



# UEL Block F Transportation Assessment

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Musqueam Capital Corp.

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## 1. INTRODUCTION

In 2008, through settlement agreements with the Province of British Columbia, the Musqueam First Nation acquired free title to a 22 acre parcel referred to as 'Block F' in the University Endowment Lands (UEL) located on the south side of University Boulevard between the existing developments along Acadia Road and the University Golf Course. Extensive master planning and community consultation efforts were undertaken over the last few years, and Musqueam now would like to make a formal rezoning application to develop a mixed-use project on this parcel. **Exhibit 1.1** shows the location of the development site.

Bunt & Associates Engineering (B.C) Ltd was commissioned by Musqueam Capital Corp. to undertake a Transportation Assessment for the proposed master plan development at Block F. The proposed build-out of the master plan is expected to occur over 10 to 12 years. Future redevelopment is also expected in UBC's Acadia neighbourhood immediately to the west of this parcel. A future rapid transit station has also been identified along University Boulevard adjacent to the Block F site.

This report has been set out in the following manner:

- **Section 2** provides a review of the study area travel characteristics, planning policy, as well as neighbouring development plans that influence future travel characteristics in the area;
- **Section 3** examines the existing transportation system, modal splits, and traffic operations in the local network;
- **Section 4** outlines the development contents and specifically the transportation aspects including parking provisions;
- **Section 5** establishes the future vehicle projections in the study street network, taking into consideration of background traffic growth in the area and the development vehicle movements. It also examines the likely trip distribution for the proposed development and assesses the effect of the development traffic on the study street network.



## Exhibit 1.1 Site Location

## 2. LOCAL CONTEXT AND POLICY REVIEW

This section provides an overview of the existing infrastructure in the study area as well as an outline of transportation policies and plans relevant to the proposed development site.

### 2.1 Study Area Travel Characteristics and Infrastructure

#### 2.1.1 Walking

Walking is an everyday activity, whether part of a single-purpose trip or linked with transit and driving. Typically, people are willing to walk up to 15 minutes for certain activities (i.e. work, school, recreation activities) with 400 to 800 metres being typical average distances for such trips (transit, shopping, etc.).

**Exhibit 2.1** highlights the various destinations within a comfortable walking distance of the development site and clearly demonstrates that residents, employees and visitors can access a wide range of amenities including commercial/retail services, restaurants, open space, and a hospital.

Bus stops along University Boulevard, Wesbrook Mall and Acadia Road are located within a 500-metre walking distance from the development site, providing convenient transit connections to areas throughout UBC and Vancouver.

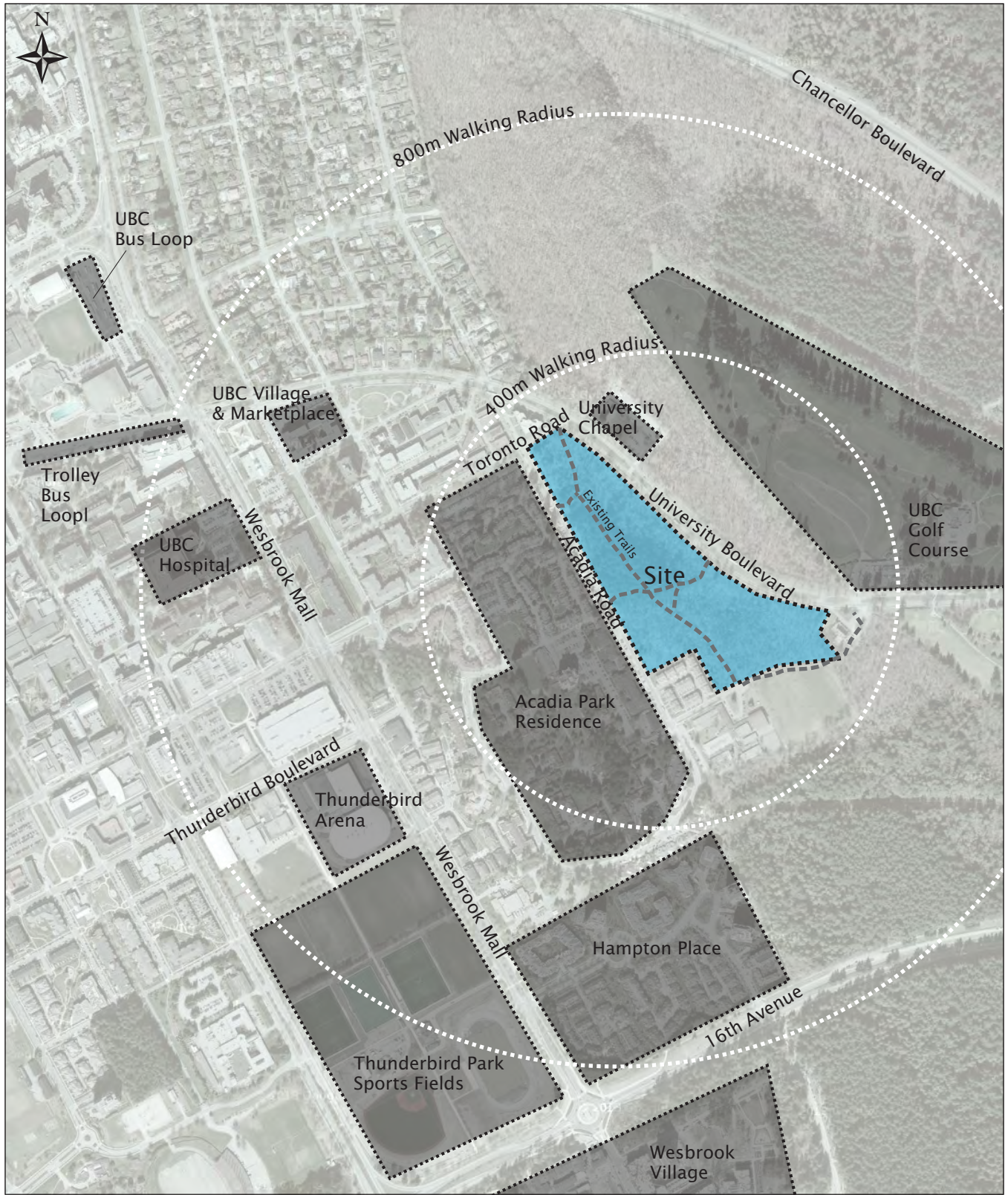
Key destinations within close proximity to the site include: UBC Hospital, University Village, University Golf Course, as well as several churches, schools, and daycare centres.

Located in the southeast quadrant of the University Boulevard & Western Parkway intersection are the University Village and University Marketplace developments, which offer a variety of commercial/retail stores and restaurants.

Block permeability is adequate within the vicinity of the site which should further encourage walking as an activity and mode of transportation for the development site. While the street network along Acadia Road is fairly abstract, it is supplemented with a system of lanes and pathways which help enhance the pedestrian network. As part of the future master plan, a well connected street network will be provided, enhancing pedestrian connections between University Boulevard and the Acadia neighbourhood.

Decommissioning and redevelopment of the Acadia Park Courts may have some implications on the pedestrian routes available to/from the development site in the future. However, it is expected that any future redevelopment of Acadia will continue to follow best practices in terms of providing pedestrian accessibility to future residents in the area and adjacent developments.

Sidewalks are provided on various streets nearby the site, with boulevards (buffer strips) also available on many of the streets within the study area. Sidewalks in the area are generally in adequate condition and vary in width from 1.2 m to 1.8 m. Boulevards (buffer strips) in the study area, which provide adequate space for vehicle door swings and create comfortable walking spaces, vary in width from 2.5m to 3.9m.



## Exhibit 2.1 Existing Walking Destinations

The exceptions in the neighbourhood are the site fronting sidewalks on Acadia Road and Toronto Road, neither of which have buffers. The lack of buffer space results in door swing from parked vehicles intruding into the pedestrian sidewalk space. As part of the master plan development, sidewalks along the perimeter of the parcel will be upgraded to provide sufficient buffer space for on-street parking, enhancing the pedestrian walking experience around the perimeter of the Block F site.

Pedestrian crosswalk facilities are located on all legs at the intersections along Acadia Road and Toronto Road, and at other major intersections nearby. In addition, signed and marked crosswalks are located at the intersections along Acadia Road at Toronto Road and Ortona Avenue.

Two trails: Sword Fern Trail (part of Iva Mann Trail) and Fairview Trail, currently bisect the development site. Given the site is located between the northern and southern sections of Pacific Spirit Regional Park, Sword Fern Trail and Fairview Trail serve as important connections to the numerous trails within the park. Connection to these trails will be maintained as part of the master plan of Block F.

### 2.1.2 Cycling

Cyclists can generally travel 3 to 4 times the distance of pedestrians over a similar period of time, suggesting that a 4 to 5 kilometre trip is a reasonable travel distance for cyclists to travel to an activity. Cycling is becoming an increasingly more popular travel mode in Vancouver for work and leisure.

Improvements to cycling infrastructure in the City of Vancouver and UBC are helping make cycling more convenient and safer. While the number of cycling trips at UBC has fluctuated within the last 15 years, recent years have shown a steady increase.

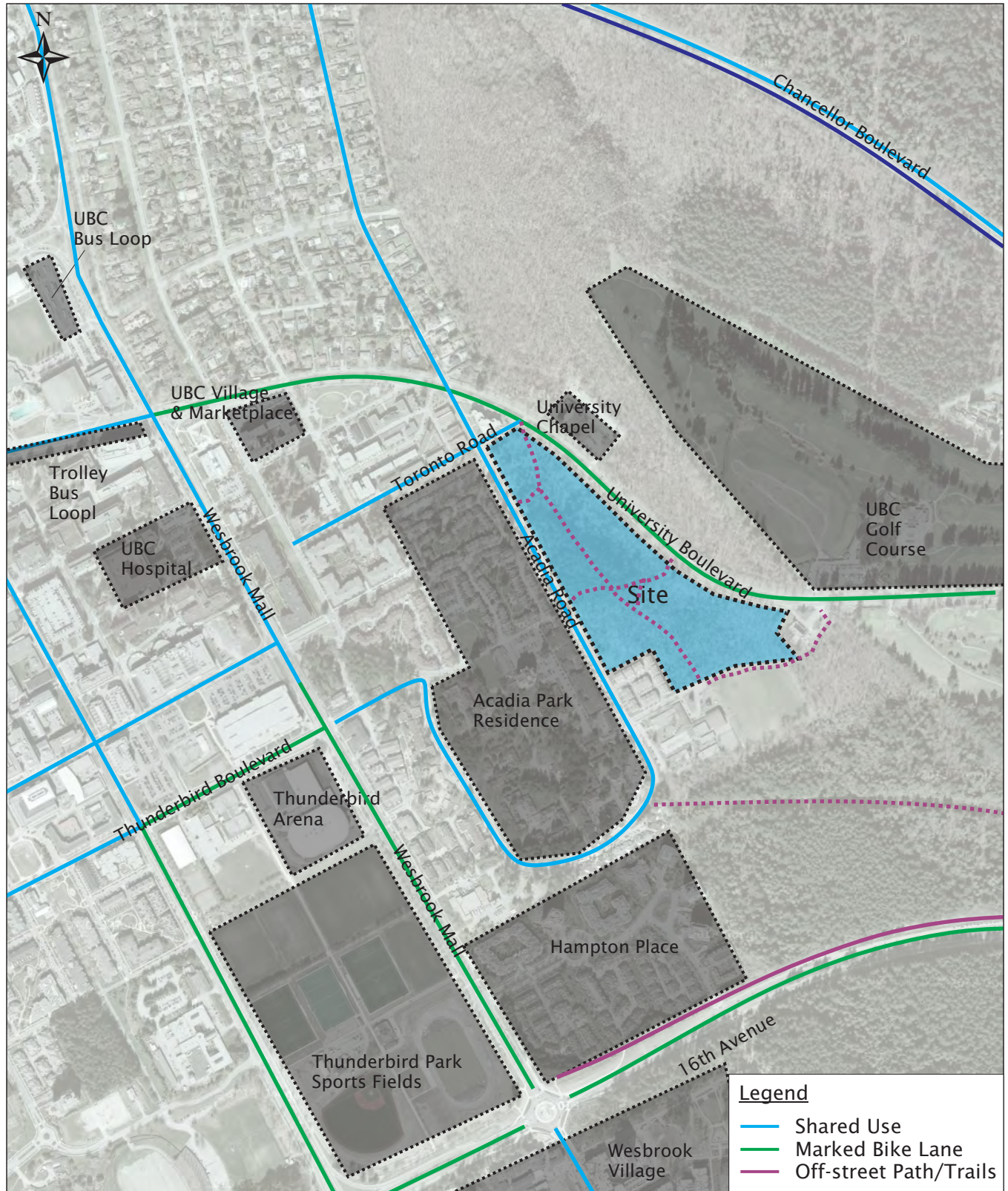
The average cycling speed for commuters is about 15km/h and the average distance per journey is approximately 5km. This equates to about a 20-minute journey on average.

**Exhibit 2.2** shows the cycle routes and infrastructure in the context of the development site. The site is well connected with routes on University Boulevard, Acadia Road, Toronto Road, and Fairview Lane/Avenue. University Boulevard provides an east-west link through the university and to Blanca Street, from which various routes connect throughout Vancouver.

Dedicated bike lanes are provided along University Boulevard and along Wesbrook Mall (south of Thunderbird Boulevard). Bikeways along Acadia Road and Toronto Road are shared with traffic. Multi-use trails within Pacific Spirit Regional Park also provide cyclists with connections throughout the park and to Chancellor Boulevard/West 10<sup>th</sup> Avenue and West 16<sup>th</sup> Avenue, which serve as major routes to/from Vancouver.

Overall, cycling infrastructure within the vicinity of the site is very good with several key cycling routes in the campus located near the development site. Bicycle facilities can be found throughout the UBC campus, including a bicycle repair shop, 9 bicycle locker locations, 10 bicycle parking facilities, and various shower locations. In addition, bike share programs are also available for UBC staff and students.





## Exhibit 2.2 Existing Cycling Routes and Infrastructure

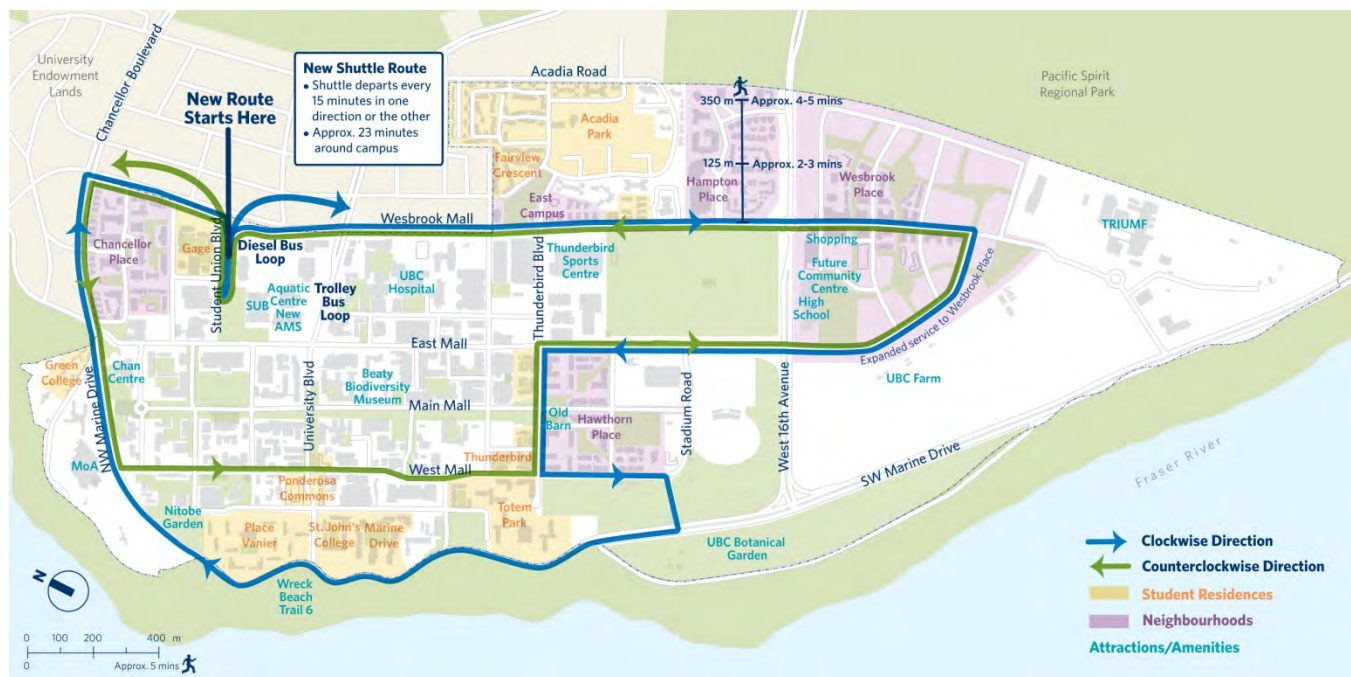
### 2.1.3 Transit

The development site is well served by transit with bus stops located nearby on University Boulevard and Wesbrook Mall. A potential future rapid transit line is also planned for the Broadway corridor via University Boulevard between UBC and the Commercial Drive SkyTrain Station, which would further increase accessibility to the site. This will be discussed in further detail in the policy review section.

There are several bus routes providing a high frequency of transit service near the site, all of which provide connections to UBC and the wider transit network to various key destinations in the Lower Mainland. Bus routes with stops along University Boulevard include: C22, 4, 9, 14, and N17. The C22 shuttle currently provides a route between the Diesel Bus Loop at UBC and the residential streets fronting Hampton Place and Arcadia Park.

However, the existing C20 and C22 community shuttle routes are planned to be replaced in the near future by a new route that will circulate a larger area of the campus. **Figure 2.1** shows the new proposed community shuttle route.

**Figure 2.1: Proposed community shuttle route** (Source: <http://transportation.ubc.ca/>)



Bus stops at the southeast and northwest corners of University Boulevard and Allison Road, 400m from the development site, provide access to the 99 B-Line. The 99 B-Line is an express bus service between UBC and Commercial Drive SkyTrain Station, providing high frequency transit service on one of the busiest transit routes outside of downtown. Bus stops along Wesbrook Mall near the UBC Hospital and

Thunderbird Boulevard are within a 550 m walk, about a 7 to 8 minute walk, providing access to the following bus routes: 25, 33, 41, 43, 49, and 480. **Exhibit 2.3** summarizes the transit routes available near the site.

Transit stop amenities (i.e. bus shelters, garbage/recycling bins) are currently not provided at most stops along the University Boulevard corridor. The only bus shelter that is available along University Boulevard is at the eastbound 99-B Line bus stop at Allison Road. Future opportunities may be available to provided new bus stop amenities as the Master Plan develops.

#### **2.1.4 Auto**

The existing roadway laning and on-street parking regulations in the study street network adjacent to the development site are shown on **Exhibit 2.4**. A brief description of these streets is provided below, which focuses on their function, design characteristics and intersection controls.

##### *University Boulevard*

University Boulevard is a two-lane arterial road that borders the northeast side of the development site, serving as a major connection between UBC and Vancouver. The two travel lanes are separated by a 10-metre wide grass median that extends from Wesbrook Mall to Blanca Street. Designated as a bicycle route, both sides of University Boulevard have marked bike lanes along the curbs. In addition, parking is restricted on both sides of the road.

Intersections along University Boulevard at Wesbrook Mall and Blanca Street are controlled by traffic signals, while intersections at Allison Road and Arcadia Road are controlled by pedestrian signals. A signed and marked crosswalk is provided to allow pedestrian crossing between the University Golf Course and St. Anselm's Anglican Church.

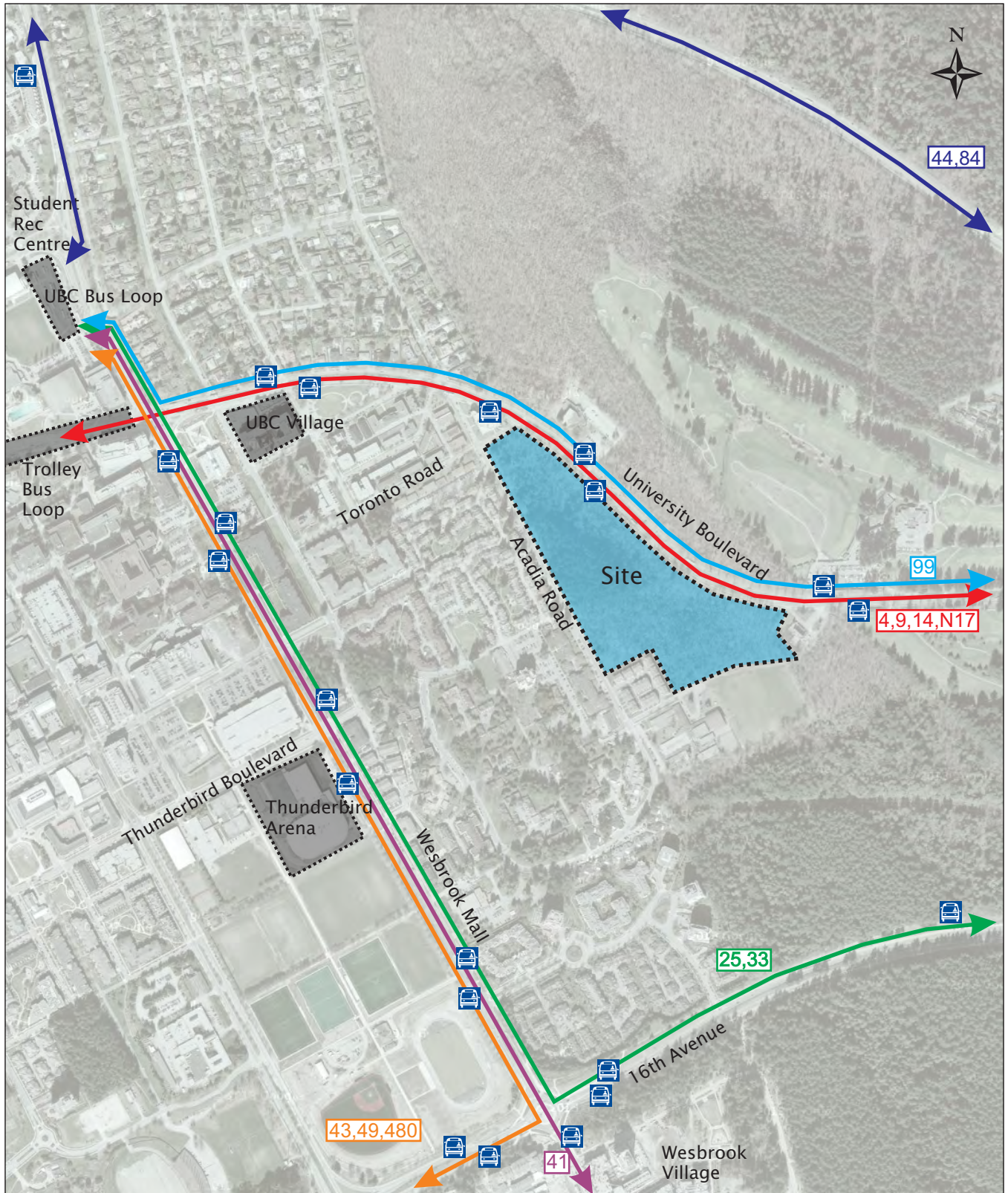
##### *Acadia Road*

Acadia Road is a two-lane local road that borders the southwest side of the site, serving as a main access route to the Acadia Park residences. There are numerous residential driveways and lanes that intersect with this road. Several 90-degree parking pockets are also located along the west side of the road, while street parking is currently restricted on the east side.

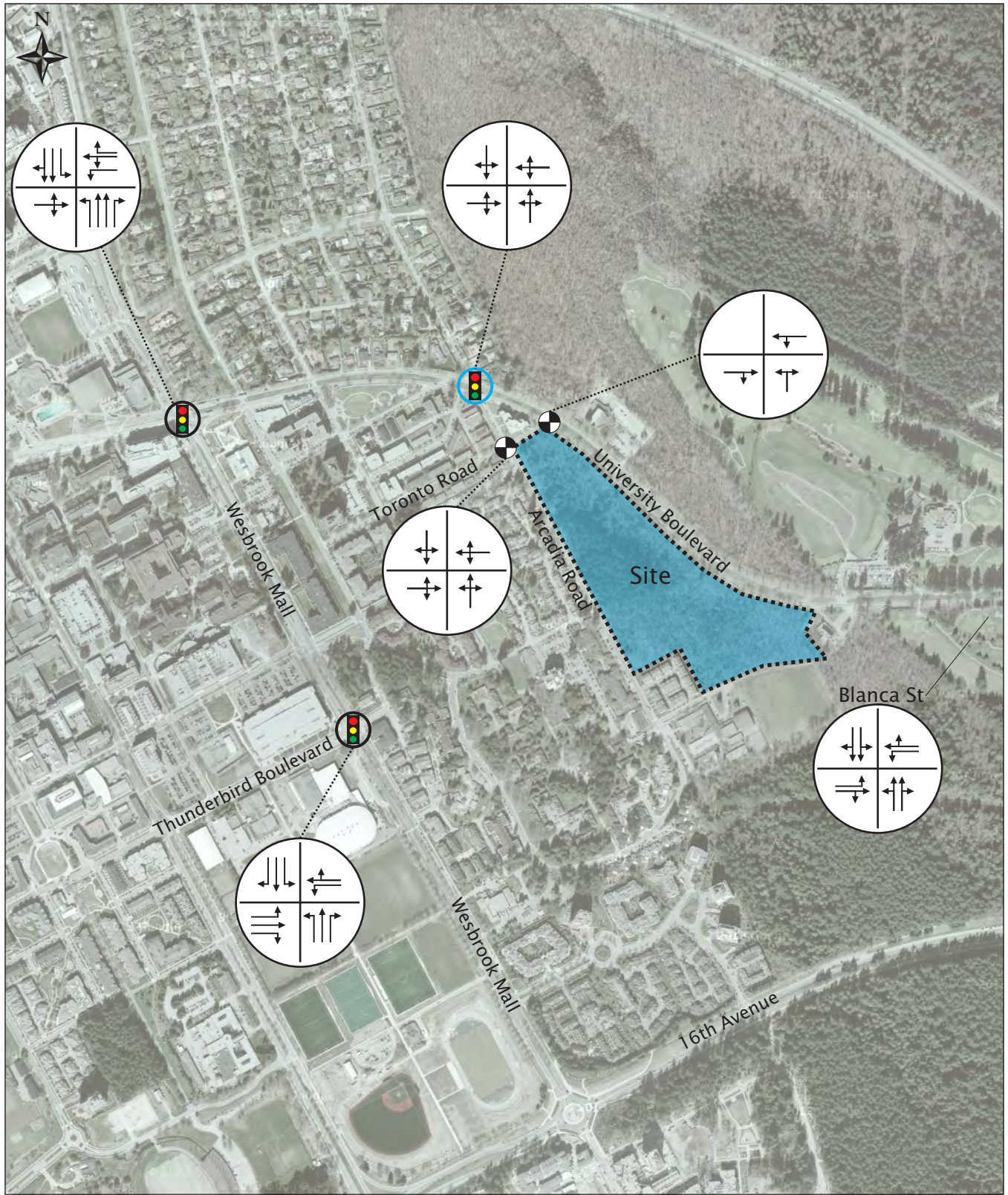
Signed and marked crosswalks are provided at the intersection with Melfa Road and the four-way stop controlled intersection at Toronto Road.

##### *Toronto Road*

Toronto Road is a two-lane local road that provides an east-west connection between Acadia Road and Western Parkway. Bordering the northwest side of the development site, this road provides access to several residential lanes and driveways. Toronto Road is a traffic calmed road and parking is only allowed on the south side. Signed and marked crosswalks are provided at the intersection with Western Parkway and the four-way stop controlled intersection at Acadia Road.



## Exhibit 2.3 Transit Routes and Facilities



## Exhibit 2.4 Existing Lane Configuration and Traffic Control

## 2.2 Policy Review

### 2.2.1 Official Community Plan

The University Endowment Lands Official Community Plan (OCP), adopted in 2005, identifies the key policies and objectives to guide planning and land uses to achieve the community's visions and goals. The OCP was developed through two and a half years of information mail outs, questionnaires, public meetings and open houses, and the OCP continues to evolve as the goals and visions of the community take shape.

In 2008, Block F was included in Area D of the OCP, which is bordered by University Boulevard, Agronomy Road, Toronto Road, and Wesbrook Mall. Topics supporting the development in Block F include:

- Area D shall maintain a village-like atmosphere with a mix of high and low-rise apartments, townhouses, and retail spaces.
- As Area D currently houses higher density mixed-use projects, new developments should help optimize density levels to ensure a human-scaled streetscape environment
- There is continued community support for a grocery store in Area D.
- Area D has the potential for new mixed commercial and multi-family development.

Transportation related topics discussed in the OCP include:

- Bicycle use is encouraged through the requirement of provision of end-of-trip facilities at new multi-family and commercial developments.
- Through the Ministry of Transportation, University Boulevard shall be maintained as an arterial road designed to support transit and bicycle use.

### 2.2.2 UBC Vancouver Campus Plan to 2030

The UBC Vancouver Campus Plan to 2030, adopted in 2010, provides the guidelines for growth at the university that "will support UBC's world-class community of scholars with a campus that physically reflects the stature of the university, provides the optimal environment for teaching, learning and research, and encourages a unique community life; and with a campus that is beautiful, functional, sustainable, cost-effective, connected to its neighbours and responsible to future generations."

While the development site does not fall within the campus plan's subject area, there are several topics in the plan that are of relevance to the proposed Master Plan:

- The student population is expected to increase: 37,600 full time equivalent (FTE) students to 39,700 FTE students and 6,800 graduate students to 11,300 graduate students; until 2017, after which it will be capped until 2030.

- Academic and research floor space is expected to increase by 1 million square feet, while student housing floor space is expected to increase by 3.6 million square feet in order to provide accommodation for 50 percent of full-time students.
- Connections to hubs and neighbourhoods throughout the campus via TransLink community shuttles.

### 2.2.3 UBC Strategic Transportation Plan (2005)

The UBC Strategic Transportation Plan (STP) was approved in 1999 and outlines various policies to address a broad range of transportation subjects. Among the goals of the plan was to reduce automobile traffic, increase transit use and manage travel demands. An update of the document was completed in 2005 to quantify the consequences of the plan. Some of the key policies and topics outlined in the report include:

- Numerous transportation initiatives (i.e. U-Pass program, carpool programs, various bicycle facilities, and reduced parking supply) were implemented, resulting in all but one of the goals being achieved: reduce single occupancy vehicle (SOV) trips by 20% from 1997 levels.
- Automobile usage goals were revised to be based on trips per person. SOV trips per person has seen a 22% decrease since 1997, the university aims to reach a 30% reduction.
- UBC and TransLink have plans to provide Community Shuttle service covering the entire campus.
- Increase the provision of bicycle lanes and end-of-trip facilities (i.e. bike storage, lockers and showers).
- Improve safety at crossings through implementation of raised crosswalks, lighting, and audible and tactile indicators.
- Manage the commuter and residential parking supply and parking prices.
- Minimize and disperse heavy truck traffic travelling to/from UBC.

### 2.2.4 Transportation Status Report (2012)

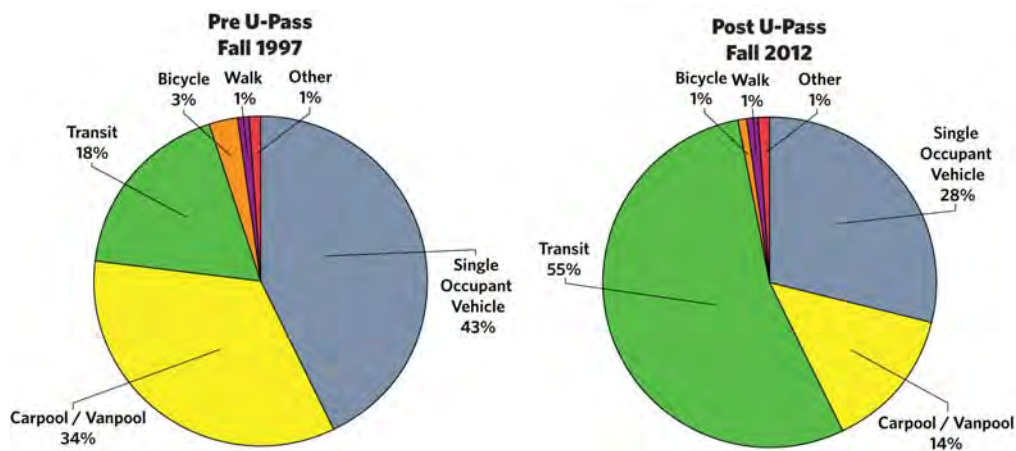
The Transportation Status Report is an annual report that compiles all of the findings from annual data collection programs conducted at UBC. These data collection programs vary from speed counts to screen-line and intersection traffic counts. The report provides an understanding of the year-to-year travel trends and progress of achieving the university's transportation goals and strategies. Key findings that provide context to the Block F development site include:

- Daytime population (including students, staff, and faculty members) at UBC has steadily increased from 42,300 in 1997 to 63,700 in 2012, representing a 51% increase over 15 years.

- A variety of changes at UBC have significantly increased transit ridership such as introduction of the U-pass program, increased transit service, decreased parking supply and increased parking costs. Transit trips have quadrupled in the last 15 years and now represent 55% of all trips to and from UBC.
- Despite the considerable population growth and steady increase in person trips at UBC, automobile trips (single occupancy vehicle and carpool trips) have decreased by 23%, achieving the goal to not exceed daily automobile traffic in 1997 as set out in the STP.
- SOV trips per person have decreased 44% since 1997, exceeding the STP goal of 30%.
- Pedestrian and bicycle trips have decreased 29% and 33% since 1997, respectively, but have marginally fluctuated in the last 5 years.
- The 99 B-Line carried the greatest number of bicycles – 75 of 201 daily bicycles

With the provision of various Transportation Demand Management programs (U-Pass, employer pass programs, bike-share and car-share programs) and end-of-trip cyclist facilities, UBC has seen a major shift from auto trips to transit trips. **Figure 2.2** below shows a significant shift in auto trips to transit trips since the introduction of the U-Pass in 1997.

**Figure 2.2: Mode Split (Source: UBC Transportation Planning)**





### 2.2.5 UBC Line

The UBC Line is a potential rapid transit line along the Broadway corridor connecting UBC with Central Broadway, and other rapid transit lines in Vancouver. The UBC line is being considered because of the continued growth occurring along the Broadway regional corridor and the increasing number of students enrolling at UBC. Due to this growth, the existing bus transit service is reaching its capacity. Major stakeholder groups (TransLink, the Province, the City of Vancouver, UBC, University Endowment Lands, and Metro Vancouver) are working on a technical study to determine the transportation technology and alignment of this potential new rapid transit line. The transportation technology for the UBC Line has not yet been decided at this stage. Alternatives that are under considerations include, Bus Rapid Transit (BRT), Light Rail Transit (LRT), and Rail Rapid Transit (RRT).

The potential location of a rapid transit line within close proximity to the development site in the future makes this site highly accessible by transit to all areas throughout the Lower Mainland. While the design for the UBC Line has not yet been determined, all seven alternatives currently being considered indicate that UBC Line would run along Broadway / University Boulevard. Five of the alternatives consider a potential station directly across from the development site.

The UBC Line is still in the planning stages and a timeline for construction and completion has not yet been determined although the *Provincial Transit Plan* published in 2008 indicated the UBC Line is planned to be completed by 2020.

## 2.3 Proposed Acadia Elementary School

A site to the southeast of the development that was formerly a high school is being redeveloped by Vancouver School Board (VSB) into a new elementary school. Vehicle access to this new school will be located off Acadia Road. Expected vehicle movements from the proposed elementary school will be taken into consideration in forming the background vehicle flows for the future conditions, which will be discussed in further details in Section 5.2 of the report.

### 3. EXISTING CONDITIONS

Currently, the site consists of forested vacant land bounded by Acadia Road to the west, University Boulevard to the east and Toronto Road to the north. A number of multi-use trails traverse the site providing connections for pedestrians and cyclists.

The surrounding neighbourhood is comprised primarily of residential and institutional developments along Acadia Road and some retail, restaurant and institutional uses along University Boulevard to the west.

#### 3.1 Study Area

**Table 3.1** indicates the intersections that are included in the study area along with their control types.

**Table 3.1: Study Area Intersections**

Intersection	Control
University Boulevard & Arcadia Road	Pedestrian/Bike-Actuated Signal
University Boulevard & Toronto Road	Stop control on Toronto Road
Acadia Road & Toronto Road	Four-way stop control
University Boulevard & Wesbrook Boulevard	Signal
University Boulevard & Blanca Street	Signal
Wesbrook Boulevard & Thunderbird Boulevard	Signal

The intersection of Wesbrook Boulevard & Thunderbird Boulevard is included given the connection to the site via Acadia Road.

Traffic surveys were conducted in March of 2011 and 2013 and were used to determine existing traffic movements in the area during the morning (7am to 9am) and afternoon (3pm to 6pm) peak periods. The observed morning and afternoon peak hour traffic volumes are summarized in **Exhibit 3.1**.

#### 3.2 Mode Split

The University of British Columbia published mode split data in their *Fall 2011 Transportation Status Report*. Screenline data from 1997 to 2011 was presented. This data measures mode split for all trips to and from the university and is helpful in relation to the expected mode split of our site. Mode splits presented in *Figure 2.3* of the *UBC Fall 2011 Transportation Status Report* are summarized in **Table 3.2**.



**Exhibit 3.1**  
Existing Peak Hour Vehicle Volumes

**Table 3.2: Weekday Mode Split**

Trip Mode	1997 UBC	2011 UBC
Transit	18%	54%
Single Occupant Vehicle	43%	29%
Carpool and Vanpool	34%	14%
Bicycle	3%	1%
Walk	1%	1%
Other	1%	1%
Total	100%	100%

The large change in transit users is largely in part to the introduction of the U-pass. However, in both 1997 and 2011, single occupancy vehicles represent less than 50% of the trips. Statistics Canada identifies Metro Vancouver's journey to work mode split as approximately 60% single occupancy vehicle based on 2006 census data, down slightly from 1996. The university area experiences a higher number of alternative mode trips than the Metro Vancouver average. The land use of the site is not identical to that of the university, but will be similar and complementary in some cases. It is expected that the site will experience a lower number of vehicle trips than a similar development elsewhere in the lower mainland.

### 3.3 Peak Hour Factor

The peak hour factor for the collected data was analysed to better approximate the existing peak hour traffic conditions. The peak hour factors for the study area during the morning peak-hour were approximately 0.80 to 0.85. This indicates a slightly sharper peak than the typically range. During the afternoon peak hour, the peak hour factors were in a typical range of approximately 0.90 to 0.95.

The peak hour factors used for all movements for all analysis periods was 0.80 during the AM Peak hour and 0.92 during the PM Peak hour.

### 3.4 Existing Traffic Operations

Traffic operations of the study intersections were evaluated using Trafficware's Synchro 8.0 traffic analysis model. This model uses standard procedures to test the Volume to Capacity ratio (V/C) and the corresponding delay-based traffic Level of Service (LOS) at each of the intersections in the study area. For the Level of Service indicator, the following summarize the range of delays (in seconds per vehicle) for signalized and unsignalized intersections:

- For signalized intersection, the Level of Service ranging from LOS 'A' conditions with minimal delay (< 10 sec per vehicle) through to LOS 'E' 'near capacity' conditions (> 55 sec to ≤ 80 sec per vehicle) and LOS 'F' 'over-saturated' conditions (> 80 sec per vehicle).
- For unsignalized intersection, the Level of Service ranging from LOS 'A' conditions with minimal delay (< 10 sec per vehicle) through to LOS 'E' 'near capacity' conditions (> 35 sec to ≤ 50 sec per vehicle) and LOS 'F' 'over-saturated' conditions (> 50 sec per vehicle).

As Synchro does not analyze pedestrian/cyclist-actuated signals, the intersection at University Boulevard and Acadia Road was modelled as both an unsignalized intersection (representing traffic operations when no pedestrian actuation occurs) and as a semi-actuated signal (representing a pedestrian signal with high pedestrian/cyclist volumes or calls, when left turning vehicles have a protected phase). This approach results in two reported values of capacity and LOS for the pedestrian-actuated signals reflecting the very different traffic operations experienced when pedestrian actuation is present, or not.

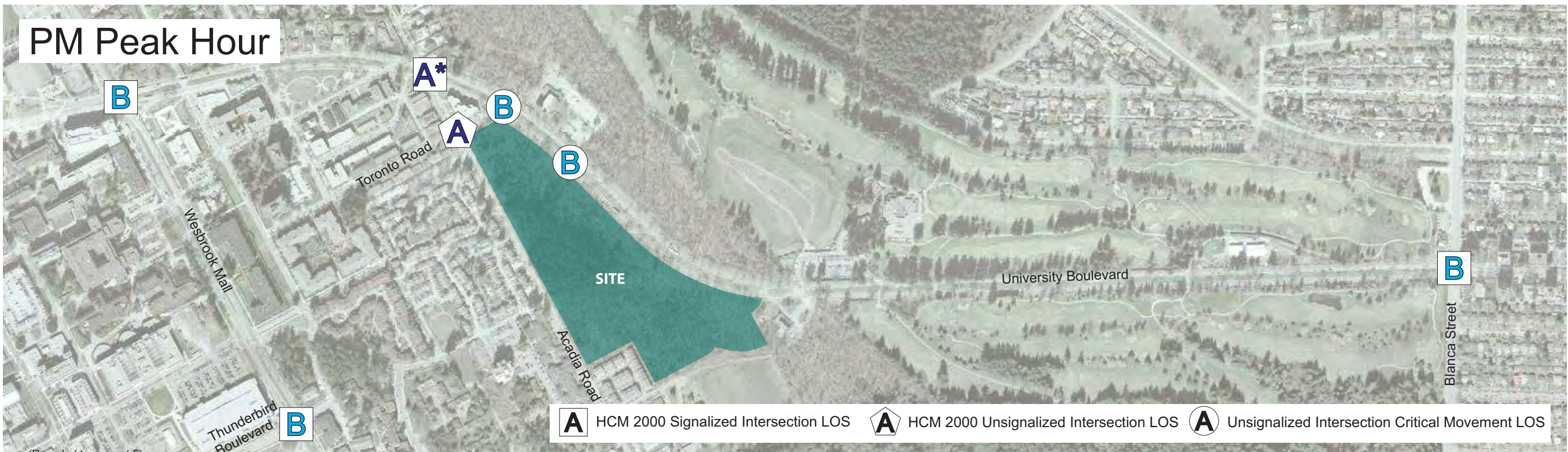
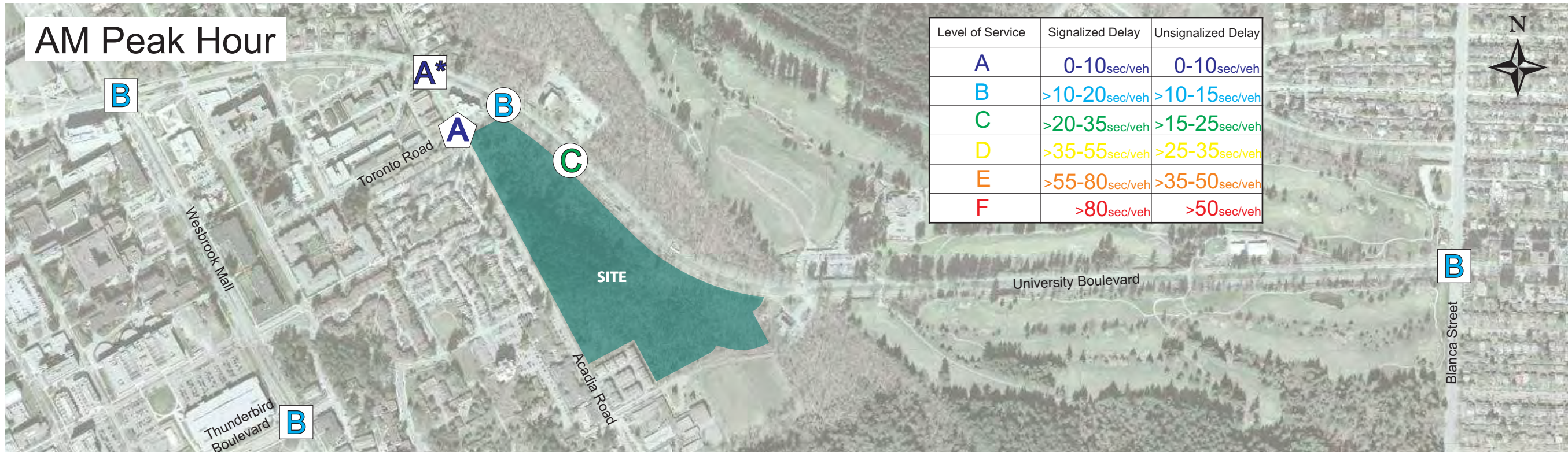
It should also be noted that Synchro only outputs levels of service (not v/c ratios or 95th percentile queue lengths) for 4-way stop controlled intersections.

Finally, given the wide through/right curb lanes at all the approaches of the Blanca Street & University Boulevard intersection, the curb lanes have been modelled as separate through and right lanes. The modelling assumption is consistent with the actual operations that were being observed on-site.

This modelling approach is also supported by the Highway Capacity Manual (HCM). In particular, Chapter 18 of HCM 2010 states that when lane widths are greater than 16 ft (4.8m), "the analyst should consider whether the wide lane actually operates as two narrow lanes. The analysis should reflect the way in which the lane width is actually used or expected to be used."

**Table 3.3** summarizes the performances of each of the study intersections analysed for the morning and afternoon peak periods. The v/c ratio, LOS, and 95<sup>th</sup> percentile queue have been presented for the critical movement for each approach. The same information is also presented graphically in **Exhibit 3.2**.

Model outputs are included in **Appendix A**.



AM (PM) - Volumes (Rounded to nearest 5)  
 \* - Pedestrian signal: only the overall intersection LOS for the signalized scenario is presented

**Exhibit 3.2**  
**Existing Intersection LOS Summary**

**Table 3.3: Existing Traffic Operations**

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Signalized Intersection</b>							
Wesbrook Mall (NB/SB) & Thunderbird Blvd (EB/WB)	Overall	0.52	B	-	0.79	B	-
	EB L	0.32	B	20	0.74	C	52
	WB L	0.30	C	13	0.49	C	20
	NB T/R	0.47	A	64	0.40	B	49
	SB T	0.49	C	49	0.74	C	107
Wesbrook Mall (NB/SB) & University Blvd (EB/WB)	Overall	0.32	B	-	0.40	B	-
	EB L/T/R	0.10	C	11	0.43	C	28
	WB L	0.31	B	26	0.17	B	13
	NB T	0.34	B	31	0.29	B	33
	SB L	-	-	-	0.43	B	34
University Blvd (EB/WB) & Blanca St (NB/SB)	Overall	0.49	B	-	0.40	B	-
	EB L/T	0.30	B	21	0.52	B	39
	WB T	0.65	B	75	0.36	B	36
	NB T	0.29	B	28	0.28	B	28
	SB L/T	0.20	B	16	0.15	B	12
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Signalized)	Overall	0.50	A	-	0.44	A	-
	EB L/T/R	0.27	A	19	0.46	A	36
	WB L/T/R	0.51	A	45	0.26	A	18
	NB L/T/R	0.39	B	13	0.21	B	7
	SB L/T/R	0.25	B	9	0.32	B	10
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Unsignalized)	EB L/T/R	0.01	A	0.1	0.00	A	0.1
	WB L/T/R	0.00	A	0	0.00	A	0.1
	NB L/T/R	0.22	C	6	0.11	C	3
	SB L/T/R	0.14	C	4	0.17	C	5

Table 3.3: Existing Traffic Operations (Cont'd)

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Unsignalized Intersection</b>							
Acadia Rd (NB/SB) & Toronto Rd (EB/WB) (4-way Stop)	EB L/T/R	-	A	-	-	A	-
	WB L/T/R	-	A	-	-	A	-
	NB L/T/R	-	A	-	-	A	-
	SB L/T/R	-	A	-	-	A	-
University Blvd (NB/SB) & Toronto Rd (EB/WB)	NB L/T	0.10	A	3	0.10	A	3
	EB L/R	0.22	B	6	0.31	B	10
University Blvd (NB/SB) & University Chapel (EB/WB)	SB L/T	0.02	A	0.4	0.00	A	0.1
	WB L/R	0.04	C	1	0.06	B	2

- Notes: a) "-" represents a value that is not calculated by Synchro;  
b) **Bolded** results indicate an LOS F, a v/c ratio > 1.0 or a 95<sup>th</sup> percentile queue that exceeds its physical storage space.  
c) EB, WB, NB, and SB represent eastbound, westbound, northbound, and southbound, respectively.  
d) L, T, R represent left, through, and right, respectively.

Overall, levels of service during the weekday AM and PM peak hours are satisfactory, ranging from LOS 'A' to 'C'. In addition, all movements are shown to operate with low v/c ratios and short 95th percentile queue lengths.

The pedestrian-actuated signal at University Boulevard and Acadia Road operates at an acceptable level both during the time when the signal is being called by pedestrians or when no called is made.



## 4. PROPOSED DEVELOPMENT

**Exhibit 4.1** shows the site plan for the development. The existing Sword Fern and Fairview Trails remain largely untouched, and are integrated into the design to provide access to existing trails. Retail and hotel uses are located on the north end of the site while residential uses occupy the rest of the site. **Table 4.1** summarizes the land use breakdown. It is anticipated that the proposed development breakdown would represent the upper limit of the developable programme on the site.

**Table 4.1: Proposed Development Breakdown**

Land Use	Quantity
Residential	1,400 units
Retail	30,000 ft <sup>2</sup>
Office	10,000 ft <sup>2</sup>
Hotel	150 rooms
Daycare	2,500 ft <sup>2</sup>

Currently, a grocery store is planned to be part of the retail use. It is planned to be 15,000 ft<sup>2</sup> of the 30,000 ft<sup>2</sup> of retail use. The remaining uses are expected to be a combination of restaurant/café and general retail.

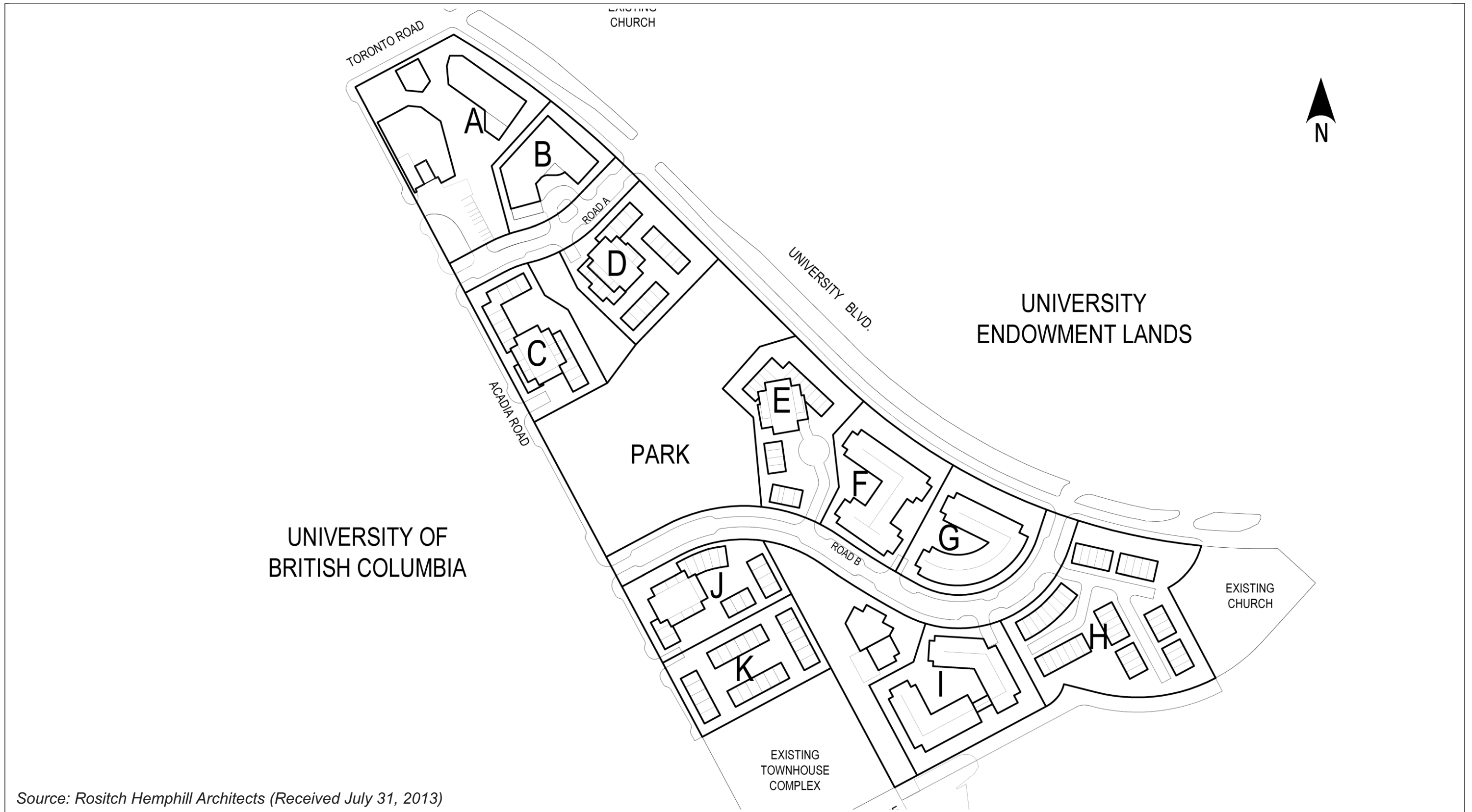
### 4.1 Street Network and Vehicle Access

As part of the development plan, two access roads will be provided, with connections between Acadia Road and University Boulevard.

#### 4.1.1 Road A

Located at the northern part of the site, Road A provides a full movement signalized access from University Boulevard to the commercial precinct of the development site. Traffic signal at this location would allow for left-turn exit from the site to University Boulevard as well as westbound left-turn access from University Boulevard. Left-turn bays are planned at the intersection of Road A & University Boulevard, with storage lengths proposed at 50m and 30m for the westbound and eastbound directions, respectively.

The signalized intersection at Road A & University Boulevard will also provide controlled crossing opportunities for future residents accessing to the bus stops along University Boulevard. In addition, in light of the proposed UBC rapid transit line along University Boulevard, consideration should be given to potentially provide a rapid transit stop at this location to take advantage of the controlled pedestrian crossing point.



**Exhibit 4.1**  
**Proposed Site Plan**

The planning of the UBC rapid transit station is outside of the scope of this project. However, the traffic signal proposed will not preclude the implementation of the future rapid transit stops along University Boulevard.

The intersection of Road A at Acadia Road will be a stop-controlled intersection with priority movement along Acadia Road.

#### 4.1.2 Road B

Located at the southern part of the site, Road B provides access primarily to various residential buildings that are proposed in the Master Plan. As it will be evident in Section 5, it is expected that majority of the residential vehicle trips are oriented to/from the East. Given these, intersection control at the intersection of Road B & University Boulevard is proposed to be unsignalized, with Right-in/Right-out and Left-in access only. A westbound left-turn bay is proposed along University Boulevard, with storage length of approximately 45m.

Similar to Road A, the intersection of Road B at Acadia Road will also be operated with stop signs along the minor streets approaches (Road B), with priority movement along Acadia Road.

On-street parking is generally available on both Road A and Road B. As part of the development plan, on-street parking is also planned along the site frontages on Acadia Road.

## 4.2 Parking

Parking requirements for the development have been carefully planned, taking into consideration relevant planning policies, as well as anticipated built-form and expected parking demand for the proposed Master Plan. Excessive provision of parking would undermine the urban design and generate unnecessary vehicle trips. It is imperative that parking be provided at a level that meets the broad sustainability objectives, while ensuring the development is commercially viable.

The following highlights the parking requirements that are currently mandated for the University Endowment Lands. It will then compare with the parking rates that are currently used for the South Campus community in the UBC neighbourhood, as well as the Proposed parking supply ratios that are developed based on the Project Team's experiences for other mixed-use community similar to the proposed development.

**Table 4.2** shows the comparison of the market-residential parking rates, while **Table 4.3** shows the comparison of the commercial parking rates including hotel use.

**Table 4.2: Comparison of Market-Residential Parking Rates**

Use	UEL Land Use, Building and Community Administrative By-Law (1999)	UBC South Campus Northeast Sub-Area Neighbourhood Plan (2005)	Proposed Parking Supply Ratios (Minimum)
Apartments & Condominiums	1.6 for every unit inclusive of a minimum of 0.25 per unit for visitors	Minimum: None; Maximum: 1 for each 70 sq m of GFA, or 1.8 per unit, whichever is less, Inclusive of 0.1 for visitor and 0.1 for handicap.	Low-rise (up to 6 storeys): 1.1 per unit for residents plus 0.1 per unit for visitors;  Condominium (7-16 storeys): 1.0 per unit for residents plus 0.1 per unit for visitors.
Townhouses	1.75 for every unit inclusive of a minimum of 0.25 per unit for visitors	Minimum: None; Maximum: 2.0 spaces per unit inclusive of 0.1 for visitor and 0.1 for handicap.	1.4 per unit for residents plus 0.1 per unit for visitors.

Both UEL and UBC South Campus do have specific parking requirements for Market-Residential (Apartment/ Condominium and Townhouse uses). The UEL minimum parking rate for Apartments and Condominiums are approximately 30% to 35% higher than what have been previously applied by Bunt & Associates for similar communities. For townhouses, the UEL parking rate is 10% to 15% higher than the rates that have been applied for other comparable communities. The UBC South Campus community does not have any minimum parking rate for Market-Residential use, as this determination is left to the individual developer.

**Table 4.3: Comparison of Commercial Parking Rates**

Use	UEL Land Use, Building and Community Administrative By-Law (1999)	UBC South Campus Northeast Sub-Area Neighbourhood Plan (2005)	Proposed Parking Supply Ratio (Minimum)
Office	1 for every 1,000 sq ft	N/A	1.5 to 2 per 1,000 sq ft
Retail	None	N/A	2.5 per 1,000 sq ft GFA
Restaurants	None	N/A	6 to 8 per 1,000 sq ft.
Hotels	1 for every two sleeping units	N/A	1 for every two sleeping units
Daycare (Staff Parking)	Not Specified	N/A	1 per 15 students

From Table 4.3, it is clear that the current UEL By-Law and the UBC South Campus Neighbourhood Plan do not provide much guidance with regards to the appropriate parking supply levels for commercial uses. This could partly be explained by the fact that both the UBC South Campus community and the existing community at UEL do have a significant number of residents where they can access the commercial facilities easily by walking or cycling hence reducing the need of parking for the commercial uses.

For the proposed Block F Master Plan, some provision of parking would be appropriate to ensure the viability of the commercial uses in the community. Shared parking opportunities may also be available given office and retail have different peak parking demand periods. Given two internal streets are also planned in the Master Plan, flexibility should also be given to count the on-street parking as part of the overall parking requirements.

## 5. FUTURE TRAFFIC OPERATIONS

### 5.1 Capacity Analysis Scenarios

Four future analysis horizons will be analyzed:

- Background 2030 – AM Peak
- Background 2030 – PM Peak
- Total (Background + New Site Trips) 2030 – AM Peak
- Total (Background + New Site Trips) 2030 – PM Peak

Results of this analysis are presented in Section 5.4.

The project is phased over 10-12 years, with the Master Plan build-out expected to be 2025. The analysis year of 2030 was selected to coincide with the final year of the *UBC Vancouver Campus Plan to 2030* discussed in Section 2. Often, in a report of this nature, an opening day horizon and a horizon 10 years after opening day are both analyzed. The decision was made to consider only 2030 given:

- The short time between the two years;
- The small amount of background growth;
- The lack of any significant network change between the two horizon years; and,
- The small number of network improvements required.

The Background 2030 Horizon will identify any network improvements required as a result of the existing traffic and any background traffic growth not generated by the Master Plan.

The Total 2030 Horizon will add the new site trips to the network and apply any expected adjustments to the background traffic including pass-by and shortcutting trips. Trip generation and distribution assumptions are identified and discussed in Section 5.2.

### 5.2 Background Traffic Growth

The UBC Fall 2011 Transportation Status Report (April 13, 2012) summarizes the mode choice and number of person trips to and from the university. UBC has been working to reduce automobile trips to and from UBC and encouraging alternative modes of travel. Between 1997 and 2011, automobile volumes have reduced from over 60,000 daily vehicles to fewer than 50,000 based on UBC screenline counts. During that time, UBC daytime population (students, staff and faculty) has increased 43%. One major factor was the introduction of the U-Pass for students, giving all students a reduced cost transit pass

included in their student fees. This was implemented for the fall of 2003 and that year showed an automobile volume drop of over 5,000 daily trips.

The *UBC Vancouver Campus Plan (June 2010)* identifies daytime population (student, staff and faculty) growth up to 2017, at which point enrollment is planned to be capped. The expected increase from 2007 to 2017 is approximately 5% (~2,500 persons); this is significantly lower than the 43% (~18,000 persons) increase in daytime population between 1997 and 2011.

A combination of the historic reduction in automobile volumes and the slowing of daytime population growth provide a reasonable expectation that background volumes are unlikely to increase during the analysis period.

One additional consideration affecting background growth is the redevelopment and densification of the Acadia Neighbouring adjacent to the site. Data specific to the Acadia Neighbourhood was not available, however, some data was available for campus wide student housing was available. The *UBC Vancouver Campus Plan (June 2010)* identifies a goal to house 50% of full time students on campus by 2030.

Achieving this goal will result in an additional 8,000 beds, nearly doubling the existing supply. The new student housing will not be located solely in the Acadia Neighbourhood. However, it is prudent to consider the transportation impacts of additional people living on campus. The process to determine traffic growth based on additional student housing is outlined below.

**5.2.1 Student Housing Vehicle Trip Generation**

Trip rates for student housing collected previously by Bunt & Associates were used to determine expected vehicle trips for the new student housing. **Table 5.1** summarizes the volumes.

**Table 5.1: Student Housing Trip Generation**

Period	Bunt Trip Rate for Student Housing (trips per bed)		Total Trips (8,000 beds)
	Inbound	Outbound	
AM Peak	0.03	0.02	407
PM Peak	0.08	0.08	1,303

**5.2.2 New Vehicle Trips per year**

Construction of the new student housing is assumed to begin immediately (2013) and be completed in 2030. This period is 17 years and assuming an even distribution, an increase of approximately 100 vehicle trips per year during the peak-hour periods (AM and PM combined) is assumed.

**5.2.3 Screenline Volume Distribution**

Based on Figure 2.7 in the *UBC Fall Transportation Status Report*, approximately 23% of traffic accessing UBC uses University Boulevard. Applying this yields *approximately 25 new vehicle trips* during the peak-hour periods along University Boulevard every year.

**5.2.4 Percentage Growth**

To approximate the spread of the new student housing throughout the campus, a percentage increase was applied to all movements within the study area rather than strictly increasing traffic along University Boulevard.

Considering the existing 2013 two way volumes along University Boulevard of 1,175 vph during the AM Peak and 1,075 vph during the PM Peak, the 25 daily new trips per year correspond to an approximate growth of 1% per year. A linear growth rate of 1% per year was applied to the existing 2013 volumes through to 2030.

This process represents a conservative analysis as the existing volumes are not adjusted based on the reduction of students living off-campus.

**5.2.5 Vehicle Trips from Proposed Acadia Elementary School**

The new elementary school in the Acadia neighbourhood is expected to increase vehicle movements within the study area during the morning and early afternoon. A *Traffic and Parking Study* was prepared by Creative Transportation Solutions (CTS) in 2010 for the VSB to support the proposed new school. Based on information presented in the CTS report, the expected peak hours of the school are 8:15am to 9:15am and 2:45 to 3:45pm. The afternoon peak-hour for the elementary school occurs before the peak-hour in the study area and therefore will not be included in the analysis.

The distribution for the morning peak-hour from the CTS report is presented in **Table 5.2**.

**Table 5.2: Elementary School Morning Peak Hour Distribution**

From/To	Inbound	Outbound
North	16.4%	17.4%
East	29.3%	55.3%
West	55.3%	43.5%
Total	100.0%	100.0%

More detailed volume data is available in *Figure 12* of the CTS report. Based on the information from the CTS report, approximately 90 vehicles are expected to depart via the intersection of Wesbrook Mall & Thunderbird Boulevard and 140 vehicles arrive by the same intersection.



The expected volumes at Acadia Road and Toronto Road are approximately 115 vehicles both departing and arriving, and approximately 65% of these vehicles are expected to use University Boulevard east of Toronto Road. The routing presented in the CTS report was used for our analysis with some additional assumptions for the intersections outside of the CTS study area.

### 5.2.6 Summary

A 1% per year linear growth rate was applied to account for the Acadia Neighbourhood densification. The morning peak-hour volumes for the new elementary school in the Acadia Neighbourhood were added to the background growth. The afternoon peak-hour of the school occurs outside of the study area peak and therefore is not included in the analysis.

No background volume reduction was considered even though the proposed UBC rapid transit line is expected to open in 2021. Summarizing the information above, the morning and afternoon peak hour 2030 Background volumes are presented in **Exhibit 5.1**.

## 5.3 Site Vehicle Trip Generation and Distribution

Vehicle trip generation for the proposed development was estimated using trip rates observed from residential development located at the UBC South Campus area, as well as trip rates published in the Institute of Transportation Engineer's (ITE) Trip Generation Report (9th Edition).

ITE Trip rates for the non-residential uses were reduced by 30% to account for internal capture and the Master Plan's proximity to the UBC Campus and transit services, resulting in higher percentage of non-vehicular trips. **Table 5.3** presents the vehicle trip rates used for the Weekday AM and PM Peak periods.

**Table 5.3: Site Vehicle Trip Rates**

Use	Source	Weekday AM Peak			Weekday PM Peak		
		In	Out	Total	In	Out	Total
Residential	Bunt Trip Rates collected from UBC South Campus Area	0.13	0.18	0.31	0.20	0.09	0.29
Daycare	ITE Day Care Centre less 30%	4.52	4.01	8.53	4.06	4.58	8.64
Grocery Store	ITE Supermarket (850) less 30%	1.48	0.9	2.38	3.39	3.25	6.64
Restaurant/Café	ITE High-Turnover (Sit Down) Restaurant (932) less 30%	4.16	3.41	7.57	4.14	2.76	6.90
Retail	ITE Specialty Retail (214)	0.43	0.27	0.70	1.19	1.52	2.71
Office	ITE General Office (710) less 30%	0.96	0.13	1.09	0.18	0.86	1.04
Hotel	ITE Hotel (310) less 30%	0.22	0.15	0.37	0.21	0.21	0.42



**Exhibit 5.1**  
Background 2030 Peak Hour Vehicle Volumes

**Table 5.4** presents the vehicle trip estimates for the current site plan. These vehicle volumes are used for the analysis in Section 5.3.

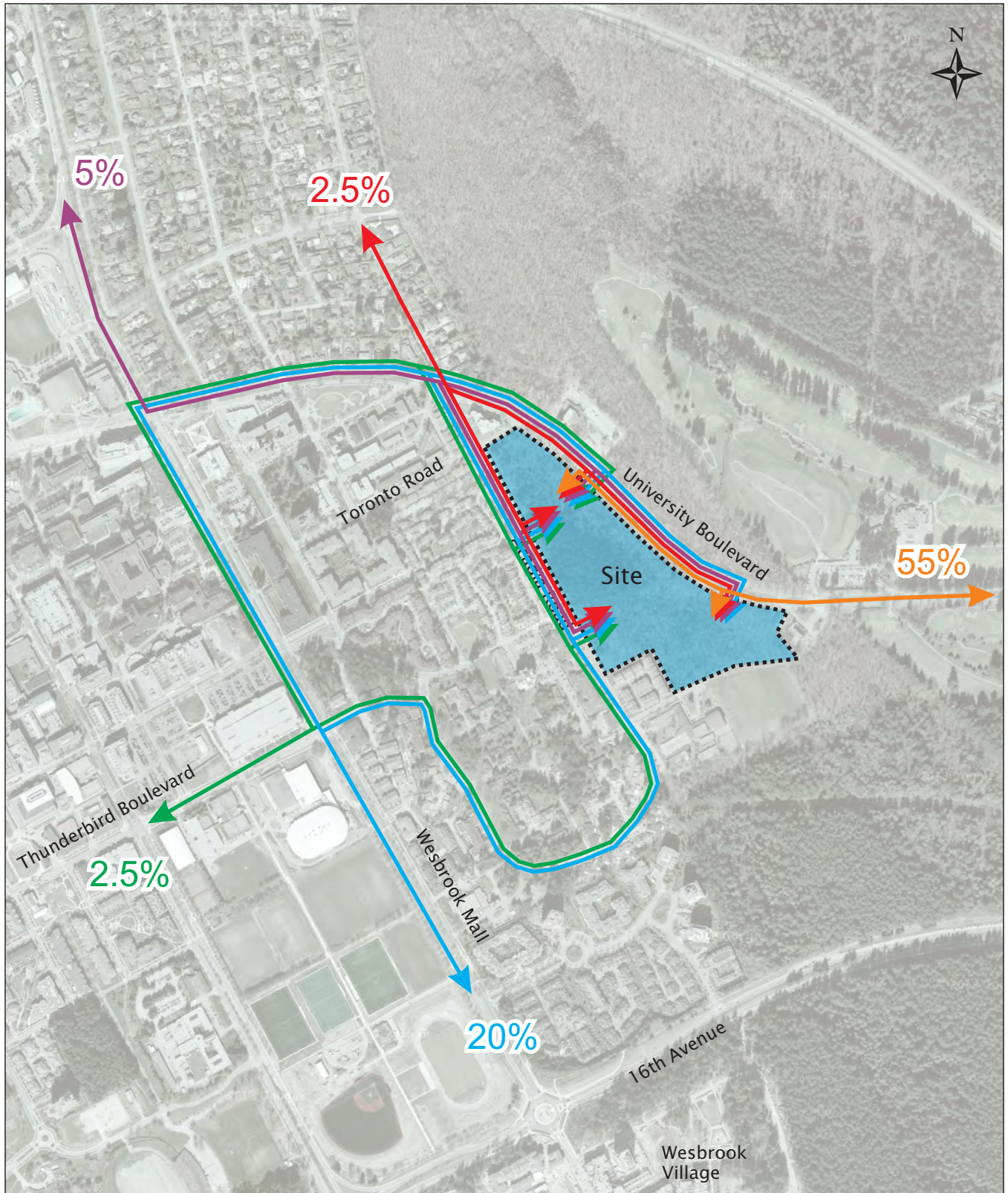
**Table 5.4: Site Vehicle Trip Estimates**

Land Use	Size	Weekday AM Peak			Weekday PM Peak		
		In	Out	Total	In	Out	Total
Residential	1,400 units	182	253	435	280	126	406
Daycare	2,500 ft <sup>2</sup>	11	10	21	10	11	21
Retail	15,000 ft <sup>2</sup>	34	28	62	40	32	72
Grocery	15,000 ft <sup>2</sup>	22	14	36	51	49	100
Office	10,000 ft <sup>2</sup>	10	1	11	2	9	11
Hotel	150 rooms	33	23	56	32	32	64
Total		292	329	621	415	259	674
<i>Pass-by Trips</i>		28	28	56	46	46	92
<b>Total New Trips</b>		<b>264</b>	<b>301</b>	<b>565</b>	<b>369</b>	<b>213</b>	<b>582</b>

The development is expected to generate approximately 625 to 675 vehicle trips per hour during the morning and afternoon peak-hour periods, respectively. Approximately 100 of these trips are assumed to be pass-by trips from the existing neighbourhood. Pass-by was assumed to be 50% of the inbound retail trips.

Vehicle trip distribution pattern for the development is established based on existing traffic patterns and anticipated origin and destinations of site traffic. University Boulevard was the primary road for the residential, office and amenity uses at approximately 70% of the trips. The retail use has a relatively even distribution split between the west (University Boulevard), north (Acadia Road and Wesbrook Mall), south (Wesbrook Mall) and the neighbouring Acadia Neighbourhood.

The approximate total distribution of site trips is summarized in **Table 5.5**, while the same information is also presented graphically in **Exhibit 5.2**.



## Exhibit 5.2 Trip Distribution Pattern

**Table 5.5: Trip Distribution Pattern**

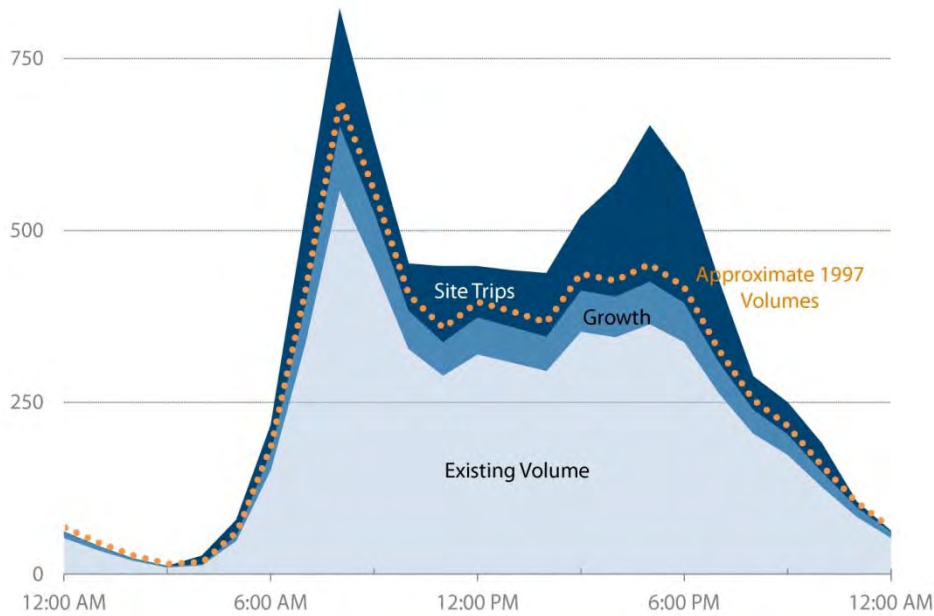
Direction	Potential Route (s)	Destination	Percentage
East	University Boulevard	University Boulevard	55%
North	Acadia Road	Acadia Road	2.5%
North	University Boulevard	Wesbrook Mall	5%
South	University Boulevard, Osoyoos Crescent	Wesbrook Mall	20%
West	University Boulevard, Osoyoos Crescent	Thunderbird Boulevard	2.5%
Total			85%

The additional 15% of the site trips do not leave the study area and would be primarily to/from the Acadia neighbourhood. From Table 5.4, over half of the site development traffic is expected to orient to/from the East. With a total of 675 vehicle trips predicted for the Weekday AM and PM peak periods, this means that approximately 375 vehicle trips (275 new trips) are expected to travel to/from the east.

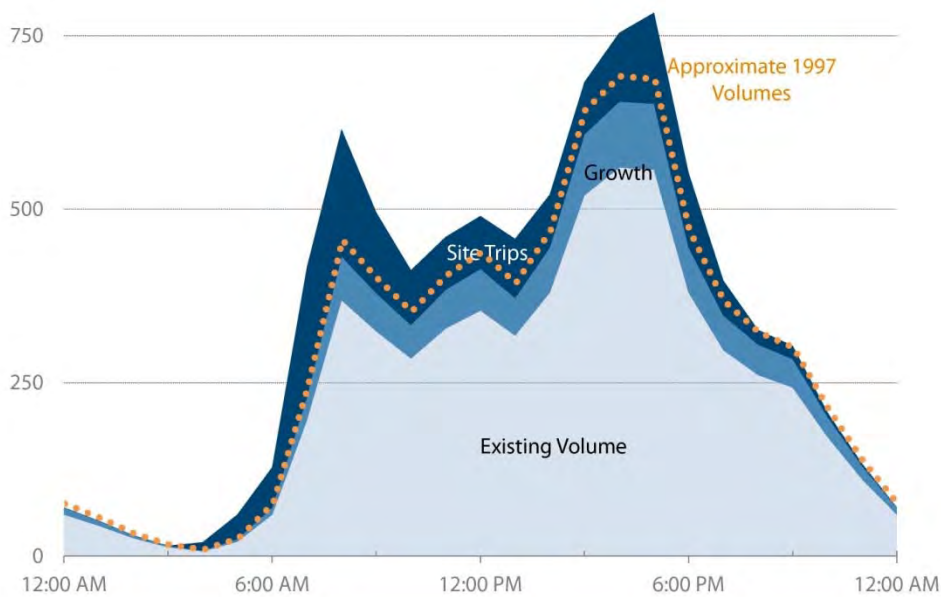
Anticipated westbound volumes along University Boulevard east of the site are presented in **Exhibit 5.3** and eastbound volumes are presented in **Exhibit 5.4**.

**Exhibit 5.5** summarizes Total 2030 volumes for the AM and PM Peak Periods including background volumes, pass-by trips, new site trips and diverted trips from the Acadia neighbourhood. For the purpose of the traffic analysis, it was assumed that 70% of existing vehicles using Toronto Road to travel between Acadia Road south and University Boulevard east would be diverted through the site given the shorter travel distance that is provided by the site. This corresponds to approximately 120 vehicles during the morning peak and 140 vehicles during the afternoon peak.

**Exhibit 5.3: Future Westbound Volumes along University Boulevard**



**Exhibit 5.4: Future Eastbound Volumes along University Boulevard**





**Exhibit 5.5**  
**Total 2030 Peak Hour Vehicle Volumes**

### 5.4 Construction Truck Movements

The effects of construction truck movements will be considered separately in the future as and when detailed information (i.e. construction schedule, building programme, etc.) becomes available for each parcel.

### 5.5 Future Traffic Analysis (2030)

The following presents the Capacity Analysis for the future scenarios. Model outputs are included in **Appendix B**.

#### 5.5.1 Background 2030 Conditions

**Table 5.6** summarizes the intersection performances for the background traffic conditions. The v/c ratio, LOS, and 95<sup>th</sup> percentile queues for the critical movements of each approach are presented. Intersection LOS Summary is also presented graphically in **Exhibit 5.6**.

**Table 5.6: Background 2030 Conditions**

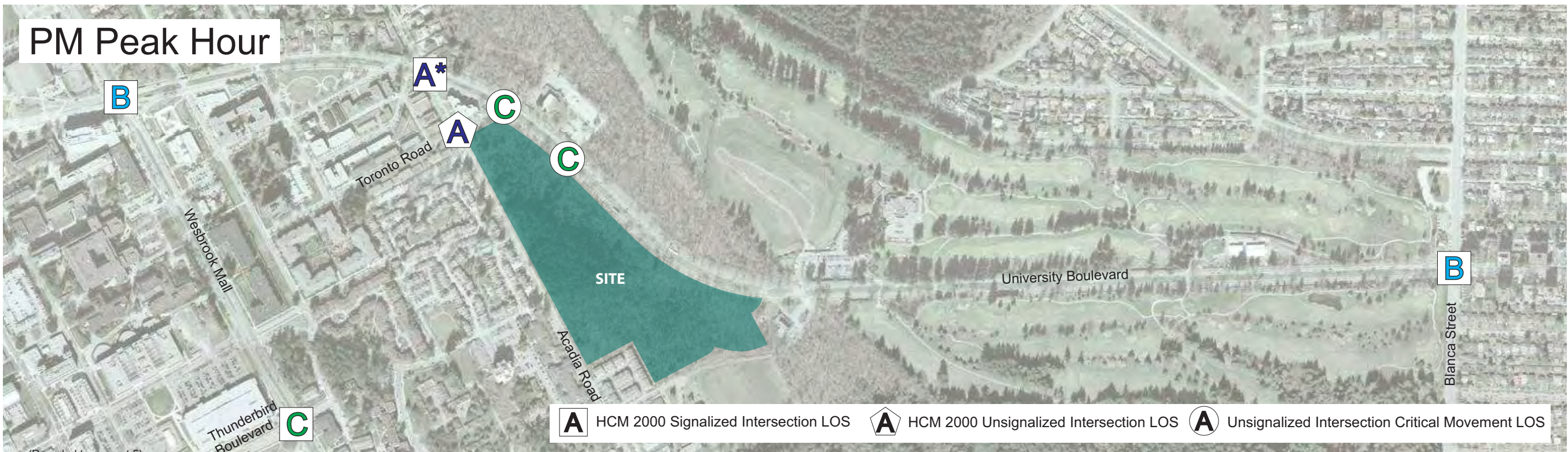
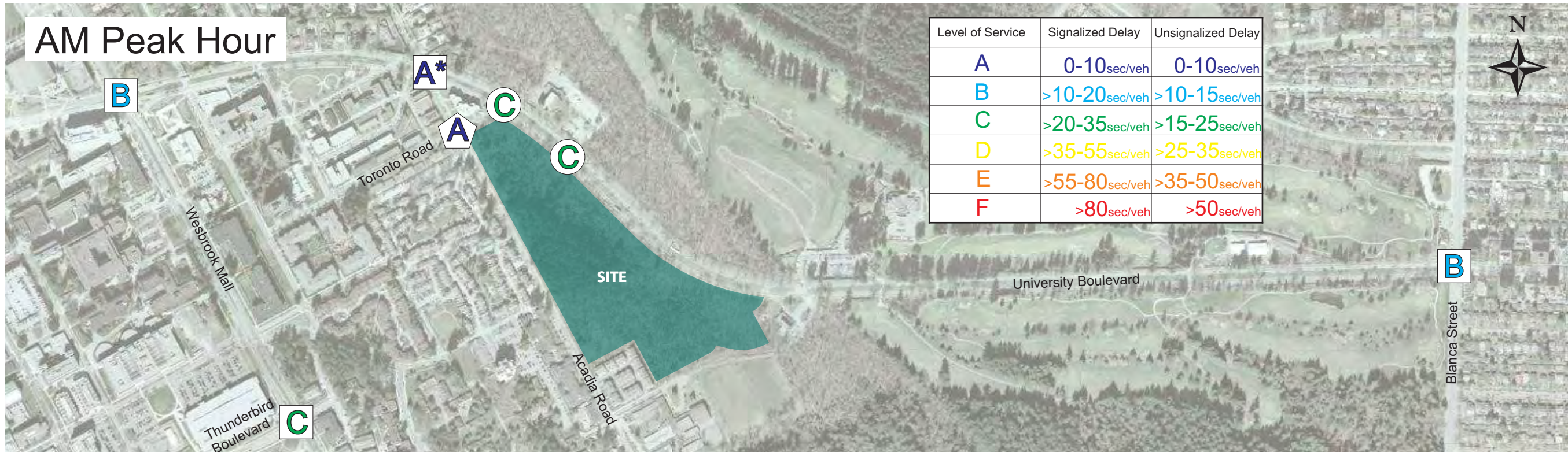
Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Signalized Intersection</b>							
Wesbrook Mall (NB/SB) & Thunderbird Blvd (EB/WB)	Overall	0.74	C	-	0.92	C	-
	EB L	0.34	B	22	0.86	D	68
	WB L	0.46	C	23	0.54	C	23
	NB T/R	0.75	B	113	0.47	B	62
	SB T	0.66	C	63	0.88	D	137
Wesbrook Mall (NB/SB) & University Blvd (EB/WB)	Overall	0.44	B	-	0.46	B	-
	EB L/T/R	0.20	C	12	0.51	C	33
	WB L	0.39	B	32	0.22	B	15
	NB T	0.47	B	40	0.39	B	39
	SB L	-	-	-	0.48	B	40
	SB T/R	0.35	B	35	-	-	-



Table 5.6: Background 2030 Conditions (Cont'd)

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Signalized Intersection</b>							
University Blvd (EB/WB) & Blanca St (NB/SB)	Overall	0.70	B	-	0.55	B	-
	EB L	0.56	B	21	0.71	B	21
	WB L	-	-	-	0.52	C	27
	WB T	0.74	B	86	-	-	-
	NB L	0.61	C	34	0.21	B	15
	SB L/T	0.38	B	23	0.08	B	15
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Signalized)	Overall	0.66	A	-	0.51	A	-
	EB L/T/R	0.39	A	29	0.53	A	48
	WB L/T/R	0.69	A	71	0.30	A	22
	NB L/T/R	0.52	B	24	0.26	B	9
	SB L/T/R	0.30	B	16	0.39	B	14
University Blvd (EB/W B) & Acadia Rd (NB/SB) (Unsignalized)	EB L/T/R	0.01	A	0.2	0.01	A	0.1
	WB L/T/R	0.00	A	0	0.01	A	0.1
	NB L/T/R	0.58	E	25	0.14	C	4
	SB L/T/R	0.35	D	11	0.23	C	7
<b>Unsignalized Intersection</b>							
Acadia Rd (EB/WB) & Toronto Rd (NB/SB) (4-way Stop)	EB L/T/R	-	A	-	-	A	-
	WB L/T/R	-	B	-	-	A	-
	NB L/T/R	-	B	-	-	A	-
	SB L/T/R	-	A	-	-	A	-
University Blvd (NB/SB) & Toronto Rd (EB/WB)	NB L/T	0.23	A	7	0.13	A	3
	EB L/R	0.49	C	20	0.41	C	15
University Blvd (NB/SB) & University Chapel (EB/WB)	SB L/T	0.03	A	1	0.00	A	0.1
	WB L/R	0.08	C	2	0.08	C	2

- Notes:
- "-" represents a value that is not calculated by Synchro;
  - Bolded** results indicate an LOS F, a v/c ratio > 1.0 or a 95<sup>th</sup> percentile queue that exceeds its physical storage space.
  - EB, WB, NB, and SB represent eastbound, westbound, northbound, and southbound, respectively.
  - L, T, R represent left, through, and right, respectively.



AM (PM) - Volumes (Rounded to nearest 5)  
 \* - Pedestrian signal: only the overall intersection LOS for the signalized scenario is presented

**Exhibit 5.6**  
**Background 2030 Intersection LOS Summary**

Overall, levels of service of the unsignalized intersections during the weekday AM and PM peak hours are satisfactory, generally ranging from LOS 'A' to 'C'. In addition, all movements are shown to operate with low v/c ratios and short 95<sup>th</sup> percentile queue lengths.

The pedestrian-actuated signal at University Boulevard and Acadia Road operates at acceptable levels with low v/c ratios and queues both during the time when the signal is being called by pedestrians or when no called is made. The only exception is the northbound movement at morning peak hour, where longer delays are predicted when no pedestrian call is made at the intersection. However, it is expected that the actual intersection operations would be between the signalized and unsignalized scenarios.

The intersection at Wesbrook Mall and Thunderbird Boulevard nears capacity in the PM peak hour, reaching an overall v/c ratio of 0.92 and sees considerable delays for eastbound left and southbound through movements, resulting in LOS 'D'. The signal timing plan for this intersection is recommended to be reviewed in the future to improve operations.

**5.5.2 Total 2030 Conditions**

**Table 5.7** summarizes the intersection performances for the Total traffic conditions. The v/c ratio, LOS, and 95<sup>th</sup> percentile queues for the critical movements of each approach are presented. Intersection LOS Summary is also presented graphically in **Exhibit 5.7**.

**Table 5.7: Total 2030 Conditions**

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Signalized Intersection</b>							
Wesbrook Mall (NB/SB) & Thunderbird Blvd (EB/WB)	Overall	0.81	C	-	0.95	C	-
	EB L	0.34	C	22	0.81	C	62
	WB L	0.62	D	34	0.65	D	29
	NB T/R	0.82	C	167	0.57	B	83
	SB T	0.62	C	76	0.92	D	151
Wesbrook Mall (NB/SB) & University Blvd (EB/WB)	Overall	0.47	B	-	0.49	B	-
	EB L/T/R	0.21	C	13	0.51	C	33
	WB L	0.44	B	35	0.24	B	16
	NB T	0.49	C	41	0.39	B	39
	SB L	0.34	B	23	0.52	B	44

**Table 5.7: Total 2030 Conditions (Cont'd)**

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Signalized Intersection</b>							
University Blvd (EB/WB) & Blanca St (NB/SB) (As pre-timed)	Overall	0.84	C	-	0.61	B	-
	EB L	0.82	D	44	-	-	-
	EB T	-	-	-	0.82	C	122
	WB L	-	-	-	0.80	D	35
	WB T	0.78	B	107	-	-	-
	NB L	0.90	E	59	-	-	-
	NB T	-	-	-	0.35	B	34
	SB L/T	0.51	C	29	0.20	B	15
University Blvd (EB/WB) & Blanca St (NB/SB) (As semi-actuated)	Overall	0.89	B	-	0.62	B	-
	EB L	0.90	D	45	-	-	-
	EB T	-	-	-	0.86	C	122
	WB L	-	-	-	0.82	D	35
	WB T	0.80	B	109	-	-	-
	NB L	0.59	C	53	-	-	-
	NB T	-	-	-	0.34	B	34
	SB L/T	0.49	C	26	0.19	B	15
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Signalized)	Overall	0.70	A	-	0.56	A	-
	EB L/T/R	0.44	A	35	0.58	A	61
	WB L/T/R	0.72	A	77	0.30	A	24
	NB L/T/R	0.63	C	30	0.44	B	17
	SB L/T/R	0.30	B	17	0.41	B	17

**Table 5.7: Total 2030 Conditions (Cont'd)**

Intersection	Critical Movement	AM			PM		
		V/C	LOS	95th Percentile Queue (m)	V/C	LOS	95th Percentile Queue (m)
<b>Signalized Intersection</b>							
University Blvd (NB/SB) & Road A (EB/WB) (Improved - Signalized)	Overall	0.65	A	-	0.52	A	-
	SB T/R	0.45	A	36	0.58	A	59
	NB L	-	-	-	0.43	A	18
	NB T/R	0.76	A	84	-	-	-
	EB L/T/R	0.19	B	13	0.15	B	13
	WB L/T/R	0.01	B	4	0.09	B	6
<b>Unsignalized Intersection</b>							
University Blvd (EB/WB) & Acadia Rd (NB/SB) (Unsignalized)	EB L/T/R	0.01	A	0.2	0.01	A	0.2
	WB L/T/R	0.00	A	0	0.01	A	0.2
	NB L/T/R	0.82	F	47	0.38	D	27
	SB L/T/R	0.40	D	14	0.36	C	25
Acadia Rd (NB/SB) & Toronto Rd (EB/WB) (4-way Stop)	EB L/T/R	-	A	-	-	A	-
	WB L/T/R	-	A	-	-	A	-
	NB L/T/R	-	B	-	-	A	-
	SB L/T/R	-	A	-	-	A	-
University Blvd (NB/SB) & Toronto Rd (EB/WB)	NB L/T	0.11	A	3	0.05	A	1
	EB L/R	0.25	B	7	0.23	B	7
Acadia Rd (NB/SB) & Road A (EB/WB)	WB L/R	0.40	C	15	0.25	B	8
	SB L/T	0.04	A	1	0.04	A	1
Acadia Rd (NB/SB) & Road B (EB/WB)	WB L/R	0.23	C	7	0.12	B	3
	SB L/T	0.01	A	0.1	0.01	A	0.1
University Blvd (NB/SB) & Road B (EB/WB)	NB L	0.17	B	5	0.23	B	7
	EB L/R	0.47	C	19	0.27	C	8

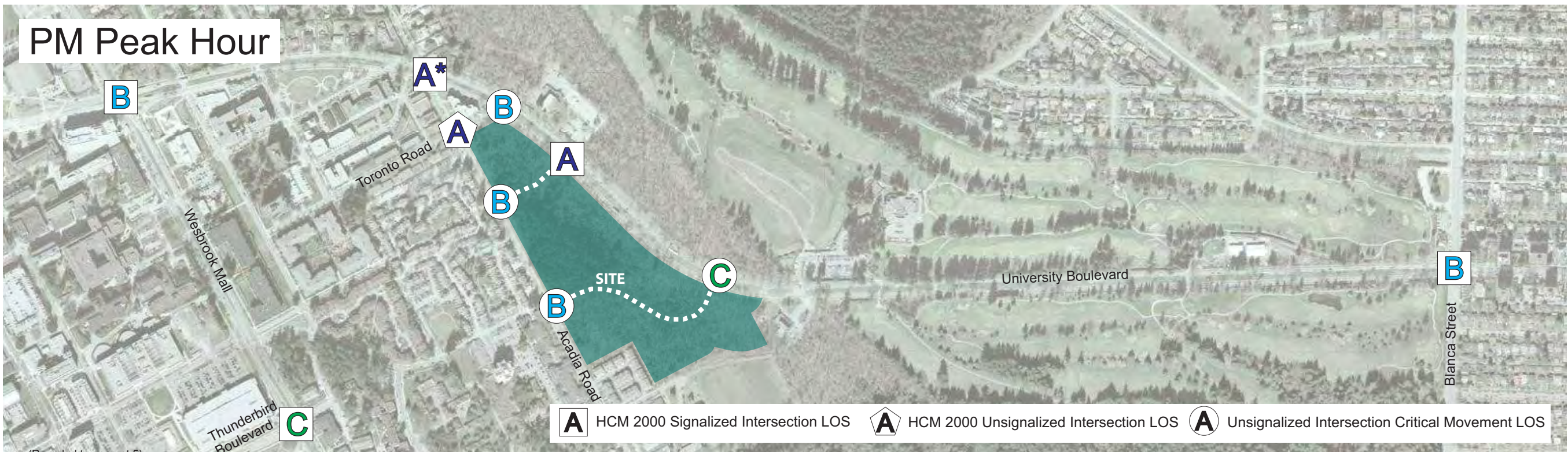
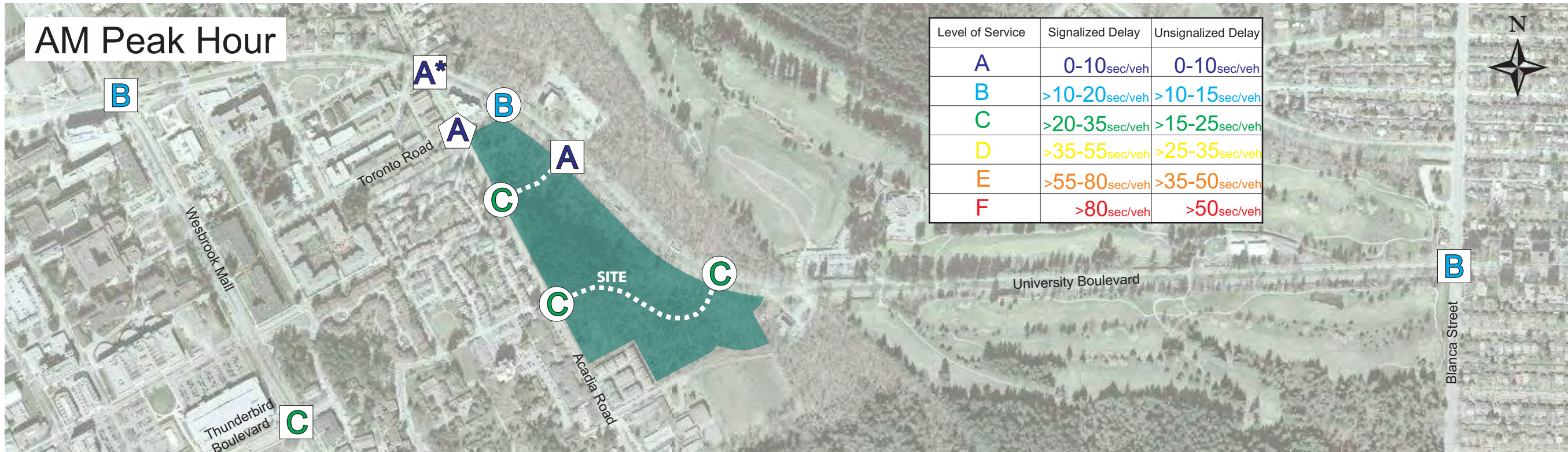
- Notes:
- a) "-" represents a value that is not calculated by Synchro.
  - b) **Bolded** results indicate an LOS F, a v/c ratio > 1.0 or a 95<sup>th</sup> percentile queue that exceeds its physical storage space.
  - c) "Err" represents a value that is too high for Synchro to calculate.
  - d) EB, WB, NB, and SB represent eastbound, westbound, northbound, and southbound, respectively.
  - e) L, T, R represent left, through, and right, respectively.

Overall, levels of service of the unsignalized intersections during the weekday AM and PM peak hours are satisfactory, generally ranging from LOS 'A' to 'C'. In addition, all movements are shown to operate with low v/c ratios and short 95<sup>th</sup> percentile queue lengths.

The pedestrian-actuated signal at University Boulevard and Acadia Road operates at acceptable levels with low v/c ratios and queues both during the time when the signal is being called by pedestrians or when no call is made. Similar to the 2030 Background scenario, longer delays are predicted for the northbound movement at morning peak hour when no pedestrian call is made at the intersection. However, it is expected that the actual intersection operations would be between the signalized and unsignalized scenarios.

Overall levels of service and v/c ratios at University Boulevard and Blanca Street are acceptable. However, the northbound and eastbound left-turn movements face significant delays. Installation of detector loops to convert the pre-timed intersection control to an actuated signal control should be considered in the future before the build-out of the Block F Master Plan, perhaps at some point after the opening of Phase 1 of the development. As shown in Table 5.7, the intersection sees overall decreases in delays.

Again, the intersection at Westbrook Mall and Thunderbird Boulevard nears capacity in the PM peak hour, reaching an overall v/c ratio of 0.95 and sees considerable queues for eastbound left and southbound through movements, resulting in LOS 'D'. Adjustments to the signal timing plan for this intersection shall be considered following an intersection review closer to the time the intersection is constructed.



AM (PM) - Volumes (Rounded to nearest 5)  
 \* - Pedestrian signal: only the overall intersection LOS for the signalized scenario is presented

**Exhibit 5.7**  
**Total 2030 Intersection LOS Summary**

## 6. SUMMARY

The Musqueam is proposing a mixed-use project on a 22 acre freehold parcel in 'Block F' of the University Endowment Lands, located on the south side of University Boulevard between the existing developments along Acadia Road, Pacific Spirit Park and the University Golf Course.

The build-out of the master plan is expected to occur over 10 to 12 years, with a maximum of 1,400 multi-family residential units, 150 hotel rooms, 30,000 ft<sup>2</sup> of retail, 10,000 ft<sup>2</sup> of office, along with amenity spaces. Parking for the development is provided based on best practice guidelines, recognizing the mixed-use nature of the development, while ensuring the viability of the commercial uses that are proposed in the Master Plan.

The development is expected to generate approximately 625 to 675 vehicle trips per hour during the morning and afternoon peak-hour periods at full build-out. These vehicle trips will be served by two access roads, with connections between Acadia Road and University Boulevard.

Capacity analyses indicate that intersections in the study street network are expected to continue to operate satisfactorily with the master plan build-out vehicle volumes factored in, along with the background traffic growth that are expected from the redevelopment of the Acadia Neighbourhood and UBC. The only exception is the University Boulevard and Blanca Street intersection, where the northbound and eastbound left-turn movements are predicted to experience longer delays during the 2030 horizon year.

Installation of detector loops at the University Boulevard and Blanca Street intersection to convert the pre-timed intersection control to an actuated signal control would improve operation at this intersection and should be considered closer to the build-out horizon of the Master Plan.

Based on the analysis outlined in this study, it is concluded that the proposed form and density of the proposed development can be supported from a transportation perspective.



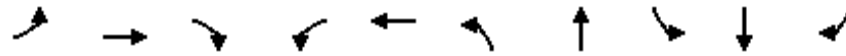
# APPENDIX A

## Synchro Model Output – Existing

(to be provided electronically only)

Queues  
1: Wesbrook Mall & Thunderbird Blvd

Existing AM  
8/1/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	90	42	23	36	63	243	477	15	238	137
v/c Ratio	0.26	0.07	0.04	0.19	0.24	0.38	0.43	0.06	0.49	0.25
Control Delay	20.0	18.1	0.1	32.5	25.6	11.6	12.0	22.1	27.1	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	18.1	0.1	32.5	25.6	11.6	12.0	22.1	27.1	3.9
Queue Length 50th (m)	8.0	3.6	0.0	4.3	5.4	16.8	37.4	1.5	27.5	0.0
Queue Length 95th (m)	19.9	11.1	0.0	13.3	16.8	30.9	64.1	5.9	49.3	8.1
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	391	1319	1151	721	953	699	1258	370	755	743
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.03	0.02	0.05	0.07	0.35	0.38	0.04	0.32	0.18

Intersection Summary

HCM Signalized Intersection Capacity Analysis  
1: Wesbrook Mall & Thunderbird Blvd

Existing AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	83	39	21	33	41	17	224	380	59	14	219	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1803		1789	1846		1789	1883	1601
Flt Permitted	0.35	1.00	1.00	0.73	1.00		0.41	1.00		0.49	1.00	1.00
Satd. Flow (perm)	651	1883	1601	1374	1803		781	1846		924	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	42	23	36	45	18	243	413	64	15	238	137
RTOR Reduction (vph)	0	0	17	0	16	0	0	5	0	0	0	101
Lane Group Flow (vph)	90	42	6	36	47	0	243	472	0	15	238	36
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	17.9	17.9	17.9	5.7	5.7		35.3	35.3		17.0	17.0	17.0
Effective Green, g (s)	17.9	17.9	17.9	5.7	5.7		35.3	35.3		17.0	17.0	17.0
Actuated g/C Ratio	0.27	0.27	0.27	0.09	0.09		0.54	0.54		0.26	0.26	0.26
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	285	516	439	120	157		614	999		240	490	417
v/s Ratio Prot	c0.03	0.02			0.03		0.08	c0.26			0.13	
v/s Ratio Perm	c0.06		0.00	0.03			0.14			0.02		0.02
v/c Ratio	0.32	0.08	0.01	0.30	0.30		0.40	0.47		0.06	0.49	0.09
Uniform Delay, d1	18.4	17.5	17.2	27.9	27.9		8.5	9.2		18.1	20.4	18.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	0.0	1.4	1.1		0.4	0.5		0.1	1.0	0.1
Delay (s)	19.0	17.6	17.2	29.3	28.9		8.9	9.7		18.3	21.4	18.3
Level of Service	B	B	B	C	C		A	A		B	C	B
Approach Delay (s)		18.4			29.1			9.4			20.2	
Approach LOS		B			C			A			C	

Intersection Summary

HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	24.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
2: Wesbrook Mall & University Blvd

Existing AM  
8/1/2013



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	46	187	197	222	22	333	96	91	305
v/c Ratio	0.09	0.29	0.28	0.27	0.04	0.35	0.19	0.17	0.22
Control Delay	17.3	12.3	12.2	2.7	12.4	22.6	7.0	12.9	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	12.3	12.2	2.7	12.4	22.6	7.0	12.9	15.9
Queue Length 50th (m)	3.3	14.0	14.8	0.0	1.7	20.0	0.0	7.1	13.2
Queue Length 95th (m)	10.7	25.6	26.7	9.4	5.3	31.1	10.5	15.2	28.6
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	676	768	1264	1290	791	1334	657	772	1570
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.24	0.16	0.17	0.03	0.25	0.15	0.12	0.19

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 2: Wesbrook Mall & University Blvd

Existing AM  
8/1/2013



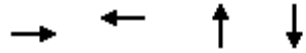
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↖	↖	↖	↕	↖	↖	↕	↖
Volume (vph)	1	28	14	249	104	204	20	306	88	84	273	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1799		1700	1752	1601	1789	3579	1601	1789	3564	
Flt Permitted		0.99		0.67	0.89	1.00	0.57	1.00	1.00	0.44	1.00	
Satd. Flow (perm)		1790		1204	1594	1601	1066	3579	1601	838	3564	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	30	15	271	113	222	22	333	96	91	297	8
RTOR Reduction (vph)	0	12	0	0	0	126	0	0	69	0	1	0
Lane Group Flow (vph)	0	34	0	187	197	96	22	333	27	91	304	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		12.4		27.6	27.6	27.6	19.3	17.6	17.6	28.1	23.4	
Effective Green, g (s)		12.4		27.6	27.6	27.6	19.3	17.6	17.6	28.1	23.4	
Actuated g/C Ratio		0.19		0.43	0.43	0.43	0.30	0.28	0.28	0.44	0.37	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		348		608	718	693	342	988	442	481	1309	
v/s Ratio Prot				c0.05	0.05		0.00	c0.09		c0.02	0.09	
v/s Ratio Perm		0.02		c0.08	0.07	0.06	0.02		0.02	0.06		
v/c Ratio		0.10		0.31	0.27	0.14	0.06	0.34	0.06	0.19	0.23	
Uniform Delay, d1		21.1		11.6	11.6	10.9	15.7	18.4	17.0	10.6	13.9	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		0.2	0.2	0.1	0.1	0.1	0.0	0.2	0.1	
Delay (s)		21.1		11.8	11.8	11.0	15.7	18.5	17.0	10.8	14.0	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		21.1			11.5			18.0			13.3	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	63.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	47.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
3: Acadia Rd & University Blvd

Existing AM  
8/1/2013



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	351	662	72	48
v/c Ratio	0.24	0.46	0.21	0.15
Control Delay	3.6	5.1	16.3	14.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	3.6	5.1	16.3	14.4
Queue Length 50th (m)	8.3	19.8	4.7	2.7
Queue Length 95th (m)	19.4	45.0	12.9	9.0
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1736	1748	675	627
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.20	0.38	0.11	0.08

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 3: Acadia Rd & University Blvd

Existing AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	5	310	8	1	595	13	17	50	0	17	21	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			1.00			1.00			0.98	
Flt Protected		1.00			1.00			0.99			0.98	
Satd. Flow (prot)		1876			1878			1860			1812	
Flt Permitted		0.99			1.00			0.90			0.85	
Satd. Flow (perm)		1865			1878			1694			1562	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	337	9	1	647	14	18	54	0	18	23	7
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	350	0	0	661	0	0	72	0	0	42	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		26.4			26.4			4.2			4.2	
Effective Green, g (s)		26.4			26.4			4.2			4.2	
Actuated g/C Ratio		0.68			0.68			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1275			1284			184			169	
v/s Ratio Prot												
v/s Ratio Perm		0.19			0.35			0.04			0.03	
v/c Ratio		0.27			0.51			0.39			0.25	
Uniform Delay, d1		2.4			3.0			16.0			15.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.1			0.4			1.4			0.8	
Delay (s)		2.5			3.3			17.4			16.5	
Level of Service		A			A			B			B	
Approach Delay (s)		2.5			3.3			17.4			16.5	
Approach LOS		A			A			B			B	

### Intersection Summary

HCM 2000 Control Delay	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	38.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
4: Acadia Rd & Toronto Road

Existing AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	50	19	69	43	0	22	65	78	0	29	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	54	21	75	47	0	24	71	85	0	32	3
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	77	122	179	35								
Volume Left (vph)	2	75	24	0								
Volume Right (vph)	21	0	85	3								
Hadj (s)	-0.12	0.16	-0.22	-0.02								
Departure Headway (s)	4.4	4.6	4.2	4.6								
Degree Utilization, x	0.09	0.16	0.21	0.04								
Capacity (veh/h)	771	733	818	737								
Control Delay (s)	7.9	8.5	8.3	7.8								
Approach Delay (s)	7.9	8.5	8.3	7.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.2									
Level of Service			A									
Intersection Capacity Utilization			35.5%	ICU Level of Service	A							
Analysis Period (min)			15									



HCM Unsignalized Intersection Capacity Analysis  
5: Toronto Road & University Blvd

Existing AM  
8/1/2013



Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	320	0	116	595	3	133
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	348	0	126	647	3	145
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	139					
pX, platoon unblocked						
vC, conflicting volume			348		1247	348
vC1, stage 1 conf vol					348	
vC2, stage 2 conf vol					899	
vCu, unblocked vol			348		1247	348
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			90		99	79
cM capacity (veh/h)			1211		282	695

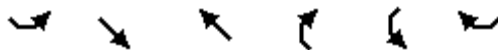
Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	348	0	773	148
Volume Left	0	0	126	3
Volume Right	0	0	0	145
cSH	1700	1700	1211	674
Volume to Capacity	0.20	0.00	0.10	0.22
Queue Length 95th (m)	0.0	0.0	2.6	6.3
Control Delay (s)	0.0	0.0	2.5	11.8
Lane LOS			A	B
Approach Delay (s)	0.0		2.5	11.8
Approach LOS				B

Intersection Summary			
Average Delay		2.9	
Intersection Capacity Utilization		54.5%	ICU Level of Service A
Analysis Period (min)		15	

# HCM Unsignalized Intersection Capacity Analysis

## 6: University Blvd & University Chapel

Existing AM  
8/1/2013



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	14	435	705	18	7	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	473	766	20	8	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	786				1279	776
vC1, stage 1 conf vol					776	
vC2, stage 2 conf vol					503	
vCu, unblocked vol	786				1279	776
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	98				98	99
cM capacity (veh/h)	833				315	397

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	488	786	13
Volume Left	15	0	8
Volume Right	0	20	5
cSH	833	1700	345
Volume to Capacity	0.02	0.46	0.04
Queue Length 95th (m)	0.4	0.0	0.9
Control Delay (s)	0.5	0.0	15.9
Lane LOS	A		C
Approach Delay (s)	0.5	0.0	15.9
Approach LOS			C

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization	48.2%		ICU Level of Service
Analysis Period (min)	15		A

Queues  
7: Blanca St & University Blvd

Existing AM  
8/1/2013



Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	
Lane Group Flow (vph)	373	82	104	565	68	125	207	89	241	129	
v/c Ratio	0.30	0.11	0.23	0.65	0.09	0.29	0.29	0.15	0.20	0.19	
Control Delay	11.1	3.1	11.5	17.1	3.2	15.1	14.2	12.9	13.0	3.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.1	3.1	11.5	17.1	3.2	15.1	14.2	12.9	13.0	3.6	
Queue Length 50th (m)	12.7	0.0	6.5	45.3	0.0	9.2	15.2	6.2	9.0	0.0	
Queue Length 95th (m)	20.6	5.7	15.0	74.8	5.2	19.9	28.3	14.0	15.6	8.4	
Internal Link Dist (m)	1111.2			86.8			126.9			80.4	
Turn Bay Length (m)					10.0		35.0		10.0		10.0
Base Capacity (vph)	1226	778	457	863	770	434	721	613	1179	693	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.30	0.11	0.23	0.65	0.09	0.29	0.29	0.15	0.20	0.19	

Intersection Summary

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

Existing AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗	↖	↕	↗	↖	↕	↗		↕↕	↗
Volume (vph)	63	281	75	96	520	63	115	190	82	48	174	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor		0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)		3546	1601	1789	1883	1601	1789	1883	1601		3540	1601
Flt Permitted		0.75	1.00	0.53	1.00	1.00	0.60	1.00	1.00		0.86	1.00
Satd. Flow (perm)		2678	1601	998	1883	1601	1134	1883	1601		3077	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	68	305	82	104	565	68	125	207	89	52	189	129
RTOR Reduction (vph)	0	0	44	0	0	37	0	0	0	0	0	80
Lane Group Flow (vph)	0	373	38	104	565	31	125	207	89	0	241	49
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Effective Green, g (s)		27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Actuated g/C Ratio		0.46	0.46	0.46	0.46	0.46	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)		1227	733	457	863	733	434	721	613		1179	613
v/s Ratio Prot					c0.30			0.11				
v/s Ratio Perm		0.14	0.02	0.10		0.02	c0.11		0.06		0.08	0.03
v/c Ratio		0.30	0.05	0.23	0.65	0.04	0.29	0.29	0.15		0.20	0.08
Uniform Delay, d1		10.2	9.0	9.8	12.6	9.0	12.8	12.8	12.1		12.4	11.8
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2		0.6	0.1	1.2	3.9	0.1	1.7	1.0	0.5		0.4	0.3
Delay (s)		10.9	9.1	11.0	16.4	9.1	14.5	13.8	12.6		12.8	12.0
Level of Service		B	A	B	B	A	B	B	B		B	B
Approach Delay (s)		10.6			15.0			13.8			12.5	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
3: Acadia Rd & University Blvd

Existing AM - Unsignalized  
7/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	310	8	1	595	13	17	50	0	17	21	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	337	9	1	647	14	18	54	0	18	23	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	661			346			1026	1015	341	1035	1012	654
vC1, stage 1 conf vol							352	352		656	656	
vC2, stage 2 conf vol							674	663		379	357	
vCu, unblocked vol	661			346			1026	1015	341	1035	1012	654
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			94	84	100	94	93	99
cM capacity (veh/h)	927			1213			314	343	701	315	346	467

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	351	662	73	48
Volume Left	5	1	18	18
Volume Right	9	14	0	7
cSH	927	1213	335	345
Volume to Capacity	0.01	0.00	0.22	0.14
Queue Length 95th (m)	0.1	0.0	6.2	3.6
Control Delay (s)	0.2	0.0	18.7	17.1
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.0	18.7	17.1
Approach LOS			C	C

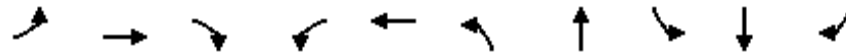
Intersection Summary			
Average Delay		2.0	
Intersection Capacity Utilization		43.4%	ICU Level of Service
Analysis Period (min)		15	A

## Queues

Existing PM

## 1: Wesbrook Mall &amp; Thunderbird Blvd

8/1/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	242	57	125	72	72	87	384	58	452	83
v/c Ratio	0.76	0.10	0.23	0.36	0.25	0.22	0.41	0.17	0.71	0.13
Control Delay	36.6	17.1	5.0	32.1	16.1	10.5	11.7	20.7	30.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	17.1	5.0	32.1	16.1	10.5	11.7	20.7	30.3	0.4
Queue Length 50th (m)	23.7	5.0	0.0	8.4	3.3	5.2	26.5	5.3	51.2	0.0
Queue Length 95th (m)	#51.8	12.5	9.9	19.8	13.5	12.6	49.4	14.9	#107.3	0.0
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	320	1169	1041	568	743	678	1370	340	636	656
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.05	0.12	0.13	0.10	0.13	0.28	0.17	0.71	0.13

## Intersection Summary

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

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis  
1: Wesbrook Mall & Thunderbird Blvd

Existing PM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	223	52	115	66	27	40	80	308	45	53	416	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1715		1789	1847		1789	1883	1601
Flt Permitted	0.38	1.00	1.00	0.72	1.00		0.23	1.00		0.53	1.00	1.00
Satd. Flow (perm)	719	1883	1601	1356	1715		431	1847		1006	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	242	57	125	72	29	43	87	335	49	58	452	83
RTOR Reduction (vph)	0	0	87	0	38	0	0	5	0	0	0	56
Lane Group Flow (vph)	242	57	38	72	34	0	87	379	0	58	452	27
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	19.8	19.8	19.8	7.1	7.1		33.4	33.4		21.2	21.2	21.2
Effective Green, g (s)	19.8	19.8	19.8	7.1	7.1		33.4	33.4		21.2	21.2	21.2
Actuated g/C Ratio	0.30	0.30	0.30	0.11	0.11		0.51	0.51		0.33	0.33	0.33
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	326	571	486	147	186		352	946		327	612	520
v/s Ratio Prot	c0.07	0.03			0.02		0.02	c0.20			c0.24	
v/s Ratio Perm	c0.15		0.02	0.05			0.10			0.06		0.02
v/c Ratio	0.74	0.10	0.08	0.49	0.18		0.25	0.40		0.18	0.74	0.05
Uniform Delay, d1	19.0	16.3	16.2	27.3	26.4		10.0	9.8		15.8	19.5	15.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.8	0.1	0.1	2.6	0.5		0.4	0.4		0.4	5.0	0.1
Delay (s)	27.8	16.4	16.3	29.9	26.9		10.4	10.1		16.1	24.5	15.2
Level of Service	C	B	B	C	C		B	B		B	C	B
Approach Delay (s)		22.9			28.4			10.2			22.4	
Approach LOS		C			C			B			C	

Intersection Summary

HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	24.0
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
2: Wesbrook Mall & University Blvd

Existing PM  
8/1/2013



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	130	77	82	130	13	342	270	232	357
v/c Ratio	0.19	0.10	0.08	0.13	0.02	0.26	0.36	0.35	0.20
Control Delay	24.2	10.9	10.8	2.8	12.2	23.9	5.3	14.9	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.2	10.9	10.8	2.8	12.2	23.9	5.3	14.9	16.3
Queue Length 50th (m)	14.1	5.6	6.0	0.0	1.0	21.2	0.0	19.7	15.7
Queue Length 95th (m)	28.3	12.6	13.2	7.8	3.8	33.0	17.2	34.3	33.0
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	645	752	1004	1017	691	1244	732	679	1650
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.10	0.08	0.13	0.02	0.27	0.37	0.34	0.22

Intersection Summary



# HCM Signalized Intersection Capacity Analysis

## 2: Wesbrook Mall & University Blvd

Existing PM  
8/1/2013



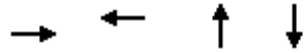
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕	↕	↕	↕↕	↕	↕	↕↕	
Volume (vph)	4	104	12	117	29	120	12	315	248	213	326	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1855		1700	1736	1601	1789	3579	1601	1789	3574	
Flt Permitted		0.99		0.45	0.91	1.00	0.54	1.00	1.00	0.46	1.00	
Satd. Flow (perm)		1842		802	1637	1601	1014	3579	1601	868	3574	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	113	13	127	32	130	13	342	270	232	354	3
RTOR Reduction (vph)	0	6	0	0	0	81	0	0	181	0	1	0
Lane Group Flow (vph)	0	124	0	77	82	49	13	342	89	232	356	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		10.2		24.4	24.4	24.4	23.1	21.4	21.4	32.2	27.5	
Effective Green, g (s)		10.2		24.4	24.4	24.4	23.1	21.4	21.4	32.2	27.5	
Actuated g/C Ratio		0.16		0.38	0.38	0.38	0.36	0.33	0.33	0.50	0.43	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		290		444	633	604	382	1185	530	543	1521	
v/s Ratio Prot				c0.03	0.02		0.00	0.10		c0.05	0.10	
v/s Ratio Perm		c0.07		0.04	0.03	0.03	0.01		0.06	c0.16		
v/c Ratio		0.43		0.17	0.13	0.08	0.03	0.29	0.17	0.43	0.23	
Uniform Delay, d1		24.6		13.6	13.2	12.9	13.4	16.0	15.3	9.5	11.8	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7		0.1	0.1	0.0	0.0	0.0	0.1	0.5	0.1	
Delay (s)		25.3		13.7	13.2	12.9	13.5	16.0	15.4	10.0	11.9	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		25.3			13.2			15.7			11.2	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	64.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
3: Acadia Rd & University Blvd

Existing PM  
8/1/2013



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	579	332	38	69
v/c Ratio	0.40	0.23	0.12	0.20
Control Delay	4.7	3.6	13.6	13.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	4.7	3.6	13.6	13.4
Queue Length 50th (m)	15.7	7.3	2.2	3.7
Queue Length 95th (m)	36.0	17.6	7.0	10.1
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1781	1763	684	743
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.33	0.19	0.06	0.09
<b>Intersection Summary</b>				

# HCM Signalized Intersection Capacity Analysis

## 3: Acadia Rd & University Blvd

Existing PM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	5	515	13	4	280	22	16	17	3	17	37	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.98	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1876			1864			1823			1819	
Flt Permitted		1.00			1.00			0.82			0.90	
Satd. Flow (perm)		1873			1856			1534			1656	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	560	14	4	304	24	17	18	3	18	40	11
RTOR Reduction (vph)	0	1	0	0	4	0	0	3	0	0	10	0
Lane Group Flow (vph)	0	578	0	0	328	0	0	35	0	0	59	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		24.8			24.8			4.1			4.1	
Effective Green, g (s)		24.8			24.8			4.1			4.1	
Actuated g/C Ratio		0.67			0.67			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1258			1247			170			184	
v/s Ratio Prot												
v/s Ratio Perm		c0.31			0.18			0.02			c0.04	
v/c Ratio		0.46			0.26			0.21			0.32	
Uniform Delay, d1		2.9			2.4			14.9			15.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			0.1			0.6			1.0	
Delay (s)		3.1			2.5			15.5			16.1	
Level of Service		A			A			B			B	
Approach Delay (s)		3.1			2.5			15.5			16.1	
Approach LOS		A			A			B			B	

### Intersection Summary

HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	36.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
4: Acadia Rd & Toronto Road

Existing PM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	55	18	70	24	0	18	26	103	1	38	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	60	20	76	26	0	20	28	112	1	41	4
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	80	102	160	47								
Volume Left (vph)	1	76	20	1								
Volume Right (vph)	20	0	112	4								
Hadj (s)	-0.11	0.18	-0.36	-0.02								
Departure Headway (s)	4.4	4.6	4.0	4.5								
Degree Utilization, x	0.10	0.13	0.18	0.06								
Capacity (veh/h)	781	733	852	752								
Control Delay (s)	7.8	8.3	7.9	7.8								
Approach Delay (s)	7.8	8.3	7.9	7.8								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.0									
Level of Service			A									
Intersection Capacity Utilization			33.8%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
5: Toronto Road & University Blvd

Existing PM  
8/1/2013



Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	525	0	91	305	1	154
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	571	0	99	332	1	167
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.87	0.87	0.87	
vC, conflicting volume			571	1100	571	
vC1, stage 1 conf vol				571		
vC2, stage 2 conf vol				529		
vCu, unblocked vol			435	1042	435	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			90	100	69	
cM capacity (veh/h)			981	342	542	

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	571	0	430	168
Volume Left	0	0	99	1
Volume Right	0	0	0	167
cSH	1700	1700	981	540
Volume to Capacity	0.34	0.00	0.10	0.31
Queue Length 95th (m)	0.0	0.0	2.5	10.1
Control Delay (s)	0.0	0.0	3.0	14.7
Lane LOS			A	B
Approach Delay (s)	0.0		3.0	14.7
Approach LOS				B

Intersection Summary			
Average Delay		3.2	
Intersection Capacity Utilization	38.2%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
6: University Blvd & University Chapel

Existing PM  
8/1/2013



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	3	665	395	1	17	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	723	429	1	18	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	430				1159	430
vC1, stage 1 conf vol					430	
vC2, stage 2 conf vol					729	
vCu, unblocked vol	430				1159	430
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	99
cM capacity (veh/h)	1129				346	625

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	726	430	24
Volume Left	3	0	18
Volume Right	0	1	5
cSH	1129	1700	385
Volume to Capacity	0.00	0.25	0.06
Queue Length 95th (m)	0.1	0.0	1.5
Control Delay (s)	0.1	0.0	15.0
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	15.0
Approach LOS			B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		47.4%	ICU Level of Service
Analysis Period (min)		15	A

Queues  
7: Blanca St & University Blvd

Existing PM  
8/1/2013



Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	
Lane Group Flow (vph)	645	110	91	291	51	79	216	92	188	46	
v/c Ratio	0.52	0.15	0.33	0.36	0.07	0.16	0.28	0.14	0.15	0.07	
Control Delay	14.6	5.1	15.6	13.4	3.9	12.1	12.8	11.6	11.3	4.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	14.6	5.1	15.6	13.4	3.9	12.1	12.8	11.6	11.3	4.2	
Queue Length 50th (m)	26.2	2.0	6.4	20.7	0.0	5.2	15.0	6.0	6.4	0.0	
Queue Length 95th (m)	39.4	9.4	16.3	36.3	4.9	12.4	27.6	13.4	11.8	4.7	
Internal Link Dist (m)	1111.2			86.8			126.9			80.4	
Turn Bay Length (m)					10.0		35.0		10.0		10.0
Base Capacity (vph)	1236	725	280	800	709	496	784	667	1247	693	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.52	0.15	0.33	0.36	0.07	0.16	0.28	0.14	0.15	0.07	

Intersection Summary

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

Existing PM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕	↗	↖	↕	↗	↖	↕	↗		↕↕	↗
Volume (vph)	111	482	101	84	268	47	73	199	85	50	123	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor		0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)		3545	1601	1789	1883	1601	1789	1883	1601		3528	1601
Flt Permitted		0.81	1.00	0.35	1.00	1.00	0.63	1.00	1.00		0.84	1.00
Satd. Flow (perm)		2908	1601	660	1883	1601	1193	1883	1601		2994	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	121	524	110	91	291	51	79	216	92	54	134	46
RTOR Reduction (vph)	0	0	45	0	0	29	0	0	0	0	0	27
Lane Group Flow (vph)	0	645	65	91	291	22	79	216	92	0	188	19
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		25.5	25.5	25.5	25.5	25.5	25.0	25.0	25.0		25.0	25.0
Effective Green, g (s)		25.5	25.5	25.5	25.5	25.5	25.0	25.0	25.0		25.0	25.0
Actuated g/C Ratio		0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42		0.42	0.42
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)		1235	680	280	800	680	497	784	667		1247	667
v/s Ratio Prot					0.15			c0.11				
v/s Ratio Perm		c0.22	0.04	0.14		0.01	0.07		0.06		0.06	0.01
v/c Ratio		0.52	0.10	0.33	0.36	0.03	0.16	0.28	0.14		0.15	0.03
Uniform Delay, d1		12.7	10.3	11.5	11.7	10.1	10.9	11.5	10.8		10.9	10.3
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2		1.6	0.3	3.1	1.3	0.1	0.7	0.9	0.4		0.3	0.1
Delay (s)		14.3	10.6	14.6	13.0	10.1	11.6	12.4	11.3		11.1	10.4
Level of Service		B	B	B	B	B	B	B	B		B	B
Approach Delay (s)		13.8			13.0			12.0			11.0	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



HCM Unsignalized Intersection Capacity Analysis  
 3: Acadia Rd & University Blvd

Existing PM - Unsignalized  
 7/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	5	515	13	4	280	22	16	17	3	17	37	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	560	14	4	304	24	17	18	3	18	40	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	328			574			934	915	567	915	910	316
vC1, stage 1 conf vol							578	578		325	325	
vC2, stage 2 conf vol							356	337		590	585	
vCu, unblocked vol	328			574			934	915	567	915	910	316
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			95	95	99	95	89	98
cM capacity (veh/h)	1231			999			349	375	523	356	374	724

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	579	333	39	70
Volume Left	5	4	17	18
Volume Right	14	24	3	11
cSH	1231	999	371	399
Volume to Capacity	0.00	0.00	0.11	0.17
Queue Length 95th (m)	0.1	0.1	2.7	4.7
Control Delay (s)	0.1	0.2	15.8	15.9
Lane LOS	A	A	C	C
Approach Delay (s)	0.1	0.2	15.8	15.9
Approach LOS			C	C

Intersection Summary			
Average Delay		1.8	
Intersection Capacity Utilization		41.3%	ICU Level of Service A
Analysis Period (min)		15	

# APPENDIX B

## Synchro Model Output – Future

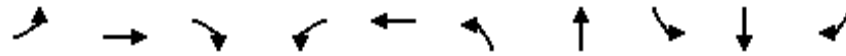
(to be provided electronically only)

## Queues

Background (2030) AM

8/1/2013

## 1: Wesbrook Mall &amp; Thunderbird Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	118	116	30	87	152	320	713	44	312	179
v/c Ratio	0.33	0.20	0.05	0.45	0.52	0.60	0.74	0.23	0.65	0.33
Control Delay	21.4	19.7	0.2	38.9	32.9	16.9	20.6	27.7	33.4	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	19.7	0.2	38.9	32.9	16.9	20.6	27.7	33.4	6.2
Queue Length 50th (m)	12.3	12.0	0.0	12.0	17.4	26.3	76.7	5.2	41.1	0.0
Queue Length 95th (m)	21.9	21.3	0.0	23.1	31.3	42.7	112.6	12.9	63.1	10.8
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	373	1177	1037	528	752	544	1096	233	592	626
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.10	0.03	0.16	0.20	0.59	0.65	0.19	0.53	0.29

## Intersection Summary

HCM Signalized Intersection Capacity Analysis  
1: Wesbrook Mall & Thunderbird Blvd

Background (2030) AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	97	95	25	71	84	41	262	445	139	36	256	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1791		1789	1816		1789	1883	1601
Flt Permitted	0.42	1.00	1.00	0.68	1.00		0.30	1.00		0.39	1.00	1.00
Satd. Flow (perm)	800	1883	1601	1285	1791		568	1816		742	1883	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	118	116	30	87	102	50	320	543	170	44	312	179
RTOR Reduction (vph)	0	0	20	0	22	0	0	10	0	0	0	134
Lane Group Flow (vph)	118	116	10	87	130	0	320	703	0	44	312	45
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	23.7	23.7	23.7	11.0	11.0		38.6	38.6		18.8	18.8	18.8
Effective Green, g (s)	23.7	23.7	23.7	11.0	11.0		38.6	38.6		18.8	18.8	18.8
Actuated g/C Ratio	0.32	0.32	0.32	0.15	0.15		0.52	0.52		0.25	0.25	0.25
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	343	600	510	190	265		523	943		187	476	405
v/s Ratio Prot	c0.03	0.06			c0.07		0.11	c0.39			0.17	
v/s Ratio Perm	0.08		0.01	0.07			0.20			0.06		0.03
v/c Ratio	0.34	0.19	0.02	0.46	0.49		0.61	0.75		0.24	0.66	0.11
Uniform Delay, d1	18.7	18.4	17.3	28.9	29.1		11.7	14.0		22.0	24.8	21.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.2	0.0	1.7	1.4		2.1	3.5		0.9	3.6	0.2
Delay (s)	19.3	18.5	17.3	30.7	30.5		13.9	17.5		22.9	28.4	21.5
Level of Service	B	B	B	C	C		B	B		C	C	C
Approach Delay (s)		18.7			30.6			16.3			25.7	
Approach LOS		B			C			B			C	

Intersection Summary

HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	74.3	Sum of lost time (s)	24.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
2: Wesbrook Mall & University Blvd

Background (2030) AM  
8/1/2013



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	61	245	259	318	28	462	126	144	423
v/c Ratio	0.13	0.39	0.36	0.37	0.05	0.48	0.24	0.29	0.33
Control Delay	17.8	14.0	13.5	2.9	12.3	24.2	6.8	13.8	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	14.0	13.5	2.9	12.3	24.2	6.8	13.8	18.8
Queue Length 50th (m)	4.4	19.0	20.3	0.0	2.1	28.8	0.0	11.6	19.1
Queue Length 95th (m)	12.3	32.3	33.8	8.4	5.7	39.7	9.5	19.9	34.8
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	673	749	1293	1303	783	1323	671	753	1488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.33	0.20	0.24	0.04	0.35	0.19	0.19	0.28

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 2: Wesbrook Mall & University Blvd

Background (2030) AM

8/1/2013



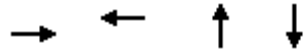
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕		↖	↖	↖	↖	↕↕	↖	↖	↕↕	
Volume (vph)	1	33	16	291	122	261	23	379	103	118	339	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1799		1700	1752	1601	1789	3579	1601	1789	3566	
Flt Permitted		0.99		0.61	0.92	1.00	0.51	1.00	1.00	0.34	1.00	
Satd. Flow (perm)		1786		1088	1648	1601	951	3579	1601	635	3566	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	1	40	20	355	149	318	28	462	126	144	413	10
RTOR Reduction (vph)	0	18	0	0	0	180	0	0	92	0	1	0
Lane Group Flow (vph)	0	43	0	245	259	138	28	462	34	144	422	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		7.7		27.8	27.8	27.8	20.9	17.5	17.5	28.3	21.9	
Effective Green, g (s)		7.7		27.8	27.8	27.8	20.9	17.5	17.5	28.3	21.9	
Actuated g/C Ratio		0.12		0.43	0.43	0.43	0.33	0.27	0.27	0.44	0.34	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		214		625	740	694	354	977	437	420	1218	
v/s Ratio Prot				c0.10	0.09		0.00	c0.13		c0.04	0.12	
v/s Ratio Perm		0.02		c0.07	0.06	0.09	0.02		0.02	0.11		
v/c Ratio		0.20		0.39	0.35	0.20	0.08	0.47	0.08	0.34	0.35	
Uniform Delay, d1		25.4		12.2	12.1	11.2	14.8	19.4	17.3	11.2	15.8	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3		0.3	0.2	0.1	0.1	0.1	0.0	0.5	0.1	
Delay (s)		25.8		12.5	12.3	11.4	14.9	19.6	17.3	11.7	15.9	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		25.8			12.0			18.9			14.8	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	64.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
3: Acadia Rd & University Blvd

Background (2030) AM  
8/1/2013



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	485	870	139	89
v/c Ratio	0.37	0.66	0.41	0.25
Control Delay	5.2	9.0	22.3	18.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.2	9.0	22.3	18.3
Queue Length 50th (m)	14.9	37.8	9.2	5.1
Queue Length 95th (m)	29.3	70.9	24.0	15.5
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1544	1569	502	521
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.31	0.55	0.28	0.17
<b>Intersection Summary</b>				

# HCM Signalized Intersection Capacity Analysis

## 3: Acadia Rd & University Blvd

Background (2030) AM

8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	6	363	29	1	698	15	40	74	0	20	46	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			1.00			0.99	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1864			1878			1851			1833	
Flt Permitted		0.99			1.00			0.88			0.92	
Satd. Flow (perm)		1847			1878			1663			1708	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	7	443	35	1	851	18	49	90	0	24	56	9
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	481	0	0	869	0	0	139	0	0	81	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.1			31.1			7.5			7.5	
Effective Green, g (s)		31.1			31.1			7.5			7.5	
Actuated g/C Ratio		0.67			0.67			0.16			0.16	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1232			1253			267			274	
v/s Ratio Prot												
v/s Ratio Perm		0.26			0.46			0.08			0.05	
v/c Ratio		0.39			0.69			0.52			0.30	
Uniform Delay, d1		3.5			4.8			17.9			17.2	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			1.7			1.8			0.6	
Delay (s)		3.7			6.5			19.7			17.8	
Level of Service		A			A			B			B	
Approach Delay (s)		3.7			6.5			19.7			17.8	
Approach LOS		A			A			B			B	

### Intersection Summary

HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	46.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



HCM Unsignalized Intersection Capacity Analysis  
4: Acadia Rd & Toronto Road

Background (2030) AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	59	22	152	50	0	26	111	171	0	75	4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	2	72	27	185	61	0	32	135	209	0	91	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	101	246	376	96
Volume Left (vph)	2	185	32	0
Volume Right (vph)	27	0	209	5
Hadj (s)	-0.12	0.18	-0.28	0.00
Departure Headway (s)	5.4	5.5	4.8	5.4
Degree Utilization, x	0.15	0.37	0.50	0.15
Capacity (veh/h)	590	613	714	598
Control Delay (s)	9.4	11.7	12.3	9.4
Approach Delay (s)	9.4	11.7	12.3	9.4
Approach LOS	A	B	B	A

Intersection Summary			
Delay		11.4	
Level of Service		B	
Intersection Capacity Utilization	48.8%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
5: Toronto Road & University Blvd

Background (2030) AM  
8/1/2013



Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	374	0	207	696	4	234
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	456	0	252	849	5	285
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			456		1810	456
vC1, stage 1 conf vol					456	
vC2, stage 2 conf vol					1354	
vCu, unblocked vol			367		1836	367
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			77		97	54
cM capacity (veh/h)			1098		149	625

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	456	0	1101	290
Volume Left	0	0	252	5
Volume Right	0	0	0	285
cSH	1700	1700	1098	593
Volume to Capacity	0.27	0.00	0.23	0.49
Queue Length 95th (m)	0.0	0.0	6.8	20.4
Control Delay (s)	0.0	0.0	5.4	16.7
Lane LOS			A	C
Approach Delay (s)	0.0		5.4	16.7
Approach LOS				C

Intersection Summary			
Average Delay		5.8	
Intersection Capacity Utilization		71.4%	ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
6: University Blvd & University Chapel

Background (2030) AM  
8/1/2013



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	16	587	896	21	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	20	716	1093	26	10	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1118				1860	1105
vC1, stage 1 conf vol					1105	
vC2, stage 2 conf vol					755	
vCu, unblocked vol	1118				1860	1105
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				95	97
cM capacity (veh/h)	625				204	256

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	735	1118	17
Volume Left	20	0	10
Volume Right	0	26	7
cSH	625	1700	223
Volume to Capacity	0.03	0.66	0.08
Queue Length 95th (m)	0.7	0.0	1.9
Control Delay (s)	0.9	0.0	22.4
Lane LOS	A		C
Approach Delay (s)	0.9	0.0	22.4
Approach LOS			C

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

Queues  
7: Blanca St & University Blvd

Background (2030) AM  
8/1/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	113	450	130	137	784	90	187	271	117	317	191
v/c Ratio	0.56	0.43	0.14	0.30	0.74	0.10	0.61	0.49	0.25	0.38	0.32
Control Delay	22.8	9.8	3.3	9.7	16.1	2.5	29.8	22.7	19.4	19.9	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	9.8	3.3	9.7	16.1	2.5	29.8	22.7	19.4	19.9	5.8
Queue Length 50th (m)	7.8	28.1	2.2	7.8	64.0	0.4	19.2	26.8	10.7	15.8	1.5
Queue Length 95th (m)	21.0	40.1	7.1	15.2	86.3	4.4	33.8	41.3	19.8	23.0	11.1
Internal Link Dist (m)	1111.2						86.8	126.9		80.4	
Turn Bay Length (m)	50.0		10.0			35.0			10.0		10.0
Base Capacity (vph)	203	1057	936	458	1057	934	308	550	467	836	591
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.43	0.14	0.30	0.74	0.10	0.61	0.49	0.25	0.38	0.32

Intersection Summary

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

Background (2030) AM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	369	107	112	643	74	153	222	96	56	204	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3541	1601
Flt Permitted	0.19	1.00	1.00	0.43	1.00	1.00	0.56	1.00	1.00		0.80	1.00
Satd. Flow (perm)	362	1883	1601	817	1883	1601	1054	1883	1601		2863	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	113	450	130	137	784	90	187	271	117	68	249	191
RTOR Reduction (vph)	0	0	37	0	0	36	0	0	0	0	0	123
Lane Group Flow (vph)	113	450	93	137	784	54	187	271	117	0	317	68
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	36.5	36.5	36.5	36.5	36.5	36.5	19.0	19.0	19.0		19.0	19.0
Effective Green, g (s)	36.5	36.5	36.5	36.5	36.5	36.5	19.0	19.0	19.0		19.0	19.0
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56	0.56	0.29	0.29	0.29		0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	203	1057	899	458	1057	899	308	550	467		836	467
v/s Ratio Prot		0.24			c0.42			0.14				
v/s Ratio Perm	0.31		0.06	0.17		0.03	c0.18		0.07		0.11	0.04
v/c Ratio	0.56	0.43	0.10	0.30	0.74	0.06	0.61	0.49	0.25		0.38	0.15
Uniform Delay, d1	9.1	8.2	6.6	7.5	10.7	6.5	19.8	19.0	17.6		18.3	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	10.6	1.3	0.2	1.7	4.7	0.1	8.6	3.1	1.3		1.3	0.7
Delay (s)	19.7	9.5	6.9	9.2	15.4	6.6	28.4	22.2	18.8		19.6	17.7
Level of Service	B	A	A	A	B	A	C	C	B		B	B
Approach Delay (s)		10.6			13.8			23.5			18.9	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
3: Acadia Rd & University Blvd

Background (2030) AM - Unsignalized  
8/1/2013

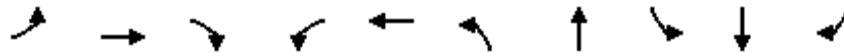


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	6	363	29	1	698	15	40	74	0	20	46	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	7	443	35	1	851	18	49	90	0	24	56	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	870			478			1374	1347	460	1383	1355	860
vC1, stage 1 conf vol							475	475		863	863	
vC2, stage 2 conf vol							899	872		520	493	
vCu, unblocked vol	870			478			1374	1347	460	1383	1355	860
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			76	66	100	89	79	98
cM capacity (veh/h)	775			1084			204	263	601	218	265	355

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	485	871	139	89
Volume Left	7	1	49	24
Volume Right	35	18	0	9
cSH	775	1084	239	256
Volume to Capacity	0.01	0.00	0.58	0.35
Queue Length 95th (m)	0.2	0.0	25.1	11.3
Control Delay (s)	0.3	0.0	39.2	26.4
Lane LOS	A	A	E	D
Approach Delay (s)	0.3	0.0	39.2	26.4
Approach LOS			E	D

Intersection Summary			
Average Delay		5.0	
Intersection Capacity Utilization		53.8%	ICU Level of Service
Analysis Period (min)		15	A

## 1: Wesbrook Mall &amp; Thunderbird Blvd



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	284	66	147	84	86	102	449	67	529	97
v/c Ratio	0.87	0.12	0.26	0.40	0.28	0.30	0.48	0.21	0.84	0.15
Control Delay	49.3	17.3	4.8	33.1	16.0	11.8	13.0	22.2	39.6	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.3	17.3	4.8	33.1	16.0	11.8	13.0	22.2	39.6	1.0
Queue Length 50th (m)	28.9	5.9	0.0	9.9	4.0	6.3	33.4	6.4	65.2	0.0
Queue Length 95th (m)	#67.5	14.0	10.7	22.5	15.2	14.7	61.7	17.5	#137.0	1.7
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	326	1154	1038	556	739	645	1352	316	628	650
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.06	0.14	0.15	0.12	0.16	0.33	0.21	0.84	0.15

## Intersection Summary

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

HCM Signalized Intersection Capacity Analysis  
1: Wesbrook Mall & Thunderbird Blvd

Background (2030) PM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	261	61	135	77	32	47	94	360	53	62	487	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.91		1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1716		1789	1847		1789	1883	1601
Flt Permitted	0.39	1.00	1.00	0.71	1.00		0.15	1.00		0.50	1.00	1.00
Satd. Flow (perm)	737	1883	1601	1345	1716		278	1847		948	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	284	66	147	84	35	51	102	391	58	67	529	97
RTOR Reduction (vph)	0	0	102	0	45	0	0	5	0	0	0	66
Lane Group Flow (vph)	284	66	45	84	41	0	102	444	0	67	529	31
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	20.4	20.4	20.4	7.7	7.7		33.7	33.7		21.2	21.2	21.2
Effective Green, g (s)	20.4	20.4	20.4	7.7	7.7		33.7	33.7		21.2	21.2	21.2
Actuated g/C Ratio	0.31	0.31	0.31	0.12	0.12		0.51	0.51		0.32	0.32	0.32
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	332	581	494	156	199		292	941		304	603	513
v/s Ratio Prot	c0.09	0.04			0.02		0.03	c0.24			c0.28	
v/s Ratio Perm	c0.18		0.03	0.06			0.14			0.07		0.02
v/c Ratio	0.86	0.11	0.09	0.54	0.21		0.35	0.47		0.22	0.88	0.06
Uniform Delay, d1	20.5	16.4	16.3	27.5	26.4		11.4	10.5		16.4	21.2	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	18.9	0.1	0.1	3.5	0.5		0.7	0.5		0.5	13.9	0.1
Delay (s)	39.4	16.5	16.3	31.1	26.9		12.1	11.0		16.9	35.2	15.6
Level of Service	D	B	B	C	C		B	B		B	D	B
Approach Delay (s)		29.5			29.0			11.2			30.7	
Approach LOS		C			C			B			C	

Intersection Summary

HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Queues  
2: Wesbrook Mall & University Blvd



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	153	91	95	152	15	401	315	271	418
v/c Ratio	0.31	0.15	0.13	0.18	0.03	0.43	0.48	0.46	0.24
Control Delay	25.8	11.4	11.2	2.8	12.1	25.6	6.3	16.2	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.8	11.4	11.2	2.8	12.1	25.6	6.3	16.2	16.4
Queue Length 50th (m)	17.1	6.8	7.1	0.0	1.1	25.5	0.0	23.6	18.8
Queue Length 95th (m)	32.7	14.5	14.9	8.3	4.1	38.5	18.4	40.1	38.4
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	75.0	
Base Capacity (vph)	517	612	949	1023	639	996	673	603	1772
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.15	0.10	0.15	0.02	0.40	0.47	0.45	0.24

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 2: Wesbrook Mall & University Blvd

Background (2030) PM

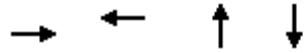
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↙	↘	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	5	122	14	137	34	140	14	369	290	249	381	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1855		1700	1736	1601	1789	3579	1601	1789	3573	
Flt Permitted		0.99		0.39	0.85	1.00	0.51	1.00	1.00	0.39	1.00	
Satd. Flow (perm)		1841		694	1517	1601	956	3579	1601	735	3573	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	133	15	149	37	152	15	401	315	271	414	4
RTOR Reduction (vph)	0	6	0	0	0	95	0	0	225	0	1	0
Lane Group Flow (vph)	0	147	0	91	95	57	15	401	90	271	417	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.8	30.0	
Effective Green, g (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.8	30.0	
Actuated g/C Ratio		0.16		0.37	0.37	0.37	0.31	0.29	0.29	0.51	0.44	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		288		416	599	596	320	1023	457	565	1571	
v/s Ratio Prot				c0.03	0.02		0.00	0.11		c0.09	0.12	
v/s Ratio Perm		c0.08		0.05	0.03	0.04	0.01		0.06	c0.16		
v/c Ratio		0.51		0.22	0.16	0.09	0.05	0.39	0.20	0.48	0.27	
Uniform Delay, d1		26.4		14.9	14.3	13.9	16.3	19.6	18.4	9.9	12.1	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1		0.2	0.1	0.1	0.0	0.1	0.1	0.6	0.1	
Delay (s)		27.5		15.0	14.4	14.0	16.3	19.7	18.5	10.6	12.2	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		27.5			14.4			19.1			11.6	
Approach LOS		C			B			B			B	

### Intersection Summary

HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	68.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	678	390	47	82
v/c Ratio	0.47	0.27	0.15	0.24
Control Delay	5.3	3.7	15.1	14.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.3	3.7	15.1	14.9
Queue Length 50th (m)	20.6	9.3	2.7	4.3
Queue Length 95th (m)	47.9	22.0	9.4	13.5
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1741	1724	608	663
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.39	0.23	0.08	0.12
<b>Intersection Summary</b>				

# HCM Signalized Intersection Capacity Analysis

## 3: Acadia Rd & University Blvd

Background (2030) PM

8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	6	603	15	5	328	26	19	20	4	20	43	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		1.00			0.99			0.99			0.98	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1876			1864			1821			1819	
Flt Permitted		1.00			0.99			0.82			0.89	
Satd. Flow (perm)		1871			1854			1521			1646	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	655	16	5	357	28	21	22	4	22	47	13
RTOR Reduction (vph)	0	1	0	0	4	0	0	4	0	0	12	0
Lane Group Flow (vph)	0	677	0	0	386	0	0	43	0	0	70	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		26.5			26.5			4.3			4.3	
Effective Green, g (s)		26.5			26.5			4.3			4.3	
Actuated g/C Ratio		0.68			0.68			0.11			0.11	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1277			1266			168			182	
v/s Ratio Prot												
v/s Ratio Perm		c0.36			0.21			0.03			c0.04	
v/c Ratio		0.53			0.30			0.26			0.39	
Uniform Delay, d1		3.1			2.5			15.8			16.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			0.1			0.8			1.4	
Delay (s)		3.5			2.6			16.6			17.4	
Level of Service		A			A			B			B	
Approach Delay (s)		3.5			2.6			16.6			17.4	
Approach LOS		A			A			B			B	

### Intersection Summary

HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	38.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 4: Acadia Rd & Toronto Road

Background (2030) PM  
 8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	64	21	82	28	0	21	30	121	1	44	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	70	23	89	30	0	23	33	132	1	48	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	93	120	187	54
Volume Left (vph)	1	89	23	1
Volume Right (vph)	23	0	132	5
Hadj (s)	-0.11	0.18	-0.36	-0.02
Departure Headway (s)	4.5	4.7	4.1	4.6
Degree Utilization, x	0.12	0.16	0.21	0.07
Capacity (veh/h)	757	714	830	728
Control Delay (s)	8.1	8.6	8.2	7.9
Approach Delay (s)	8.1	8.6	8.2	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay		8.3	
Level of Service		A	
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis  
5: Toronto Road & University Blvd

Background (2030) PM  
8/1/2013



Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	614	0	106	357	1	180
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	667	0	115	388	1	196
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.81	0.81	0.81	
vC, conflicting volume			667	1286	667	
vC1, stage 1 conf vol				667		
vC2, stage 2 conf vol				618		
vCu, unblocked vol			477	1237	477	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			87	100	59	
cM capacity (veh/h)			883	285	479	

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	667	0	503	197
Volume Left	0	0	115	1
Volume Right	0	0	0	196
cSH	1700	1700	883	477
Volume to Capacity	0.39	0.00	0.13	0.41
Queue Length 95th (m)	0.0	0.0	3.4	15.2
Control Delay (s)	0.0	0.0	3.5	17.8
Lane LOS			A	C
Approach Delay (s)	0.0		3.5	17.8
Approach LOS				C

Intersection Summary				
Average Delay			3.8	
Intersection Capacity Utilization		43.5%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis  
6: University Blvd & University Chapel

Background (2030) PM  
8/1/2013



Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (veh/h)	4	778	462	1	20	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	846	502	1	22	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		Raised	Raised			
Median storage veh		1	1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	503				1357	503
vC1, stage 1 conf vol					503	
vC2, stage 2 conf vol					854	
vCu, unblocked vol	503				1357	503
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				93	99
cM capacity (veh/h)	1061				296	569

Direction, Lane #	SE 1	NW 1	SW 1
Volume Total	850	503	28
Volume Left	4	0	22
Volume Right	0	1	7
cSH	1061	1700	333
Volume to Capacity	0.00	0.30	0.08
Queue Length 95th (m)	0.1	0.0	2.1
Control Delay (s)	0.1	0.0	16.8
Lane LOS	A		C
Approach Delay (s)	0.1	0.0	16.8
Approach LOS			C

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		54.1%	ICU Level of Service
Analysis Period (min)		15	A

Queues  
7: Blanca St & University Blvd

Background (2030) PM  
8/1/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	141	613	128	107	341	60	92	253	108	221	53
v/c Ratio	0.33	0.71	0.16	0.52	0.40	0.08	0.21	0.35	0.18	0.20	0.08
Control Delay	13.2	18.7	2.7	23.0	12.5	3.3	14.0	14.9	13.3	13.0	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	18.7	2.7	23.0	12.5	3.3	14.0	14.9	13.3	13.0	4.5
Queue Length 50th (m)	9.3	50.8	0.0	7.9	23.3	0.0	6.5	19.2	7.6	8.2	0.0
Queue Length 95th (m)	20.6	84.0	7.1	#26.5	40.0	4.9	15.2	34.3	16.4	14.5	5.4
Internal Link Dist (m)	1111.2			86.8			126.9			80.4	
Turn Bay Length (m)	50.0		10.0						10.0		10.0
Base Capacity (vph)	425	863	803	206	863	766	443	721	613	1120	646
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.71	0.16	0.52	0.40	0.08	0.21	0.35	0.18	0.20	0.08

Intersection Summary

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



HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

Background (2030) PM  
8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	564	118	98	314	55	85	233	99	59	144	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3527	1601
Flt Permitted	0.49	1.00	1.00	0.24	1.00	1.00	0.61	1.00	1.00		0.82	1.00
Satd. Flow (perm)	929	1883	1601	451	1883	1601	1156	1883	1601		2922	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	613	128	107	341	60	92	253	108	64	157	53
RTOR Reduction (vph)	0	0	69	0	0	33	0	0	0	0	0	33
Lane Group Flow (vph)	141	613	59	107	341	28	92	253	108	0	221	20
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Effective Green, g (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46	0.46	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	425	863	733	206	863	733	443	721	613		1120	613
v/s Ratio Prot		c0.33			0.18			c0.13				
v/s Ratio Perm	0.15		0.04	0.24		0.02	0.08		0.07		0.08	0.01
v/c Ratio	0.33	0.71	0.08	0.52	0.40	0.04	0.21	0.35	0.18		0.20	0.03
Uniform Delay, d1	10.4	13.1	9.1	11.6	10.7	9.0	12.4	13.2	12.2		12.3	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.1	4.9	0.2	9.1	1.4	0.1	1.1	1.3	0.6		0.4	0.1
Delay (s)	12.5	18.0	9.4	20.6	12.1	9.1	13.5	14.5	12.9		12.7	11.7
Level of Service	B	B	A	C	B	A	B	B	B		B	B
Approach Delay (s)		15.8			13.5			13.9			12.5	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
3: Acadia Rd & University Blvd

Background (2030) PM - Unsignalized

7/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	6	603	15	5	328	26	19	20	4	20	43	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	655	16	5	357	28	21	22	4	22	47	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	385			672			1095	1072	664	1073	1066	371
vC1, stage 1 conf vol							677	677		382	382	
vC2, stage 2 conf vol							418	396		692	685	
vCu, unblocked vol	385			672			1095	1072	664	1073	1066	371
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			93	93	99	93	86	98
cM capacity (veh/h)	1174			919			297	330	461	302	329	675

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	678	390	47	82
Volume Left	7	5	21	22
Volume Right	16	28	4	13
cSH	1174	919	322	350
Volume to Capacity	0.01	0.01	0.14	0.23
Queue Length 95th (m)	0.1	0.1	3.8	6.8
Control Delay (s)	0.2	0.2	18.1	18.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.2	18.1	18.4
Approach LOS			C	C

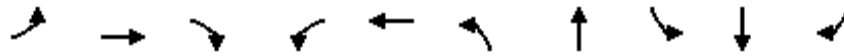
Intersection Summary			
Average Delay		2.1	
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

Queues

OpeningDay + 5yrs (2030) AM

1: Wesbrook Mall & Thunderbird Blvd

8/2/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	120	122	30	138	163	320	785	44	341	179
v/c Ratio	0.33	0.20	0.05	0.61	0.48	0.64	0.81	0.28	0.64	0.31
Control Delay	21.0	19.4	0.2	43.5	31.1	20.2	26.5	32.6	34.8	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	19.4	0.2	43.5	31.1	20.2	26.5	32.6	34.8	6.2
Queue Length 50th (m)	13.1	13.3	0.0	20.6	20.2	28.9	99.2	5.6	48.5	0.0
Queue Length 95th (m)	21.7	22.0	0.0	33.9	33.4	49.1	#166.6	14.9	75.6	11.4
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	374	1054	940	471	677	512	983	155	531	579
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.12	0.03	0.29	0.24	0.63	0.80	0.28	0.64	0.31

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis  
1: Wesbrook Mall & Thunderbird Blvd

OpeningDay + 5yrs (2030) AM

8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	98	100	25	113	93	41	262	475	169	36	280	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1797		1789	1809		1789	1883	1601
Flt Permitted	0.44	1.00	1.00	0.68	1.00		0.29	1.00		0.29	1.00	1.00
Satd. Flow (perm)	826	1883	1601	1278	1797		545	1809		552	1883	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	120	122	30	138	113	50	320	579	206	44	341	179
RTOR Reduction (vph)	0	0	20	0	19	0	0	11	0	0	0	129
Lane Group Flow (vph)	120	122	10	138	144	0	320	774	0	44	341	50
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	27.0	27.0	27.0	14.2	14.2		42.3	42.3		22.7	22.7	22.7
Effective Green, g (s)	27.0	27.0	27.0	14.2	14.2		42.3	42.3		22.7	22.7	22.7
Actuated g/C Ratio	0.33	0.33	0.33	0.17	0.17		0.52	0.52		0.28	0.28	0.28
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	353	625	531	223	313		493	941		154	525	447
v/s Ratio Prot	c0.03	0.06			0.08		0.11	c0.43			0.18	
v/s Ratio Perm	0.08		0.01	c0.11			0.23			0.08		0.03
v/c Ratio	0.34	0.20	0.02	0.62	0.46		0.65	0.82		0.29	0.65	0.11
Uniform Delay, d1	19.7	19.4	18.2	31.0	30.1		13.1	16.4		22.9	25.8	21.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.6	0.2	0.0	5.0	1.1		2.9	6.2		1.4	3.1	0.2
Delay (s)	20.3	19.5	18.3	36.1	31.2		16.0	22.5		24.3	28.9	22.0
Level of Service	C	B	B	D	C		B	C		C	C	C
Approach Delay (s)		19.7			33.4			20.6			26.3	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	81.3	Sum of lost time (s)	24.0
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
2: Wesbrook Mall & University Blvd

OpeningDay + 5yrs (2030) AM  
8/2/2013



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	61	261	272	334	28	462	163	161	423
v/c Ratio	0.14	0.44	0.40	0.39	0.05	0.52	0.32	0.33	0.30
Control Delay	18.4	15.2	14.6	3.0	12.5	25.5	6.6	14.0	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	15.2	14.6	3.0	12.5	25.5	6.6	14.0	18.4
Queue Length 50th (m)	4.4	20.6	21.4	0.0	2.1	28.8	0.0	13.1	19.1
Queue Length 95th (m)	12.6	35.4	36.6	8.6	5.8	41.1	10.7	22.5	35.6
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	70.0	
Base Capacity (vph)	619	698	1216	1275	756	1214	651	714	1477
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.37	0.22	0.26	0.04	0.38	0.25	0.23	0.29

Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 2: Wesbrook Mall & University Blvd

OpeningDay + 5yrs (2030) AM

8/2/2013



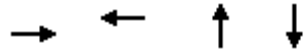
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕		↖	↖	↖	↖	↕↕	↖	↖	↕↕	
Volume (vph)	1	33	16	315	122	274	23	379	134	132	339	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1799		1700	1750	1601	1789	3579	1601	1789	3566	
Flt Permitted		0.99		0.60	0.88	1.00	0.51	1.00	1.00	0.33	1.00	
Satd. Flow (perm)		1786		1073	1580	1601	951	3579	1601	618	3566	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	1	40	20	384	149	334	28	462	163	161	413	10
RTOR Reduction (vph)	0	18	0	0	0	196	0	0	120	0	1	0
Lane Group Flow (vph)	0	43	0	261	272	138	28	462	43	161	422	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		8.0		27.8	27.8	27.8	21.3	17.8	17.8	31.7	25.2	
Effective Green, g (s)		8.0		27.8	27.8	27.8	21.3	17.8	17.8	31.7	25.2	
Actuated g/C Ratio		0.12		0.41	0.41	0.41	0.32	0.26	0.26	0.47	0.37	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		211		588	690	659	343	943	422	479	1331	
v/s Ratio Prot				c0.10	0.09		0.00	c0.13		c0.05	0.12	
v/s Ratio Perm		0.02		c0.08	0.07	0.09	0.02		0.03	0.10		
v/c Ratio		0.21		0.44	0.39	0.21	0.08	0.49	0.10	0.34	0.32	
Uniform Delay, d1		26.9		14.0	13.9	12.8	16.1	21.0	18.8	10.8	15.0	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.4		0.4	0.3	0.1	0.1	0.1	0.0	0.4	0.1	
Delay (s)		27.2		14.4	14.2	12.9	16.1	21.2	18.8	11.3	15.1	
Level of Service		C		B	B	B	B	C	B	B	B	
Approach Delay (s)		27.2			13.8			20.4			14.1	
Approach LOS		C			B			C			B	

### Intersection Summary

HCM 2000 Control Delay	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
3: Acadia Rd & University Blvd

OpeningDay + 5yrs (2030) AM  
8/2/2013



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	540	879	184	98
v/c Ratio	0.43	0.68	0.50	0.26
Control Delay	6.1	10.1	23.5	18.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	6.1	10.1	23.5	18.4
Queue Length 50th (m)	19.0	44.1	13.2	6.1
Queue Length 95th (m)	35.1	77.0	30.2	16.6
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1476	1513	519	543
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.37	0.58	0.35	0.18
<b>Intersection Summary</b>				

# HCM Signalized Intersection Capacity Analysis

## 3: Acadia Rd & University Blvd

OpeningDay + 5yrs (2030) AM

8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	6	370	67	1	708	12	67	84	0	22	51	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			1.00			0.99	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1844			1879			1842			1835	
Flt Permitted		0.99			1.00			0.86			0.90	
Satd. Flow (perm)		1828			1879			1621			1681	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	7	451	82	1	863	15	82	102	0	27	62	9
RTOR Reduction (vph)	0	10	0	0	1	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	530	0	0	878	0	0	184	0	0	91	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.2			31.2			8.6			8.6	
Effective Green, g (s)		31.2			31.2			8.6			8.6	
Actuated g/C Ratio		0.65			0.65			0.18			0.18	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1193			1226			291			302	
v/s Ratio Prot												
v/s Ratio Perm		0.29			0.47			0.11			0.05	
v/c Ratio		0.44			0.72			0.63			0.30	
Uniform Delay, d1		4.1			5.4			18.1			17.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.3			2.0			4.4			0.6	
Delay (s)		4.3			7.4			22.6			17.6	
Level of Service		A			A			C			B	
Approach Delay (s)		4.3			7.4			22.6			17.6	
Approach LOS		A			A			C			B	

### Intersection Summary

HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



HCM Unsignalized Intersection Capacity Analysis  
 4: Acadia Rd & Toronto Road

OpeningDay + 5yrs (2030) AM  
 8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	2	59	22	38	50	0	26	149	52	0	119	4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	2	72	27	46	61	0	32	182	63	0	145	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	101	107	277	150
Volume Left (vph)	2	46	32	0
Volume Right (vph)	27	0	63	5
Hadj (s)	-0.12	0.12	-0.08	0.01
Departure Headway (s)	5.0	5.2	4.6	4.8
Degree Utilization, x	0.14	0.15	0.35	0.20
Capacity (veh/h)	655	630	754	702
Control Delay (s)	8.8	9.1	10.0	9.0
Approach Delay (s)	8.8	9.1	10.0	9.0
Approach LOS	A	A	B	A

Intersection Summary			
Delay		9.4	
Level of Service		A	
Intersection Capacity Utilization	40.3%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
5: Toronto Road & University Blvd

OpeningDay + 5yrs (2030) AM  
8/2/2013




















Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	383	0	94	701	4	115
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	467	0	115	855	5	140
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	139					
pX, platoon unblocked			0.91	0.91	0.91	
vC, conflicting volume			467	1551	467	
vC1, stage 1 conf vol				467		
vC2, stage 2 conf vol				1084		
vCu, unblocked vol			361	1556	361	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			89	98	77	
cM capacity (veh/h)			1086	220	620	

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	467	0	970	145
Volume Left	0	0	115	5
Volume Right	0	0	0	140
cSH	1700	1700	1086	584
Volume to Capacity	0.27	0.00	0.11	0.25
Queue Length 95th (m)	0.0	0.0	2.7	7.4
Control Delay (s)	0.0	0.0	2.7	13.2
Lane LOS			A	B
Approach Delay (s)	0.0		2.7	13.2
Approach LOS				B

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization	58.0%		ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
6: Road A & University Blvd

OpeningDay + 5yrs (2030) AM  
8/2/2013

											
Movement	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	SWL2	SWL	SWR
Lane Configurations											
Volume (veh/h)	11	185	16	466	11	172	777	21	8	0	6
Sign Control	Stop			Free			Free			Stop	
Grade	0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	13	226	20	568	13	210	948	26	10	0	7
Pedestrians											
Lane Width (m)											
Walking Speed (m/s)											
Percent Blockage											
Right turn flare (veh)											
Median type											
Median storage veh											
Upstream signal (m)											
pX, platoon unblocked											
vC, conflicting volume	1988	2007	973			582			2100	2001	960
vC1, stage 1 conf vol	614	614							1380	1380	
vC2, stage 2 conf vol	1374	1393							720	621	
vCu, unblocked vol	1988	2007	973			582			2100	2001	960
tC, single (s)	7.1	6.5	4.1			4.1			7.1	6.5	6.2
tC, 2 stage (s)	6.1	5.5							6.1	5.5	
tF (s)	3.5	4.0	2.2			2.2			3.5	4.0	3.3
p0 queue free %	86	0	97			79			0	100	98
cM capacity (veh/h)	96	115	709			992			2	112	311
<b>Direction, Lane #</b>											
	NB 1	SE 1	SE 2	NW 1	NW 2	SW 1					
Volume Total	239	20	582	210	973	17					
Volume Left	13	20	0	210	0	10					
Volume Right	0	0	13	0	26	7					
cSH	114	709	1700	992	1700	3					
Volume to Capacity	2.10	0.03	0.34	0.21	0.57	5.70					
Queue Length 95th (m)	152.8	0.6	0.0	6.1	0.0	Err					
Control Delay (s)	585.4	10.2	0.0	9.6	0.0	Err					
Lane LOS	F	B		A		F					
Approach Delay (s)	585.4	0.3		1.7		Err					
Approach LOS	F					F					
<b>Intersection Summary</b>											
Average Delay			153.3								
Intersection Capacity Utilization			74.2%		ICU Level of Service				D		
Analysis Period (min)			15								

Queues  
7: Blanca St & University Blvd

OpeningDay + 5yrs (2030) AM  
8/2/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	
Lane Group Flow (vph)	151	638	151	137	927	90	217	271	117	317	222	
v/c Ratio	0.82	0.56	0.15	0.37	0.78	0.09	0.90	0.60	0.27	0.51	0.44	
Control Delay	49.2	10.2	3.4	10.3	15.8	2.2	68.5	31.8	14.0	28.1	11.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	49.2	10.2	3.4	10.3	15.8	2.2	68.5	31.8	14.0	28.1	11.1	
Queue Length 50th (m)	14.3	47.1	3.8	8.2	83.1	0.9	29.8	34.1	6.0	20.4	7.1	
Queue Length 95th (m)	#44.0	62.7	8.8	16.3	106.9	4.4	#58.6	50.6	15.8	28.8	19.4	
Internal Link Dist (m)	1111.2						186.8		126.9		80.4	
Turn Bay Length (m)	50.0		10.0						35.0		10.0	
Base Capacity (vph)	184	1130	990	366	1192	1040	241	451	432	623	505	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.82	0.56	0.15	0.37	0.78	0.09	0.90	0.60	0.27	0.51	0.44	

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

OpeningDay + 5yrs (2030) AM  
8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	124	509	138	112	760	74	178	222	96	56	204	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1782	1521	1789	1883	1601	1789	1883	1601		3541	1601
Flt Permitted	0.15	1.00	1.00	0.31	1.00	1.00	0.53	1.00	1.00		0.73	1.00
Satd. Flow (perm)	292	1782	1521	579	1883	1601	1006	1883	1601		2598	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	151	621	168	137	927	90	217	271	117	68	249	222
RTOR Reduction (vph)	0	1	27	0	0	26	0	0	48	0	0	121
Lane Group Flow (vph)	151	637	124	137	927	64	217	271	69	0	317	101
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4				8
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	47.5	47.5	47.5	47.5	47.5	47.5	18.0	18.0	18.0		18.0	18.0
Effective Green, g (s)	47.5	47.5	47.5	47.5	47.5	47.5	18.0	18.0	18.0		18.0	18.0
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63	0.63	0.24	0.24	0.24		0.24	0.24
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	184	1128	963	366	1192	1013	241	451	384		623	384
v/s Ratio Prot		0.36			0.49			0.14				
v/s Ratio Perm	c0.52		0.08	0.24		0.04	c0.22		0.04		0.12	0.06
v/c Ratio	0.82	0.56	0.13	0.37	0.78	0.06	0.90	0.60	0.18		0.51	0.26
Uniform Delay, d1	10.5	7.8	5.5	6.6	9.9	5.3	27.6	25.3	22.6		24.7	23.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	32.0	2.0	0.3	2.9	5.0	0.1	37.0	5.8	1.0		3.0	1.7
Delay (s)	42.5	9.9	5.8	9.5	15.0	5.4	64.6	31.1	23.7		27.6	24.8
Level of Service	D	A	A	A	B	A	E	C	C		C	C
Approach Delay (s)		14.5			13.6			41.7			26.5	
Approach LOS		B			B			D			C	

Intersection Summary

HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
8: Acadia Rd & Road A

OpeningDay + 5yrs (2030) AM  
8/2/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	136	18	203	154	36	139
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	166	22	248	188	44	170
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	599	341			435	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	599	341			435	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	63	97			96	
cM capacity (veh/h)	447	701			1124	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	188	435	213
Volume Left	166	0	44
Volume Right	22	188	0
cSH	466	1700	1124
Volume to Capacity	0.40	0.26	0.04
Queue Length 95th (m)	14.6	0.0	0.9
Control Delay (s)	17.8	0.0	2.0
Lane LOS	C		A
Approach Delay (s)	17.8	0.0	2.0
Approach LOS	C		

Intersection Summary			
Average Delay		4.5	
Intersection Capacity Utilization	48.0%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 9: Acadia Rd & Road B

OpeningDay + 5yrs (2030) AM  
 8/2/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	65	12	302	69	5	252
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	79	15	368	84	6	307
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	730	410			452	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	730	410			452	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	98			99	
cM capacity (veh/h)	387	641			1108	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	94	452	313
Volume Left	79	0	6
Volume Right	15	84	0
cSH	413	1700	1108
Volume to Capacity	0.23	0.27	0.01
Queue Length 95th (m)	6.6	0.0	0.1
Control Delay (s)	16.3	0.0	0.2
Lane LOS	C		A
Approach Delay (s)	16.3	0.0	0.2
Approach LOS	C		

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization		31.1%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 10: Road B & University Blvd

OpeningDay + 5yrs (2030) AM  
 8/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔	↔	↔	
Volume (veh/h)	644	12	114	966	0	151
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	785	15	139	1178	0	184
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			800		2249	793
vC1, stage 1 conf vol					793	
vC2, stage 2 conf vol					1456	
vCu, unblocked vol			800		2249	793
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			83		100	53
cM capacity (veh/h)			823		130	389

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	800	139	1178	184
Volume Left	0	139	0	0
Volume Right	15	0	0	184
cSH	1700	823	1700	389
Volume to Capacity	0.47	0.17	0.69	0.47
Queue Length 95th (m)	0.0	4.6	0.0	18.7
Control Delay (s)	0.0	10.3	0.0	22.3
Lane LOS		B		C
Approach Delay (s)	0.0	1.1		22.3
Approach LOS				C

Intersection Summary			
Average Delay		2.4	
Intersection Capacity Utilization		66.9%	ICU Level of Service C
Analysis Period (min)		15	



Queues  
6: Road A & University Blvd

Total 2030 AM - Improved  
8/2/2013






















Lane Group	SEL	SET	NWL	NWT	NET	SWT
Lane Group Flow (vph)	20	581	210	974	239	17
v/c Ratio	0.09	0.45	0.41	0.76	0.55	0.08
Control Delay	4.2	5.1	6.7	10.7	9.7	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.2	5.1	6.7	10.7	9.7	11.0
Queue Length 50th (m)	0.4	14.0	4.9	33.7	0.9	0.0
Queue Length 95th (m)	2.3	35.6	17.1	84.1	12.6	3.5
Internal Link Dist (m)		114.7		295.5	123.5	55.5
Turn Bay Length (m)	30.0		50.0			
Base Capacity (vph)	277	1548	623	1546	587	339
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	0.38	0.34	0.63	0.41	0.05

Intersection Summary

HCM Signalized Intersection Capacity Analysis  
6: Road A & University Blvd

Total 2030 AM - Improved  
8/2/2013

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	16	466	11	172	777	21	11	0	185	8	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.87			0.94	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1789	1877		1789	1876			1639			1728	
Flt Permitted	0.18	1.00		0.40	1.00			0.98			0.70	
Satd. Flow (perm)	338	1877		757	1876			1615			1251	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	20	568	13	210	948	26	13	0	226	10	0	7
RTOR Reduction (vph)	0	1	0	0	2	0	0	192	0	0	14	0
Lane Group Flow (vph)	20	580	0	210	972	0	0	47	0	0	3	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	33.5	33.5		33.5	33.5			7.3			7.3	
Effective Green, g (s)	33.5	33.5		33.5	33.5			7.3			7.3	
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.15			0.15	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	232	1288		519	1287			241			187	
v/s Ratio Prot		0.31			c0.52							
v/s Ratio Perm	0.06			0.28				c0.03			0.00	
v/c Ratio	0.09	0.45		0.40	0.76			0.19			0.01	
Uniform Delay, d1	2.5	3.5		3.3	5.0			18.2			17.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.3		0.5	2.6			0.4			0.0	
Delay (s)	2.7	3.7		3.8	7.6			18.6			17.7	
Level of Service	A	A		A	A			B			B	
Approach Delay (s)		3.7			6.9			18.6			17.7	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

## Queues

Total 2030 AM - Improved

## 7: Blanca St &amp; University Blvd

8/2/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	151	621	168	137	927	90	217	271	117	317	222
v/c Ratio	0.90	0.53	0.16	0.35	0.80	0.09	0.86	0.59	0.30	0.49	0.44
Control Delay	67.2	9.9	3.7	10.1	17.2	2.5	58.0	28.8	23.4	25.2	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.2	9.9	3.7	10.1	17.2	2.5	58.0	28.8	23.4	25.2	11.5
Queue Length 50th (m)	15.4	42.2	4.1	8.0	83.1	0.9	26.7	30.8	12.2	18.4	7.8
Queue Length 95th (m)	#44.7	56.8	9.3	16.0	109.3	4.6	#52.5	46.4	22.4	26.4	19.7
Internal Link Dist (m)	1111.2			86.8			126.9			80.4	
Turn Bay Length (m)	50.0		10.0		35.0		10.0		10.0		
Base Capacity (vph)	168	1163	1020	390	1163	1015	270	492	418	693	526
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.53	0.16	0.35	0.80	0.09	0.80	0.55	0.28	0.46	0.42

## Intersection Summary

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

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

Total 2030 AM - Improved  
8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	124	509	138	112	760	74	178	222	96	56	204	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3541	1601
Flt Permitted	0.14	1.00	1.00	0.33	1.00	1.00	0.55	1.00	1.00		0.74	1.00
Satd. Flow (perm)	273	1883	1601	631	1883	1601	1034	1883	1601		2652	1601
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	151	621	168	137	927	90	217	271	117	68	249	222
RTOR Reduction (vph)	0	0	31	0	0	27	0	0	0	0	0	110
Lane Group Flow (vph)	151	621	137	137	927	63	217	271	117	0	317	112
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	42.5	42.5	42.5	42.5	42.5	42.5	16.8	16.8	16.8		16.8	16.8
Effective Green, g (s)	42.5	42.5	42.5	42.5	42.5	42.5	16.8	16.8	16.8		16.8	16.8
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62	0.62	0.24	0.24	0.24		0.24	0.24
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	168	1163	988	389	1163	988	252	459	390		647	390
v/s Ratio Prot		0.33			0.49			0.14				
v/s Ratio Perm	c0.55		0.09	0.22		0.04	c0.21		0.07		0.12	0.07
v/c Ratio	0.90	0.53	0.14	0.35	0.80	0.06	0.86	0.59	0.30		0.49	0.29
Uniform Delay, d1	11.3	7.5	5.5	6.4	9.9	5.2	24.9	23.0	21.2		22.3	21.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	41.2	0.5	0.1	0.6	3.9	0.0	24.6	2.0	0.4		0.6	0.4
Delay (s)	52.5	8.0	5.6	7.0	13.8	5.3	49.5	25.0	21.6		22.9	21.5
Level of Service	D	A	A	A	B	A	D	C	C		C	C
Approach Delay (s)		14.7			12.3			33.1			22.3	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	68.8	Sum of lost time (s)	9.5
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 3: Acadia Rd & University Blvd

OpeningDay + 5yrs (2030) AM  
 8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	6	370	67	1	708	12	67	84	0	22	51	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	7	451	82	1	863	15	82	102	0	27	62	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	878			533			1420	1387	492	1431	1421	871
vC1, stage 1 conf vol							507	507		873	873	
vC2, stage 2 conf vol							913	880		558	548	
vCu, unblocked vol	878			533			1420	1387	492	1431	1421	871
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			58	60	100	87	76	98
cM capacity (veh/h)	769			1035			194	256	577	206	254	351

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	540	879	184	98
Volume Left	7	1	82	27
Volume Right	82	15	0	9
cSH	769	1035	224	244
Volume to Capacity	0.01	0.00	0.82	0.40
Queue Length 95th (m)	0.2	0.0	46.9	13.8
Control Delay (s)	0.3	0.0	67.8	29.2
Lane LOS	A	A	F	D
Approach Delay (s)	0.3	0.0	67.8	29.2
Approach LOS			F	D

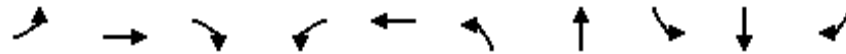
Intersection Summary			
Average Delay		9.1	
Intersection Capacity Utilization	58.6%		ICU Level of Service
Analysis Period (min)	15		B

## Queues

OpeningDay + 5 yrs (2030) PM

## 1: Wesbrook Mall &amp; Thunderbird Blvd

8/2/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	285	75	147	116	92	102	533	67	548	98
v/c Ratio	0.82	0.13	0.25	0.50	0.27	0.31	0.59	0.23	0.89	0.15
Control Delay	41.3	16.8	4.5	34.7	15.8	13.0	15.8	23.9	45.6	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.3	16.8	4.5	34.7	15.8	13.0	15.8	23.9	45.6	1.0
Queue Length 50th (m)	28.9	6.7	0.0	14.0	4.6	6.7	44.6	6.7	-71.9	0.0
Queue Length 95th (m)	#61.8	15.3	10.5	29.3	16.2	16.0	83.1	18.6	#150.6	1.7
Internal Link Dist (m)		131.0			44.8		163.9		585.5	
Turn Bay Length (m)	70.0		50.0	25.0		110.0		55.0		75.0
Base Capacity (vph)	346	1134	1022	541	732	632	1315	288	617	641
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.07	0.14	0.21	0.13	0.16	0.41	0.23	0.89	0.15

## 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.

HCM Signalized Intersection Capacity Analysis  
1: Wesbrook Mall & Thunderbird Blvd

OpeningDay + 5 yrs (2030) PM

8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	262	69	135	107	38	47	94	396	95	62	504	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.92		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1727		1789	1829		1789	1883	1601
Flt Permitted	0.42	1.00	1.00	0.71	1.00		0.15	1.00		0.47	1.00	1.00
Satd. Flow (perm)	786	1883	1601	1334	1727		276	1829		877	1883	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	285	75	147	116	41	51	102	430	103	67	548	98
RTOR Reduction (vph)	0	0	100	0	44	0	0	9	0	0	0	67
Lane Group Flow (vph)	285	75	47	116	48	0	102	524	0	67	548	31
Turn Type	pm+pt	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	21.8	21.8	21.8	9.1	9.1		33.8	33.8		21.4	21.4	21.4
Effective Green, g (s)	21.8	21.8	21.8	9.1	9.1		33.8	33.8		21.4	21.4	21.4
Actuated g/C Ratio	0.32	0.32	0.32	0.13	0.13		0.50	0.50		0.32	0.32	0.32
Clearance Time (s)	6.1	6.1	6.1	6.1	6.1		5.9	5.9		5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	351	607	516	179	232		283	914		277	596	506
v/s Ratio Prot	c0.08	0.04			0.03		0.03	c0.29			c0.29	
v/s Ratio Perm	c0.18		0.03	0.09			0.15			0.08		0.02
v/c Ratio	0.81	0.12	0.09	0.65	0.21		0.36	0.57		0.24	0.92	0.06
Uniform Delay, d1	20.1	16.2	16.0	27.7	26.0		12.3	11.8		17.1	22.3	16.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	13.3	0.1	0.1	7.8	0.4		0.8	1.0		0.6	19.6	0.1
Delay (s)	33.5	16.3	16.1	35.6	26.5		13.1	12.9		17.7	41.8	16.2
Level of Service	C	B	B	D	C		B	B		B	D	B
Approach Delay (s)		25.9			31.5			12.9			36.0	
Approach LOS		C			C			B			D	

Intersection Summary

HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	24.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
2: Wesbrook Mall & University Blvd

OpeningDay + 5 yrs (2030) PM  
8/2/2013



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	153	101	104	167	15	401	358	292	418
v/c Ratio	0.32	0.17	0.14	0.20	0.03	0.43	0.52	0.50	0.24
Control Delay	25.9	11.6	11.3	2.8	12.1	25.6	6.4	16.8	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	11.6	11.3	2.8	12.1	25.6	6.4	16.8	16.4
Queue Length 50th (m)	17.1	7.6	7.8	0.0	1.1	25.5	0.0	25.8	18.8
Queue Length 95th (m)	32.7	15.7	16.2	8.6	4.1	38.5	19.4	43.5	38.4
Internal Link Dist (m)	106.7		487.7			585.5			116.0
Turn Bay Length (m)		40.0			25.0		50.0	70.0	
Base Capacity (vph)	516	611	905	1028	638	995	703	603	1776
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.17	0.11	0.16	0.02	0.40	0.51	0.48	0.24

Intersection Summary



HCM Signalized Intersection Capacity Analysis  
2: Wesbrook Mall & University Blvd

OpeningDay + 5 yrs (2030) PM

8/2/2013



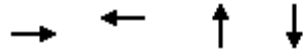
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↙	↘	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	5	122	14	155	34	154	14	369	329	269	381	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1855		1700	1733	1601	1789	3579	1601	1789	3573	
Flt Permitted		0.99		0.39	0.79	1.00	0.51	1.00	1.00	0.39	1.00	
Satd. Flow (perm)		1841		693	1420	1601	956	3579	1601	735	3573	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	133	15	168	37	167	15	401	358	292	414	4
RTOR Reduction (vph)	0	6	0	0	0	105	0	0	256	0	1	0
Lane Group Flow (vph)	0	147	0	101	104	62	15	401	102	292	417	0
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.9	30.1	
Effective Green, g (s)		10.7		25.4	25.4	25.4	21.3	19.5	19.5	34.9	30.1	
Actuated g/C Ratio		0.16		0.37	0.37	0.37	0.31	0.29	0.29	0.51	0.44	
Clearance Time (s)		4.0		4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	
Vehicle Extension (s)		2.5		2.5	2.5	2.5	2.5	0.2	0.2	3.0	2.5	
Lane Grp Cap (vph)		288		415	577	595	320	1021	457	566	1574	
v/s Ratio Prot				c0.04	0.03		0.00	0.11		c0.09	0.12	
v/s Ratio Perm		c0.08		0.05	0.04	0.04	0.01		0.06	c0.17		
v/c Ratio		0.51		0.24	0.18	0.10	0.05	0.39	0.22	0.52	0.27	
Uniform Delay, d1		26.4		15.0	14.4	14.0	16.3	19.6	18.6	10.1	12.1	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1		0.2	0.1	0.1	0.0	0.1	0.1	0.8	0.1	
Delay (s)		27.5		15.2	14.6	14.1	16.4	19.7	18.7	10.9	12.2	
Level of Service		C		B	B	B	B	B	B	B	B	
Approach Delay (s)		27.5			14.5			19.2			11.6	
Approach LOS		C			B			B			B	

Intersection Summary

HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	68.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
3: Acadia Rd & University Blvd

OpeningDay + 5 yrs (2030) PM  
8/2/2013



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	743	388	89	93
v/c Ratio	0.52	0.27	0.26	0.27
Control Delay	6.0	4.0	17.3	16.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	6.0	4.0	17.3	16.1
Queue Length 50th (m)	24.3	9.7	4.8	4.5
Queue Length 95th (m)	61.0	24.3	17.1	16.8
Internal Link Dist (m)	487.7	114.8	84.4	98.2
Turn Bay Length (m)				
Base Capacity (vph)	1692	1695	613	636
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.44	0.23	0.15	0.15
<b>Intersection Summary</b>				

HCM Signalized Intersection Capacity Analysis  
3: Acadia Rd & University Blvd

OpeningDay + 5 yrs (2030) PM  
8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	6	609	68	5	334	18	44	34	4	23	51	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.99			0.98	
Flt Protected		1.00			1.00			0.97			0.99	
Satd. Flow (prot)		1857			1869			1823			1823	
Flt Permitted		1.00			0.99			0.87			0.91	
Satd. Flow (perm)		1853			1858			1631			1678	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	662	74	5	363	20	48	37	4	25	55	13
RTOR Reduction (vph)	0	6	0	0	3	0	0	4	0	0	11	0
Lane Group Flow (vph)	0	737	0	0	385	0	0	85	0	0	82	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		28.3			28.3			4.9			4.9	
Effective Green, g (s)		28.3			28.3			4.9			4.9	
Actuated g/C Ratio		0.69			0.69			0.12			0.12	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1272			1276			193			199	
v/s Ratio Prot												
v/s Ratio Perm		c0.40			0.21			c0.05			0.05	
v/c Ratio		0.58			0.30			0.44			0.41	
Uniform Delay, d1		3.4			2.5			16.9			16.8	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.6			0.1			1.6			1.4	
Delay (s)		4.0			2.7			18.5			18.2	
Level of Service		A			A			B			B	
Approach Delay (s)		4.0			2.7			18.5			18.2	
Approach LOS		A			A			B			B	

Intersection Summary

HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	41.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 4: Acadia Rd & Toronto Road

OpeningDay + 5 yrs (2030) PM  
 8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	64	21	11	28	0	21	69	38	1	106	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	70	23	12	30	0	23	75	41	1	115	5

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	93	42	139	122
Volume Left (vph)	1	12	23	1
Volume Right (vph)	23	0	41	5
Hadj (s)	-0.11	0.09	-0.11	0.01
Departure Headway (s)	4.4	4.7	4.2	4.4
Degree Utilization, x	0.12	0.06	0.16	0.15
Capacity (veh/h)	756	711	812	781
Control Delay (s)	8.0	8.0	8.1	8.1
Approach Delay (s)	8.0	8.0	8.1	8.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay		8.1	
Level of Service		A	
Intersection Capacity Utilization	29.2%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
5: Toronto Road & University Blvd

OpeningDay + 5 yrs (2030) PM  
8/2/2013




















Movement	EBR	EBR2	NWL2	NWL	NEL	NER
Lane Configurations						
Volume (veh/h)	622	0	37	356	1	97
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	676	0	40	387	1	105
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)	139					
pX, platoon unblocked			0.80	0.80	0.80	
vC, conflicting volume			676	1143	676	
vC1, stage 1 conf vol				676		
vC2, stage 2 conf vol				467		
vCu, unblocked vol			471	1055	471	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)				5.4		
tF (s)			2.2	3.5	3.3	
p0 queue free %			95	100	78	
cM capacity (veh/h)			873	336	475	

Direction, Lane #	EB 1	EB 2	NW 1	NE 1
Volume Total	676	0	427	107
Volume Left	0	0	40	1
Volume Right	0	0	0	105
cSH	1700	1700	873	473
Volume to Capacity	0.40	0.00	0.05	0.23
Queue Length 95th (m)	0.0	0.0	1.1	6.5
Control Delay (s)	0.0	0.0	1.4	14.8
Lane LOS			A	B
Approach Delay (s)	0.0		1.4	14.8
Approach LOS				B

Intersection Summary				
Average Delay			1.8	
Intersection Capacity Utilization		41.8%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis  
6: Road A & University Blvd

OpeningDay + 5 yrs (2030) PM  
8/2/2013

											
Movement	NBL	NBR	SEL	SET	SER	NWL	NWT	NWR	SWL2	SWL	SWR
Lane Configurations											
Volume (veh/h)	8	152	4	690	14	157	384	1	20	0	6
Sign Control	Stop			Free			Free			Stop	
Grade	0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	165	4	750	15	171	417	1	22	0	7
Pedestrians											
Lane Width (m)											
Walking Speed (m/s)											
Percent Blockage											
Right turn flare (veh)											
Median type				Raised			Raised				
Median storage veh				1			1				
Upstream signal (m)											
pX, platoon unblocked											
vC, conflicting volume	1532	1526	418			765			1601	1533	418
vC1, stage 1 conf vol	766	766							759	759	
vC2, stage 2 conf vol	765	760							841	774	
vCu, unblocked vol	1532	1526	418			765			1601	1533	418
tC, single (s)	7.1	6.5	4.1			4.1			7.1	6.5	6.2
tC, 2 stage (s)	6.1	5.5							6.1	5.5	
tF (s)	3.5	4.0	2.2			2.2			3.5	4.0	3.3
p0 queue free %	96	21	100			80			43	100	99
cM capacity (veh/h)	193	208	1141			848			38	166	635
<b>Direction, Lane #</b>	<b>NB 1</b>	<b>SE 1</b>	<b>SE 2</b>	<b>NW 1</b>	<b>NW 2</b>	<b>SW 1</b>					
Volume Total	174	4	765	171	418	28					
Volume Left	9	4	0	171	0	22					
Volume Right	0	0	15	0	1	7					
cSH	207	1141	1700	848	1700	49					
Volume to Capacity	0.84	0.00	0.45	0.20	0.25	0.58					
Queue Length 95th (m)	47.6	0.1	0.0	5.7	0.0	16.8					
Control Delay (s)	74.9	8.2	0.0	10.3	0.0	151.3					
Lane LOS	F	A		B		F					
Approach Delay (s)	74.9	0.0		3.0		151.3					
Approach LOS	F					F					
<b>Intersection Summary</b>											
Average Delay			12.2								
Intersection Capacity Utilization			72.4%		ICU Level of Service				C		
Analysis Period (min)			15								

## Queues

OpeningDay + 5 yrs (2030) PM

## 7: Blanca St &amp; University Blvd

8/2/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	163	711	150	107	520	60	130	253	108	221	91
v/c Ratio	0.59	0.82	0.18	0.80	0.60	0.08	0.29	0.35	0.18	0.20	0.14
Control Delay	23.2	24.7	2.7	61.4	15.8	3.3	15.2	14.9	13.3	13.0	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.2	24.7	2.7	61.4	15.8	3.3	15.2	14.9	13.3	13.0	3.9
Queue Length 50th (m)	12.5	64.0	0.0	9.5	40.3	0.0	9.6	19.2	7.6	8.2	0.0
Queue Length 95th (m)	#36.5	#121.8	7.6	#35.1	66.8	4.9	20.7	34.3	16.4	14.5	7.1
Internal Link Dist (m)		1111.2			86.8			126.9		80.4	
Turn Bay Length (m)	50.0		10.0			35.0			10.0		10.0
Base Capacity (vph)	277	863	815	133	863	766	443	721	613	1120	669
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.82	0.18	0.80	0.60	0.08	0.29	0.35	0.18	0.20	0.14

## Intersection Summary

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

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

OpeningDay + 5 yrs (2030) PM

8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	654	138	98	478	55	120	233	99	59	144	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3527	1601
Flt Permitted	0.32	1.00	1.00	0.15	1.00	1.00	0.61	1.00	1.00		0.82	1.00
Satd. Flow (perm)	607	1883	1601	292	1883	1601	1156	1883	1601		2922	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	711	150	107	520	60	130	253	108	64	157	91
RTOR Reduction (vph)	0	0	81	0	0	33	0	0	0	0	0	56
Lane Group Flow (vph)	163	711	69	107	520	28	130	253	108	0	221	35
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Effective Green, g (s)	27.5	27.5	27.5	27.5	27.5	27.5	23.0	23.0	23.0		23.0	23.0
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.46	0.46	0.38	0.38	0.38		0.38	0.38
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	278	863	733	133	863	733	443	721	613		1120	613
v/s Ratio Prot		c0.38			0.28			c0.13				
v/s Ratio Perm	0.27		0.04	0.37		0.02	0.11		0.07		0.08	0.02
v/c Ratio	0.59	0.82	0.09	0.80	0.60	0.04	0.29	0.35	0.18		0.20	0.06
Uniform Delay, d1	12.0	14.1	9.2	13.9	12.2	9.0	12.9	13.2	12.2		12.3	11.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	8.8	8.8	0.3	38.7	3.1	0.1	1.7	1.3	0.6		0.4	0.2
Delay (s)	20.8	22.9	9.5	52.6	15.3	9.1	14.5	14.5	12.9		12.7	11.8
Level of Service	C	C	A	D	B	A	B	B	B		B	B
Approach Delay (s)		20.6			20.5			14.2			12.5	
Approach LOS		C			C			B			B	

Intersection Summary

HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



HCM Unsignalized Intersection Capacity Analysis  
8: Acadia Rd & Road A

OpeningDay + 5 yrs (2030) PM  
8/2/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	120	31	96	109	50	78
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	130	34	104	118	54	85
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	357	164			223	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	357	164			223	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	96			96	
cM capacity (veh/h)	615	881			1346	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	164	223	139
Volume Left	130	0	54
Volume Right	34	118	0
cSH	656	1700	1346
Volume to Capacity	0.25	0.13	0.04
Queue Length 95th (m)	7.5	0.0	1.0
Control Delay (s)	12.3	0.0	3.2
Lane LOS	B		A
Approach Delay (s)	12.3	0.0	3.2
Approach LOS	B		

Intersection Summary			
Average Delay		4.7	
Intersection Capacity Utilization		37.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 9: Acadia Rd & Road B

OpeningDay + 5 yrs (2030) PM  
 8/2/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	61	7	179	56	7	153
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	8	195	61	8	166
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	407	225			255	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	407	225			255	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	99			99	
cM capacity (veh/h)	597	814			1310	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	74	255	174
Volume Left	66	0	8
Volume Right	8	61	0
cSH	614	1700	1310
Volume to Capacity	0.12	0.15	0.01
Queue Length 95th (m)	3.1	0.0	0.1
Control Delay (s)	11.7	0.0	0.4
Lane LOS	B		A
Approach Delay (s)	11.7	0.0	0.4
Approach LOS	B		

Intersection Summary			
Average Delay		1.8	
Intersection Capacity Utilization		24.2%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 10: Road B & University Blvd

OpeningDay + 5 yrs (2030) PM  
 8/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻		↻	↻	↻	
Volume (veh/h)	836	18	155	541	0	83
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	909	20	168	588	0	90
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			928		1843	918
vC1, stage 1 conf vol					918	
vC2, stage 2 conf vol					925	
vCu, unblocked vol			928		1843	918
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			77		100	73
cM capacity (veh/h)			737		182	329

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	928	168	588	90
Volume Left	0	168	0	0
Volume Right	20	0	0	90
cSH	1700	737	1700	329
Volume to Capacity	0.55	0.23	0.35	0.27
Queue Length 95th (m)	0.0	6.7	0.0	8.3
Control Delay (s)	0.0	11.3	0.0	20.0
Lane LOS		B		C
Approach Delay (s)	0.0	2.5		20.0
Approach LOS				C

Intersection Summary			
Average Delay		2.1	
Intersection Capacity Utilization		68.8%	ICU Level of Service C
Analysis Period (min)		15	

Queues  
6: Road A & University Blvd

OpeningDay + 5 yrs (2030) PM - Improved  
8/2/2013

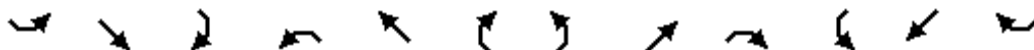


Lane Group	SEL	SET	NWL	NWT	NET	SWT
Lane Group Flow (vph)	4	765	171	418	174	29
v/c Ratio	0.01	0.55	0.41	0.30	0.44	0.14
Control Delay	3.0	6.0	7.6	3.9	8.5	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	6.0	7.6	3.9	8.5	13.3
Queue Length 50th (m)	0.1	21.2	4.0	8.9	0.6	0.7
Queue Length 95th (m)	0.7	58.7	18.1	24.2	13.0	6.1
Internal Link Dist (m)		114.7		295.5	123.5	55.5
Turn Bay Length (m)	30.0		50.0			
Base Capacity (vph)	772	1489	454	1492	791	534
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	0.01	0.51	0.38	0.28	0.22	0.05
<b>Intersection Summary</b>						

HCM Signalized Intersection Capacity Analysis  
6: Road A & University Blvd

OpeningDay + 5 yrs (2030) PM - Improved

8/2/2013



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↔	↔		↔	↔			↕			↕	
Volume (vph)	4	690	14	157	384	1	8	0	152	20	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.87			0.97	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.96	
Satd. Flow (prot)	1789	1878		1789	1883			1638			1755	
Flt Permitted	0.52	1.00		0.30	1.00			0.98			0.66	
Satd. Flow (perm)	975	1878		572	1883			1609			1209	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	750	15	171	417	1	9	0	165	22	0	7
RTOR Reduction (vph)	0	1	0	0	0	0	0	145	0	0	16	0
Lane Group Flow (vph)	4	764	0	171	418	0	0	29	0	0	13	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	30.6	30.6		30.6	30.6			5.3			5.3	
Effective Green, g (s)	30.6	30.6		30.6	30.6			5.3			5.3	
Actuated g/C Ratio	0.70	0.70		0.70	0.70			0.12			0.12	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	679	1309		398	1312			194			145	
v/s Ratio Prot		c0.41			0.22							
v/s Ratio Perm	0.00			0.30				c0.02			0.01	
v/c Ratio	0.01	0.58		0.43	0.32			0.15			0.09	
Uniform Delay, d1	2.0	3.4		2.9	2.6			17.3			17.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	0.7		0.7	0.1			0.4			0.3	
Delay (s)	2.0	4.1		3.6	2.7			17.6			17.4	
Level of Service	A	A		A	A			B			B	
Approach Delay (s)		4.1			3.0			17.6			17.4	
Approach LOS		A			A			B			B	

Intersection Summary

HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	43.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Queues  
7: Blanca St & University Blvd

OpeningDay + 5 yrs (2030) PM - Improved

8/2/2013



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	
Lane Group Flow (vph)	163	711	150	107	520	60	130	253	108	221	91	
v/c Ratio	0.64	0.86	0.21	0.82	0.63	0.08	0.28	0.34	0.17	0.19	0.13	
Control Delay	27.3	27.9	7.4	64.7	16.6	3.4	14.9	14.5	13.2	12.6	3.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	27.3	27.9	7.4	64.7	16.6	3.4	14.9	14.5	13.2	12.6	3.9	
Queue Length 50th (m)	12.7	64.0	5.7	9.3	40.3	0.0	9.6	19.2	7.6	8.2	0.0	
Queue Length 95th (m)	#37.9	#121.8	14.3	#34.7	66.8	4.9	20.7	34.3	16.4	14.5	7.1	
Internal Link Dist (m)	1111.2						86.8		126.9		80.4	
Turn Bay Length (m)	50.0		10.0			35.0			10.0		10.0	
Base Capacity (vph)	276	897	791	141	897	794	460	750	637	1167	692	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.59	0.79	0.19	0.76	0.58	0.08	0.28	0.34	0.17	0.19	0.13	

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis  
7: Blanca St & University Blvd

OpeningDay + 5 yrs (2030) PM - Improved

8/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	654	138	98	478	55	120	233	99	59	144	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1883	1601		3527	1601
Flt Permitted	0.31	1.00	1.00	0.16	1.00	1.00	0.61	1.00	1.00		0.82	1.00
Satd. Flow (perm)	581	1883	1601	298	1883	1601	1156	1883	1601		2929	1601
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	711	150	107	520	60	130	253	108	64	157	91
RTOR Reduction (vph)	0	0	30	0	0	34	0	0	0	0	0	55
Lane Group Flow (vph)	163	711	120	107	520	26	130	253	108	0	221	36
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	25.3	25.3	25.3	25.3	25.3	25.3	23.1	23.1	23.1		23.1	23.1
Effective Green, g (s)	25.3	25.3	25.3	25.3	25.3	25.3	23.1	23.1	23.1		23.1	23.1
Actuated g/C Ratio	0.44	0.44	0.44	0.44	0.44	0.44	0.40	0.40	0.40		0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	253	822	699	130	822	699	461	751	638		1168	638
v/s Ratio Prot		c0.38			0.28			c0.13				
v/s Ratio Perm	0.28		0.07	0.36		0.02	0.11		0.07		0.08	0.02
v/c Ratio	0.64	0.86	0.17	0.82	0.63	0.04	0.28	0.34	0.17		0.19	0.06
Uniform Delay, d1	12.8	14.8	9.9	14.3	12.7	9.3	11.8	12.1	11.2		11.3	10.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.5	9.4	0.1	32.6	1.6	0.0	1.5	1.2	0.6		0.4	0.2
Delay (s)	18.3	24.2	10.0	46.9	14.3	9.4	13.3	13.3	11.8		11.7	10.9
Level of Service	B	C	B	D	B	A	B	B	B		B	B
Approach Delay (s)		21.2			18.9			13.0			11.4	
Approach LOS		C			B			B			B	

Intersection Summary

HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	57.9	Sum of lost time (s)	9.5
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 3: Acadia Rd & University Blvd

OpeningDay + 5yrs (2030) PM  
 8/1/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	6	609	68	5	334	18	44	34	4	23	51	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	7	743	83	6	407	22	54	41	5	28	62	15
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	429			826			1275	1240	784	1255	1271	418
vC1, stage 1 conf vol							799	799		430	430	
vC2, stage 2 conf vol							476	441		824	840	
vCu, unblocked vol	429			826			1275	1240	784	1255	1271	418
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			78	86	99	88	78	98
cM capacity (veh/h)	1130			805			245	287	393	240	277	635

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	833	435	100	105
Volume Left	7	6	54	28
Volume Right	83	22	5	15
cSH	1130	805	266	288
Volume to Capacity	0.01	0.01	0.38	0.36
Queue Length 95th (m)	0.1	0.2	12.7	12.2
Control Delay (s)	0.2	0.2	26.5	24.5
Lane LOS	A	A	D	C
Approach Delay (s)	0.2	0.2	26.5	24.5
Approach LOS			D	C

Intersection Summary			
Average Delay		3.7	
Intersection Capacity Utilization		54.7%	ICU Level of Service
Analysis Period (min)		15	A