TRANSPORTATION PLANNERS AND ENGINEERS

bunt & associates

4545 West 10th Avenue

Transportation Assessment and Management Study

Version 1.0

Prepared for

BentallGreenOak

Date

August 17, 2023

Project No.

04-21-0460

August 17, 2023
04-21-0460

David Roche
BentallGreenOak (Canada) LP
1800 – 1055 Dunsmir Street
Four Bentall Centre, PO Box 49001
Vancouver BC
V7X 1B1

Dear David:

Re: 4545 West 10th Avenue
Transportation Assessment and Management Study

Bunt & Associates Engineering Ltd. (Bunt) has completed the following Transportation Assessment and Management Study (TAMS) for the planned mixed-use commercial and office development at 4545 West 10th Avenue in Vancouver, BC.

The attached report documents the site context and accessibility, parking and loading supply, our site plan design review, the estimated number of vehicle and person trips generated by the development, and the anticipated traffic operations effects of the development traffic on the adjacent street network. This report also includes a draft TDM plan prepared according to the City's requirements.

We are pleased to have the opportunity to work with BentallGreenOak on this unique project, and trust that our input will be of assistance in supporting project approvals.

Yours truly,
Bunt & Associates

Yulia Liem, P.Eng., PTOE.
Principal

Hana Stoer, EIT
Transportation Analyst

CORPORATE AUTHORIZATION

Prepared By:	Coco Yang, EIT Transportation Analyst	Bunt & Associates Engineering Ltd. 1550-1050 West Pender Street Vancouver, BC V6E 3S7
	Hana Stoer, EIT Transportation Analyst	Canada
Reviewed By:	Yulia Liem, P.Eng., PTOE. Principal	Telephone: +1 604 685 6427 Facsimile: +1 604 685 6579
		Date: 2023-08-17 Project No. 04-21-0460
Approved By:	Yulia Liem, P.Eng., PTOE. Principal	Status: Version 1

TABLE OF CONTENTS

EXHIBITS

FIGURES

TABLES

EXECUTIVE SUMMARY

BentallGreenOak (Canada) LP has proposed to redevelop the site located at 4545 West 10th Avenue, in West Point Grey, City of Vancouver. The site is used to house Safeway which closed its door in 2018 and has since remained an empty lot. With the proposed development, the site is planned to provide almost 570 units of rental housings including 114 below market rental units under the Moderate-Income Rental Housing Pilot Program (MIRHPP), and over 42,100 sf of retail space including a potential neighbourhood grocery store. The plan will revitalize the area with the ground level retail space and plaza, and will bring in the much-needed rental housings to the community.

The site benefits from its proximity to West 10th major transit corridor, well connected to major cycling network in the city, and will be potentially located within walking distance to a rapid transit system – UBC extension which has been approved by the Mayors' Council and part of the 10 years priority to be completed between 2030-2035. The intersections adjacent to the site are currently operating well with no capacity issues and queueing observed during the weekday morning and afternoon peak hours.

The proposed development is anticipated to generate between 330 – 480 vehicles during the weekday peak hours, which translates to an average of 5 – 8 vehicles added onto the road network every minute during the peak hour. The existing road capacity is expected to be able to accommodate these new trips without any mitigations. The only improvement warranted is an upgrade from the pedestrian activated signal to a full signal control at the intersection of West 10th Avenue & Tolmie Street with the completion of the project. Based on the pedestrian crossing control warrant analysis, both intersections of West 9th Avenue & Tolmie Street and West 9th Avenue & Sasamat Street are candidates for pedestrian crossing facilities with side-mounted signs and parallel crossing lines in the future if pedestrian traffic projections at a rate of 1% per year are realized.

The project is planning to provide the off-street vehicle, bicycle, loading and passenger spaces meeting or exceeding the minimum Bylaw requirements, and provide a set of Transportation Demand Management (TDM) measures that support sustainable transportation options for residents and employees. Several TDM measures proposed include additional long-term bicycle parking, share e-bike fleet, car share vehicles and spaces, additional passenger spaces, improved end-of-trip facilities, bike maintenance facilities and bike wash.

Overall, the proposed development will bring values to the community, offering 500+ of rental housings with different size units for single person to family, and reactivate the area with retails and plaza for gathering space, while generating minimal impact to the area road network with its parking provision and abundant contribution of TDM measures.

1. INTRODUCTION

1.1 Study Purpose & Objectives

BentallGreenOak (Canada) LP (BentallGreenOak) has proposed a mixed-used development located on West 10th Avenue, between Tolmie Street and Sasamat Street in West Point Grey in the City of Vancouver, BC. The site location is illustrated on **Exhibit 1.1**. The project features 455 market rental suites and 114 below market rental suites which are under the Moderate-Income Rental Housing Pilot Program (MIRHPP), and over 42,100 sf of retail space. This development will provide the need of rental housing in the community and re-activate the vacant site that was home to a grocery store before, with a range of ground level retail components.

As part of the Rezoning Policy for Sustainable Large Developments, the City of Vancouver requires BentallGreenOak to submit a *Transportation Assessment and Management Study* (TAMS) and a *Transportation Demand Management* (TDM) Plan as part of its application. BentallGreenOak engaged Bunt & Associates Engineering Ltd. (Bunt) to prepare both the TAMS and TDM Plan in support of site development approvals.

The City of Vancouver's *Transportation Assessment and Management Study Guidelines for Consultants* and *Transportation Demand Management for Developments in Vancouver* Administrative Bulletin clearly outline the required scope elements for TAMS and TDM Plan documents, respectively. This report addresses the scope requirements of both application documents, and the approved study Terms of Reference is included in **Appendix A**.

The objective of this report is to provide City staff with confidence that the proposed development can be supported from a transportation perspective, and includes the following elements:

- A review of the current site context and accessibility for all transportation modes;
- Forecasts of the expected vehicle trip generation by the site development and distribution of this traffic demand on the immediate street network;
- An analysis of the impact of additional vehicle traffic demands on the adjacent network and potential mitigation measures to reduce this impact; and,
- A review of proposed access, parking and loading supply in accordance to the City's bylaw requirements;
- An assessment of site transportation design features to confirm adequacy of access and parking layouts, vehicle circulation, loading vehicle manoeuvres, etc.;

- Presentation of a draft Transportation Demand Management (TDM) Plan to meet the City of Vancouver's policy requirement of 30 points for large sites.

1.2 Study Scope & Area

The study area for the TAMS is also illustrated on **Exhibit 1.1** and includes the following intersections:

- West 10th Avenue & Blanca Street
- West 10th Avenue & Tolmie Street
- West 10th Avenue & Sasamat Street
- West 9th Avenue & Tolmie Street
- West 9th Avenue & Sasamat Street
- Tolmie Street and Laneway / Site Access
- Sasamat Street and Laneway / Existing Access

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 1.1

Site Location & Study Intersections

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates

1.3 Organization of Report

This report is organized into the following sections:

- Section 1 - Introduction
- Section 2 – Existing Conditions
- Section 3 – Future Traffic Conditions
- Section 4 – Signal Warrant Analysis
- Section 5 – Site Plan Review
- Section 6 – Transportation Demand Management Plan
- Section 7 – Conclusions & Recommendations

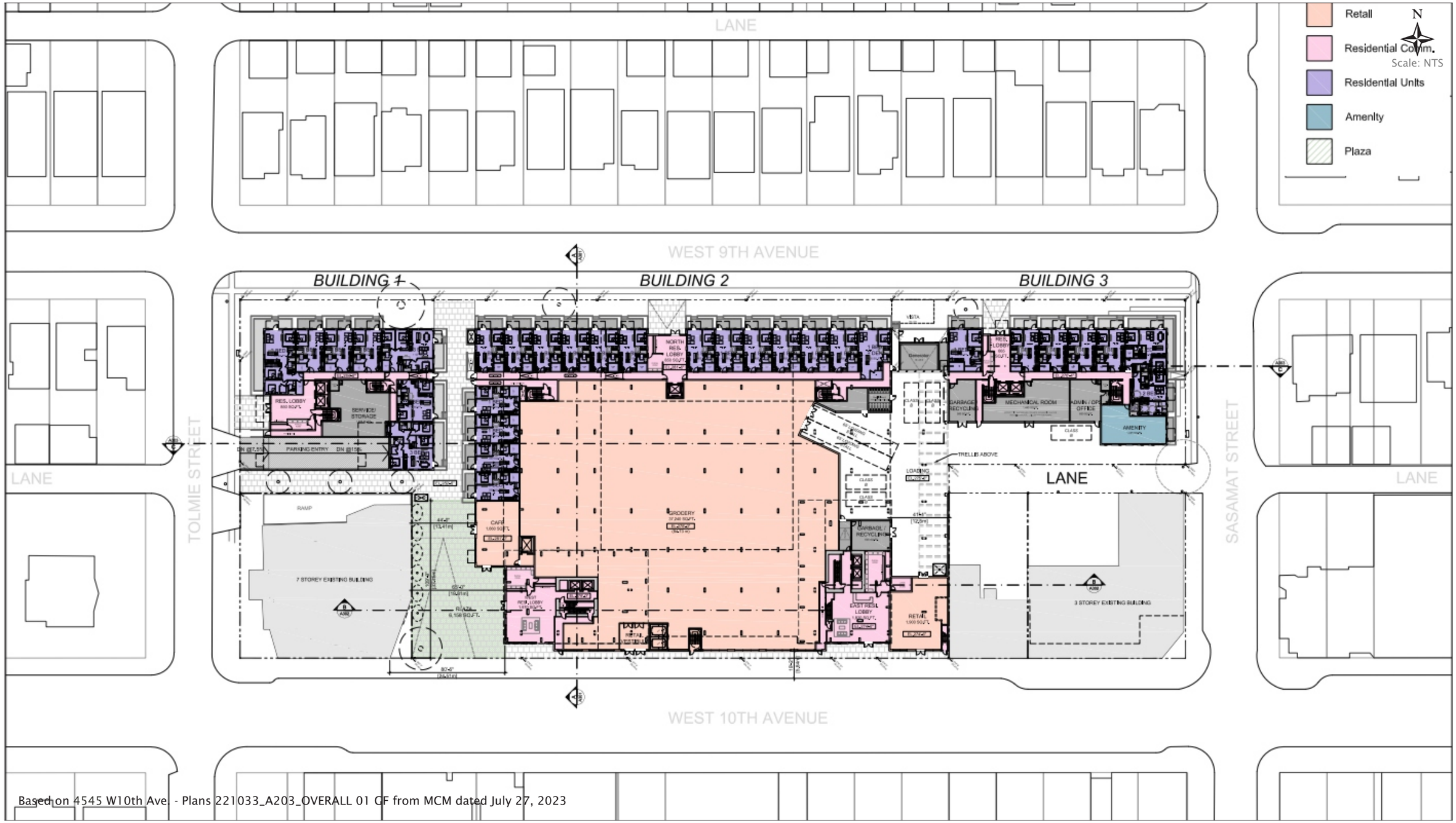
1.4 Proposed Development

4545 West 10th Avenue is a residential-commercial development on a currently vacant site. It consists of three buildings varying from 5 to 15 stories and 2 levels of underground parking. It was accepted into the Moderate-Income Rental Housing Pilot Program (MIRHPP) and expected to deliver 569 units of secured market and below market retail units under the MIRHPP guidelines. It will also provide neighbourhood retail including a grocery store, a pharmacy, and a plaza on the ground level to replace the grocery store that has operated on this site for decades and closed its door in 2018. The site has been vacant since then.

There will be one parkade driveway access on the west frontage of the site facing Tolmie Street. Access to the Class A and Class B goods loading zones are located on the east frontage of the site facing Sasamat Street. The proposed ground level site plan is shown in **Exhibit 1.2**.

Table 1.1: Proposed Land Uses (Based on May 10, 2022 Stats)

LAND USE	UNIT TYPE	AVERAGE UNIT SIZE (FT²)	UNITS
Residential – Market Rental	Studio	459	1
	1 Bedroom	574	281
	2 & 3 Bedrooms	832 (2 bedrooms) & 1,081 (3 bedrooms)	173
	Subtotal	-	**455**
Residential - MIRHPP	Studio	459	28
	1 Bedroom	574	46
	2 & 3 Bedrooms	832 (2 bedrooms) & 1,081 (3 bedrooms)	40
	Subtotal	-	**114**
	Residential Subtotal	486,740 SF	**569**
Retail	-	40,735 SF	-



Based on 4545 W10th Ave. - Plans 221033_A203_OVERALL 01 CF from MCM dated July 27, 2023

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 1.2
Site Plan

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates

2. EXISTING CONDITIONS

2.1 Land Use

The site is currently vacant. It used to house a grocery store, which closed in 2018 and was subsequently demolished. Adjacent to the site, there is currently a high-rise residential tower with retail and a bank on the ground level on the southwest corner, and a low-rise residential-commercial complex on the southeast corner.

The site is currently zoned as C-2, designated to provide commercial uses "serving both local and city-wide needs, as well as residential uses, along arterial streets". The two blocks to the east of the site along West 10th Avenue are also zoned as C-2 and consists of mostly low-rise commercial buildings. The residential neighbourhood to the north is zoned at RS-1 and consists of single-family homes. The block to the west of the site is zoned as RM-3 and consists of several high-rise residential towers.

2.2 Existing Transportation Network

2.2.1 Road Network

Table 2.1: Existing Street Characteristics

STREET	CLASSIFICATION	NUMBER OF TRAVEL LANES	PARKING FACILITIES	TOTAL PEAK LINK FLOW (EXISTING PM, TWO-WAY)
West 9th Avenue	Local Road	2 travel lanes	Curbside parking on both road edges	30 veh/hr
West 10th Avenue	Arterial Road, Truck Route	4 travel lanes	Curbside parking on both road edges	850 veh/ hr
Sasamat Street	Local Road	2 travel lanes	Curbside parking on both road edges	125 veh/hr
Tolmie Street	Local Road	2 travel lanes	Curbside parking on both road edges	80 veh/hr
Blanca Street	Collector Road, Truck Route	4 travel lanes with unidirectional painted bike lane on the west side	Mostly no on-street parking	525 veh/hr

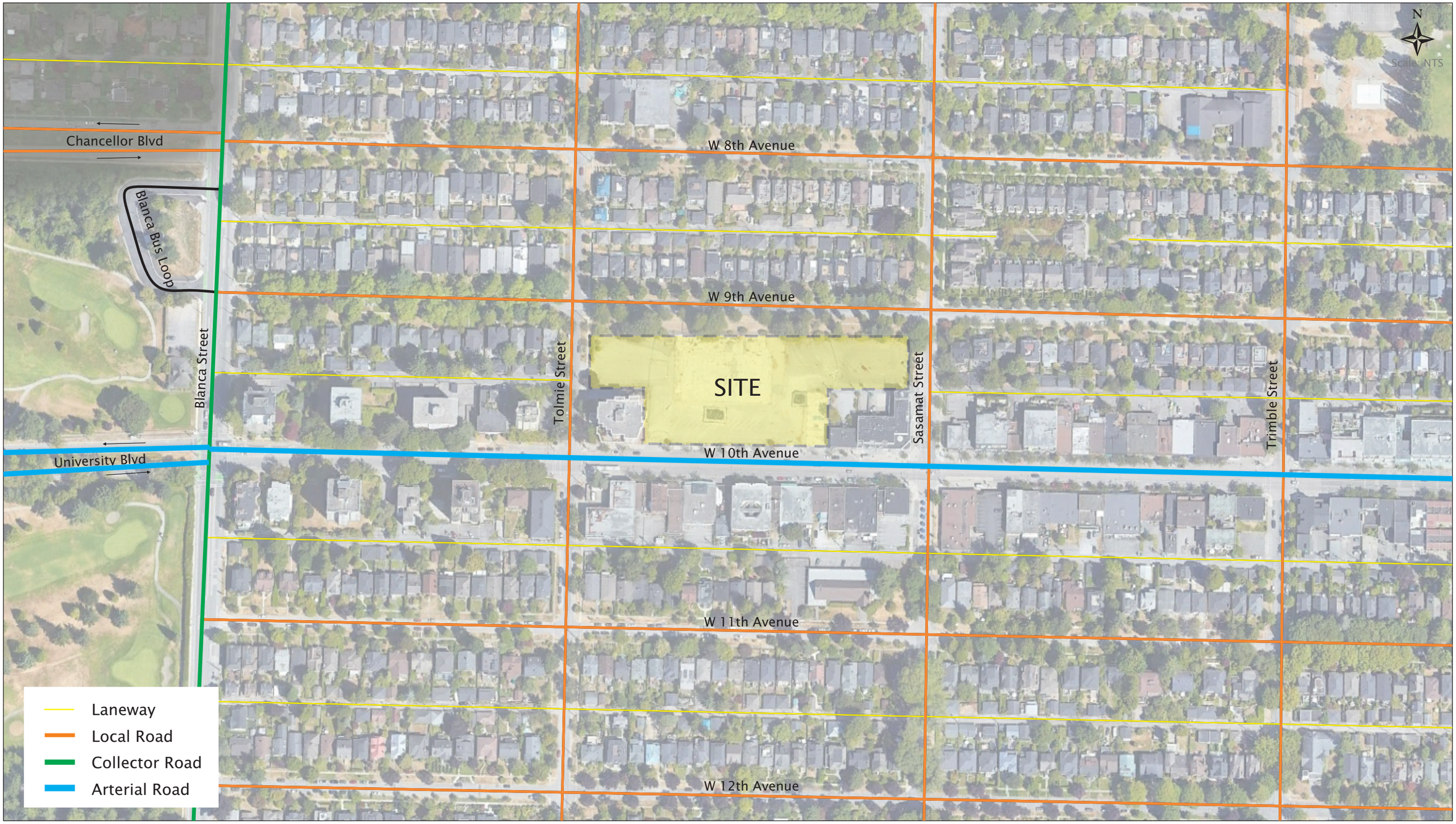
West 9th Avenue is a two-way, east-west local residential road with two travel lanes and curbside parking, either permit parking or free 2hr parking, on both road edges.

West 10th Avenue is a two-way, east-west arterial road with four travel lanes and on-street pay parking on both sides to accommodate the needs of nearby businesses. It is an important bus corridor in West Point Grey and on the routes of Bus #9 and #14 in addition to the 99 B-Line. West 10th Avenue between Blanca Street and Alma Street is also part of the City's truck routes.

Sasamat Street and **Tolmie Street** are two-way, north-side local residential roads with two travel lanes and curbside parking, either permit parking or free 2hr parking, on both road edges.

Blanca Street is a two-way, north-south collector road on the eastern edge of University Golf Club. It features a unidirectional painted bike lane on its west edge and does not provide on-street parking on either side. Blanca Street between Chancellor Boulevard and West 10th Avenue is part of the City's truck routes.

Exhibit 2.1 shows the existing road network and **Exhibit 2.2** details the existing laning and traffic controls at the study intersections.



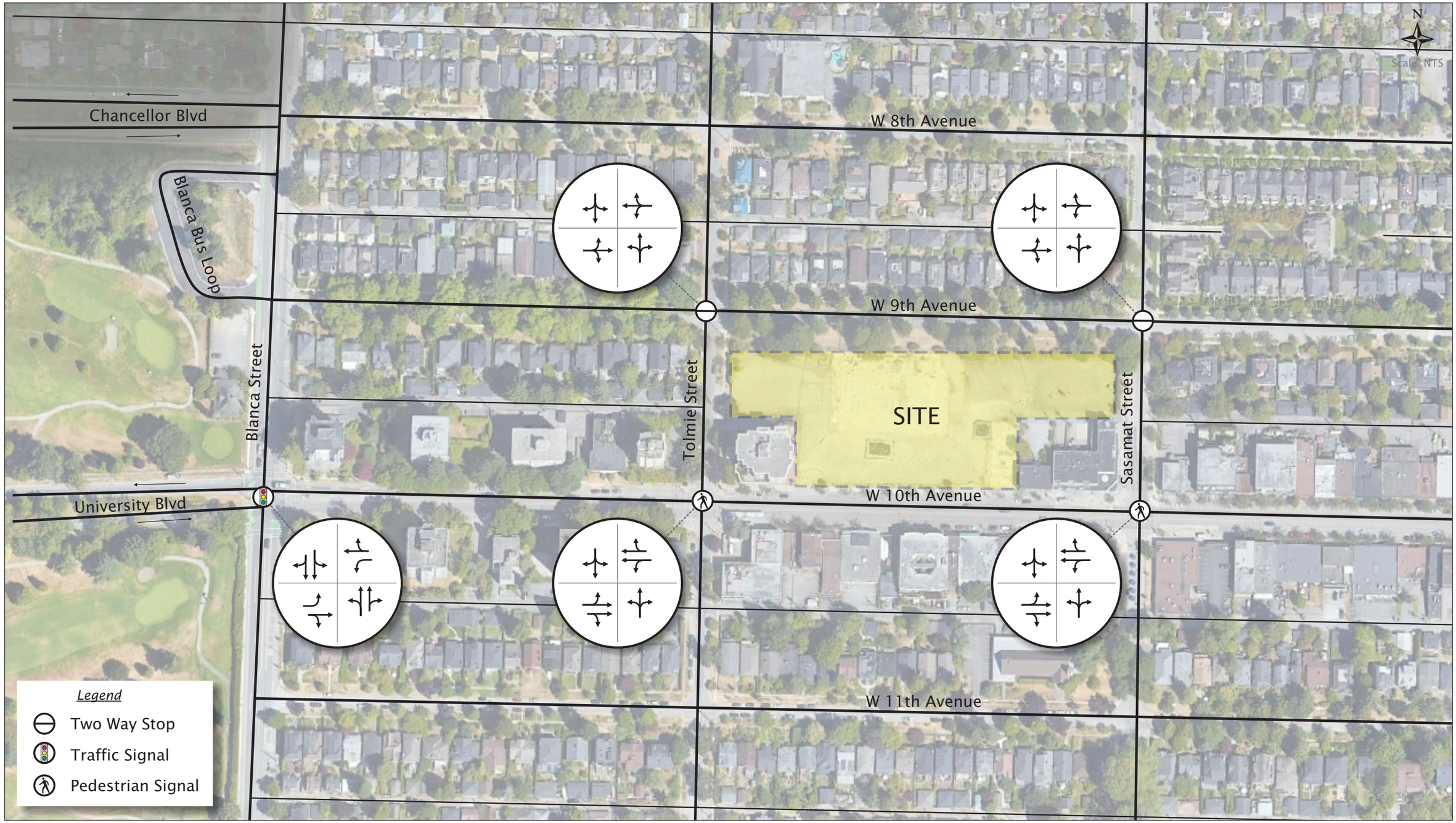
M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 2.1
Street Network

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates



M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 2.2

Existing Laning & Traffic Control

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates

2.2.2 Transit Network

The site enjoys excellent transit accessibility with West 10th Avenue, a major transit corridor in West Point Grey that connects with West Broadway via Alma Street approximately 1.7 km east of the site. There are 10 bus stops within 400m or 10 minutes of walking distance from the site, providing convenient access to Routes 4, 9, 14, and 99. Routes 4, 9, 14, and 99 are all frequent transit routes with a frequency less than 15 minutes throughout most of the day. The 99 B-Line is a rapid transit route that provides high-frequency, high-capacity transit links to Canada Line and Expo Line stations.

Table 2.2 shows the stops within 400m walking distance of the site, which are also illustrated in **Exhibit 2.3**.

Table 2.2: Transit Stops within 400m Walking Distance of Site

STOP LOCATION	DIRECTION	STOP #	AMENITY	ROUTES SERVICED	WALKING DISTANCE
West 10th Avenue @ Tolmie Street	EB	50275	Post and Covered Bench Area	9, 14, N17	<100m
West 10th Avenue @ Tolmie Street	WB	50577	Post and Covered Bench Area	9, 14, N17	<100m
West 10th Avenue @ Sasamat Street	WB	58023	Post and Covered Bench Area	9, 14, 99, N17	<100m
West 10th Avenue @ Sasamat Street	EB	50276	Post and Covered Bench Area	9, 14, 99, N17	150m
West 10th Avenue @ Sasamat Street	EB	50276	Post and Covered Bench Area	9, 14, 99, N17	150m
West 10th Avenue @ Blanca Street	EB	50274	Post and Covered Bench Area	9, 14, N17	250 m
West 10th Avenue @ Blanca Street	NB	50272	Post Only	4	250m
West 10th Avenue @ Trimble Street	WB	50576	Post Only	9, 14, N17	300m
University Boulevard @ Blanca Street	WB	50601	Post and Covered Bench Area	4, 9, 14, N17	320m
West 10th Avenue @ Trimble Street	EB	50277	Post and Covered Bench Area	9, 14, N17	400m

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 2.3

Transit Routes & Stops

4545 W10th Avenue
04-21-0460 August 2023

bunt & associates

2.2.3 Cycling & Pedestrian Networks

The site has excellent accessibility to nearby cycling facilities, as illustrated in **Exhibit 2.4** following which show the cycling facilities in the vicinity of the site. **Table 2.3** lists the closest designated bike routes, which are typically one or two blocks from the site and connect to other major routes such as the NW Marine Drive route to the north and the Arbutus Greenway to the east.

Table 2.3: Bicycle Routes Close to the Site

CITY BIKE ROUTE	GENERAL DIRECTION	LOCATION	TYPE
Blanca Street	North-south	1 block to the west	Painted bike lanes
West 8th Avenue	East-west	1 block to the north	Local street bikeway
Discovery Street	North-south	2 blocks to the east	Local street bikeway

Sidewalks are provided on all streets surrounding the site. Pedestrian activated signals are provided at both Tolmie and Sasamat Streets intersection with W 10th Avenue. No marked pedestrian crossing facilities at the intersections with W 9th Avenue. As part of this TAMS, a pedestrian crossing facility warrant analysis is to be completed at the study intersections with W 9th Avenue. All pedestrian facilities in the nearby area are illustrated in **Exhibit 2.5**.

N

Scale: NTS

Dog Off-Leash Area
Spanish Banks Beach Park
NW MARINE DR
Pacific Spirit Regional Park
Locarno Park
Jericho Beach Park
Hastings Mill Park
POINT GREY RD
Tatlow Park
Chancellor Boulevard
Acadia Rd
IONA DR
WALTER GAGE RD
WESTERN PKWY
ALLISON RD
KNOX RD
NW MARINE DR
CRESCENT RD
West Mall
East Mall
MAIN MALL
LOWER MALL
UBC Hospital
TORONTO RD
STORES RD
AGRONOMY RD
THUNDERBIRD BLVD
NW MARINE DR
STADIUM RD
Wesbrook Mall
OSOYOOS CRES
University Boulevard
SIMPSON AVE
BELMONT AVE
W 1ST AVE
W 2ND AVE
W 3RD AVE
W 4TH AVE
W 5TH AVE
W 6TH AVE
W 7TH AVE
W 8TH AVE
W 9TH AVE
W 10TH AVE
W 11TH AVE
W 12TH AVE
W 13TH AVE
W 14TH AVE
W 15TH AVE
W 16TH AVE
W 4th Ave
W 8th Ave
W 16th Ave
Trimble Park
BLANCA ST
SASAMAT ST
TRIMBLE ST
Discovery St
COURTENAY ST
CAMOSUN ST
WALLACE ST
Highbury St
ALMA ST
DUNBAR ST
COLLINGWOOD ST
WATERLOO ST
McBride Park
BLENHEIM ST
TRUTCH ST
W 3rd Ave
STEPHENS ST
Almond Park
Balaclava St
W 17TH AVE
W 18th Ave
W 19TH AVE
W 20TH AVE
W 21ST AVE
W 22ND AVE
W 23RD AVE
W 24TH AVE
W KING EDWARD AVE
Camosun Park
Carnarvon Park
Chaldecott Park
W 27TH AVE
W 28TH AVE
BERTON AVE
BIRNEY AVE
GRAY AVE
BINNING RD
ROSS DR
WESBROOK MALL
SW MARINE DR
IMPERIAL DR
Powerline Trail
Imperial Trail

Route Legend

- AAA Network
- Protected Bike Lane
- Local Street Bikeway
- Painted Bike Lane
- Shared Use Lane

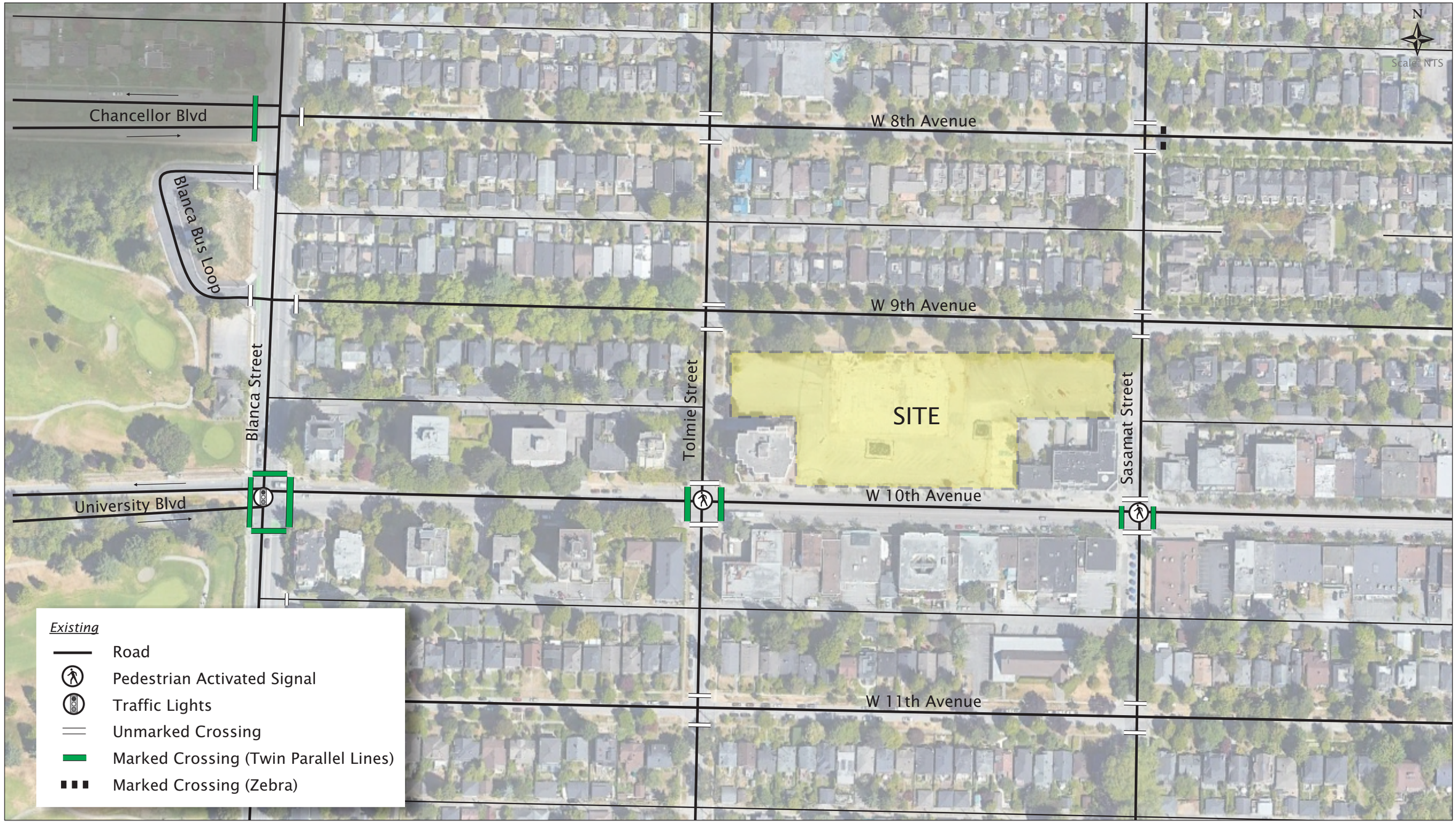
From Vancouver Cycling Map & Guide2021, City of Vancouver, Fall 2021

M:\Operations\Dept BC\Projects\2021\04-21-0460 4545 W10th Avenue\5.0 Deliverables\5.1 Draft Report\Graphics

Exhibit 2.4
Cycling Facilities

04-21-0460
4545 W10th Avenue
August 2023

bunt & associates



M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 2.5

Pedestrian Facilities

4545 W10th Avenue
August 2023

04-21-0460

bunt & associates

2.3 Current Relevant Policies & Plans

2.3.1 Moderate Income Rental Housing Pilot Program (MIRHPP)[1]

The MIRHPP is "a limited pilot program that enables up to 20 rezonings for new buildings that provide 100% of the residential floor area as secured market rental housing, with a minimum of 20% permanently secured for moderate income households" (households with earning from $30,000 to $80,000 per year). It was initiated by the City of Vancouver to address the critical gap of affordable rental housing in the local rental housing market. As a participant of this program, the proposed development is expected to meet the specified rental provision.

2.3.2 The Broadway Subway Project (Millennium Line Extension)

The City of Vancouver, along with the Province and TransLink are currently constructing the Broadway Subway, a 5.7km extension of the Millennium Line along the Broadway Corridor from the existing VCC–Clark Station to Arbutus Street. The project is on schedule for the opening in 2025.

Future investment is expected to further connect the service to UBC's Point Grey campus. Since late 2017, TransLink has been collaborating with the City of Vancouver and UBC on technical assessments of connecting rapid transit from Arbutus to UBC, and in January 2019 it was concluded that a SkyTrain extension of the Millennium Line all the way to UBC is the most feasible option. The report also assessed the long-term sustainability of the SkyTrain extension project and predicted that the extended service will provide enough capacity to meet commuter demand beyond 2045 and is also expandable to meet the longer-term transportation needs of the region. A decision was made by the mayors to fund and build rapid transit to UBC in two phases based on available funding.

Although the extension to UBC is still at a preliminary stage, the completion of the project will most likely extend along Broadway and serve many of the same stops as today's 99 B-Line. As such, the site may eventually be situated within walking distance to rapid transit and this consideration is reflected in its transit-oriented design.

2.4 Existing Traffic Volumes

2.4.1 Traffic Data Collection Program

Bunt conducted weekday AM and PM period intersection turning movement counts on Wednesday March 2, 2022 and Thursday March 3, 2022 at the study intersections. Detailed count program is shown in **Table 2.4**.

[1] "Moderate Income Rental Housing Pilot Program, Frequently Asked Questions – December 2019" retrieved from https://vancouver.ca/files/cov/mirhpp-public-faqs.pdf.

Table 2.4: Summary of Available and Counted Traffic Data

INTERSECTION	SOURCE	DATE OF COUNT	PEAK HOURS	
			AM	PM
West 10th Avenue & Blanca Street	Bunt counts	March 2, 2022	8:00-9:00	15:00-16:00
West 10th Avenue & Tolmie Street	Bunt counts	March 2, 2022	8:00-9:00	15:15-16:15
West 10th Avenue & Sasamat Street	Bunt counts	March 2, 2022	8:00-9:00	15:15-16:15
West 9th Avenue & Tolmie Street	Bunt counts	March 2, 2022	8:00-9:00	15:00-16:00
West 9th Avenue & Sasamat Street	Bunt counts	March 2, 2022	8:00-9:00	15:00-16:00
Tolmie Street & Laneway	Bunt counts	March 3, 2022	8:00-9:00	15:00-16:00
Sasamat Street & Laneway / Existing Access	Bunt counts	March 3, 2022	7:00-8:00	16:15-17:15
OVERALL STUDY AREA PEAK HOUR			8:00-9:00	15:00-16:00

Analysis of the intersection count data indicated that the peak hours of traffic demand in the study area were from 8:00 AM to 9:00 AM during the weekday morning peak period and 3:00 PM to 4:00 PM during the weekday afternoon peak period. Note, pedestrian demographic data at the West 9th Avenue & Sasamat Street and West 9th Avenue & Tolmie Street intersections were collected on July 18, 2022, to capture the higher summer pedestrian volumes for the pedestrian crossing control analysis.

2.4.2 Peak Hour Traffic Volumes

Exhibit 2.6 illustrates the observed 2022 peak hour turning movement counts while **Exhibit 2.7** summarizes the pedestrian and cyclist counts associated with the study area intersections during the weekday AM and PM peak hours. Note, for vehicle volumes, only turning volumes were counted at the Tolmie Street & W10th Avenue and Sasamat Street & Lane intersections; therefore, through volumes were balanced based on the adjacent intersections. No seasonal adjustment has been applied.

Table 2.5 presents a summary of the two-way peak-hour vehicle movements for the streets in the study area. W10th Avenue has highest link volume in both peak periods, followed by Blanca Street.

Table 2.5: Existing Peak Hour Roadway Link Two-Way Volumes

ROAD LINK	PEAK LINK VOLUMES (VEH/HR)	
	AM	PM
EAST-WEST LINKS		
W10th Avenue	770	875
W9th Avenue	30	35
NORTH-SOUTH LINKS		
Blanca Street	545	565
Tolmie Street	65	80
Sasamat Street	95	125

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 2.6

Existing Weekday Peak Hour Vehicle Traffic Volumes

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 2.7

Existing Weekday Peak Hour Pedestrian & Cycling Traffic Volumes

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates

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 6th Edition (HCM6), using the Synchro 11 analysis software (Build 1). 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 2.6 below summarizes the LOS thresholds for the six Levels of Service, for both signalized and unsignalized intersections.

Table 2.6: 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.

As directed by the City of Vancouver, 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 6th Edition output for individual movement LOS is reported. HCM 6th Edition does not generate overall V/C ratios for intersections. For signalized three-legged intersection, the HCM 6th Edition methodology in Synchro 10 does not generate results, because it is not standard NEMA four-leg phasing. Therefore, for any intersections that do not generate HCM 6th results, please refer to the HCM 2000 reports;
- For unsignalized Two-way Stop controlled intersections: HCM 6th Edition V/C output is reported just for individual lanes as the HCM methodology does not report overall performance. SimTraffic, the micro-simulation module of the Synchro software, estimated queues and delays have also been reported, as the HCM 6th Edition methodology does not directly take into account the gaps afforded by adjacent signalized intersections. The LOS and 95th Percentile Queues are reported as estimated by SimTraffic. 95th Percentile Queues are reported as estimated by SimTraffic as there are a noticeable left-turning volumes at Tolmie Street & West 10th Avenue, the movement of which might be impacted by the adjacent full signal and pedestrian signal; and
- For unsignalized All-way Stop controlled intersections: HCM 6th Edition V/C output is reported for individual lanes. The LOS and 95th Percentile Queues are reported as estimated by SimTraffic.

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

Signal Timing:

- Existing signal timing plans (received from the City of Vancouver on April 14, 2022) are used in the existing conditions analysis.
- The pedestrian signal at Tolmie Street & W10th Avenue and Sasamat Street & W10th Avenue with stop signs on the side streets have been modelled as a pedestrian-actuated signal in Synchro as a conservative approach.

Synchro Parameters

- Intersection PHF identified in Bunt's turning movement counts have been used.
- Heavy vehicle factors for each movement are based on Bunt's turning movement counts.
- For other parameters, Synchro defaults have been used.

2.5.3 Existing Operational Analysis Results

Table 2.7 summarizes the existing traffic operations in the study area. All intersections were found to operate well within the performance thresholds for the AM and PM peak hours.

Table 2.7: Existing Traffic Operations

INTERSECTION (TRAFFIC CONTROL)	LANE GROUP	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Tolmie Street & W9th Avenue (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	A	0.00	0	A	0.00	0
	WBLTR	A	0.00	0	A	0.00	0
	NBLTR	A	0.03	0	A	0.05	0
	SBLTR	A	0.03	0	A	0.03	0
Sasamat Street & W9th Avenue (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	A	0.03	0	A	0.03	0
	WBLTR	A	0.02	0	A	0.03	0
	NBLTR	A	0.00	0	A	0.01	0
	SBLTR	A	0.00	0	A	0.00	0
Tolmie Street & Laneway/Driveway (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	A	0.01	0	A	0.01	0
	WBLTR	A	0.05	0	A	0.00	0
	NBLTR	A	0.00	0	A	0.00	0
	SBLTR	A	0.02	0	A	0.00	0
Sasamat Street & Laneway/Driveway (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	A	0.00	0	B	0.01	0
	WBLTR	A	0.01	0	B	0.01	0
	NBLTR	A	0.00	0	A	0.00	0
	SBLTR	A	0.00	0	A	0.00	0
Blanca Street & W10th Avenue (Full Traffic Signal)	*OVERALL*	*B*			*B*		
	EBL	A	0.14	10	A	0.10	10
	EBTR	B	0.33	25	B	0.44	45
	WBL	A	0.15	10	A	0.18	5
	WBTR	A	0.46	30	A	0.21	10
	NBLTR	C	0.48	25	C	0.45	35
	SBLTR	B	0.35	10	C	0.22	15
Tolmie Street & W10th Avenue (Pedestrian Signal with Stop Signs on Tolmie Street)	*OVERALL*	*A*			*A*		
	EBLTR	A	0.18	5	A	0.26	15
	WBLTR	A	0.26	10	A	0.23	15
	NBLTR	C	0.11	10	C	0.15	10
	SBLTR	B	0.08	10	C	0.09	10
Sasamat Street & W10th Avenue (Pedestrian Signal with Stop Sign on Sasamat Street)	*OVERALL*	*A*			*A*		
	EBLT	A	0.21	15	A	0.28	20
	WBTR	A	0.33	25	A	0.21	15
	SBLR	B	0.20	15	C	0.24	15

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 if the site did not redevelop. As the existing site is vacant, no trips are generated by the site; therefore, the background traffic is equivalent to all non-site generated traffic. Historical growth rates indicate that this area does not experience traffic growth, and a zero-growth rate has been approved by the City's Engineer (see Appendix A for the Terms of Reference). Therefore, no operation analysis was conducted for future background conditions.

3.1.2 Site Traffic

Trip Generation

Vehicle trip rates were obtained from the ITE Trip Generation Manual (11th Edition) and are summarized in **Table 3.1**. The trip rates for residential and grocery store were taken from the dense multi-use urban conditions while the trip rates for retail component were taken from the general urban/sub-urban conditions since there are not enough data points for dense multi-use conditions.

Table 3.1: Peak Hour Vehicle Trip Rates

LAND USE	UNITS	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
High-rise Residential	D.U.	0.10	0.14	0.24	0.10	0.10	0.20
Mid-rise Residential	D.U.	0.04	0.24	0.28	0.19	0.07	0.26
Retail	1000 SF GLA	0.52	0.52	0.84	1.63	1.77	3.4
Grocery Store	1000 SF GFA	2.74	2.25	4.99	4.66	4.66	9.32

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	DENSITY	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
High-rise Residential	432 D.U.	43	61	104	43	43	86
Mid-rise Residential	137 D.U.	6	33	39	26	10	36
Retail	3,218 SF GLA*	2	1	3	5	6	11
Grocery Store	37,160 SF GFA	102	83	185	173	173	346
		153	178	331	247	232	479

* assumed GLA = 0.9 of GFA

The development is expected to generate between 330 and 480 vehicle trips during the weekday peak hour, which translates to an average of 5 – 8 vehicles per minute added to the road network during the peak hour.

Trip Distribution & Assignment

Trip distribution is loosely based on current traffic patterns and adjusted based on realistic conditions. The majority of the site traffic is driven by trips to and from the grocery store, which might not align with the background traffic pattern in the study area. For example, the trips entering and exiting the study area via W10th Avenue seem to be largely commuter traffic to and from the UBC area, which do not necessarily enter/exit the site. **Table 3.3** summarizes the estimated trip distribution used in our traffic analysis.

Table 3.3: Estimated Trip Distribution

ORGIN/DESTINATION	AM PEAK HOUR		PM PEAK HOUR	
	IN (%)	OUT (%)	IN (%)	OUT (%)
Blanca Street North	15	21	10	21
Balance Street South	16	14	16	14
Tolmie Street North	5	4	5	4
Tolmie Street South	11	10	11	10
Sasamat Street North	6	4	6	4
W10th Avenue West	10	18	10	18
W10th Avenue East	35	25	35	25
W9th Avenue East	2	3	2	3
TOTAL	100%	100%	100%	100%

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 3.1

Site Traffic Forecasts

04-21-0460

4545 W10th Avenue
August 2023

bunt & associates

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
West 10th Avenue & Blanca Street	1,255	105	9%	1,305	180	14%
West 10th Avenue & Tolmie Street	720	240	33%	985	380	39%
West 10th Avenue & Sasamat Street	945	105	11%	1,005	160	16%
West 9th Avenue & Tolmie Street	80	95	116%	95	110	117%
West 9th Avenue & Sasamat Street	125	25	21%	150	30	20%
Tolmie Street & Laneway / Tower Access	120	235	198%	85	375	441%
Sasamat Street & Laneway / Existing Access	105	0	0%	150	0	0%

As the parkade access is located at Tolmie Street, the majority of the new traffic associated with the development will enter/exit the site via West 10th Avenue and Tolmie Street intersection, while some will come via the back route, West 9th Avenue and Tolmie Street intersection.

3.1.3 Total Traffic

Total traffic is the sum of the background traffic and the site traffic. The total traffic is illustrated on the study network in **Exhibit 3.2**.

3.2 Future Traffic Operations

3.2.1 Future Conditions Analysis Assumptions

Peak hour factors and heavy vehicle percentages used in the existing operations have been maintained. Signal timing plans were also maintained as existing.

M:\Operations\Tools & Ref\Dept BC\Shared H Drive\Forms & Templates\Graphics\CDR\2017 CDR

Exhibit 3.2

Opening Day Total Traffic Forecasts

4545 W10th Avenue
04-21-0460 August 2023

bunt & associates

3.2.2 Future Total Traffic Operations

The opening day traffic operation results are summarized in **Table 3.5**.

All intersections, including the proposed site access, were found to still operate well within the acceptable performance thresholds.

Table 3.5: Opening Day Total Vehicle Operations

INTERSECTION (TRAFFIC CONTROL)	LANE GROUP	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Tolmie Street & W9th Avenue (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	A	0.00	0	A	0.00	0
	WBLTR	A	0.01	0	A	0.01	0
	NBLTR	A	0.10	0	B	0.13	0
	SBLTR	A	0.04	0	A	0.05	0
Sasamat Street & W9th Avenue (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	B	0.05	0	A	0.05	0
	WBLTR	B	0.03	0	B	0.03	0
	NBLTR	A	0.00	0	A	0.01	0
	SBLTR	A	0.00	0	A	0.00	0
Tolmie Street & Proposed Site Access (Minor Street Stop Control)	*OVERALL*						
	WBLR	B	0.23	5	B	0.33	10
	NBTR	A	-	0	A	-	0
	SBLT	A	0.03	0	A	0.04	0
Tolmie Street & Laneway/Driveway (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	B	0.02	0	B	0.01	0
	WBLTR	B	0.08	0	B	0.01	0
	NBLTR	A	0.01	0	A	0.00	0
	SBLTR	A	0.02	0	A	0.00	0
Sasamat Street & Laneway/Driveway (Two-way Stop Controlled)	*OVERALL*						
	EBLTR	A	0.00	0	B	0.01	0
	WBLTR	A	0.01	0	B	0.01	0
	NBLTR	A	0.00	0	A	0.00	0
	SBLTR	A	-	0	A	0.01	0
Blanca Street & W10th Avenue (Full Traffic Signal)	*OVERALL*	*B*			*B*		
	EBL	A	0.14	10	A	0.10	10
	EBTR	B	0.36	25	B	0.48	50
	WBL	A	0.21	10	A	0.27	10
	WBTR	A	0.51	25	A	0.25	15
	NBLTR	C	0.50	25	C	0.53	30
	SBLTR	B	0.35	10	C	0.24	15

INTERSECTION (TRAFFIC CONTROL)	LANE GROUP	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Tolmie Street & W10th Avenue (Pedestrian Signal with Stop Signs on Tolmie Street)	*OVERALL*	*A*			*A*		
	EBLTR	A	0.26	10	A	0.37	25
	WBLTR	A	0.33	20	A	0.28	20
	NBLTR	B	0.14	10	C	0.19	15
	SBLTR	C	0.42	25	C	0.51	40
Sasamat Street & W10th Avenue (Pedestrian Signal with Stop Sign on Sasamat Street)	*OVERALL*	*A*	*0.31*		*A*	*0.30*	
	EBLT	A	0.24	15	A	0.35	30
	WBTR	A	0.36	25	A	0.26	20
	SBLR	B	0.17	15	C	0.15	15

4. SIGNAL WARRANT ANALYSIS

4.1 Methodology

As requested by the City, Bunt conducted the following traffic signal warrants at the following intersections using methods outlined in the TAC Signal Warrant 2007 and the TAC Pedestrian Crossing Control Guide (3rd Edition):

- West 10th Avenue & Tolmie Street (Full Signal Warrant)
- West 10th Avenue & Sasamat Street (Full Signal Warrant)
- West 9th Avenue & Tolmie Street (Full Signal and Pedestrian Control Warrant)
- West 9th Avenue & Sasamat Street (Full Signal and Pedestrian Control Warrant)

The first step to determine whether a pedestrian crossing control treatment is warranted is to check the traffic signal warrant. As such, a full traffic signal warrant was conducted as a preliminary step at each intersection. TAC implements a "cumulative factors methodology" to estimate vehicle-vehicle conflicts as well as vehicle-pedestrian conflicts. Factors are then applied to account for roadway characteristic features, pedestrian demographics, and pedestrian exposures. These calculations were completed by filling out the Canadian Traffic Signal Warrant Matrix Procedure 2007 spreadsheet provided by TAC.

Following "Figure 6: Decision Support Tool – Preliminary Assessment" from the TAC Pedestrian Control Guide, the rest of the assessment related to vehicle and pedestrian volumes, site location, and connectivity demand was conducted to determine whether a pedestrian crossing control treatment is needed at the intersection analyzed.

If the intersection is a candidate for pedestrian crossing control, "Table 1: Decision Support Tool – Treatment Selection Matrix" from the same manual would then be used to select an appropriate intersection treatment based on the average daily traffic (ADT), speed limit, and lanings at the intersection. Potential treatments include passive crossing treatments (crosswalks with side-mounted signs), active crossing treatments (RRFB and OF), and traffic signal systems (full signals or pedestrian signals).

This procedure was completed for the following scenarios.

1. Existing / Future Background: existing vehicle volumes were recorded in March 2022 and pedestrian volumes in July 2022.
2. Future Total: volumes were obtained by adding traffic that will be generated by 4545 W10th Avenue to the Existing/Future Background scenario.

As the TAC methodology requires vehicle and pedestrian volumes input of 6 hours, and only 5 hours (7 A.M. – 9 A.M. and 3 P.M – 6 P.M.) of traffic counts were taken by Bunt, the 6th hour was selected to be 6 P.M. to 7 P.M. based on the time-of-day profile of person trips (Table 6.1) indicated in the TransLink's 2017 Regional Trip Diary. The "existing counts" of this 6th hour is then extrapolated from PM Peak Hour count (5 P.M. to 6 P.M.) by scaling the peak hour volume with the relative ratio calculated from the person trips distribution.

Since site trips were only generated for the AM and PM peak hours, similar extrapolation was completed to obtain full 6-hour site traffic volumes. Note that AM and PM extrapolations were done separately using the relative ratios shown in **Table 4.1**. Since the PM peak hour is different than the region-wide person trips peak hour, the ratios from the four PM hours with the highest volumes were used accordingly.

Table 4.1: Time-of-day Profile of Person Trips According to TransLink's 2017 Regional Trip Diary

TIME OF DAY	PROPORTIONS OF PERSON TRIPS	AM PERIOD RELATIVE RATIO	PM PERIOD RELATIVE RATIO	PM PERIOD RELATIVE RATIO AJUSTED FOR SITE
Midnight	0.4%	-	-	
1:00	0.3%	-	-	
2:00	0.2%	-	-	
3:00	0.2%	-	-	
4:00	0.2%	-	-	
5:00	0.6%	-	-	
6:00	2.0%	-	-	
7:00*	5.8%	0.57	-	
8:00*	10.2%	**1.00**	-	
9:00	5.1%	-	-	
10:00	4.7%	-	-	
11:00	4.7%	-	-	
12:00	5.3%	-	-	
13:00	5.3%	-	-	
14:00	5.4%	-	-	
15:00*	8.5%	-	0.89	**1.00**
16:00*	9.1%	-	0.96	0.96
17:00*	9.6%	-	**1.00**	0.89
18:00*	7.6%	-	0.79	0.79
19:00	5.1%	-	-	
20:00	3.5%	-	-	
21:00	3.1%	-	-	
22:00	2.1%	-	-	
23:00	1.0%	-	-	
	100.0%			

** Hours of interest*

4.2 Pedestrian Volumes

The TAC analysis methodology measures pedestrian volumes in terms of Equivalent Adult Units (EAUs). Under the EAU system, Adults = 1.0 EAUs, Children (<12 yrs) = 2.0 EAUs, Seniors (>65 yrs) = 1.5 EAUs.

On July 12, 2022, Bunt completed a 7-hour pedestrian count that included pedestrian classifications at West 9th Avenue & Tolmie Street and West 9th Avenue & Sasamat Street from 7:00 – 9:00 am, and 2:00 – 6:00 pm. **Table 4.2** and **Table 4.3** summarize the observed volumes.

Table 4.2: Existing Pedestrian Volumes at West 9th Avenue & Tolmie Street

CROSSING DIRECTION	TIME	CHILD VOLUME	ADULT VOLUME	SENIOR VOLUME	EAU
NS	7:00am – 9:00am	1	41	6	52
	2:00pm – 6:00pm	5	130	0	140
SUBTOTAL		**6**	**171**	**6**	**192 (OR 27 EAU/HOUR)**
EW	7:00am – 9:00am	1	26	5	36
	2:00pm – 6:00pm	6	53	0	65
SUBTOTAL		**7**	**79**	**5**	**101 EAU (OR 14 EAU/HOUR)**
		13 CHILDREN	250 ADULTS	11 SENIORS	293 EAU (OR 42 EAU/HOUR)

Table 4.3: Existing Pedestrian Volumes at West 9th Avenue & Sasamat Street

CROSSING DIRECTION	TIME	CHILD VOLUME	ADULT VOLUME	SENIOR VOLUME	EAU
NS	7:00am – 9:00am	1	36	20	68
	2:00pm – 6:00pm	16	185	44	283
SUBTOTAL		**17**	**221**	**64**	**351 (OR 50 EAU/HOUR)**
EW	7:00am – 9:00am	3	53	19	88
	2:00pm – 6:00pm	9	47	13	85
SUBTOTAL		**12**	**100**	**32**	**173 (OR 25 EAU/HOUR)**
		29 CHILDREN	321 ADULTS	96 SENIORS	524 EAU (OR 75 EAU/HOUR)

Future pedestrian volumes were increased conservatively at a linear rate of 1% per year, based on the pedestrian mode share of the surrounding area obtained from the City of Vancouver 2019 Transportation Panel Survey and 2040 mode share target. It was assumed that the site will be fully build out by 2028, thus, the pedestrian volumes were projected to horizon year 2028. The projected future EAU/hour is shown in **Table 4.4**.

Table 4.4: Projected Future Pedestrian Crossing Volumes

INTERSECTION	CROSSING DIRECTION	EXISTING EAU/HOUR	FUTURE EAU/HOUR
West 9th Avenue & Tolmie Street	NS	27	29
	EW	14	15
West 9th Avenue & Sasamat Street	NS	50	53
	EW	25	27

4.3 Warrant Results

4.3.1 Full Signal Warrant

Following the Canadian Traffic Signal Warrant Matrix Procedure 2007, the results indicate that the four intersections analyzed do not need a full traffic signal in both the existing and future scenario with the site developed, except the West 10th Avenue & Tolmie intersection in the Future Total Scenario with the site developed. The key values calculated using the spreadsheet provided by TAC and warrant analysis results are summarized in **Tables 4.5** and 4.**6**, for existing and future scenarios, respectively.

Table 4.5: Full Signal Warrant Analysis Result Summary – Existing/Future Background Scenario

INTERSECTION	VEHICLE-VEHICLE CONFLICT POINTS	VEHICLE-PEDESTRIAN CONFLICT POINTS	TOTAL POINTS	FULL SIGNAL WARRANTED?
Tolmie Street & W10th Avenue	13	25	38	N (Vs<75)
Sasamat Street & W10th Avenue	16	93	109	N (Vs<75)
Tolmie Street & W9th Avenue	1	0	1	N (Vs<75)
Sasamat Street & W9th Avenue	1	2	3	N (Vs<75)

Table 4.6: Full Signal Warrant Analysis Result Summary – Future Total Scenario

INTERSECTION	VEHICLE-VEHICLE CONFLICT POINTS	VEHICLE-PEDESTRIAN CONFLICT POINTS	TOTAL POINTS	FULL SIGNAL WARRANTED?
Tolmie Street & W10th Avenue	64	52	116	Y
Sasamat Street & W10th Avenue	19	126	145	N (Vs<75)
Tolmie Street & W9th Avenue	3	2	5	N (Vs<75)
Sasamat Street & W9th Avenue	2	2	4	N (Vs<75)

4.3.2 Pedestrian Crossing Control Warrant

Both intersections along West 9th Avenue were assessed using the TAC Pedestrian Crossing Control Guide (2018) for their North-South (NS) and East-West (EW) crossing directions to determine if pedestrian crossing control is required for each location. There are two main decision support tools in the Pedestrian Crossing Control Guide: (i) Preliminary Assessment, and (ii) Treatment Selection Matrix.

Decision Support Tool - Preliminary Assessment

The Preliminary Assessment Tool is presented as a flowchart in Figure 8 of the Guide. It is summarized below in question format for the potential crossings.

1. Is a traffic signal warranted at this location?

CROSSING	EXISTING/FUTURE BACKGROUND	FUTURE TOTAL
Tolmie Street & W9th Avenue – NS	No (Table 4.4)	No (Table 4.5)
Tolmie Street & W9th Avenue – EW	No (Table 4.4)	No (Table 4.5)
Sasamat Street & W9th Avenue – NS	No (Table 4.4)	No (Table 4.5)
Sasamat Street & W9th – EW	No (Table 4.4)	No (Table 4.5)

2. Is the average hourly pedestrian volume greater or equal to 15 EAUs AND vehicle volumes greater than 1,500 vehicles per day?

CROSSING	EXISTING/FUTURE BACKGROUND	FUTURE TOTAL
Tolmie Street & W9th Avenue – NS	No, EAU = 27, ADT = 280	No, EAU = 29, ADT = 625
Tolmie Street & W9th Avenue – EW	No, EAU = 14, ADT = 585	No, EAU = 15, ADT = 1,240
Sasamat Street & W9th Avenue – NS	No, EAU = 50, ADT = 350	No, EAU = 53, ADT 505
Sasamat Street & W9th – EW	No, EAU = 25, ADT = 1,000	No, EAU = 27, ADT = 1,110

3. Is this site greater than 100-200 metres from the nearest traffic control device?

CROSSING	EXISTING/FUTURE BACKGROUND	FUTURE TOTAL
Tolmie Street & W9th Avenue – NS	Yes, no nearby traffic control in the EW direction	Yes, no nearby traffic control in the EW direction
Tolmie Street & W9th Avenue – EW	No, 95m away	No, 95m away
Sasamat Street & W9th Avenue – NS	Yes, no nearby traffic control in the EW direction	Yes, no nearby traffic control in the EW direction
Sasamat Street & W9th – EW	No, 95m away	No, 95m away

4. Based on engineering judgement, is this location on a pedestrian desire line?

CROSSING	EXISTING/FUTURE BACKGROUND	FUTURE TOTAL
Tolmie Street & W9th Avenue – NS	Yes	Yes
Tolmie Street & W9th Avenue – EW	No	No
Sasamat Street & W9th Avenue – NS	Yes	Yes
Sasamat Street & W9th – EW	No	No

Based on the Preliminary Assessment Tool, both the West 9th Avenue at Tolmie Street and Sasamat Street intersections are candidates for pedestrian crossing treatments for the NS crossings in both the existing/background and total scenarios.

Decision Support Tool – Treatment Selection Matrix

The Treatment Selection Matrix is shown in **Table 4.7** and recommends three possible treatment system categories: passive crossing treatments (GM and GM+), active crossing treatment systems (RRFB and OF), and traffic signal systems (TS1 and TS2). Further tables in the Guide then provide recommended, desirable, and optional components for each treatment; however essential elements of all treatment systems include:

- Adequate sight distance.
- Artificial lighting.
- Curb cuts and ramps.
- Sidewalk connectivity.

Table 4.7: Decision Support Tool – Treatment Selection Matrix

Average Daily Traffic	Speed Limit [2] (km/h)	Total Number of Lanes [1]				
		1 or 2 lanes	3 lanes (two-way)	3 lanes (one-way)	2 or 3 lanes/direction w/ raised refuge	2 lanes/ direction w/o raised refuge
1,500 < ADT ≤ 4,500	≤ 50	GM	GM	GM	GM	GM+
	60	GM+	GM+	OF	RRFB or OF [3]	RRFB
	70	RRFB	RRFB	OF	OF	OF
4,500 < ADT ≤ 9,000	≤ 50	GM	GM	GM	GM	RRFB
	60	GM+	GM+	OF	RRFB or OF [3]	OF
	70	RRFB	OF	OF	OF	TS
9,000 < ADT ≤ 12,000	≤ 50	GM	RRFB	OF	RRFB or OF [3]	OF
	60	RRFB	RRFB	OF	RRFB or OF [3]	TS
	70	OF	OF	OF	TS	TS
12,000 < ADT ≤ 15,000	≤ 50	RRFB	RRFB	OF	RRFB or OF [3]	OF
	60	RRFB	OF	OF	RRFB or OF [3]	TS
	70	OF	TS	TS	TS	TS
> 15,000	≤ 50	RRFB	OF	OF	RRFB or OF [3]	TS
	60	RRFB	TS	TS	TS	TS
	70	OF	TS	TS	TS	TS

Both of the intersections have average daily traffic volumes of less than 1,500 with 1 lane in each direction and a speed limit of 50 km/h. Therefore, based on this, both intersections warrant a crosswalk with **side-mounted signs (GM)**. GM is a passive crossing treatment system that is recommended to include side-mounted signs, twin parallel line crosswalk markings, stopping prohibitions at least 15m on the approach and 10m following the crossing, and passing restrictions on single lane approaches.

The detailed signal warrant analyses and pedestrian crossing control warrant analyses are included in **Appendix C**.

5. SITE PLAN REVIEW

5.1 Site Access Design

A single vehicle access to the project basement parking is planned west of the site via Tolmie Street. Residential loading and service vehicles will also access Level P1 using the same access while retail loading truck access is planned on the east of the site via Sasamat Street.

5.2 Parking Supply

5.2.1 Vehicle Parking

The parking requirements are based on the updated City of Vancouver Parking Bylaw. According to the City's Parking Bylaw, a development can obtain a scaled parking reduction based on the site's proximity to high-quality transit. There are three different categories of transit accessibility, they are summarized as follows:

Level A, within:

- 100 m walking distance of any one (1) existing FTN route, including B-Line stops, or
- 200 m walking distance of any intersection of two (2) existing FTN routes, including B-Line routes, or
- 400 m walking distance of a SkyTrain station.

Level B, within:

- 101 m to 200 m walking distance to any one existing FTN route, including B-Line stops, or
- 201 – 400 m walking distance of any intersection of two (2) existing FTN routes, including B-Line routes, or
- 401 to 800 m walking distance of a SkyTrain station.

Level C, greater than:

- 200 m walking distance of any one (1) existing FTN route, including B-Line stops, or
- 400 m walking distance of any intersection of two (2) existing FTN routes, including B-Line routes, or
- 800 m walking distance of a SkyTrain station.

Given that the location of the development is located in an area within Level "A" Transit Accessibility, the base parking reduction that can be obtained is 20% for Rental and 10% for Retail. As a large site, the development is required to provide a TDM Plan (outline in **Section** 6) from which the development may obtain an additional reduction of up to 40% for Rental and 20% for Retail, for a total of 60% reduction for Rental and 30% reduction for Retail.

The bylaw requirements and subsequent reductions are set out in **Table 5.1**.

Table 5.1: Vehicle Parking Supply Bylaw Requirement & Provision

LAND USE	DENSITY	BYLAW RATE	MIN. REQ.	MAX. ALLOWABLE	REDUCTION - 60% RENTAL AND 30% FOR RETAIL	MINIMUM REQUIREMENT AFTER TDM
Residential - Market Rental & MIRHPP	45,220 m²	A minimum of 1 space for each 125 m² of gross floor area. The maximum number of spaces equal to the total minimum number of spaces plus 0.5 spaces per dwelling unit.	362	647	-217	145
Residential - Visitor	569 d.u.	A minimum of an additional 0.05 parking spaces for every dwelling unit and a maximum of an additional 0.1 spaces for every dwelling unit.	28	57	-	28
Residential - Accessible*	569 d.u.	At least one accessible parking space for each building that contains at least seven residential units and an additional 0.034 space for each additional dwelling unit.	(20)	-	-	(20)
		Subtotal	**390**	**704**	**-217**	**173**
Grocery Store & Café & Retail	3,784 m²	A minimum of one space for each 100 m² of GFA up to 300 m², one additional space for each additional 20 m² of GFA up to 2,300 m², and one additional space for each additional 30 m² of GFA over 2,300 m²	152	-	-46	106
Non-Residential-Accessible	3,784 m²	At least one accessible parking space for each building that contains at least 500 m² of GFA and an additional 0.4 parking space for each 1000 m² of GFA.	(3)	-	-	(3)
		Subtotal	**152**	**-**	**-45**	**106**
		TOTAL	542	-	-262	280

*Accessible stalls are included in the total number of required spaces. Each required accessible stall counts as 2 for the purpose of satisfying the minimum number of required stalls.

Another allowable parking reduction that can be achieved is through the provision of Accessible Parking spaces given that one of these space types is equivalent to two standard-sized parking spaces in the Bylaw count. The project will provide 20 accessible spaces for residents and 2 accessible spaces for non-residential use to meet the minimum Bylaw requirement, showing a reduction of up to 22 physical spaces can be achieved for the parking calculation.

Therefore, a total of 258 physical off-street vehicle parking spaces (equivalent to 280 spaces) is required for the development to meet the City's minimum parking requirements.

The development is planning to provide 313 rental spaces and 110 retail spaces for a combined of 423 spaces, which exceeds the minimum parking requirements.

5.2.2 Bicycle Parking

Well managed, secure, accessible and covered bicycle parking will be provided as part of the development plan. The development will supply at least 1,079 Class A spaces and 35 Class B spaces. The definition of Class A and Class B bicycle parking can be located in Section 6 "Off-Street Bicycle Space Regulations" of the Parking-Bylaw (May 2018). Additionally, the City of Vancouver's updated "Parking Bylaw Updates to Achieve Transportation 2040 Actions" includes a number of policy changes that are recommended and summarized below:

Class A Bicycle Parking Access

- Requirements for a minimum of 5% of bicycle parking spaces provided to accommodate non-standard bicycles such as recumbent, tandem, cargo bikes and trailers. This requires a larger space of 2.4 m x 0.9 m compared to a typical 1.8 m x 0.6 m bicycle parking space, as well as a wider access aisle of 1.5 m;
- Requirements for automatic openers on doors leading to and from bicycle parking;
- Allowances for stacked bicycle parking at up to 60% of the provided spaces;
- Adjustment of maximums for vertical spaces to accommodate the provision of stacked bicycle parking. A combined total of 60% of spaces may be vertical and stacked, with up to 30% of spaces being vertical; and,
- Adjustment to and minimums for lockers to 10% of the total number of spaces.

Class B Bicycle Parking Access

- Provided for the benefit of visitors to buildings and are typically located outside, on private property, in the form of bike racks; and,
- In order to improve the usability of Class B bicycle parking, increased spacing requirements and dimensions are recommended; currently sized at 0.3 m x 1.8 m.

Table 5.2 summarizes the required off-street bicycle parking supply based on the City's Bylaw.

Table 5.2: Bicycle Parking Supply Requirement & Provision

LAND USE	UNIT TYPE	DENSITY	BYLAW RATE (CLASS A)	BYLAW RATE (CLASS B)	BYLAW REQ.
Residential	< 65 m²	359 d.u.	Min 1.5 spaces / D.U.	A min of 2 spaces for any development containing at least 20 D.U., and one additional space for every additional 20 dwelling units.	1,068 Class A, 29 Class B
	65-105 m²	201 d.u.	Min 2.5 spaces / D.U.		
	> 105 m²	9 d.u.	Class A: min 3 spaces / D.U.		
Retail	-	3,784 m²	Class A: min of 1 space / 340 m² of GFA	A min of 6 spaces for any development containing a min of 1,000 m² of GFA	11 Class A, 6 Class B
					1,079 CLASS A, 35 CLASS B

The developer plans to exceed the City's minimum bicycle parking requirement by providing a total of 1,107 Class A spaces and 35 Class B spaces.

The Bylaw also has a requirement for the provision of clothing lockers, water closets, wash basins and showers for the retail use of the development. For the 11 Class A bicycle spaces required for the non-residential use of the development, a total of 15 lockers, 1 water closet, 1 wash basin, and 1 shower are required to be provided.

5.3 Service Vehicle Operations

The City of Vancouver's Parking Bylaw (No. 6059) outlines loading requirements for different uses in new projects. **Table 5.3** summarizes the requirements that are relevant to the proposed development along with the required loading spaces.

Table 5.3: Loading Bylaw Rates

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT
Residential	569 d.u.	Class A: No requirement. Class B: At least one space for 100 to 299 units; a minimum of one additional space for 300 to 499 units; and at least one additional space for any portion of each additional 200 units. Class C: No requirement.	Class A: 0 Class B: 3 Class C: 0
Retail	3,784 sq.m.	Class A: No requirement. Class B: A minimum of one space for the first 465m² of gross floor area plus one space for any portion of the next 1,860m² and one additional space for each additional 2,325m². Class C: At least one space for 2,000m² to 5,000 m² of gross floor area for retail use.	Class A: 0 Class B: 3 Class C: 1
		TOTAL	**CLASS A: 0 CLASS B: 6 CLASS C: 1**

Based on the Bylaw, the development would require 3 Class B loading spaces for the residential component and 3 Class B loading spaces for the commercial component. In addition, 1 Class C loading spaces would also be required to support the non-residential component of the project. The project is proposing to meet or exceed the requirement by providing 6 Class B and 2 Class C loading spaces.

According to the City's Bylaw, the definitions of the various Classes of loading are summarized below:

- Class A: off-street loading space must be at least 5.5 m long, 2.7 m wide and 2.3 m high;
- Class B: must be at least 8.5 m long, 3.0 m wide and 3.9 m high; and
- Class C: must be at least 17.0 m long, 3.5 m wide and 4.3 m high.

5.4 Passenger Loading Spaces

The City of Vancouver Bylaw Section 7 outlines the off-street passenger space requirements for different land uses. **Table 5.4** summarizes the applicable Bylaw requirements and calculations for the proposed development.

Table 5.4: Passenger Space Bylaw Rates

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT
Residential	569 d.u.	Class A: A minimum of one space for any development with 50 – 125 units; plus one additional space for every additional 150 units. Class B: No requirement. Class C: No requirement.	Class A: 4 Class B: 0 Class C: 0
Retail	3,784 sq.m.	Class A: A minimum of one space for the first 4000 m^2 of gross floor area. Class B: No requirement. Class C: No requirement.	Class A: 1 Class B: 0 Class C: 0
		TOTAL	CLASS A: 5 CLASS B: 0 CLASS C: 0

Based on the Bylaw, the development would require a total of 5 Class A passenger spaces. The current plan provides more than minimum requirements with 7 Class A passenger spaces and 1 Class B passenger space to achieve TDM points as discussed in more detailed in the following section.

5.5 Parking Layout & On-Site Vehicle Circulation

A parking design review was conducted for the ground level loadings, parkade access, and underground parking and loading spaces. Where required, modifications to improve maneuverability and circulation were suggested based on the applicable design vehicles. The turning swept paths were provided to the Project Architect (MCM) informing the site plan design. Detailed turning swept path diagrams are also included in **Appendix D** and will be further refined as part of the development submission at a later stage.

6. TRANSPORTATION DEMAND MANAGEMENT

6.1 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"[2]. 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.

6.2 TDM Requirements

The City of Vancouver requires large sites (over 45,000 m^2 of new floor area) to provide a TDM Plan with a minimum of 8 of the required points coming from shared vehicle measures. The project is required to achieve a minimum of 30 points for the rental use and a minimum of 30 points for the retail use.

The points may also be used to obtain a reduction in parking – 40% reduction for rental and 20% reduction for retail. Additionally, as the site is located within 100 metres walking distance of an existing FTN route, it is able to gain an additional reduction for transit accessibility Level A – 20% for rental and 10% for retail. A total reduction of 60% and 30% for the rental and retail uses, respectively, may be obtained.

The TDM Schedule A for the project is included in **Appendix E**.

6.3 Proposed TDM Plan for Site

The proposed TDM plan for the site is laid out in **Table 6.1**.

Table 6.1: Proposed TDM Measures

MEASURE	DESCRIPTION	RENTAL POINTS	RETAIL POINTS
ACT-01: Additional Class A Bicycle Parking	Provide up to 40% above the minimum requirements.	0.5	2
ACT-02: Improved Access to Class A Bicycle Parking	Bicycle access ramp fully separated from the vehicle parking ramp. Provide excellent design of lighting, finishes, grades, convenience, etc.	4	4
ACT-05: Bicycle Maintenance Facilities	Provide bicycle maintenance facilities and workspace.	2	-
ACT-08: Shared Bicycle Fleet	Provide fleet of bicycles for residents and guests to use (private bicycle share) for 20 years to encourage all types of cycling. One (1) cycle for each 10 dwelling units, with a minimum of six (6) cycles provided.	0.5	-

[2] http://ops.fhwa.dot.gov/tdm/index.htm FHWA Travel Demand Management home page

MEASURE	DESCRIPTION	RENTAL POINTS	RETAIL POINTS
ACT-09: Walking Improvements	Secured public pedestrian connections linking building entrances with the surrounding pedestrian network, transit stops, and key destinations, other than connections along the site frontage.	6	6
COM-01: Car Share Spaces	Provide dedicated publicly available parking spaces for car share vehicles (one-way or two-way) up to the following ratios: Rental: 1 car share parking space for every 10 dwelling units. Retail: 1 car share parking space for each 930m^2 of gross floor area.	3	8
COM-02: Car Share Vehicles and Spaces	Provide dedicated publicly accessible two-way car share vehicles and spaces on-site for at least 3 years, up to the following ratios: Rental: 1 car share vehicle and space for every 25 dwelling units. Retail: 1 car share vehicle and space for every 4,600m^2 of gross floor area.	1	3
COM-03: Additional Pick-Up/Drop-Off Spaces	Provide 2 Additional Class A and 1 additional Class B short-term pick-up/drop-off passenger spaces.	8	8
SUP-01: Transportation Marketing Services	Provide individualized, tailored marketing and communication campaigns, including incentives to encourage the use of sustainable transportation modes.	2	-
SUP-03: Multimodal Wayfinding Signage	Provide directional signage to major destinations and public amenities.	2	2
OTH-01: Innovative Strategies	Provide bike wash station within maintenance room.	1	-
TOTAL		30	32

6.3.1 TDM Measure Descriptions

ACT-01: Additional Class A Bicycle Parking

Based on Section 6 of the Parking Bylaw, the development must provide a minimum of 1,068 rental and 11 retail Class A bicycle spaces. By providing an additional 25 rental and 3 retail Class A spaces, or 2% additional rental and 27% additional retail spaces, the project can receive **0.5 TDM points** for the rental use and **2 TDM points** for the retail use.

ACT-02: Improved Access to Class A Bicycle Parking

The site will provide a separate bicycle access ramp on Sasamat Street and excellent design of lighting, finishes, grades, and convenience to the Class A bicycle parking to achieve **4 TDM points** for the rental use and **3 TDM points** for the retail use.

ACT-05: Bicycle Maintenance Facilities

The project will provide a bicycle maintenance facility for rental residents. This measure will achieve **2 TDM points** for the rental use. In this facility, bicycle maintenance tools and supplies will be readily available on a permanent basis and offered in good condition to encourage cycling. Tools and supplies will include, at a minimum, those necessary for fixing a flat tire, adjusting a chain, and performing other basic bicycle maintenance. Examples include a bicycle pump, wrenches, a chain tool, lubricants, tire levers, hex keys/Allen wrenches, torx keys, screwdrivers, and spoke wrenches. Regular maintenance of the tools will

be provided to ensure that the facility remains in good working condition. Residents will be instructed to notify the management staff if any tools or supplies need replacing.

ACT-08: Shared Bicycle Fleet

For this measure, the project is proposing to provide a shared fleet of bicycles for use by the rental residents for a minimum of 20 years to encourage all types of cycling.

The shared bicycle fleet will include 8 bicycles, with each bicycle being equipped with locks, automatic lights, and other safety features (reflectors, bell, etc.). Furthermore, Class A secure bicycle spaces (above what is required by the Parking Bylaw) will be provided to accommodate these shared bicycles.

To achieve the full 4 points, the project must provide 1 bicycle per 10 units, which translates to 56.9 bicycles. As such the proposed supply of 8 bicycles would translate proportionally to **0.5 TDM points** for the rental use.

ACT-09: Walking Improvements

As the warrant analyses result suggested both intersections of West 9th Avenue & Tolmie and Sasamat Streets are candidate for pedestrian crossing facilities, the project will upgrade the NS crossings at these intersections to the GM crossing system as outlined in Section 4.3.2 above. The project is seeking **6 TDM points** for each use for this measure.

COM-01: Car Share Spaces

For this measure the developer is proposing to provide 12 car share spaces for the rental and retail users.

To achieve the full 16 rental points the project must provide 1 car share parking space per 10 dwelling units, or 56.9 spaces. To achieve the full 8 retail points the project must provide 1 car share parking space for each 930 m^2 of gross floor area, or 4.1 spaces.

By providing 12 car share spaces, the development achieves **3 TDM points** for the rental use and **8 TDM points** for the retail use.

COM-02: Car Share Vehicles & Spaces

For this measure the developer is proposing to provide 2 car share vehicles and spaces for the rental and retail users.

To achieve the full 16 rental points the project must provide 1 car share vehicle and space for every 25 dwelling units, or 22.8 vehicles and spaces. To achieve the full 3 retail points the project must provide 1 car share vehicle and space for every 4,600 m^2 of gross floor area, or 0.8 vehicles and spaces.

By providing 2 car share vehicles and spaces, the development achieves **1 TDM point** for the rental use and **3 TDM points** for the retail use.

COM-03: Additional Pick-Up/Drop-Off Spaces

The project will claim **8 TDM points** for both the rental and retail uses for providing 2 additional Class A and 1 additional Class B passenger space. The spaces will be designed to meet the Bylaw requirements.

SUP-01: Transportation Marketing Services

To achieve **2 TDM points** for the rental use for this measure, the Developer is considering the following initiatives:

- Providing a 'Welcome Pack' to new tenants detailing the sustainable transportation options to access the site and articulate that this is a key element of the company's overall sustainability approach;
- Providing regular updates on transit service improvements or changes, City initiatives (e.g., bike to work week), and updates on Metro Vancouver and/or Provincial initiatives.

SUP-03: Multimodal Wayfinding Signage

To achieve **2 TDM points**, the project will provide durable multimodal wayfinding signage in a key location to direct people to the nearby active transportation and transit network. It is envisaged that this will take the form of a typical City of Vancouver wayfinding sign, as shown in **Figure 6.1**. The wayfinding sign will be located on private property.

Figure 6.1: Multimodal Wayfinding Signage Example

Note: Image shown is an example only.
Source: appliedwayfinding.com

OTH-01: Innovative Strategies

Bike Wash Station

In addition to the bicycle repair tools, the bike maintenance facility (ACT-05) will include a bike wash station. At a minimum, this station will be provided in the form of a water hose located near a drain. The bike wash station will be maintained by the building manager, in the same fashion as the bicycle maintenance tools. The Developer is aiming to achieve **1 TDM point** for the rental use through this measure.

7. CONCLUSIONS & RECOMMENDATIONS

7.1 Conclusions

Existing Conditions

1. The site is currently vacant and located in a commercial area to the south of a residential neighbourhood.
2. The site is well connected to transit and cycling networks with pedestrian crossing facilities with pedestrian activated signals on both West 10th Avenue & Tolmie Street and West 10th Avenue & Sasamat Street.
3. All intersections were found to operate within the performance thresholds during the existing AM and PM peak hours.

Future Traffic Conditions

1. Historical growth rates indicated that there is no traffic growth in this area, resulting in a zero-growth rate and no operational analysis for the background condition.
2. Vehicle site generated trips were estimated using the ITE Trip Generation Manual (11th Edition) and resulted in approximately 330 trips in the AM peak hour and 480 trips during the PM peak hour.
3. All intersections were projected to still operate within the performance thresholds in the future total AM and PM peak hours with the proposed development in place.

Signal Warrant Analysis

1. Four intersections were analyzed for a full signal:
    a. Tolmie Street & W10th Avenue.
    b. Sasamat Street & W10th Avenue.
    c. Tolmie Street & W9th Avenue.
    d. Sasamat Street & W9th Avenue.
2. For the existing/background scenario, none of the above intersections warrant a full signal.
3. For the future total scenario, Tolmie Street & W10th Avenue warrants an upgrade to a full signal.
4. Pedestrian crossing warrants were conducted for:
    a. Tolmie Street & W9th Avenue.
    b. Sasamat Street & W9th Avenue.
5. Both intersections were found as candidates for a pedestrian crossing control on the NS crossings.

Site Design Review

1. One vehicular access is proposed for the site on Tolmie Street while retail loading is planned via Sasamat Street.
2. The site is located within 100m walking distance of an FTN route, qualifying it for Level A transit accessibility. Therefore, the project may obtain up to a 60% reduction in rental parking and up to a 30% reduction in retail parking, for TDM measures and transit accessibility.

3. The project is planning to provide 313 rental parking spaces including 28 visitor spaces, and 110 retail parking stalls, which exceeds the minimum parking requirements.
4. A total of 1107 Class A bicycle spaces and 35 Class B bicycle spaces will be provided on-site which exceeds the minimum Class A requirements and meets the minimum Class B requirements.
5. A total of 6 Class B and 2 Class C loading spaces will be provided for the site, in excess of the minimum Bylaw requirements of 6 Class B and 1 Class C spaces.
6. A total of 7 Class A and 1 Class B passenger spaces will be provided for the site, in excess of the minimum Bylaw requirements of 5 Class A and 0 Class B spaces to achieve TDM points.

Transportation Demand Management

1. As the development is a large site, it is required to provide a TDM Plan with 30 points for each of the rental and retail uses, and a minimum of 8 points must be from car share measures.
2. The proposed TDM plan includes:
    a. Additional Class A Bicycle Parking.
    b. Improved Access to Class A Bicycle Parking.
    c. Bicycle Maintenance Facilities.
    d. Share Bicycle Fleet.
    e. Walking Improvements.
    f. Car Share Spaces.
    g. Car Share Vehicles & Spaces.
    h. Additional Pick-Up/Drop-Off Spaces.
    i. Transportation Marketing Services.
    j. Multimodal Wayfinding Signage.
    k. Bike Wash Station.

7.2 Recommendations

Based on the warrant analyses results, Bunt recommends:

1. Upgrading Tolmie Street & West 10th Avenue intersection to a full signal.
2. Implementing pedestrian crossing facility with side-mounted signs at Tolmie Street & West 9th Avenue and Sasamat Street & West 9th Avenue.