
Stage 1	932	932	-	854	854	-	-	-	-	-	-	-
Stage 2	448	854	-	449	943	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	104	81	526	118	79	573	733	-	-	816	-	-
Stage 1	287	343	-	320	373	-	-	-	-	-	-	-
Stage 2	560	373	-	559	339	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	87	69	501	98	67	548	700	-	-	789	-	-
Mov Cap-2 Maneuver	87	69	-	98	67	-	-	-	-	-	-	-
Stage 1	257	321	-	290	338	-	-	-	-	-	-	-
Stage 2	505	338	-	507	317	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	25.9		27.3		0.6		0.2	
HCM LOS	D		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	700	-	-	219	174	789	-	-
HCM Lane V/C Ratio	0.036	-	-	0.217	0.072	0.01	-	-
HCM Control Delay (s)	10.3	0.3	-	25.9	27.3	9.6	0.1	-
HCM Lane LOS	B	A	-	D	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.8	0.2	0	-	-

Queues  
2: Douglas Street & Caledonia Av.

Existing AM  
02/25/2022



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	22	56	264	116	584	777
v/c Ratio	0.04	0.06	0.33	0.14	0.43	0.81
Control Delay	10.2	9.3	12.9	2.7	17.3	28.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	9.3	12.9	2.7	17.3	28.4
Queue Length 50th (m)	1.5	3.4	21.3	0.0	30.2	49.7
Queue Length 95th (m)	4.9	8.7	36.2	7.2	42.9	#80.1
Internal Link Dist (m)		170.5	150.1		84.6	66.4
Turn Bay Length (m)				50.0		
Base Capacity (vph)	505	873	812	812	1350	957
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	0.04	0.06	0.33	0.14	0.43	0.81

Intersection Summary

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

HCM 6th Signalized Intersection Summary  
2: Douglas Street & Caledonia Av.

Existing AM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	45	6	86	157	107	3	510	25	109	592	15
Future Volume (veh/h)	20	45	6	86	157	107	3	510	25	109	592	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.98	0.99		0.83	0.96		0.83
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1796	1870	1870	1870	1870	1870	1870	1870	1826	1767	1796
Adj Flow Rate, veh/h	22	49	7	93	171	116	3	554	27	118	643	16
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
Percent Heavy Veh, %	2	7	2	2	2	2	2	2	2	5	9	7
Cap, veh/h	532	756	108	320	561	764	50	1334	65	177	918	24
Arrive On Green	0.49	0.49	0.48	0.49	0.49	0.49	0.40	0.40	0.39	0.40	0.40	0.39
Sat Flow, veh/h	1079	1532	219	517	1137	1548	4	3335	161	283	2295	60
Grp Volume(v), veh/h	22	0	56	264	0	116	310	0	274	357	0	420
Grp Sat Flow(s),veh/h/ln	1079	0	1751	1655	0	1548	1865	0	1635	1056	0	1583
Q Serve(g_s), s	0.9	0.0	1.3	3.0	0.0	3.1	0.0	0.0	9.1	15.3	0.0	16.3
Cycle Q Clear(g_c), s	7.6	0.0	1.3	6.7	0.0	3.1	9.0	0.0	9.1	24.3	0.0	16.3
Prop In Lane	1.00		0.13	0.35		1.00	0.01		0.10	0.33		0.04
Lane Grp Cap(c), veh/h	532	0	864	881	0	764	794	0	654	486	0	633
V/C Ratio(X)	0.04	0.00	0.06	0.30	0.00	0.15	0.39	0.00	0.42	0.73	0.00	0.66
Avail Cap(c_a), veh/h	532	0	864	881	0	764	794	0	654	486	0	633
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.6	0.0	10.0	11.3	0.0	10.4	16.2	0.0	16.3	21.6	0.0	18.4
Incr Delay (d2), s/veh	0.1	0.0	0.1	0.9	0.0	0.4	1.4	0.0	2.0	9.4	0.0	5.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.2	1.2	0.0	0.5	2.3	0.0	2.1	4.5	0.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	0.0	10.1	12.1	0.0	10.8	17.6	0.0	18.2	31.1	0.0	23.8
LnGrp LOS	B	A	B	B	A	B	B	A	B	C	A	C
Approach Vol, veh/h		78			380			584			777	
Approach Delay, s/veh		11.1			11.7			17.9			27.1	
Approach LOS		B			B			B			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		34.0		41.0		34.0		41.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		29.0		36.0		29.0		36.0				
Max Q Clear Time (g_c+I1), s		11.1		9.6		26.3		8.7				
Green Ext Time (p_c), s		5.9		0.6		1.8		4.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				20.3								
HCM 6th LOS				C								

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↘	
Traffic Vol, veh/h	0	8	0	0	109	10
Future Vol, veh/h	0	8	0	0	109	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	0	0	118	11

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	124	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	927	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	927	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s	8.9	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	927	-	-
HCM Lane V/C Ratio	0.009	-	-
HCM Control Delay (s)	8.9	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	2.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	199	251	0	0	117
Future Vol, veh/h	0	199	251	0	0	117
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	216	273	0	0	127

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	766
HCM Lane V/C Ratio	-	-	0.166
HCM Control Delay (s)	-	-	10.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.6

Queues  
5: Blanshard Street & Caledonia Av.

Existing AM  
02/25/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	36	181	28	292	25	796	320	1106
v/c Ratio	0.13	0.30	0.08	0.50	0.19	0.52	0.66	0.40
Control Delay	18.2	18.2	17.2	19.4	22.5	21.7	17.1	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	18.2	17.2	19.4	22.5	21.7	17.1	9.1
Queue Length 50th (m)	3.3	16.4	2.5	25.3	2.4	31.2	20.6	26.8
Queue Length 95th (m)	9.4	30.7	7.6	46.3	8.3	42.0	42.4	34.9
Internal Link Dist (m)		15.7		207.1		198.1		257.5
Turn Bay Length (m)	35.0		60.0		60.0		55.0	
Base Capacity (vph)	267	600	340	587	134	1519	486	2798
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.30	0.08	0.50	0.19	0.52	0.66	0.40
Intersection Summary								

HCM 6th Signalized Intersection Summary  
5: Blanchard Street & Caledonia Av.

Existing AM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	148	18	26	170	98	23	716	17	294	960	58
Future Volume (veh/h)	33	148	18	26	170	98	23	716	17	294	960	58
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.89	0.93		0.89	0.98		0.90	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1826	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	36	161	20	28	185	107	25	778	18	320	1043	63
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
Percent Heavy Veh, %	2	2	2	2	2	5	2	2	2	2	2	2
Cap, veh/h	294	527	66	387	347	201	253	1536	35	567	2733	165
Arrive On Green	0.33	0.33	0.30	0.33	0.33	0.30	0.30	0.30	0.27	0.20	0.56	0.53
Sat Flow, veh/h	1035	1605	199	1121	1057	611	500	5119	118	1781	4906	296
Grp Volume(v), veh/h	36	0	181	28	0	292	25	517	279	320	723	383
Grp Sat Flow(s),veh/h/ln	1035	0	1804	1121	0	1668	500	1702	1833	1781	1702	1798
Q Serve(g_s), s	2.1	0.0	5.3	1.3	0.0	10.1	2.6	8.8	8.8	7.4	8.4	8.5
Cycle Q Clear(g_c), s	12.1	0.0	5.3	6.6	0.0	10.1	2.6	8.8	8.8	7.4	8.4	8.5
Prop In Lane	1.00		0.11	1.00		0.37	1.00		0.06	1.00		0.16
Lane Grp Cap(c), veh/h	294	0	593	387	0	548	253	1021	550	567	1897	1002
V/C Ratio(X)	0.12	0.00	0.31	0.07	0.00	0.53	0.10	0.51	0.51	0.56	0.38	0.38
Avail Cap(c_a), veh/h	294	0	593	387	0	548	253	1021	550	567	1897	1002
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.1	0.0	17.6	20.0	0.0	19.5	18.1	20.2	20.3	11.7	8.7	8.8
Incr Delay (d2), s/veh	0.9	0.0	1.3	0.4	0.0	3.7	0.8	1.8	3.3	4.0	0.6	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.4	0.2	0.0	2.7	0.2	2.2	2.6	1.5	0.8	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.9	0.0	19.0	20.4	0.0	23.1	18.8	22.0	23.6	15.7	9.3	9.9
LnGrp LOS	C	A	B	C	A	C	B	C	C	B	A	A
Approach Vol, veh/h		217			320			821			1426	
Approach Delay, s/veh		19.9			22.9			22.5			10.9	
Approach LOS		B			C			C			B	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	18.0	25.0		27.0		43.0		27.0				
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s	13.0	19.0		21.0		37.0		21.0				
Max Q Clear Time (g_c+I1), s	9.4	10.8		14.1		10.5		12.1				
Green Ext Time (p_c), s	0.8	4.9		0.9		14.4		1.9				

Intersection Summary

HCM 6th Ctrl Delay	16.4
HCM 6th LOS	B



Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	2	38	1	2	35	13	1144	2	16	620	19
Future Vol, veh/h	11	2	38	1	2	35	13	1144	2	16	620	19
Conflicting Peds, #/hr	1	0	5	5	0	1	78	0	68	68	0	78
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	2	44	1	2	40	15	1315	2	18	713	22

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1528	2253	451	1813	2263	728	813	0	0	1385	0	0
Stage 1	838	838	-	1414	1414	-	-	-	-	-	-	-
Stage 2	690	1415	-	399	849	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	80	41	556	49	40	366	810	-	-	490	-	-
Stage 1	327	380	-	145	202	-	-	-	-	-	-	-
Stage 2	401	202	-	598	375	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	55	30	509	35	30	340	746	-	-	456	-	-
Mov Cap-2 Maneuver	55	30	-	35	30	-	-	-	-	-	-	-
Stage 1	279	326	-	125	174	-	-	-	-	-	-	-
Stage 2	322	174	-	504	322	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	44		29.2		0.5		0.7	
HCM LOS	E		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	746	-	-	149	192	456	-
HCM Lane V/C Ratio	0.02	-	-	0.393	0.227	0.04	-
HCM Control Delay (s)	9.9	0.4	-	44	29.2	13.2	0.4
HCM Lane LOS	A	A	-	E	D	B	A
HCM 95th %tile Q(veh)	0.1	-	-	1.7	0.8	0.1	-

Queues  
2: Douglas Street & Caledonia Av.

Existing PM  
02/25/2022



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	40	197	273	155	1123	716
v/c Ratio	0.11	0.27	0.44	0.24	0.67	0.69
Control Delay	16.1	16.5	20.2	11.8	17.4	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.1	16.5	20.2	11.8	17.4	19.6
Queue Length 50th (m)	3.7	18.5	31.5	12.1	63.3	41.0
Queue Length 95th (m)	9.8	32.8	53.0	25.1	84.2	61.1
Internal Link Dist (m)		170.5	150.1		84.6	66.4
Turn Bay Length (m)				50.0		
Base Capacity (vph)	373	739	626	639	1678	1033
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	0.11	0.27	0.44	0.24	0.67	0.69
Intersection Summary						

HCM 6th Signalized Intersection Summary  
2: Douglas Street & Caledonia Av.

Existing PM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	160	21	80	171	143	9	979	45	86	547	26
Future Volume (veh/h)	37	160	21	80	171	143	9	979	45	86	547	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.95	0.97		0.95	0.99		0.87	1.00		0.87
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1737	1870
Adj Flow Rate, veh/h	40	174	23	87	186	155	10	1064	49	93	595	28
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	11	2
Cap, veh/h	356	642	85	222	447	602	51	1671	76	138	981	51
Arrive On Green	0.40	0.40	0.39	0.40	0.40	0.40	0.50	0.50	0.49	0.50	0.50	0.49
Sat Flow, veh/h	1018	1606	212	406	1117	1504	10	3341	153	157	1963	102
Grp Volume(v), veh/h	40	0	197	273	0	155	595	0	528	291	0	425
Grp Sat Flow(s),veh/h/ln	1018	0	1818	1523	0	1504	1857	0	1647	678	0	1544
Q Serve(g_s), s	2.4	0.0	5.8	5.2	0.0	5.5	0.0	0.0	18.9	15.2	0.0	15.2
Cycle Q Clear(g_c), s	13.5	0.0	5.8	11.1	0.0	5.5	18.7	0.0	18.9	34.1	0.0	15.2
Prop In Lane	1.00		0.12	0.32		1.00	0.02		0.09	0.32		0.07
Lane Grp Cap(c), veh/h	356	0	727	668	0	602	974	0	824	398	0	772
V/C Ratio(X)	0.11	0.00	0.27	0.41	0.00	0.26	0.61	0.00	0.64	0.73	0.00	0.55
Avail Cap(c_a), veh/h	356	0	727	668	0	602	974	0	824	398	0	772
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.7	0.0	16.2	17.6	0.0	16.1	14.7	0.0	14.8	19.5	0.0	13.8
Incr Delay (d2), s/veh	0.6	0.0	0.9	1.8	0.0	1.0	2.9	0.0	3.8	11.2	0.0	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	2.3	3.5	0.0	1.8	7.1	0.0	6.5	5.6	0.0	4.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.3	0.0	17.1	19.4	0.0	17.1	17.5	0.0	18.6	30.8	0.0	16.6
LnGrp LOS	C	A	B	B	A	B	B	A	B	C	A	B
Approach Vol, veh/h		237			428			1123				716
Approach Delay, s/veh		18.2			18.6			18.0				22.4
Approach LOS		B			B			B				C
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		44.0		36.0		44.0		36.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		39.0		31.0		39.0		31.0				
Max Q Clear Time (g_c+I1), s		20.9		15.5		36.1		13.1				
Green Ext Time (p_c), s		11.7		1.8		1.9		4.0				

Intersection Summary

HCM 6th Ctrl Delay	19.4
HCM 6th LOS	B

Intersection						
Int Delay, s/veh	1.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↘	
Traffic Vol, veh/h	0	20	0	0	39	38
Future Vol, veh/h	0	20	0	0	39	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	0	0	42	41

Major/Minor	Minor2		Major2	
Conflicting Flow All	-	63	-	0
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	6.22	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.318	-	-
Pot Cap-1 Maneuver	0	1002	-	-
Stage 1	0	-	-	-
Stage 2	0	-	-	-
Platoon blocked, %			-	-
Mov Cap-1 Maneuver	-	1002	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	SB
HCM Control Delay, s	8.7	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	1002	-	-
HCM Lane V/C Ratio	0.022	-	-
HCM Control Delay (s)	8.7	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	346	250	0	0	59
Future Vol, veh/h	0	346	250	0	0	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	376	272	0	0	64

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	272
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	0	767
Stage 1	0	-	-	0	-
Stage 2	0	-	-	0	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	767
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	767
HCM Lane V/C Ratio	-	-	0.084
HCM Control Delay (s)	-	-	10.1
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.3

Queues  
5: Blanshard Street & Caledonia Av.

Existing PM  
02/25/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	100	276	43	296	28	1320	373	1178
v/c Ratio	0.49	0.53	0.20	0.58	0.16	0.63	1.03	0.38
Control Delay	35.0	29.0	24.7	25.9	18.0	20.3	78.7	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	29.0	24.7	25.9	18.0	20.3	78.7	8.1
Queue Length 50th (m)	13.4	36.3	4.9	32.2	2.6	56.4	~45.7	29.1
Queue Length 95th (m)	m25.6	m59.7	13.0	56.6	8.2	70.6	#96.4	36.8
Internal Link Dist (m)		15.7		207.1		198.1		257.5
Turn Bay Length (m)	35.0		60.0		60.0		55.0	
Base Capacity (vph)	203	525	212	510	171	2087	361	3071
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.53	0.20	0.58	0.16	0.63	1.03	0.38

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary  
5: Blanchard Street & Caledonia Av.

Existing PM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	92	228	26	40	159	113	26	1194	20	343	1018	65
Future Volume (veh/h)	92	228	26	40	159	113	26	1194	20	343	1018	65
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.87	0.94		0.87	0.99		0.93	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1826	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	100	248	28	43	173	123	28	1298	22	373	1107	71
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
Percent Heavy Veh, %	2	2	2	2	2	5	2	2	2	2	2	2
Cap, veh/h	222	466	53	255	274	195	284	2130	36	441	2993	192
Arrive On Green	0.29	0.29	0.26	0.29	0.29	0.26	0.41	0.41	0.39	0.15	0.61	0.59
Sat Flow, veh/h	1031	1622	183	1041	953	677	470	5163	88	1781	4887	313
Grp Volume(v), veh/h	100	0	276	43	0	296	28	856	464	373	771	407
Grp Sat Flow(s),veh/h/ln	1031	0	1805	1041	0	1630	470	1702	1847	1781	1702	1796
Q Serve(g_s), s	7.5	0.0	10.3	2.9	0.0	12.7	3.0	15.8	15.8	9.0	9.1	9.2
Cycle Q Clear(g_c), s	20.2	0.0	10.3	13.2	0.0	12.7	3.0	15.8	15.8	9.0	9.1	9.2
Prop In Lane	1.00		0.10	1.00		0.42	1.00		0.05	1.00		0.17
Lane Grp Cap(c), veh/h	222	0	519	255	0	469	284	1404	762	441	2085	1100
V/C Ratio(X)	0.45	0.00	0.53	0.17	0.00	0.63	0.10	0.61	0.61	0.85	0.37	0.37
Avail Cap(c_a), veh/h	222	0	519	255	0	469	284	1404	762	441	2085	1100
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.7	0.0	24.1	29.5	0.0	25.2	14.7	18.4	18.5	14.5	7.8	7.9
Incr Delay (d2), s/veh	6.4	0.0	3.9	1.4	0.0	6.3	0.7	2.0	3.6	17.7	0.5	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	4.5	0.8	0.0	5.2	0.3	5.7	6.5	4.8	2.5	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.1	0.0	27.9	31.0	0.0	31.5	15.4	20.4	22.1	32.3	8.3	8.8
LnGrp LOS	D	A	C	C	A	C	B	C	C	C	A	A
Approach Vol, veh/h		376			339			1348			1551	
Approach Delay, s/veh		31.2			31.5			20.9			14.2	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	16.0	37.0		27.0		53.0		27.0				
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s	11.0	31.0		21.0		47.0		21.0				
Max Q Clear Time (g_c+I1), s	11.0	17.8		22.2		11.2		15.2				
Green Ext Time (p_c), s	0.0	10.2		0.0		18.4		1.5				

Intersection Summary

HCM 6th Ctrl Delay	20.1
HCM 6th LOS	C



Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	2	28	26	5	34	20	629	17	15	696	18
Future Vol, veh/h	9	2	28	26	5	34	20	629	17	15	696	18
Conflicting Peds, #/hr	11	0	2	2	0	11	44	0	33	33	0	44
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	3	35	33	6	43	25	786	21	19	870	23

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1421	1854	493	1357	1855	448	937	0	0	840	0	0
Stage 1	964	964	-	880	880	-	-	-	-	-	-	-
Stage 2	457	890	-	477	975	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	97	73	522	108	73	558	727	-	-	791	-	-
Stage 1	274	332	-	308	363	-	-	-	-	-	-	-
Stage 2	553	359	-	538	328	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	71	60	498	86	60	533	695	-	-	764	-	-
Mov Cap-2 Maneuver	71	60	-	86	60	-	-	-	-	-	-	-
Stage 1	244	301	-	278	327	-	-	-	-	-	-	-
Stage 2	461	324	-	470	297	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	32.3		57.6		0.6		0.4	
HCM LOS	D		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	695	-	-	180	145	764	-	-
HCM Lane V/C Ratio	0.036	-	-	0.271	0.56	0.025	-	-
HCM Control Delay (s)	10.4	0.3	-	32.3	57.6	9.8	0.2	-
HCM Lane LOS	B	A	-	D	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1	2.8	0.1	-	-

Queues  
2: Douglas Street & Caledonia Av.

Total AM  
02/25/2022

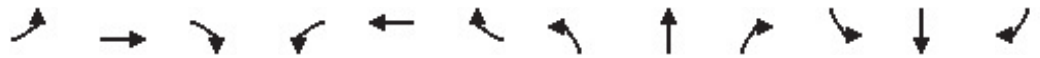


Lane Group	EBL	EBT	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	22	57	271	143	594	814
v/c Ratio	0.07	0.09	0.46	0.22	0.33	0.64
Control Delay	16.6	14.9	21.6	4.2	10.3	15.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.6	14.9	21.6	4.2	10.3	15.3
Queue Length 50th (m)	2.0	4.6	28.8	0.0	22.6	39.7
Queue Length 95th (m)	6.5	11.6	49.1	10.3	32.4	57.8
Internal Link Dist (m)		170.5	150.1		84.6	66.4
Turn Bay Length (m)				50.0		
Base Capacity (vph)	327	639	585	641	1796	1266
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	0.07	0.09	0.46	0.22	0.33	0.64

Intersection Summary

HCM 6th Signalized Intersection Summary  
2: Douglas Street & Caledonia Av.

Total AM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	46	6	90	159	132	3	514	29	137	597	15
Future Volume (veh/h)	20	46	6	90	159	132	3	514	29	137	597	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.97		0.97	0.99		0.88	0.97		0.88
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1796	1870	1870	1870	1870	1870	1870	1870	1826	1767	1796
Adj Flow Rate, veh/h	22	50	7	98	173	143	3	559	32	149	649	16
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
Percent Heavy Veh, %	2	7	2	2	2	2	2	2	2	5	9	7
Cap, veh/h	347	552	77	249	411	553	50	1766	100	275	1171	30
Arrive On Green	0.36	0.36	0.35	0.36	0.36	0.36	0.53	0.53	0.52	0.53	0.53	0.52
Sat Flow, veh/h	1046	1534	215	509	1143	1535	3	3311	188	389	2197	56
Grp Volume(v), veh/h	22	0	57	271	0	143	316	0	278	356	0	458
Grp Sat Flow(s),veh/h/ln	1046	0	1749	1652	0	1535	1866	0	1637	1052	0	1588
Q Serve(g_s), s	1.2	0.0	1.6	5.5	0.0	4.9	0.0	0.0	7.2	13.0	0.0	14.2
Cycle Q Clear(g_c), s	10.2	0.0	1.6	9.0	0.0	4.9	7.1	0.0	7.2	20.2	0.0	14.2
Prop In Lane	1.00		0.12	0.36		1.00	0.01		0.11	0.42		0.03
Lane Grp Cap(c), veh/h	347	0	630	660	0	553	1043	0	873	629	0	847
V/C Ratio(X)	0.06	0.00	0.09	0.41	0.00	0.26	0.30	0.00	0.32	0.57	0.00	0.54
Avail Cap(c_a), veh/h	347	0	630	660	0	553	1043	0	873	629	0	847
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.1	0.0	15.9	18.1	0.0	16.9	9.8	0.0	9.9	13.3	0.0	11.5
Incr Delay (d2), s/veh	0.4	0.0	0.3	1.9	0.0	1.1	0.7	0.0	1.0	3.7	0.0	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.4	2.3	0.0	1.1	1.2	0.0	1.1	1.7	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	0.0	16.2	20.0	0.0	18.1	10.6	0.0	10.8	16.9	0.0	14.0
LnGrp LOS	C	A	B	C	A	B	B	A	B	B	A	B
Approach Vol, veh/h		79			414			594			814	
Approach Delay, s/veh		17.9			19.3			10.7			15.3	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		44.0		31.0		44.0		31.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		39.0		26.0		39.0		26.0				
Max Q Clear Time (g_c+I1), s		9.2		12.2		22.2		11.0				
Green Ext Time (p_c), s		7.6		0.4		8.7		3.4				

Intersection Summary		
HCM 6th Ctrl Delay		14.8
HCM 6th LOS		B

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↘	
Traffic Vol, veh/h	0	8	0	0	110	27
Future Vol, veh/h	0	8	0	0	110	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	0	0	120	29

Major/Minor	Minor2	Major2
Conflicting Flow All	- 135	- 0
Stage 1	- -	- -
Stage 2	- -	- -
Critical Hdwy	- 6.22	- -
Critical Hdwy Stg 1	- -	- -
Critical Hdwy Stg 2	- -	- -
Follow-up Hdwy	- 3.318	- -
Pot Cap-1 Maneuver	0 914	- -
Stage 1	0 -	- -
Stage 2	0 -	- -
Platoon blocked, %		- -
Mov Cap-1 Maneuver	- 914	- -
Mov Cap-2 Maneuver	- -	- -
Stage 1	- -	- -
Stage 2	- -	- -

Approach	EB	SB
HCM Control Delay, s	9	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	914	-	-
HCM Lane V/C Ratio	0.01	-	-
HCM Control Delay (s)	9	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0	-	-

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	243	287	0	0	118
Future Vol, veh/h	0	243	287	0	0	118
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	264	312	0	0	128

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	728
HCM Lane V/C Ratio	-	-	0.176
HCM Control Delay (s)	-	-	11
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.6

## Queues

Total AM

## 5: Blanshard Street &amp; Caledonia Av.

02/25/2022

























Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	60	204	28	300	34	796	320	1128
v/c Ratio	0.23	0.34	0.09	0.51	0.29	0.58	0.62	0.40
Control Delay	20.0	18.6	17.3	19.8	27.9	23.9	16.4	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	18.6	17.3	19.8	27.9	23.9	16.4	9.1
Queue Length 50th (m)	5.6	18.5	2.5	26.5	3.5	32.6	20.6	27.3
Queue Length 95th (m)	14.2	34.1	7.7	47.9	11.2	43.9	43.9	35.7
Internal Link Dist (m)		15.7		207.1		198.1		257.5
Turn Bay Length (m)	35.0		60.0		60.0		55.0	
Base Capacity (vph)	261	596	323	587	118	1374	515	2791
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.34	0.09	0.51	0.29	0.58	0.62	0.40

## Intersection Summary

HCM 6th Signalized Intersection Summary  
5: Blanchard Street & Caledonia Av.

Total AM  
02/25/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	160	28	26	178	98	31	716	17	294	960	78
Future Volume (veh/h)	55	160	28	26	178	98	31	716	17	294	960	78
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.95		0.89	0.94		0.89	0.98		0.89	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1826	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	60	174	30	28	193	107	34	778	18	320	1043	85
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
Percent Heavy Veh, %	2	2	2	2	2	5	2	2	2	2	2	2
Cap, veh/h	289	500	86	369	354	196	235	1389	32	595	2668	217
Arrive On Green	0.33	0.33	0.30	0.33	0.33	0.30	0.27	0.27	0.24	0.23	0.56	0.53
Sat Flow, veh/h	1028	1521	262	1103	1076	597	489	5117	118	1781	4789	390
Grp Volume(v), veh/h	60	0	204	28	0	300	34	517	279	320	741	387
Grp Sat Flow(s),veh/h/ln	1028	0	1784	1103	0	1673	489	1702	1831	1781	1702	1775
Q Serve(g_s), s	3.6	0.0	6.1	1.4	0.0	10.4	3.8	9.1	9.2	7.4	8.6	8.7
Cycle Q Clear(g_c), s	13.9	0.0	6.1	7.5	0.0	10.4	3.8	9.1	9.2	7.4	8.6	8.7
Prop In Lane	1.00		0.15	1.00		0.36	1.00		0.06	1.00		0.22
Lane Grp Cap(c), veh/h	289	0	586	369	0	550	235	924	497	595	1897	989
V/C Ratio(X)	0.21	0.00	0.35	0.08	0.00	0.55	0.14	0.56	0.56	0.54	0.39	0.39
Avail Cap(c_a), veh/h	289	0	586	369	0	550	235	924	497	595	1897	989
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.0	0.0	17.9	20.7	0.0	19.5	20.0	21.9	22.0	11.7	8.8	8.9
Incr Delay (d2), s/veh	1.6	0.0	1.6	0.4	0.0	3.9	1.3	2.4	4.5	3.5	0.6	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	1.6	0.3	0.0	2.7	0.3	2.4	2.9	1.4	0.8	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.6	0.0	19.6	21.1	0.0	23.4	21.3	24.3	26.5	15.2	9.4	10.1
LnGrp LOS	C	A	B	C	A	C	C	C	C	B	A	B
Approach Vol, veh/h		264			328			830			1448	
Approach Delay, s/veh		21.2			23.2			25.0			10.9	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	20.0	23.0		27.0		43.0		27.0				
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s	15.0	17.0		21.0		37.0		21.0				
Max Q Clear Time (g_c+l1), s	9.4	11.2		15.9		10.7		12.4				
Green Ext Time (p_c), s	1.1	3.7		1.0		14.7		1.9				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				17.3								
HCM 6th LOS				B								



Queues  
1: Douglas Street & Discovery Street

Total AM - Douglas & Discovery Signal  
02/25/2022



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	49	82	832	912
v/c Ratio	0.09	0.15	0.47	0.50
Control Delay	9.7	11.7	11.9	12.3
Queue Delay	0.0	0.0	2.0	0.0
Total Delay	9.7	11.7	13.9	12.3
Queue Length 50th (m)	1.4	4.1	37.1	41.7
Queue Length 95th (m)	7.0	11.2	42.6	47.2
Internal Link Dist (m)	144.8	164.4	66.4	226.5
Turn Bay Length (m)				
Base Capacity (vph)	542	530	1782	1819
Starvation Cap Reductn	0	0	761	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.09	0.15	0.81	0.50
Intersection Summary				

HCM 6th Signalized Intersection Summary  
1: Douglas Street & Discovery Street

Total AM - Douglas & Discovery Signal  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	9	2	28	26	5	34	20	629	17	15	696	18
Future Volume (veh/h)	9	2	28	26	5	34	20	629	17	15	696	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		0.96	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	2	35	32	6	42	25	786	21	19	870	22
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	140	52	368	235	62	259	74	1827	48	63	1862	47
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.55	0.55	0.55	0.55	0.55	0.55
Sat Flow, veh/h	261	159	1131	529	192	797	47	3322	87	30	3386	85
Grp Volume(v), veh/h	48	0	0	80	0	0	428	0	404	473	0	438
Grp Sat Flow(s),veh/h/ln	1551	0	0	1518	0	0	1775	0	1682	1818	0	1683
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	12.6
Cycle Q Clear(g_c), s	1.6	0.0	0.0	2.7	0.0	0.0	10.7	0.0	11.4	12.2	0.0	12.6
Prop In Lane	0.23		0.73	0.40		0.52	0.06		0.05	0.04		0.05
Lane Grp Cap(c), veh/h	559	0	0	556	0	0	1024	0	925	1046	0	925
V/C Ratio(X)	0.09	0.00	0.00	0.14	0.00	0.00	0.42	0.00	0.44	0.45	0.00	0.47
Avail Cap(c_a), veh/h	559	0	0	556	0	0	1024	0	925	1046	0	925
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.8	0.0	0.0	19.1	0.0	0.0	10.5	0.0	10.7	10.8	0.0	10.9
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.5	0.0	0.0	1.3	0.0	1.5	1.4	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	0.7	0.0	0.0	1.9	0.0	1.9	2.1	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.1	0.0	0.0	19.7	0.0	0.0	11.8	0.0	12.2	12.3	0.0	12.7
LnGrp LOS	B	A	A	B	A	A	B	A	B	B	A	B
Approach Vol, veh/h		48			80			832				911
Approach Delay, s/veh		19.1			19.7			12.0				12.5
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		49.0		31.0		49.0		31.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		44.0		26.0		44.0		26.0				
Max Q Clear Time (g_c+I1), s		13.4		3.6		14.6		4.7				
Green Ext Time (p_c), s		7.8		0.2		8.6		0.4				

Intersection Summary

HCM 6th Ctrl Delay	12.7
HCM 6th LOS	B

HCM 6th TWSC  
1: Douglas Street & Discovery Street

Total PM  
02/25/2022

Intersection												
Int Delay, s/veh	72.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	7	38	46	5	83	13	1164	35	35	629	19
Future Vol, veh/h	11	7	38	46	5	83	13	1164	35	35	629	19
Conflicting Peds, #/hr	1	0	5	5	0	1	78	0	68	68	0	78
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	8	44	53	6	95	15	1338	40	40	723	22

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1595	2368	456	1907	2359	758	823	0	0	1446	0	0
Stage 1	892	892	-	1456	1456	-	-	-	-	-	-	-
Stage 2	703	1476	-	451	903	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	72	35	551	~42	35	350	803	-	-	465	-	-
Stage 1	303	358	-	136	193	-	-	-	-	-	-	-
Stage 2	394	189	-	557	354	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	31	23	505	~22	23	325	739	-	-	433	-	-
Mov Cap-2 Maneuver	31	23	-	~22	23	-	-	-	-	-	-	-
Stage 1	255	277	-	115	164	-	-	-	-	-	-	-
Stage 2	245	160	-	414	274	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	156.6	\$ 1051.5	0.5	1.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	739	-	-	76	52	433	-	-
HCM Lane V/C Ratio	0.02	-	-	0.847	2.962	0.093	-	-
HCM Control Delay (s)	10	0.4	-	156.6	\$ 1051.5	14.2	1	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.1	-	-	4.2	16.3	0.3	-	-

Notes  
~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Queues  
2: Douglas Street & Caledonia Av.

Total PM  
02/25/2022



Lane Group	EBL	EBT	WBT	WBR	NBT	SBT
Lane Group Flow (vph)	40	199	284	202	1138	775
v/c Ratio	0.15	0.33	0.58	0.37	0.59	0.72
Control Delay	21.1	21.3	26.0	14.2	12.4	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.1	21.3	26.0	14.2	12.4	16.9
Queue Length 50th (m)	4.3	21.5	29.2	11.3	53.1	40.6
Queue Length 95th (m)	11.4	38.1	54.3	29.7	70.5	62.4
Internal Link Dist (m)		170.5	150.1		84.6	66.4
Turn Bay Length (m)				50.0		
Base Capacity (vph)	268	602	491	544	1928	1082
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	0.15	0.33	0.58	0.37	0.59	0.72
Intersection Summary						

HCM 6th Signalized Intersection Summary  
2: Douglas Street & Caledonia Av.

Total PM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	162	21	87	174	186	9	988	50	131	557	26
Future Volume (veh/h)	37	162	21	87	174	186	9	988	50	131	557	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.93	0.96		0.94	1.00		0.89	1.00		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1737	1870
Adj Flow Rate, veh/h	40	176	23	95	189	202	10	1074	54	142	605	28
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
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	11	2
Cap, veh/h	222	522	68	184	330	483	51	1914	96	208	1003	49
Arrive On Green	0.32	0.32	0.31	0.32	0.32	0.32	0.57	0.57	0.56	0.57	0.57	0.56
Sat Flow, veh/h	969	1605	210	383	1016	1486	10	3328	166	241	1745	86
Grp Volume(v), veh/h	40	0	199	284	0	202	603	0	535	267	0	508
Grp Sat Flow(s),veh/h/ln	969	0	1815	1398	0	1486	1857	0	1647	520	0	1552
Q Serve(g_s), s	3.0	0.0	6.7	8.5	0.0	8.5	0.0	0.0	16.4	23.7	0.0	16.6
Cycle Q Clear(g_c), s	18.1	0.0	6.7	15.1	0.0	8.5	16.2	0.0	16.4	40.1	0.0	16.6
Prop In Lane	1.00		0.12	0.33		1.00	0.02		0.10	0.53		0.06
Lane Grp Cap(c), veh/h	222	0	590	514	0	483	1114	0	947	368	0	893
V/C Ratio(X)	0.18	0.00	0.34	0.55	0.00	0.42	0.54	0.00	0.56	0.73	0.00	0.57
Avail Cap(c_a), veh/h	222	0	590	514	0	483	1114	0	947	368	0	893
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.1	0.0	20.5	23.5	0.0	21.1	10.7	0.0	10.7	19.4	0.0	10.8
Incr Delay (d2), s/veh	1.8	0.0	1.5	4.2	0.0	2.7	1.9	0.0	2.4	11.8	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	2.8	4.7	0.0	3.0	5.6	0.0	5.1	5.0	0.0	4.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.9	0.0	22.1	27.8	0.0	23.7	12.6	0.0	13.2	31.2	0.0	13.4
LnGrp LOS	C	A	C	C	A	C	B	A	B	C	A	B
Approach Vol, veh/h		239			486			1138				775
Approach Delay, s/veh		23.9			26.1			12.8				19.5
Approach LOS		C			C			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		50.0		30.0		50.0		30.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		45.0		25.0		45.0		25.0				
Max Q Clear Time (g_c+I1), s		18.4		20.1		42.1		17.1				
Green Ext Time (p_c), s		15.4		0.8		2.0		2.7				

Intersection Summary		
HCM 6th Ctrl Delay		18.3
HCM 6th LOS		B

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗			↘	
Traffic Vol, veh/h	0	20	0	0	41	76
Future Vol, veh/h	0	20	0	0	41	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	22	0	0	45	83

Major/Minor	Minor2	Major2
Conflicting Flow All	- 87	- 0
Stage 1	- -	- -
Stage 2	- -	- -
Critical Hdwy	- 6.22	- -
Critical Hdwy Stg 1	- -	- -
Critical Hdwy Stg 2	- -	- -
Follow-up Hdwy	- 3.318	- -
Pot Cap-1 Maneuver	0 971	- -
Stage 1	0 -	- -
Stage 2	0 -	- -
Platoon blocked, %		- -
Mov Cap-1 Maneuver	- 971	- -
Mov Cap-2 Maneuver	- -	- -
Stage 1	- -	- -
Stage 2	- -	- -

Approach	EB	SB
HCM Control Delay, s	8.8	0
HCM LOS	A	

Minor Lane/Major Mvmt	EBLn1	SBT	SBR
Capacity (veh/h)	971	-	-
HCM Lane V/C Ratio	0.022	-	-
HCM Control Delay (s)	8.8	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑			↑
Traffic Vol, veh/h	0	417	301	0	0	61
Future Vol, veh/h	0	417	301	0	0	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	453	327	0	0	66

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	714
HCM Lane V/C Ratio	-	-	0.093
HCM Control Delay (s)	-	-	10.6
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.3

## Queues

Total PM

## 5: Blanshard Street &amp; Caledonia Av.

02/25/2022



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	140	313	43	311	43	1320	373	1203
v/c Ratio	0.68	0.58	0.21	0.59	0.33	0.80	0.76	0.40
Control Delay	39.4	24.4	24.4	25.7	28.9	29.1	26.8	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.4	24.4	24.4	25.7	28.9	29.1	26.8	8.7
Queue Length 50th (m)	14.9	31.4	4.9	34.3	4.9	66.1	35.3	30.9
Queue Length 95th (m)	m#37.5	m57.8	13.0	59.3	14.2	82.8	#73.8	39.2
Internal Link Dist (m)		15.7		207.1		198.1		257.5
Turn Bay Length (m)	35.0		60.0		60.0		55.0	
Base Capacity (vph)	207	543	200	531	131	1644	494	2995
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.58	0.21	0.59	0.33	0.80	0.76	0.40

## Intersection Summary

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

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM 6th Signalized Intersection Summary  
5: Blanchard Street & Caledonia Av.

Total PM  
02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑↑↑		↖	↑↑↑	
Traffic Volume (veh/h)	129	246	42	40	173	113	40	1194	20	343	1018	88
Future Volume (veh/h)	129	246	42	40	173	113	40	1194	20	343	1018	88
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.96		0.88	0.96		0.88	0.98		0.91	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1826	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	140	267	46	43	188	123	43	1298	22	373	1107	96
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
Percent Heavy Veh, %	2	2	2	2	2	5	2	2	2	2	2	2
Cap, veh/h	229	455	78	243	298	195	239	1677	28	526	2858	248
Arrive On Green	0.30	0.30	0.28	0.30	0.30	0.28	0.32	0.32	0.30	0.22	0.60	0.57
Sat Flow, veh/h	1024	1518	262	1019	995	651	457	5161	87	1781	4763	413
Grp Volume(v), veh/h	140	0	313	43	0	311	43	856	464	373	791	412
Grp Sat Flow(s),veh/h/ln	1024	0	1780	1019	0	1645	457	1702	1844	1781	1702	1772
Q Serve(g_s), s	10.9	0.0	12.0	3.0	0.0	13.1	5.6	18.1	18.2	9.3	9.7	9.8
Cycle Q Clear(g_c), s	24.0	0.0	12.0	15.0	0.0	13.1	5.6	18.1	18.2	9.3	9.7	9.8
Prop In Lane	1.00		0.15	1.00		0.40	1.00		0.05	1.00		0.23
Lane Grp Cap(c), veh/h	229	0	534	243	0	494	239	1106	599	526	2042	1063
V/C Ratio(X)	0.61	0.00	0.59	0.18	0.00	0.63	0.18	0.77	0.77	0.71	0.39	0.39
Avail Cap(c_a), veh/h	229	0	534	243	0	494	239	1106	599	526	2042	1063
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.6	0.0	23.9	30.2	0.0	24.5	20.1	24.3	24.4	14.0	8.3	8.5
Incr Delay (d2), s/veh	11.6	0.0	4.7	1.6	0.0	6.0	1.6	5.3	9.4	7.8	0.6	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	0.0	5.2	0.8	0.0	5.4	0.6	7.2	8.5	3.9	2.8	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.2	0.0	28.6	31.7	0.0	30.5	21.8	29.6	33.8	21.8	8.9	9.6
LnGrp LOS	D	A	C	C	A	C	C	C	C	C	A	A
Approach Vol, veh/h		453			354			1363			1576	
Approach Delay, s/veh		34.0			30.7			30.8			12.1	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	22.0	30.0		28.0		52.0		28.0				
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s	17.0	24.0		22.0		46.0		22.0				
Max Q Clear Time (g_c+I1), s	11.3	20.2		26.0		11.8		17.0				
Green Ext Time (p_c), s	1.4	3.3		0.0		18.4		1.4				

Intersection Summary

HCM 6th Ctrl Delay	23.3
HCM 6th LOS	C



## Queues

Total PM - Discovery Signal

02/25/2022

## 1: Douglas Street &amp; Discovery Street



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	65	154	1393	785
v/c Ratio	0.12	0.31	0.74	0.50
Control Delay	10.1	18.5	9.2	11.9
Queue Delay	0.0	0.0	0.1	0.1
Total Delay	10.1	18.5	9.3	12.0
Queue Length 50th (m)	2.2	13.8	33.0	34.8
Queue Length 95th (m)	9.9	27.0	40.4	46.1
Internal Link Dist (m)	144.8	164.4	66.4	226.5
Turn Bay Length (m)				
Base Capacity (vph)	528	495	1885	1578
Starvation Cap Reductn	0	0	26	0
Spillback Cap Reductn	1	1	0	89
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.12	0.31	0.75	0.53
Intersection Summary				

HCM 6th Signalized Intersection Summary  
 1: Douglas Street & Discovery Street

Total PM - Discovery Signal  
 02/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	11	7	38	46	5	83	13	1164	35	35	629	19
Future Volume (veh/h)	11	7	38	46	5	83	13	1164	35	35	629	19
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.93	1.00		0.93
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	13	8	44	53	6	95	15	1338	40	40	723	22
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	121	92	333	197	46	294	54	1917	57	89	1583	51
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.56	0.56	0.56	0.56	0.56	0.56
Sat Flow, veh/h	215	294	1066	437	147	941	14	3407	101	70	2813	90
Grp Volume(v), veh/h	65	0	0	154	0	0	731	0	662	374	0	411
Grp Sat Flow(s),veh/h/ln	1575	0	0	1526	0	0	1848	0	1675	1295	0	1678
Q Serve(g_s), s	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	22.9	2.9	0.0	11.4
Cycle Q Clear(g_c), s	2.2	0.0	0.0	5.8	0.0	0.0	22.4	0.0	22.9	25.8	0.0	11.4
Prop In Lane	0.20		0.68	0.34		0.62	0.02		0.06	0.11		0.05
Lane Grp Cap(c), veh/h	546	0	0	537	0	0	1085	0	942	779	0	944
V/C Ratio(X)	0.12	0.00	0.00	0.29	0.00	0.00	0.67	0.00	0.70	0.48	0.00	0.44
Avail Cap(c_a), veh/h	546	0	0	537	0	0	1085	0	942	779	0	944
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.7	0.0	0.0	20.8	0.0	0.0	12.6	0.0	12.7	10.1	0.0	10.1
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.3	0.0	0.0	3.3	0.0	4.4	2.1	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	0.0	2.1	0.0	0.0	8.0	0.0	7.6	3.2	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.1	0.0	0.0	22.2	0.0	0.0	15.9	0.0	17.0	12.2	0.0	11.6
LnGrp LOS	C	A	A	C	A	A	B	A	B	B	A	B
Approach Vol, veh/h		65			154			1393				785
Approach Delay, s/veh		20.1			22.2			16.4				11.9
Approach LOS		C			C			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		50.0		30.0		50.0		30.0				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		45.0		25.0		45.0		25.0				
Max Q Clear Time (g_c+I1), s		24.9		4.2		27.8		7.8				
Green Ext Time (p_c), s		12.0		0.3		6.2		0.9				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				15.4								
HCM 6th LOS				B								



*The attached information is provided to support the agency's review process  
and shall not be distributed to other parties without written consent from  
Bunt & Associates Engineering Ltd.*

## APPENDIX C

### TAC Signal Warrant Analysis