



7421-23-25 Prospect Street, BC
**Transportation Impact
Assessment**
Version 1

Prepared for
Fitzgerald Building Company

Date
January 27, 2023

Project No.
04-22-0348

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Tom Fitzgerald
Fitzgerald Building Company
7330 Arbutus St #101
Pemberton, BC
V0N 2L0

Dear Tom:

**Re: 7421-23-25 Prospect Street, Pemberton
Transportation Impact Assessment**

This report has been produced to provide a Transportation Impact Assessment for the proposed mixed-use development at 7421-23-25 Prospect Street, Pemberton. The review has been based on the latest design schedule of 45 multi-family residential units and commercial land use. A Terms of Reference was provided to the Village and was agreed to. Therefore, this report has been developed in accordance with the agreed scope.

Bunt has been responsible for providing high level transportation related advice, while we have also undertaken access and site design review, as well as provided an indication on future traffic that could be generated by the development, including the distribution through the road network and the related operational assessment of existing and future conditions. A summary of our findings and recommendations is presented herein.

Yours truly,
Bunt & Associates



Tyler Thomson, MURB MCIP RPP PTP
Associate – Senior Transportation Planner



Hugo Johnston, B.Sc
Transportation Planner

CORPORATE AUTHORIZATION

Prepared By:	Hugo Johnston Amanda Reale, EIT	Bunt & Associates Engineering Ltd. 1550-1050 West Pender Street Vancouver, BC V6E 3S7 Canada
Reviewed By:	Tyler Thomson, MCIP RPP PTP Senior Transportation Planner	Telephone: +1 604 685 6427 Facsimile: +1 604 685 6579 Date: 2023-01-27 Project No. 04-22-0348
Approved By:	Yulia Liem, P.Eng., PTOE Principal	

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1. INTRODUCTION

1.1 Study Purpose & Objectives

Fitzgerald Building Company (Fitzgerald) have engaged Bunt & Associates Engineering Ltd. to prepare a Transportation Impact Assessment (TIA) for the proposed development at 7421, 7423 and 7425 Prospect Street, Pemberton, BC referred to as 'The Site' hereon within. The proposed development will consist of a 4-storey mixed-use building with residential above ground-floor retail. Vehicle access to The Site will be provided from Aster Street to the south.

The Site will feature approximately 45 residential strata units, with commercial units located at the ground floor. Parking will be provided within the underground parkade, on-street parking will be provided in a more formalized manner with frontage improvements on Aster Street and Prospect Street. Pedestrian access to the site will be possible at the grade from both Aster Street and Prospect Street, while bicycle access will be from the parkade ramp and/or the residential elevator in the lobby.

A Terms of Reference (TOR) for this TIA was agreed upon by the Village of Pemberton (VoP) and their transportation consultants, ISL Engineering and Land Services Ltd (ISL), the letter and any corresponding emails are included in **Appendix A**. The purpose of this study is to:

- Explain the existing transportation facilities around the site;
- Evaluate the potential transportation impacts of the proposed development, including traffic impact analysis at four (4) study intersections;
- Review the development's parking and servicing strategy; and
- Evaluate the proposed site plan, its proposed access, and internal vehicle circulation.

1.2 Study Scope & Area

The site area is bounded by Prospect Street to the east, Aster Street to the south, and adjacent properties to the west (industrial/business) and north (residential). **Exhibit 1.1** illustrates the site location within the Village of Pemberton, BC. The study area is located close to the downtown core of the village and is a mixed-use area with several commercial properties and residential dwellings within the vicinity. The residential areas are primarily to the west of the site, whilst the east, north and south are primary commercial and administrative uses.

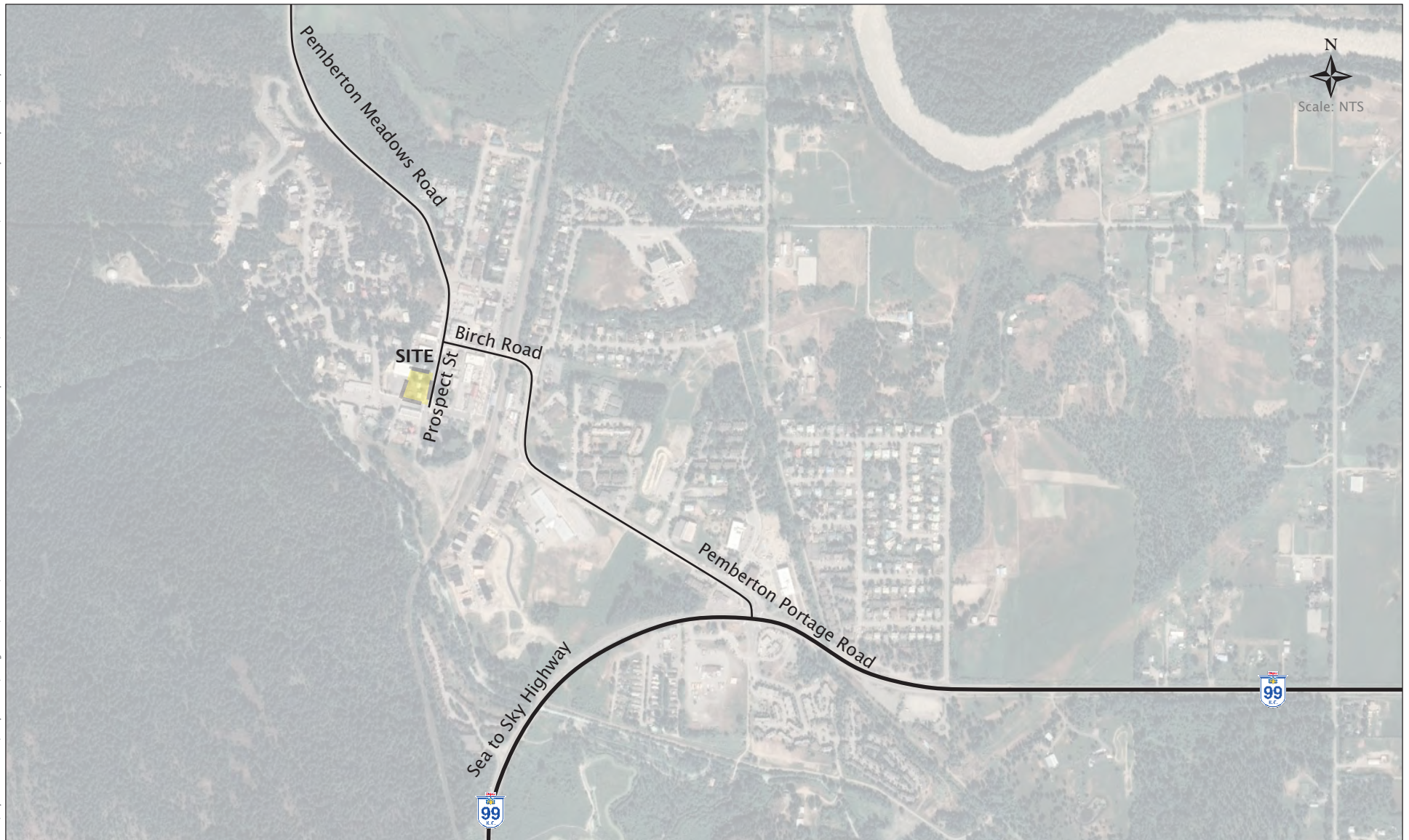


Exhibit 1.1 Site Location & Study Area

7421-23-25 Prospect Street
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1.3 Organization of Report

The report is structured as follows:

- **Section 1** - Introduces the study and outlines the proposed development;
- **Section 2** - Presents the existing transportation infrastructure within the study area and existing traffic conditions;
- **Section 3** - Describes the future traffic conditions with and without the proposed development and any potential impacts to the surrounding street network;
- **Section 4** - Reviews the Bylaw parking requirements for the development in the context of the proposed supply; and,
- **Section 5** - Presents the study conclusions and recommendations.

1.4 Proposed Development

The proposed development breakdown is summarized in **Table 1.1**.

Table 1.1: Proposed Land Uses

LAND USE	DENSITY (SQM)	UNITS
Residential	3,485	45
Commercial	1,303	10 CRU's

The current site plan is shown in **Exhibit 1.2**.

The total development will be supported by 54 parking spaces located within the underground parkade. Additionally, it is anticipated that the visitors to the site and commercial visitors will make use of the on-street parking provided within the vicinity of the site. As previously mentioned, the parkade will be accessed via a driveway off Aster Street to the south of the site.



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Exhibit 1.2 Site Plan

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2. EXISTING CONDITIONS

The following outlines a brief description of the relevant existing transportation networks/facilities including road network connections, cycling, and walking facilities in the surrounding area.

2.1 Land Use

The development is currently zoned C1 “Commercial, Town Centre” and is located to the southwest of the downtown centre of Pemberton. The site is made up of three lots, currently occupied by two single level dwellings and a small commercial property. The site is approximately 2,150 sq m and adjacent to the Rona Building centre and Foughburg Park.

Developments along Prospect Street follow a similar pattern to the low to mid-rise residential and mixed-use developments within the vicinity of the site and with access via the local roads or laneways. To the south of the site, along Aster Street and Prospect Street are commercial and community buildings.

2.2 Existing Transportation Network

2.2.1 Road Network

Exhibit 2.1 sets out the surrounding road network near the site and the intersection controls and laning within the study area. Aster Street is a two-way road that extends east-west to the south of the site and connects to Frontier Street in the east and Dogwood Street in the west. The road provides connections to residential areas of Pemberton and the Fire department to the west of the site.

Prospect Street extends north-south along the eastern frontage of the site and is a key road to the north of Pemberton. Prospect Street provides connection to Birch Road to the northeast and Pemberton Meadows Road further north. Birch Road travels east-west from the intersection with Prospect Street and connects to the roundabout intersection with Pemberton Portage Road and Aspen Boulevard in the east, this is the primary access point into the town centre, with all traffic travelling through the roundabout to access the town centre of Pemberton to/from Highway 99.

There is on-street parking located on both sides of the road along the length of Prospect Street. Aster Street also has on-street parking on both sides of the street. **Table 2.1** summarizes the characteristics of the key streets in the study area.

Table 2.1: Existing Street Characteristics

STREET	CLASSIFICATION	NUMBER OF TRAVEL LANES	POSTED* SPEED	PARKING FACILITIES
Aster Street	Local	2	30 kph	Parking bays on both sides
Prospect Street	Collector	2	30 kph	Parking bays on both sides
Birch Street	Collector	2	30 kph	Parking bays on both sides
Frontier Street	Local	2	30 kph	Parking bays on both sides for north, south has large central parking lot.

*based on signage on Pemberton Portage Road.

Collector Roads provide a mixture of both mobility and land access functions, connecting all types of activity areas in the Village and within the vicinity neighbourhoods. The function of these streets is to “collect” traffic from the neighbourhoods through which they pass and distribute this traffic to Arterial Roads and the highway, while also providing direct access to adjacent lands. Collector Roads connect local neighbourhood and district-wide origins and destinations, allowing trips to be efficiently distributed by providing a choice of routes for transit, pedestrians, drivers, and bicyclists.

Local Roads primarily carry vehicle traffic with an origin and/or destination along its length and are not intended to carry significant volumes of through traffic.

Most of the roadways in the adjacent street network are two-lane roads with sidewalks. There are on-street parking facilities provided as well.

2.3 Active Transportation Networks

The site is located to the southwest of the town centre of Pemberton and therefore, is well connected by pedestrian facilities and cycling options. The pedestrian and cycling networks are set out in **Exhibit 2.2**.

2.3.1 Pedestrian Network

Walking is an everyday activity whether as a single-purpose journey or linked with transit and driving. Typically, people are willing to walk up to 10 minutes for certain activities (i.e., work, school, and recreational activities, which is circa 800m in distance). The pedestrian network surrounding the development includes both recreational and commuter routes. There are footways provided along the length of Prospect Street within the vicinity of the site, these connect to the wider network of Birch Road and Aster Street. Likewise, Aster Street, to the south, has footways running adjacent to the road.

Most streets in the vicinity of the site have sidewalks on at least one side of the roadway although some older local roadways with limited connections or limited residential presence have no sidewalks. Pedestrian crossing facilities are provided at the adjacent intersections at Prospect Street & Aster Street and Prospect Street & Birch Road. Sidewalks are provided to key destinations such as the primary and elementary schools to the east of the site.

2.3.2 Bicycle Network

Whilst there are no significant trails within the vicinity of the site, a number of roads have been identified as providing low traffic routes (i.e., neighbourhood bikeway) that are safe for cyclists, including the Joseph Despard Pemberton Laneway and Elements Lane. Pemberton Meadows Road, to the north of the site, is also a popular route for cyclists undertaking recreational activities.

Proposed Cycling Improvements

As part of Village of Pemberton Active Transportation plan it is proposed to markup a number of routes as part of the cycling network. These routes include Aster Street, Prospect Street and Frontier Street which will provide additional routes for cyclists.



Exhibit 2.1 Study Network

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Exhibit 2.2 Pedestrian Facilities & Cycling Facilities

2.4 Existing Traffic Volumes

2.4.1 Traffic Data Collection Program

To document existing traffic volumes in the study area, Bunt conducted weekday AM (07:00-09:00) and weekday PM (15:00-18:00) peak period survey and spot counts. These counts occurred over several days due to the changing nature of the study scope. **Table 2.2** summarizes the intersection traffic data, collection dates and peak hour for the counts longer than one hour.

Table 2.2: Summary of Available and Counted Traffic Data

INTERSECTION	SOURCE	DATE OF COUNT	IDENTIFIED PEAK HOURS	
			AM	PM
Prospect Street / Aster Street	Bunt	October 25 th 2022	07:00-08:00*	15:30-16:30
	Bunt	November 8 th , 2022	-	
Prospect Street / Birch Road	Bunt	October 25 th 2022	08:00-09:00	16:15-17:15
	Bunt	November 8 th , 2022	-	
Birch Road / Frontier Street	Bunt	October 18 th 2022	08:00-09:00	-
	Bunt	November 8 th , 2022	-	16:15-17:15
Birch Road/ Pemberton Portage Road / Aspen Blvd	Bunt	October 18 th 2022	08:00-09:00	16:45 -17:45
OVERALL STUDY AREA PEAK HOUR			08:00-09:00	16:30-17:30

*Only one hour of data collected.

Initial surveys were carried out on the 18th October, 2022. However, the full study area had not been agreed to by the Village and they requested additional intersections be included within the scope. Therefore, the additional data was collected over two typical weekdays. The days were split due to the availability of counters; however, a full peak period was ultimately observed. The identified peak hour in the AM was 08:00-09:00. Within the PM peak, it was ensured that any traffic associated to the school was observed, however, the PM peak was noted at 16:30-17:30.

The peak hours were calculated using the observed traffic data, all the movements for each intersection were totaled to determine which 15min rolling hour was highest across the observed time periods.. The network peak hour was taken from the highest traffic observed at all study intersections.

2.4.2 Peak Hour Traffic Volumes

Peak hour traffic volumes were extracted from the count data at the determined AM and PM. The observed peaks are presented in **Exhibit 2.3**.

2.4.3 Pedestrian and Cyclist's movements

As part of the traffic counts, the number of pedestrians and cyclists using the intersections was also observed, these counts enabled a review of the number of pedestrians and cyclists that utilize the network within the vicinity of the site. **Exhibits 2.4** demonstrates the counts for the AM and PM peak. This exhibit

demonstrates that there are no significant number of movements within the study network. The highest number of movements were observed along the southern arm at Pemberton Portage Road, with 40 pedestrians crossing in the AM peak hour.



Exhibit 2.3 Existing Peak Hour Vehicle Traffic Volumes



Exhibit 2.4 Existing Peak Hour Pedestrian & Cycling Traffic Volumes

2.4.4 Existing Traffic Volumes

Table 2.3 presents a summary of the two-way peak-hour vehicle movements for the streets in the study area. As shown, Pemberton Portage Road is the busiest road in the network with over 600 two-way movements in the AM peak hour, and around 860 two-way movements in the PM peak hour. Birch Road and Prospect Street were next busiest with two-way traffic flows in the range of 300 – 400 movements in the AM peak hour, and 450 – 550 movements in the PM peak hour.

Table 2.3: Existing Peak Hour Roadway Link Volumes

ROAD LINK	PEAK LINK VOLUMES (VEH/HR)	
	AM	PM
Aster Street	55	102
Prospect Street	314	453
Birch Road	398	548
Pemberton Portage Road	610	859
Aspen Blvd	252	154
Frontier Street	82	260

2.4.5 Existing Site Vehicle Trip Generation

The site is currently made up of a small thrift store and 2 townhouses. Therefore, it was determined that the existing trips were considered to be very low within the peak hours and would not have a noticeable impact if removed from the analysis, therefore, no net trip generation will be calculated, and all proposed trips associated with the site will be considered on top of the surveyed traffic numbers.

2.5 Existing Operations

2.5.1 Performance Thresholds

The existing operations of study area intersections and access points were assessed using the methods outlined in the 2000 Highway Capacity Manual (HCM), using the Synchro 11 analysis software (Build 11.1.16). The traffic operations were assessed using the performance measures of Level of Service (LOS) and volume-to-capacity (V/C) ratio.

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

Table 2.4 below summarizes the LOS thresholds for the six Levels of Service, for both signalized and unsignalized intersections.

Table 2.4: Intersection Level of Service Thresholds

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

Source: Highway Capacity Manual

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

As directed by the ISL Engineering on behalf of the Village of Pemberton, the performance thresholds that were used to trigger consideration of roadway or traffic control improvements to support roadway or traffic control improvements employed in this study are listed below:

Signalized Intersections:

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

Unsignalized Intersections and Roundabouts:

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

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

- For unsignalized two-way stop-controlled intersections: HCM 6 and V/C output is reported just for individual lanes as the HCM methodology does not report overall performance. SimTraffic estimated queues and Level of Service have also been reported, as the HCM 2000 methodology does not directly take into account the gaps afforded by adjacent signalized intersections;
- For unsignalized Stop controlled intersections: HCM 2000 unsignalized LOS is reported for the overall intersection as well as by intersection approach LOS. The HCM 2000 methodology does not report an overall V/C ratio for All Way Stop controlled intersections. Degree of Utilization calculated with the HCM 2000 methodology is reported for individual movements in place of V/C, which is not part of the HCM 2000 report;
- For roundabouts: SIDRA roundabout analysis output is reported since as HCM 2000 does not calculate LOS for roundabouts. Overall LOS, and LOS and V/C by movement are provided for roundabouts but no overall V/C ratio is provided for roundabouts in the HCM 2010 methodology. This was undertaken inline with MoTI guidelines on SIDRA analysis.

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

2.5.2 Existing Conditions Analysis Assumptions

Synchro and SIDRA Parameters

- Peak Hour Factor: Existing peak hour factors were informed by available counts.
- Pedestrian Volumes: pedestrian crossing demand were entered as per Bunt's counts.
- Heavy Vehicle Percentages: Most intersections use heavy vehicle percentage informed by existing counts, with low volume intersections assuming a Synchro default of 2%.

2.5.3 Existing Operational Analysis Results

The operation analysis results are summarized in **Table 2.5** for the AM & PM peak hour conditions.

Table 2.5: Existing Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A	-	-	A	-	-
	EB	A	0.01	3	A	0.01	-
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	8	A	0.02	11
	SB	A	0.08	15	A	0.10	18
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A	-	-	A	-	-
	WB	A	0.29	28	A	0.35	25
	NB	A	0.09	17	A	0.12	17
	SB	A	0.28	24	A	0.37	26
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A	-	-	A	-	-
	EB	A	0.00	6	A	0.01	14
	WB	A	0.03	11	A	0.07	27
	NB	A	0.10	17	A	0.24	23
	SB	A	0.03	9	B	0.34	19
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A	-	-	A	-	-
	EB	A	0.25	12	A	0.32	18
	NB	A	0.25	13	A	0.37	20
	SB	A	0.19	8	A	0.09	3

All intersections within the study area were reported to operate within the performance thresholds during both the AM and PM peak hours.

3. FUTURE TRAFFIC CONDITIONS

This section documents the analysis results for future traffic operations for Opening Day (2025), Opening Day + 5 years (2030), and Opening Day + 10 years (2035) horizon years with and without the development in place and provides a discussion on the assumptions for the future forecasts, covering changes to the background conditions along with new movements generated from the development plan.

3.1 Traffic Forecasts

The future horizon year scenarios that will be examined in the traffic analysis are as follows:

- Opening Day (2025) Background Traffic
- Opening Day (2025) Total Traffic
- Opening Day + 5 Years (2030) Background Traffic
- Opening Day + 5 Years (2030) Total Traffic
- Opening Day + 10 Years (2035) Background Traffic
- Opening Day + 10 Years (2035) Total Traffic.

3.1.1 Background Traffic Forecasts

Background traffic is traffic that would be present on the road network if the site did not redevelop. Future background scenarios were developed by adding a growth factor to the existing vehicle volumes.

Future background volumes were calculated by applying a 1.0% per year linear growth rate to existing traffic volumes at the study intersections as per the approved Terms of Reference (ToR).

Exhibit 3.1 illustrate the Opening Day Horizon (2025) Background Traffic forecasts for Weekday AM & PM, while **Exhibit 3.2**, illustrate the Opening Day Horizon + 5 Years (2030) background traffic forecasts, and **Exhibit 3.3**, showing the Opening Day Horizon + 10 Years (2035) background traffic forecasts for the Weekday AM & PM peak hours.



Exhibit 3.1 Opening Day Background Traffic Forecasts



Exhibit 3.2 Opening Day + 5 Years (2030) Background Traffic Forecasts



Exhibit 3.3 Opening Day + 10 Years (2035) Background Traffic Forecasts

3.1.2 Site Traffic

Vehicle Trip Generation

The vehicle trip generation calculation for the proposed development utilizes the trip rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition, for the general urban/suburban context for the residential component.

Each commercial unit has been split in accordance with the office and retail land uses. The rates applicable to the current development statistics are summarized in **Table 3.1**. This is seen as a conservative approach and ensures that all floor area is accounted for.

Table 3.1: Peak Hour Vehicle Trip Rates

LAND USE	QUANTIT Y	UNITS	AM PEAK HOUR			PM PEAK HOUR		
			IN	OUT	TOTAL	IN	OUT	TOTAL
220 Residential - Low Rise	Dwelling units	45	0.10	0.30	0.40	0.32	0.19	0.51
822 - Strip Retail Plaza	1,000 sqft	6.55	1.42	0.94	2.36	3.30	3.26	6.59
712 - Small Office		4.36	1.37	0.30	1.67	0.73	1.43	2.16

Table 3.2 summarizes the anticipated future site generated vehicle trips for the proposed development based on the above rates. As shown, the site is expected to generate approximately 44 two-way vehicle trips in the weekday AM peak hour (less than one vehicle per minute), and 80 two-way vehicle trips in the weekday PM peak hour (just over one vehicle per minute).

Table 3.2: Estimated Peak Hour Site Vehicle Trips

LAND USE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
220 Residential - Low Rise	4	14	18	14	8	23
822 - Strip Retail Plaza	9	6	15	22	22	43
712 - Small Office	9	2	11	5	9	14
TOTAL	23	22	44	41	39	80

Trip Distribution & Assignment

Trips generated by the proposed development were assigned to the study network based largely on existing travel patterns observed for the area.

Table 3.3 summarizes the assumed site traffic distribution through the study area, while **Exhibit 3.4** presents the site generated traffic assignment on the area road network.

Table 3.3: Estimated Trip Distribution

ORGIN/DESTINATION	WEEKDAY AM PEAK HOUR		WEEKDAY PM PEAK HOUR	
	IN (%)	OUT (%)	IN (%)	OUT (%)
Prospect Street North	15%	15%	15%	15%
Frontier Street North	5%	5%	5%	5%
Aspen Blvd	5%	5%	5%	5%
Pemberton Portage Road	75%	75%	75%	75%
Aster Street West	0%	0%	0%	0%
Prospect Street South	0%	0%	0%	0%
Pioneer Road	0%	0%	0%	0%
TOTAL	100%	100%	100%	100%

3.1.3 Total Traffic

Total traffic consists of the future background traffic volumes plus the proposed development's site-generated traffic volumes layered on. **Exhibit 3.5** presents the forecasted future traffic volumes for the Opening Day (2025) Total Traffic scenario (Weekday AM & PM), while **Exhibit 3.6 & Exhibit 3.7** highlight the forecasted future traffic volumes for the Opening Day + 5 Years (2030) Total Traffic scenario (Weekday AM & PM) and Opening Day + 10 Years (2035) Total Traffic scenario (Weekday AM & PM), respectively.

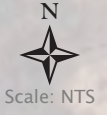


Exhibit 3.4 Site Traffic Forecasts

7421-23-25 Prospect Street
04-22-0348 January 2023





Exhibit 3.5 Opening Day (2025) Total Traffic Forecasts



Exhibit 3.6 Opening Day + 5 Years (2030) Total Traffic Forecasts



Exhibit 3.7 Opening Day + 10 Years (2035) Total Traffic Forecasts

3.2 Future Traffic Operations

3.2.1 Future Conditions Analysis Assumptions

The traffic operational analysis for future conditions was completed using the following assumptions:

- The peak hour factor, pedestrian and cyclist levels remained consistent with the surveyed levels.
- Intersection configurations and link speeds were kept the same as the existing conditions since no road improvements are planned for the study area.

3.2.2 Future Background Traffic Operations

Table 3.4, 3.5 and 3.6 summarise the weekday AM and PM peak hour traffic operations results for the Opening Day Horizon (2025) Background, Opening Day Horizon +5 Years (2035) Background traffic and Opening Day Horizon + 10 Years (2035) Background traffic scenarios.

Table 3.4: Opening Day (2025) Background Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.01	4	A	0.01	3
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	8	A	0.02	10
	SB	A	0.09	16	A	0.11	16
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A			A		
	WB	A	0.31	25	A	0.38	26
	NB	A	0.09	17	A	0.13	17
	SB	A	0.30	28	A	0.40	31
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.00	7	A	0.01	13
	WB	A	0.08	17	A	0.07	25
	NB	A	0.12	17	B	0.27	27
	SB	A	0.04	9	B	0.40	19
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A			A		
	EB	A	0.27	13	A	0.34	20
	NB	A	0.27	14	A	0.39	22
	SB	A	0.21	9	A	0.09	4

As can be seen above, the anticipated background growth traffic does not cause a significant change to the intersection performance across the network. The level of service at Birch Road and Frontier Street has changed from Level A to B, in the PM peak, on the controlled approaches with a slight increase in queue length, but this increase is still significantly below the thresholds allowed.

Table 3.5: Opening Day + 5 Years (2030) Background Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.01	2	A	0.02	-
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	9	A	0.02	12
	SB	A	0.10	15	A	0.12	16
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A			A		
	WB	A	0.35	29	A	0.43	30
	NB	A	0.11	18	A	0.15	19
	SB	A	0.33	27	A	0.45	32
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.00	4	A	0.01	17
	WB	A	0.03	13	A	0.08	32
	NB	A	0.14	19	B	0.31	28
	SB	A	0.04	10	B	0.53	20
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A			A		
	EB	A	0.30	15	A	0.38	23
	NB	A	0.30	16	A	0.43	26
	SB	A	0.23	10	A	0.11	4

As seen in the background year analysis, the 2030 results also demonstrate no significant changes to the operations of the highway network, the intersections within the study area continue to operate well below the thresholds. A slight increase to the delays and Volume /Capacity is seen throughout but the Level of Service remains unchanged.

Table 3.6: Opening Day + 10 Years (2035) Background Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.01	3	A	0.02	4
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	9	A	0.02	12
	SB	A	0.11	15	A	0.13	15
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A			A		
	WB	A	0.39	32	A	0.49	39
	NB	A	0.12	18	A	0.17	18
	SB	A	0.38	31	A	0.51	35
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.00	7	A	0.02	22
	WB	A	0.04	22	A	0.10	35
	NB	B	0.16	22	C	0.38	31
	SB	A	0.05	8	C	0.75	26
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A			A		
	EB	A	0.34	18	A	0.42	28
	NB	A	0.27	19	A	0.48	31
	SB	A	0.33	12	A	0.13	5

The table above demonstrates that similar to the 2030 background results, there have been sight increases in the queues and volume/capacity ratios. However, the delays witnessed at Frontier Street / Birch Road have been increased further from a Level B to a Level C on the controlled approaches. These still operate below the thresholds.

3.2.3 Future Total Traffic Operations

Future total traffic operations examine the background future volumes with the addition of the proposed development’s site trips. **Tables 3.5, 3.6, and 3.7** summarize the intersection operations results for the weekday AM and PM peak hours for the Opening Day (2025) Total Traffic, Opening Day + 5 Years (2030), and Opening Day + 10 Years (2034) Total Traffic scenarios. The results from the Total scenario were compared with the Background operations (i.e., without the proposed development) to assess the predicted net impact of the proposed development.

Table 3.7: Opening Day (2025) Total Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.03	2	A	0.04	7
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	8	A	0.02	9
	SB	A	0.11	17	A	0.15	19
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A			A		
	WB	A	0.34	31	A	0.43	30
	NB	A	0.12	20	A	0.18	21
	SB	A	0.31	29	A	0.42	31
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.00	4	A	0.01	15
	WB	A	0.03	18	A	0.08	27
	NB	A	0.13	19	B	0.29	28
	SB	A	0.04	10	B	0.46	19
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A			A		
	EB	A	0.30	15	A	0.37	22
	NB	A	0.30	16	A	0.41	24
	SB	A	0.22	9	A	0.10	4

The addition of development traffic to the network model has not led to anything significant impacts on the study intersections. The previously noted increases to volume/capacity ratios, and queue lengths within in the PM Peak hour at Frontier Street / Birch Road during the Opening Day 2025 scenario are still present but are significantly below the thresholds.

Table 3.8: Opening Day + 5 Year (2030) Total Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.03	3	A	0.04	10
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	10	A	0.02	10
	SB	A	0.12	18	A	0.16	20
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A			A		
	WB	A	0.38	31	A	0.49	31
	NB	A	0.14	17	A	0.20	18
	SB	A	0.34	29	A	0.48	31
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.00	8	A	0.02	15
	WB	A	0.04	20	A	0.09	34
	NB	A	0.15	22	B	0.34	31
	SB	A	0.05	9	C	0.62	21
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A			A		
	EB	A	0.33	17	A	0.40	26
	NB	A	0.32	18	A	0.46	28
	SB	A	0.25	11	A	0.11	5

Within the PM peak hour, increases to the volume/capacity ratios and the 95th percentile queues were observed to the north and southbound movements of Frontier Street, at the intersection with Birch Road. The increase saw a Level of Service C on the controlled approaches. However, both movements continue to operate well within the thresholds. No significant impact is observed within the AM peak and across the other intersections of the PM peak.

Table 3.9: Opening Day + 10 Years (2035) Total Traffic Operations

INTERSECTION/ TRAFFIC CONTROL	MOVEMENT	AM			PM		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
Aster Street / Prospect Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.03	3	A	0.04	9
	WB	A	0.00	-	A	0.00	-
	NB	A	0.01	10	A	0.03	10
	SB	A	0.13	16	A	0.18	19
Prospect Street / Birch Road (All-Way Stop Control)	OVERALL	A			A		
	WB	A	0.42	32	A	0.55	38
	NB	A	0.15	21	A	0.23	22
	SB	A	0.39	27	A	0.54	36
Birch Road / Frontier Street (Two-Way Stop Control)	OVERALL	A			A		
	EB	A	0.00	9	A	0.02	20
	WB	A	0.04	19	A	0.10	33
	NB	B	0.17	20	B	0.41	28
	SB	A	0.06	11	C	0.86	32
Birch Road / Pemberton Portage Road / Aspen Blvd (Roundabout)	OVERALL	A			A		
	EB	A	0.37	20	A	0.45	30
	NB	A	0.28	21	A	0.50	34
	SB	A	0.35	12	A	0.13	6

As per the previous results, the introduction of traffic has been demonstrated to have negligible effect on the background 2035 scenario, with minor increases within the PM peak period. The southbound movement volume capacity at Birch Road / Frontier Street is slightly above 0.85 (0.86) but is still below 0.95 and therefore, whilst it is approaching practical capacity, it is still deemed as operational. No mitigation is being suggested to the intersection at Frontier Street / Birch Road as the rest of the intersections operate without issue in the PM peak and has no issues with any movement in the AM peak.

3.2.4 Summary of Traffic Impacts

The surrounding road network operates well within capacity during the weekday AM and PM peak hours. All intersections are below the 0.85 threshold, apart from the southbound movement at Frontier Street / Birch Road in the Total 2035 PM peak, this sees a V/C ratio of 0.86 but the delay queues are still below the thresholds. Across the intersection (northbound), the peak queues are seen to be higher in the PM peak, however this is not caused by the proposed development traffic, but rather the increased through traffic volume.

4. SITE PLAN REVIEW

This section provides a design review of the transportation-related components of the development including the site access driveways, parkade access, loading access, and waste collection facilities. Within this section the bylaw calculations for all vehicle types.

4.1 Site Access Design

As **Exhibit 4.1** indicates, residents would enter and exit the site via a ramp to the south of the site, off Aster Street. The ramp connecting to the underground parkade has a maximum slope of 10%, before leveling out at the bottom of the access ramp. As shown, the site access design allows for concurrent passenger vehicle movements on the ramp entrance and within the parkade.

Residential and commercial visitors to the site would use the on-street parking that is provided within the vicinity of the site.

4.2 Parkade Circulation

Exhibit 4.2 demonstrates passenger vehicle circulation at the key corners within the parkade of where most interactions are likely to occur. The exhibit demonstrates that a standard P-TAC and small passenger vehicle can pass each other at the corners.

The parkade is set out with one driveway aisle. As the parkade is for residential land uses, the parking spaces will be allocated per resident upon the purchase of their unit, therefore, residents will travel directly to their specified space and would not circulate through the rest of the parkade. The allocation of spaces will be based on the vehicle type of the property owners.

The parking spaces that are located at the end of the southern aisle are not accessible by P-TAC passenger vehicles but can be accessed by a small car vehicle (Jeep) as demonstrated in **Exhibits 4.3 and 4.4**. This stall has been demonstrated as accommodating a small car and as such will be labelled as a small car stall, as shown in **Exhibit 4.4**.

4.3 Parking Bylaw Review

4.3.1 Vehicle Parking

The vehicle parking requirements for the proposed development as per *Village of Pemberton Bylaw No. 832, 2018* are noted in **Table 4.1** below along with the proposed provided parking supply.

Table 4.1: Vehicle Parking Supply Requirement & Provision

LAND USE		DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT	PROVIDED	DIFFERENCE
Residential	Studio	4 Units	1 per dwelling unit ¹	4	4	0
	One Bedroom	29 Units	1 per dwelling unit	29	29	0
	Two Bedroom	12 Units	1.75 per dwelling unit	21	15	-6
	Visitor	45	0.25 per dwelling Units	11	6 ²	-8
Commercial	Neighbourhood Commercial	1,021m ²	0.25 per 100m ²	3		
				68	54	-14

1. Studio dwellings are not specified in the Bylaw therefore the one-bedroom rate has been applied.

2. Shared residential visitor/commercial retail

As shown, the development is required to provide a total of 68 parking spaces, including 54 residential spaces, 11 residential visitor spaces, and 3 commercial spaces, while the proposed parking supply is 54 spaces (48 residential, and 6 shared residential visitor/commercial spaces) which is 14 spaces short of the requirement. As such, there is a parking relaxation requested, and the supporting rationale is provided below.

4.4 Parking Relaxation Supporting Rationale

The current proposal seeks a parking relaxation of 20%, or 14 parking spaces. Given the nature and scale of the development and its context within the village centre area of Pemberton Bunt considers the proposed parking provisions to be appropriate. Various factors should be considered in determining the appropriate parking provisions, including the appropriate parking rate requirements as well as the practical use and function of the site and availability of onsite and offsite parking. These factors are described in detail below.

4.4.1 Residential Parking Rate (Two-Bedroom Units)

The Village of Pemberton Zoning Bylaw requires a parking supply rate of 1.75 spaces per unit for 2-bedroom units, which when comparing with other similar municipalities, Bunt considers to be high. Bunt recommends the Village to consider a lower rate of 1.25 per unit, which is in line with average rates of other municipalities of similar size and context that are also located in more remote locations. **Table 4.2** summarizes the two-bedroom + residential parking requirements for various comparable municipalities within BC along with the number of parking spaces that would be required for 2-bedroom + units.

Table 4.2: Two Bedroom Parking Requirements for Comparable Municipalities

MUNICIPALITY	UNITS / AREA	BYLAW RATE	REQUIRED SPACES
Nelson	12	Multi-Unit Residential (2+ Bedrooms): 1 space per dwelling unit	12
Duncan		1.2 per unit with two or more bedrooms	14
Kamloops		1.5 spaces per 2-bedroom unit	18
District of Lillooet		1.25 per Dwelling Unit (includes a visitor parking area)	15
Revelstoke		1.5 per dwelling unit	18
Merritt		1 space per 1 or 2 Bedroom unit	12
Salmon Arm		Upper Floor Dwelling Unit: 1.25 per dwelling unit	15
Oliver		Studio suite, 1 or 2 bedrooms: 1 per dwelling unit	12
Average Rate		1.21 per dwelling unit	15

As shown, the average rate for two-bedroom units or similar in comparable communities in BC would yield a parking requirement of 15 parking spaces, which would be 6 parking spaces less than the Village's current requirement for 2-bedroom + units.

4.4.2 Residential Visitor Parking

The Village of Pemberton Zoning Bylaw requires a residential visitor parking rate of 0.25 spaces per unit, which is also considered to be high compared with recent trends in visitor parking demand for multi-family residential buildings¹. Given the provision of 11 formalized on-street parking spaces on the site frontages (Prospect Street and Aster Street) available to support the development, as well as consideration of visitor parking requirements in other similar municipalities, and other supporting information below, Bunt recommends an adjusted parking supply rate of 0.08 visitor parking spaces per unit be considered by the Village of Pemberton for this development as well as allowing for sharing between residential visitors and commercial customers.

Bunt has prepared the following rationale to support the proposed parking supply of 6 shared visitor/commercial parking spaces.

Table 4.3 summarizes the residential visitor parking requirements for various comparable municipalities within BC.

¹ Bunt data for multi-family residential sites indicates that visitor parking demand is typically in the realm of 0.05 to 0.10 spaces per unit or lower, which is consistent with the MVAPS and RPS studies

Table 4.3: Residential Visitor Parking Requirements for Comparable Municipalities

LAND USE	UNITS / AREA	BYLAW RATE	REQUIRED SPACES
Nelson	45	Multi-Unit Residential (2+ Bedrooms): 0.1 visitor spaces per dwelling unit	5
Duncan		No residential visitor parking requirement	0
Kamloops		Additional 15% for designated visitor parking	7
District of Lillooet		A minimum of 15% of required parking	7
Salmon Arm		No residential visitor parking requirement	0
Revelstoke		No residential visitor parking requirement	0
Merritt		0.1 parking stall per unit	5
Oliver		0.2 parking stall per unit	9
AVERAGE (0.0875/UNIT)			4

Based on the comparable municipalities, the average visitor parking supply rate of 0.0875 spaces per unit would require 4 parking spaces.

Metro Vancouver Apartment Parking Study (2012) & Regional Parking Study (2018)

The Metro Vancouver Apartment Parking Study (MVAPS) is a regional-scale apartment parking study prepared by Metro Vancouver in 2012, and supplemented in 2018 with the Regional Parking Study (RPS). One of the key findings stated in these studies is that visitor parking may be oversupplied throughout the region. Specifically, observed parking demand rates were below 0.10 spaces per apartment unit, compared to the typical municipal requirement of 0.20 visitor spaces per apartment unit.

In addition, interviews undertaken with apartment developers as part of this study indicated that a visitor parking rate of 0.20 spaces per unit was found to be excessive in their experience. As such, in some instances, surplus visitor spaces have been sold to tenants as privately assigned spaces rather than retained as designated visitor parking to be more space economical.

Previous Bunt Parking Studies

Table 4.4 provides a summary of the peak visitor parking rates observed at several multi-family residential buildings in Metro Vancouver. At these locations, peak visitor parking demand data was collected over the course of one to four days.

Table 4.4: Visitor Parking Studies by Bunt

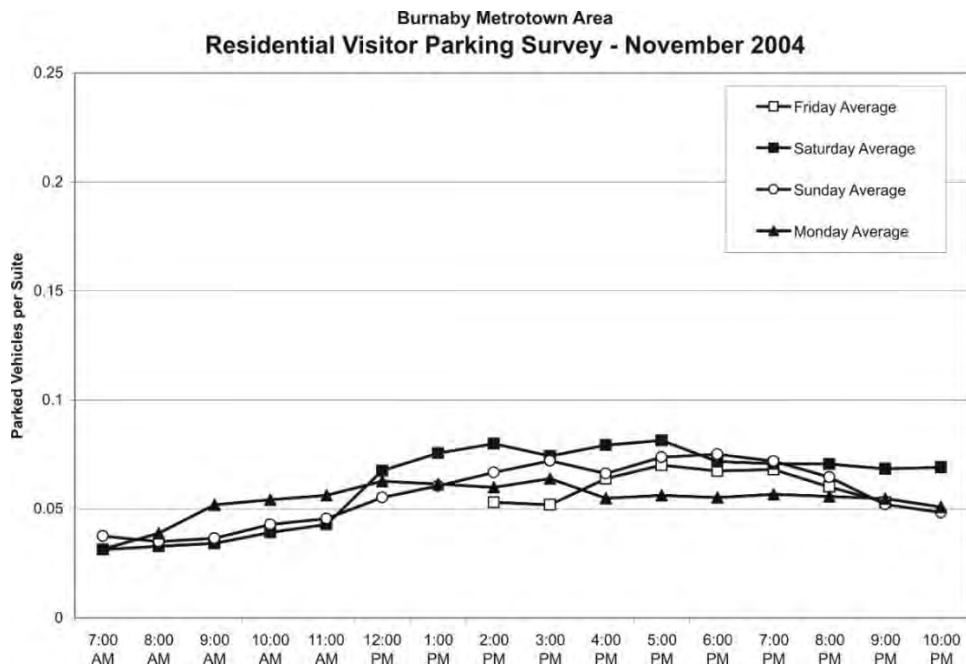
DESCRIPTION	MUNICIPALITY	# DAYS OF DATA	PEAK VISITOR PARKING DEMAND RATE (SPACES/UNIT)
One Lonsdale Corridor Rental Tower	City of North Vancouver	1 Day	0.05
Two Guildford Town Centre Apartment Towers	City of Surrey	4 Days	0.08
Six Metrotown Area Apartment Towers	City of Burnaby	2 Days	0.08

The peak visitor parking demand rate observed ranged from 0.05 to 0.08 spaces per unit. This visitor parking demand falls well under the 0.25 spaces per unit required by the Village of Pemberton.

It should be noted that during the Guildford Towers visitor parking surveys, which covered Friday and Saturday afternoon and evening periods at two buildings, Bunt interviewed the drivers who were using the designated visitor parking spaces. Over 50% of these users indicated that they were residents using the visitor parking for short-term convenience parking. As such, it is Bunt's view that this may be a common occurrence, leading to higher than required visitor parking rates when such rates are based solely on direct observation.

To provide an indication of how visitor parking demand varies over the course of a day, **Figure 4.1** provides the average observed parking demand profile from six Metrotown area apartment buildings included in Bunt's visitor parking study. As this figure indicates, visitor parking demand is generally highest on weekend afternoons, with the highest demand found to be on Saturday afternoon with a demand rate of 0.08 spaces per unit.

Figure 4.1: Residential Visitor Parking Survey



Residential Visitor Parking Summary

Based on the parking rates for comparable municipalities, information from the MVAPS and RPS studies, and Bunt’s visitor parking study as well as the fact that there will be 11 on street parking spaces provided on the site frontage as part of the development it is Bunt's opinion that providing the Village of Pemberton’s current visitor parking rate of 0.25 spaces per unit would overstate the anticipated demand and result in an over-supply of visitor parking for the site. Therefore, Bunt recommends the Village of Pemberton consider a visitor parking supply rate of 0.08 spaces per unit for this development which would equate to a parking supply of 4 visitor parking spaces.

4.4.3 Commercial Parking

The Village of Pemberton Bylaw requires a rate of 0.25 spaces per 100m² of neighbourhood commercial area. Applying this rate to the proposed development results in a requirement of 3 commercial visitor spaces. However, it is important to consider the behaviour of users driving to visit the commercial units within the building. While commercial visitors may utilize underground parking for large-format retailers, they are less likely to enter an underground parkade to visit smaller commercial street-oriented retail units which typically have higher rates of turnover with shorter visits. Further, there is likely to be some internal capture with the mixed-use nature of the development whereby residents living above, or in proximity off-site would not drive and would walk or cycle to the commercial businesses on the site.

Visitors of the commercial units will likely utilize the street parking within the area, and thus the supply of on street parking should be considered adequate to serve the limited commercial parking needs of the site, without providing any commercial parking in the underground parking garage. Notwithstanding this, it is recommended that residential visitor parking be shared with commercial parking to accommodate additional demand that may occur from time to time.

4.4.4 Parking Requirements with Adjusted Rates

Using the recommended parking ratios that were observed in similar contexts across BC as well as supporting information from the MVAPS and RPS studies, Bunt's visitor parking studies, and that there will be 11 on-street parking spaces directly adjacent to the development's frontages, a recommended level of parking for the proposed development has been set out within **Table 4.5**. The parking rate for two-bedroom units has been reduced to 1.25 parking spaces per unit and the visitor parking rate has been reduced from 0.25 to 0.08 spaces per unit (shared with commercial), while commercial parking demands as discussed, could be accommodated with the on-street parking provided along the site frontages and in the surrounding village centre area along with additional shared visitor/commercial parking spaces (6 shared spaces total).

Table 4.5: Vehicle Parking Supply with Adjusted Rates

LAND USE		DENSITY	REQUESTED RATE	ADJUSTED SUPPLY REQUIREMENT	PROVIDED	DIFFERENCE
Residential	Studio	4 Units	1 space per dwelling unit	4	4	0
	One Bedroom	29 Units	1 space per dwelling unit	29	29	0
	Two Bedroom	12 Units	1.25 spaces per dwelling unit	15	15	0
	Visitor	45	0.08 spaces per unit (shared with commercial)	6 shared	6 shared	0
Commercial	Neighbourhood Commercial	1,021m ²	4 spaces to be shared with residential visitors			
				54	54	0

The adjusted requested rates for the residential element of the site are deemed to be more inline with other remote districts within BC. Given the constraints on the site and the provision of on-street parking within the vicinity of the site, this is determined to be a reasonable level of parking for the proposed development.

4.4.5 Existing Parking Provision

The existing site does not provide any parking provision off-street, therefore, residents of the two dwellings and visitors to the small retail unit use the on-street parking provision. The proposed off-street parkade will be able to accommodate all residential parking and visitors associated with the commercial parking. This will, therefore, alleviate the existing on-street parking demand. The additional spaces gained will be able to assist in accommodating the future commercial parking demand.

4.5 Bicycle Parking

Well managed, secure, accessible, and covered bicycle parking will be provided as part of the development plan. The development will supply at least 90 bicycle parking spaces located within a secure bike room within the ground floor and/or parkade levels. The bicycle parking requirement as per the Pemberton Bylaw requires 20% of the required vehicle parking. The provision of 90 bicycle parking spaces is significantly greater than the required 14 bicycle parking spaces (i.e., 20% of 68 required vehicle parking spaces) as per the Bylaw. This bike room will be used as a ski storeroom within the winter months.

4.6 Service Vehicle Operations

Due to the constraints on the site, residential and commercial loading is proposed to occur on-street within the layby provided along Aster Street and Prospect Street. The required number of loading vehicles is in **Table 4.5**.

Table 4.5: Loading Bylaw Rates

LAND USE	DENSITY	BYLAW RATE	BYLAW SUPPLY REQUIREMENT	PROVIDED	DIFFERENCE
Commercial	1,021m ²	1 space for the 300m ² to 500m ² of GFA or 2 spaces for 501m ² to 2,500m ² of GFA, and 1 space	2	0	-2
			2	0	-2

Given the small commercial unit sizes, it is unlikely that there will be frequent loading activity. Curbside loading is considered to be adequate to serve the needs of the site. If there is insufficient space on-street, then the loading vehicle will be able to utilise the residential driveway. It is proposed that a dedicated on-street loading bay between 7am to 5pm, on Aster Street, will be implemented.

Waste collection will take place as per the existing scenario, with garbage being collected on-street. The garbage collection room is located at ground level and therefore, bins will be wheeled out by site management on collection day. The bins will be stored next to the residential driveway access.

Exhibit 4.5 and **Exhibit 4.6** demonstrates the waste collection and medium loading vehicle delivery operation.

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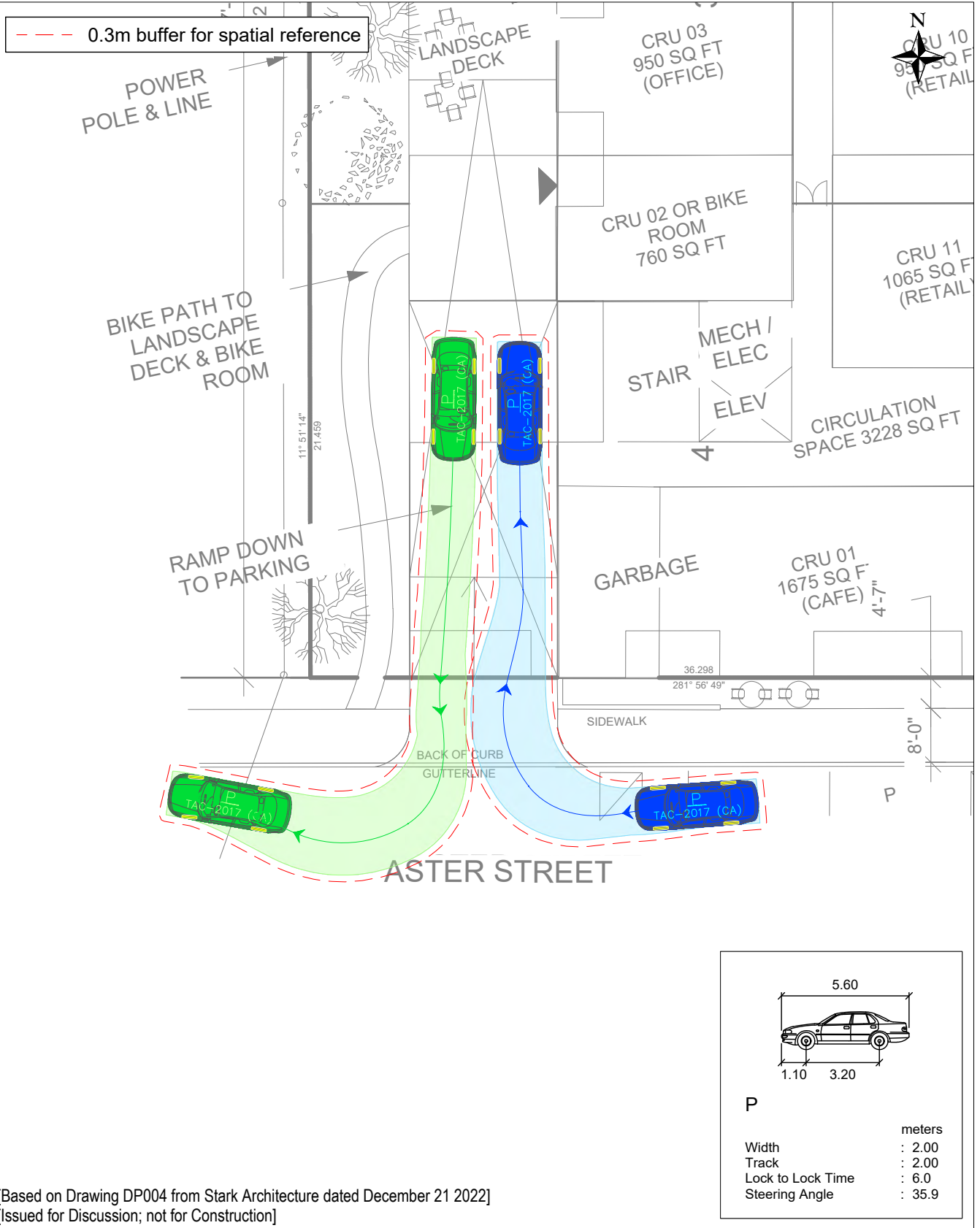


Exhibit 4.1 Passenger Vehicle: Parkade Ramp Entrance Circulation

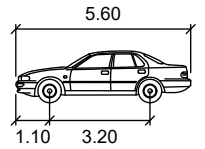
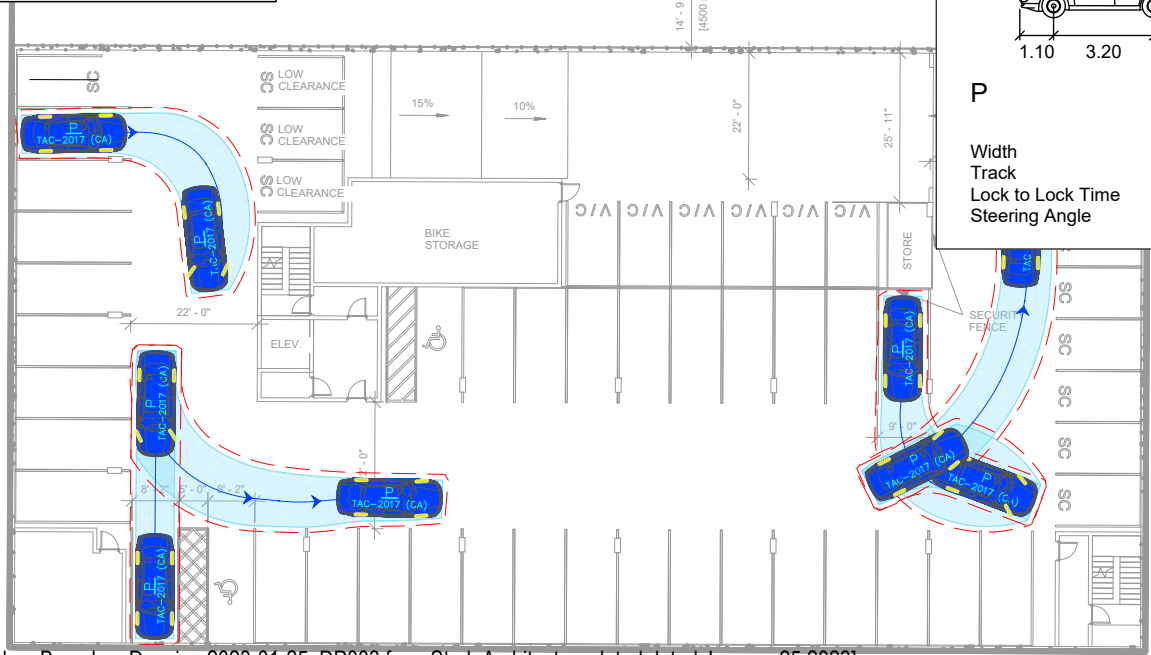


Inbound



--- 0.3m buffer for spatial reference

Outbound



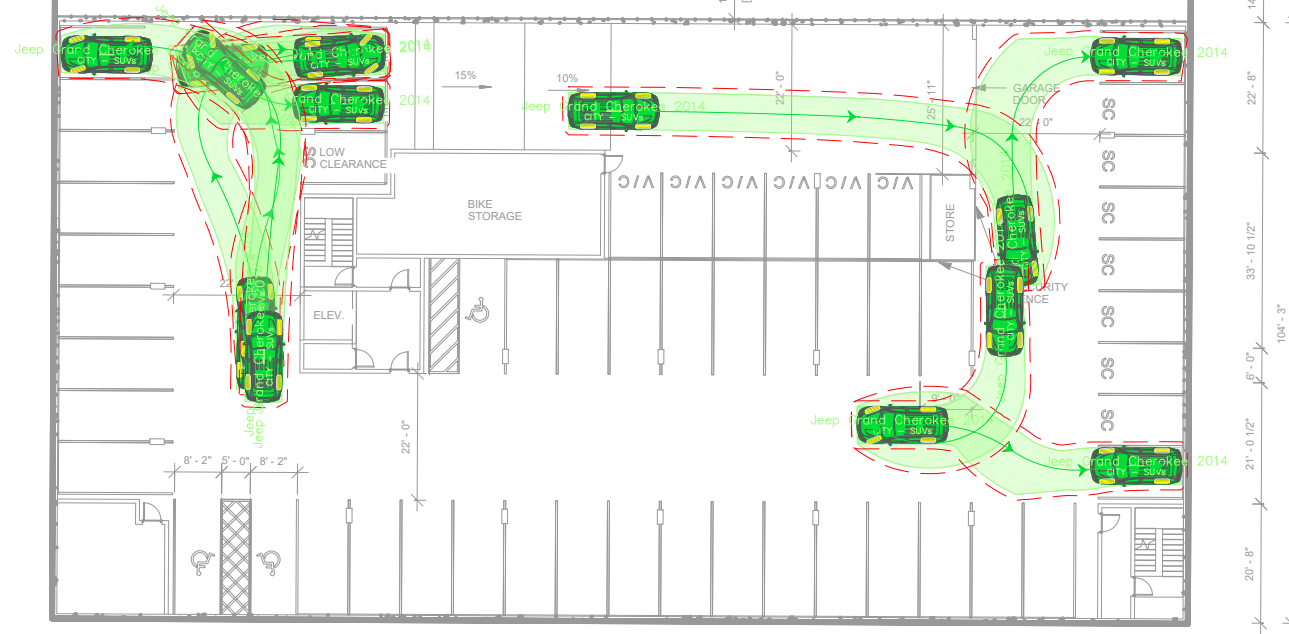
P	Width	Track	Lock to Lock Time	Steering Angle
	: 2.00	: 2.00	: 6.0	: 35.9

[Based on Based on Drawing 2023-01-25_DP003 from Stark Architecture dated dated January 25 2023]
 [Issued for Discussion; not for Construction]

Exhibit 4.3 Passenger Vehicle: Parking Stall Access

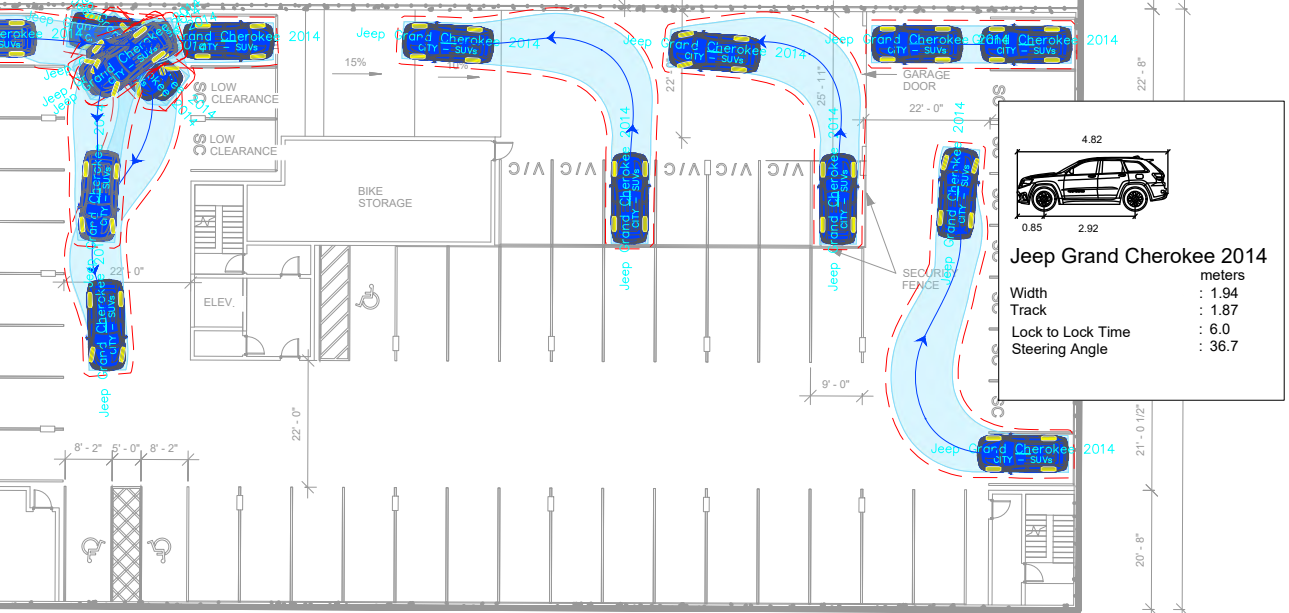


Inbound



--- 0.3m buffer for spatial reference

Outbound



Jeep Grand Cherokee 2014
 meters

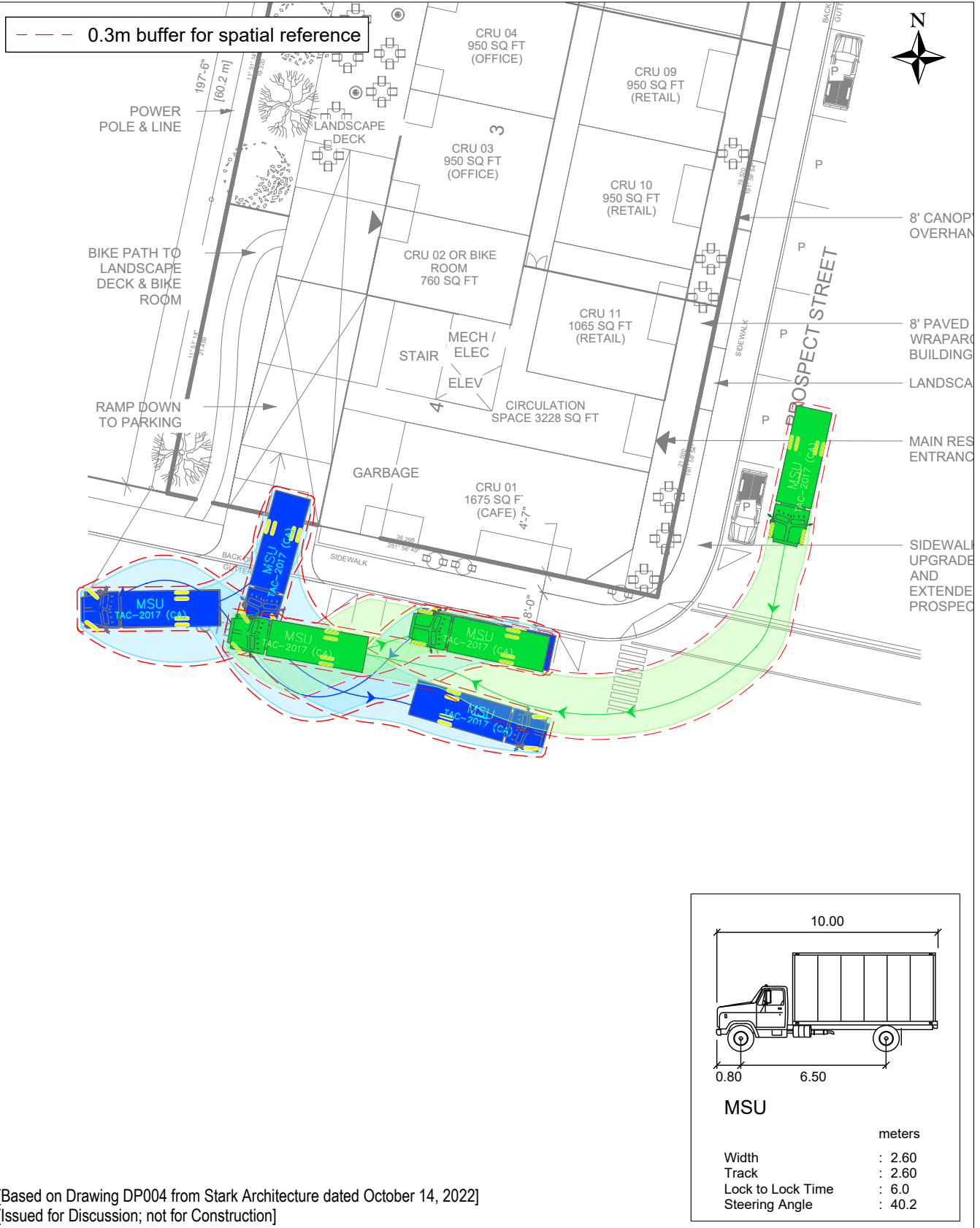
- Width : 1.94
- Track : 1.87
- Lock to Lock Time : 6.0
- Steering Angle : 36.7

[Based on Drawing 2023-01-25_DP003 from Stark Architecture dated January 25 2023]
 [Issued for Discussion; not for Construction]

Exhibit 4.4 Small Vehicle: Parking Stall Access



M:\Operations\Dept BC\Projects\2022\04-22-0348 7421-23-25 Prospect St\4.0 Analysis & Design\2. CAD\04-22-0348_7421-23-25_Prospect_Street_AT_V02-02.dwg
 2023/01/26 14:46, Plotted by Allan Conopia



[Based on Drawing DP004 from Stark Architecture dated October 14, 2022]
 [Issued for Discussion; not for Construction]

Exhibit 4.5 MSU: On-Street Loading Activity

04-22-0348 January 2023 Scale 1:400 on Letter Prepared by HJ



M:\Operations\Dept BC\Projects\2022\04-22-0348 7421-23-25 Prospect St\4.0 Analysis & Design\2. CAD\04-22-0348_7421-23-25_Prospect_Street_AT_V02-02.dwg
 2023/01/26 14:46, Plotted by Allan Conopio

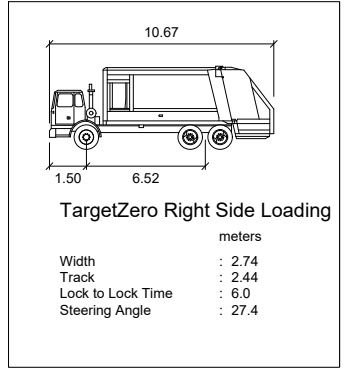
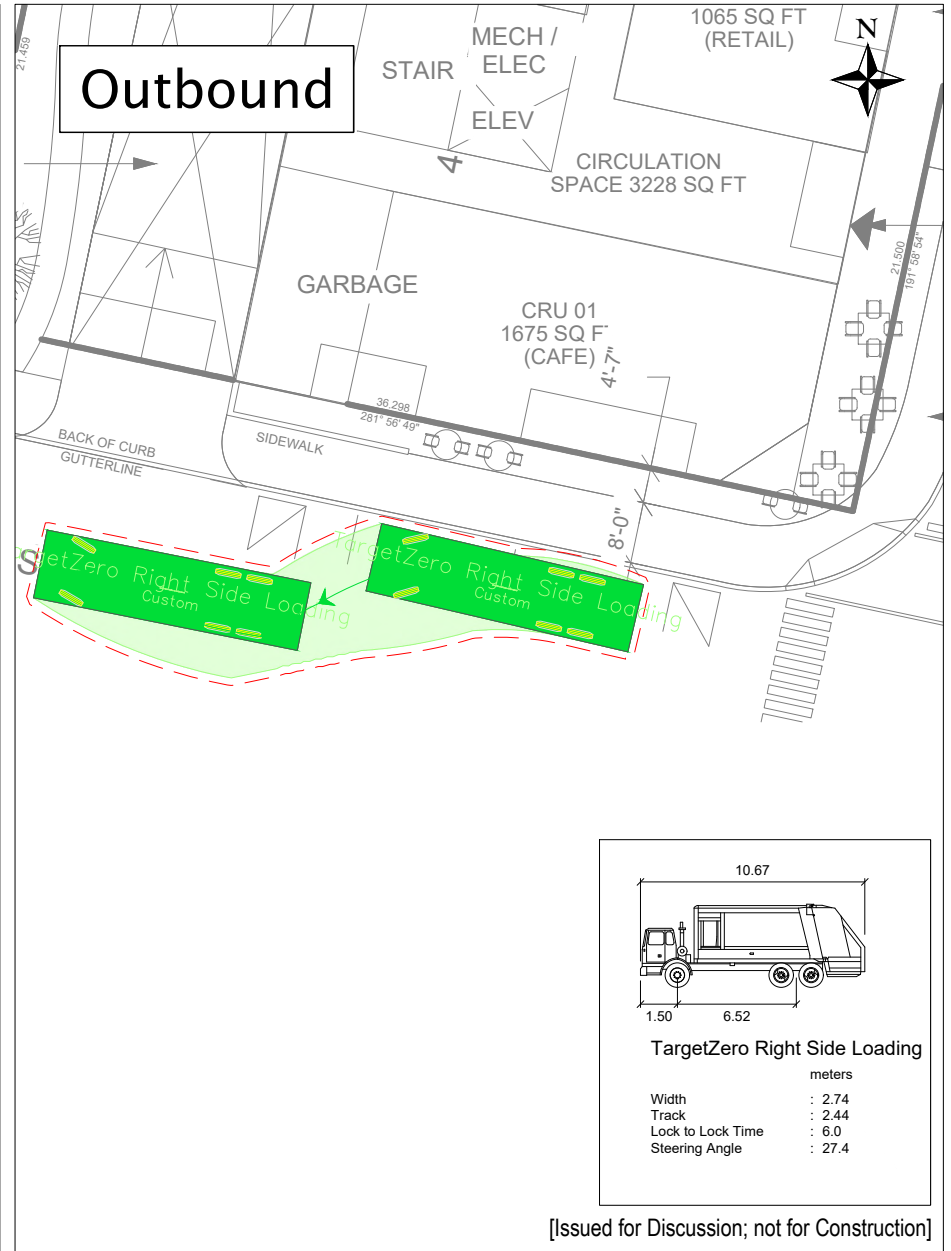


Exhibit 4.6 Side Loader Waste Collector: Garbage / Recycling Collection



5. CONCLUSIONS & RECOMMENDATIONS

Bunt's conclusions and recommendations are presented in the sections below.

5.1 Conclusions

Key points from the study are outlined below.

Existing Conditions

1. The proposed development is located at 7421, 7423, 7425 Prospect Street, BC, which is currently made up of 2 single residential dwellings and a small commercial unit.
2. The site is located to the southwest of Pemberton village, and the corner of the Aster Street / Prospect Street intersection.
3. All intersections within the study area, including the roundabout of Birch Road / Pemberton Portage Ave / Aspen Blvd are within the prescribed operational thresholds for both the Weekday AM and PM peak periods.

Future Traffic

1. The proposed development is anticipated to generate circa 44 and 80 two-way vehicle trips (inbound and outbound combined) during the AM and PM peaks periods respectively.
2. Without the development in place (i.e., background traffic) for both future scenarios, 2030 and 2035 are seen to continue to operate within the thresholds across the network. With no movement or intersection reaching the threshold of 0.85.
3. With the addition of the proposed development's site traffic, the opening day and 2030 scenarios continue to operate sufficiently across all time periods. Within the PM peak hour during the 2035 scenario, the southbound movement of Frontier Street / Birch Road has a Volume Capacity of 0.86 for the southbound approach only, the delay and queue are still considered to be below the thresholds. This result of 0.86 is within the 0.85-0.95 range, which is approaching the operational capacity but not seen to be a significant concern.

Site Design and Development Plan Review

1. The proposed development is planning to provide access from Aster Street, which will provide access to the driveway ramp and ultimately P1.
2. The current site plans show a provision of 54 parking spaces (48 residential, and 6 shared residential visitor and commercial). In addition to this, 11 on-street parking spaces are provided fronting the site.
3. A total of 90 bicycle parking spaces will be provided within the parkade, this is above and beyond the required 14 bicycle spaces as per the bylaw.
4. The garbage and loading for the commercial and residential units will take place on-street as per the existing operations at the site.

5.2 Recommendations

1. The Village of Pemberton consider a parking supply rate of 1.25 spaces per unit for two-bedroom units.
2. Given the context of the rationale provided herein, that the Village of Pemberton consider a parking supply of 0.08 spaces per unit for residential visitor parking (i.e., 4 spaces) and that this should be shared along with shared commercial parking spaces (i.e., total of 6 shared parking spaces).
3. The Village of Pemberton should consider allowing the 11 on-street parking spaces on the site frontage be applicable towards accommodating the future residential visitor and commercial customer short-term parking demands.
4. A short-term loading bay (07:00-17:00 Monday to Friday) to be implemented on Aster Street, to the east of the site driveway to accommodate additional loading demands.

APPENDIX A

Terms of Reference



September 28th, 2022
04-22-0348P

Scott McRae
Manager, Development Services
Village of Pemberton
Box 100, 7400 Prospect Street
Vancouver, BC
V0N 2L0

VIA E-MAIL: smcrae@pemberton.ca

Dear Scott,

**Re: 7421/23/35 Prospect St, Village of Pemberton
Terms of Reference – Transportation Impact Assessment**

We have prepared the following Terms of Reference (ToR) for Bunt & Associates Engineering Ltd. (Bunt) to undertake a Transportation Impact Assessment (TIA) for the proposed residential-led mixed-use development located at 7421 / 7423 / 7435 Prospect Street in the Village of Pemberton. This ToR is intended to be reviewed and approved by the Village of Pemberton (VoP) staff before commencing work on the study.

As part of this Rezoning Application submission Bunt will provide required transportation planning and engineering documents, anticipated at this time to be a TIA report with network modelling and traffic impact. We also anticipate that our services will be required for site design review and provided commentary/guidance on the loading and garbage strategy, supply, and operation.

If you have questions regarding the below or need further clarification, please call me at 604.685.6427 ext. 251 or email me at hjohnston@bunteng.com

Yours truly,

Bunt & Associates

Hugo Johnston, BSc
Transportation Planner

Tyler Thomson, MURB MCIP RPP PTP
Senior Transportation Planner

1. SCOPE OF WORK

1.1 Existing Conditions

- Provide context on-site location, as well as existing site and adjacent land uses.
- Outline the proposed development plan and statistics.
- Describe existing transportations systems of all modes (vehicles, pedestrians, cyclists, and public transit) in the vicinity of the development site in the context of amenities nearby.
- Discuss on-street and off-street parking arrangements adjacent to the site.
- Review any relevant policies or plans from the VoP.
- Undertake transportation counts (vehicles, pedestrians, cyclists and heavy vehicles) at two intersections within the vicinity of the site. These intersections have been selected using knowledge of the area and the anticipated traffic distribution as well as taking into consideration the expected vehicle trip generation for the proposed development. The transportation surveys will be undertaken for the morning (07:00-09:00) and afternoon (16:00-18:00) peak periods at the following intersections:
 - Prospect Street / Aster Street
 - Prospect Street / Birch Road
- Conduct an existing conditions traffic operations analysis at the study intersections using the Synchro traffic analysis model and software program at the intersections listed above

1.2 Future Conditions Assessment

- Background traffic - Apply a 1% annual growth rate to existing traffic volumes (recommended based on the analysis of existing datasets in the region) to develop future background traffic volumes. It is considered that any survey undertaken is similar to levels that were observed prior to the Covid-19 Pandemic, therefore, no additional growth or uplift will be applied to the observed traffic counts.
- Calculate expected future vehicle trip generation based on the ITE Trip Generation Manual and Bunt's Database. The rates Bunt proposes to use are as follows:

LAND USE	QUANTITY	MEASURE	AM PEAK HOUR			PM PEAK HOUR		
			%ENTER	%EXIT	RATE	%ENTER	%EXIT	RATE
ITE 220 - Multifamily Housing (Low-Rise)	45	Units	24%	76%	0.4	63%	37%	0.51
ITE 822 - Strip Plaza Commercial	4,540	Sq ft	60%	40%	2.36	50%	50%	6.59
ITE 712 - Small Office Building Office	4,915	Sq ft	82%	18%	1.67	34%	66%	2.16

- Calculate a net development traffic uplift based on the existing and proposed land usage.
- Assign site-generated traffic onto the study network intersections based on existing traffic distributions in the study area. As part of the study, Bunt intends to conduct traffic operations analysis at the study intersections for the following scenarios:
 - The Existing AM and PM peak hours.
 - Opening Day – Background (2025) AM and PM peak hours; and Opening Day (2025) Total AM and PM traffic conditions.
 - Future Horizon Year (Opening Day + 10 Years)– Background (2035) AM and PM peak hours; and Opening Day + 10 Years (2035) Total AM and PM traffic conditions.
- Assess operations using methods outlined in the Highway Capacity Manual (HCM) 6th Edition, with Synchro 11 and SimTraffic analysis software, where appropriate. Should HCM 6th Edition not provide an appropriate result HCM 2010 will be referred to.

1.3 Site Plan Review

- Utilize AutoTurn software to conduct a review of the proposed site plan to identify and provide feedback on potential traffic-related issues, e.g., vehicle site circulation, intersection sightlines, site access for driveway and parking ramp geometry and locations, waste collection, fire truck/emergency access, and pedestrian, cycling, and micro-mobility facilities.
- Review how non-auto modes will access the site, with connections to the surrounding network.
- Conduct parking (vehicle and bicycle) and loading supply reviews, including conducting a review of VoP’s parking requirements compared to our database to identify a preferred strategy.

1.4 Reporting

- Prepare a TIA draft report to summarize the data, findings, and recommendations.
- Finalized Report based on received comments from the Village.

We look forward to receiving the Village's comments on these proposed Terms of Reference.



To: **Village of Pemberton** Date: **October 14, 2022**
Attention: **Scott McRae | Manager, Development Services** Project No.: **30387**
Cc: **Graham Schulz and Borg Chan (ISL)**
Reference: **Review of Transportation Impact Assessment Terms of Reference for 7421 / 7423 / 7435 Prospect Street Development, Pemberton BC**
From: **Alvin Tse, P.Eng.**

1.0 Introduction

The Village of Pemberton (the Village) retained ISL Engineering (ISL) to review and comment on the letter of *7421/23/35 Prospect St, Village of Pemberton Terms of Reference – Transportation Impact Assessment* issued by Bunt & Associates Engineering (Bunt) on September 28, 2022. To be consistent with other traffic impact studies in Pemberton, ISL also crosschecked the scope of work from these past and ongoing reports. This Technical Memorandum intends to review Bunt's Terms of Reference (ToR) and verify whether their methodologies and assumptions are reasonable. With consideration of the professional ethic practices, Bunt has been informed by ISL before reviewing the ToR.

2.0 General Questions and Specific Comments

The following questions and comments are provided based on reviewing the above available document and crosschecking with other similar studies:

- **Page 1** – Verify the address of the proposed sites. Should “7435” be read as 7425 Prospect Street? Are there two separate lots or side-by-side for this development? It is assumed that it does not include 7427 and 7429.
- **Page 2 | Section 1.1 (6th Bullet)** – Include two additional Portage Road intersections for traffic analysis: unsignalized at Frontier Street / Birch Road as it was previously projected to have the worst traffic performance in Downtown Pemberton, and roundabout at Aspen Boulevard / Pemberton Portage Road as it acts as the gateway of the Downtown core.
- **Page 2 | Section 1.2 (1st Bullet)** – Annual growth rates used for previous Pemberton traffic impact studies were 2% or higher; therefore, annual growth rate of 2% should be used instead of 1%, especially if comparing to pre-pandemic traffic.
- **Page 3 | Section 1.2 (7th Bullet overall)** – For consistency, add a scenario of Future Horizon Year (Opening Day + 5 Years) for Background and Total (combined) traffic conditions to be analyzed.

We trust this Technical Memorandum meets the Village's requirements. If there are any questions or further information is required or need more clarifications, please do not hesitate to contact the undersigned.

Sincerely,



Alvin Tse, P.Eng.
Traffic / Road Safety Engineer

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

APPENDIX B

Synchro and Sidra Reports

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

EX_2022_AM
 11-24-2022



















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	65	126	21	35	142	25
Future Volume (vph)	65	126	21	35	142	25
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	80	156	26	43	175	31

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	236	69	206
Volume Left (vph)	80	0	175
Volume Right (vph)	156	43	0
Hadj (s)	-0.17	-0.28	0.29
Departure Headway (s)	4.4	4.4	4.8
Degree Utilization, x	0.29	0.09	0.28
Capacity (veh/h)	771	755	706
Control Delay (s)	9.2	7.9	9.7
Approach Delay (s)	9.2	7.9	9.7
Approach LOS	A	A	A

Intersection Summary			
Delay		9.2	
Level of Service		A	
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

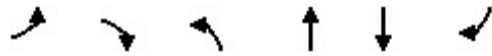
HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

EX_2022_AM
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	176	4	29	207	10	11	2	36	8	0	0
Future Volume (Veh/h)	0	176	4	29	207	10	11	2	36	8	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	0	232	5	38	272	13	14	3	47	11	0	0
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	307			239			601	620	240	662	616	310
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	307			239			601	620	240	662	616	310
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			96	99	94	97	100	100
cM capacity (veh/h)	1242			1337			384	387	774	333	389	715
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	237	323	64	11								
Volume Left	0	38	14	11								
Volume Right	5	13	47	0								
cSH	1242	1337	610	333								
Volume to Capacity	0.00	0.03	0.10	0.03								
Queue Length 95th (m)	0.0	0.7	2.8	0.8								
Control Delay (s)	0.0	1.1	11.6	16.2								
Lane LOS		A	B	C								
Approach Delay (s)	0.0	1.1	11.6	16.2								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.0									
Intersection Capacity Utilization			39.2%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

EX_2022_AM
 11-24-2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	12	208	204	98	100	42
Future Volume (veh/h)	12	208	204	98	100	42
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	15	260	255	122	125	52
Approach Volume (veh/h)	275		377		177	
Crossing Volume (veh/h)	125		15		255	
High Capacity (veh/h)	1256		1369		1134	
High v/c (veh/h)	0.22		0.28		0.16	
Low Capacity (veh/h)	1044		1147		934	
Low v/c (veh/h)	0.26		0.33		0.19	
Intersection Summary						
Maximum v/c High			0.28			
Maximum v/c Low			0.33			
Intersection Capacity Utilization			53.3%		ICU Level of Service	A

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.1
Total Del/Veh (s)	4.6	0.2	3.5	4.5	2.8	4.3	4.2	3.7

2: Frontier Street & Birch Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	All
Denied Del/Veh (s)	0.0		0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
Total Del/Veh (s)	0.8		1.9	0.6	0.2	7.3	3.4	3.5	5.5	1.2

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.4	0.3	0.2	0.2	0.2
Total Del/Veh (s)	1.7	0.4	1.8	3.8	3.8	2.1	2.1	2.7

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1				0.1	0.1	0.1	0.0	0.0	0.0
Total Del/Veh (s)	1.0	0.2				0.0	2.5	1.5	4.5	2.4	3.3

Total Zone Performance

Denied Del/Veh (s)											0.3
Total Del/Veh (s)											35.5

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	27.4	15.7	23.5
Average Queue (m)	17.3	8.9	15.7
95th Queue (m)	28.0	16.6	24.1
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	6.4	10.6	16.2	7.3
Average Queue (m)	0.7	2.6	9.2	2.7
95th Queue (m)	6.0	10.8	16.5	9.4
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	16.7	23.4	17.4
Average Queue (m)	7.9	9.1	8.1
95th Queue (m)	18.9	24.4	18.4
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

















Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	0.9	7.1	12.6
Average Queue (m)	0.3	1.9	9.0
95th Queue (m)	2.8	7.8	14.6
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

EX_2022_AM
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	6	0	2	1	13	0	6	1	4	23	35
Future Volume (Veh/h)	13	6	0	2	1	13	0	6	1	4	23	35
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	16	7	0	2	1	16	0	7	1	5	28	43
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	20			7			110	63	7	60	55	13
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	20			7			110	63	7	60	55	13
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	99	100	99	97	96
cM capacity (veh/h)	1586			1607			800	814	1072	915	823	1061
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	23	19	8	76								
Volume Left	16	2	0	5								
Volume Right	0	16	1	43								
cSH	1586	1607	840	950								
Volume to Capacity	0.01	0.00	0.01	0.08								
Queue Length 95th (m)	0.2	0.0	0.2	2.1								
Control Delay (s)	5.1	0.8	9.3	9.1								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.1	0.8	9.3	9.1								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.1									
Intersection Capacity Utilization			18.1%		ICU Level of Service				A			
Analysis Period (min)			15									

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - EX_2022_AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	378	6.0	1497	0.252	100	2.2	LOSA	1.7	12.6	Full	500	0.0	0.0
Approach	378	6.0		0.252		2.2	LOSA	1.7	12.6				
NorthEast: Aspen Blvd													
Lane 1 ^d	178	5.0	928	0.191	100	3.9	LOSA	1.1	7.8	Full	300	0.0	0.0
Approach	178	5.0		0.191		3.9	LOSA	1.1	7.8				
West: Portage Road													
Lane 1 ^d	275	4.2	1110	0.248	100	1.4	LOSA	1.6	11.9	Full	200	0.0	0.0
Approach	275	4.2		0.248		1.4	LOSA	1.6	11.9				
Intersection	830	5.2		0.252		2.3	LOSA	1.7	12.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE			Cap. veh/h					
Lane 1	255	123	378	6.0	1497	0.252	100	NA	NA	
Approach	255	123	378	6.0		0.252				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W			Cap. veh/h					
Lane 1	125	53	178	5.0	928	0.191	100	NA	NA	
Approach	125	53	178	5.0		0.191				
West: Portage Road										
Mov.	L1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S			Cap. veh/h					
Lane 1	15	260	275	4.2	1110	0.248	100	NA	NA	
Approach	15	260	275	4.2		0.248				

	Total	%HV	Deg.Satn (v/c)
Intersection	830	5.2	0.252

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

EX_2022_PM
 11-24-2022



















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	84	168	41	43	205	39
Future Volume (vph)	84	168	41	43	205	39
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	93	187	46	48	228	43

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	280	94	271
Volume Left (vph)	93	0	228
Volume Right (vph)	187	48	0
Hadj (s)	-0.30	-0.27	0.21
Departure Headway (s)	4.5	4.7	4.9
Degree Utilization, x	0.35	0.12	0.37
Capacity (veh/h)	750	714	695
Control Delay (s)	9.9	8.3	10.8
Approach Delay (s)	9.9	8.3	10.8
Approach LOS	A	A	B

Intersection Summary			
Delay		10.0	
Level of Service		B	
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

EX_2022_PM
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	235	25	81	260	89	11	2	131	48	10	5
Future Volume (Veh/h)	12	235	25	81	260	89	11	2	131	48	10	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	13	253	27	87	280	96	12	2	141	52	11	5
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	393			290			852	870	276	954	835	382
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	393			290			852	870	276	954	835	382
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			93			95	99	81	71	96	99
cM capacity (veh/h)	1160			1261			241	263	756	177	275	640
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	293	463	155	68								
Volume Left	13	87	12	52								
Volume Right	27	96	141	5								
cSH	1160	1261	635	199								
Volume to Capacity	0.01	0.07	0.24	0.34								
Queue Length 95th (m)	0.3	1.8	7.6	11.4								
Control Delay (s)	0.5	2.1	12.5	32.1								
Lane LOS	A	A	B	D								
Approach Delay (s)	0.5	2.1	12.5	32.1								
Approach LOS			B	D								
Intersection Summary												
Average Delay			5.3									
Intersection Capacity Utilization			68.1%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















EX_2022_PM
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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	34	368	402	62	27	31
Future Volume (veh/h)	34	368	402	62	27	31
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	38	413	452	70	30	35
Approach Volume (veh/h)	451			522	65	
Crossing Volume (veh/h)	30			38	452	
High Capacity (veh/h)	1353			1344	970	
High v/c (veh/h)	0.33			0.39	0.07	
Low Capacity (veh/h)	1132			1124	787	
Low v/c (veh/h)	0.40			0.46	0.08	
Intersection Summary						
Maximum v/c High			0.39			
Maximum v/c Low			0.46			
Intersection Capacity Utilization			64.6%		ICU Level of Service	C

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

EX_2022_PM
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	16	2	0	10	18	2	8	2	29	2	55
Future Volume (Veh/h)	18	16	2	0	10	18	2	8	2	29	2	55
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	20	18	2	0	11	20	2	9	2	32	2	61
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	38			20			143	97	19	94	88	29
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	38			20			143	97	19	94	88	29
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	99			100			100	99	100	96	100	94
cM capacity (veh/h)	1538			1609			769	782	1065	849	791	1033
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	40	31	13	95								
Volume Left	20	0	2	32								
Volume Right	2	20	2	61								
cSH	1538	1609	813	957								
Volume to Capacity	0.01	0.00	0.02	0.10								
Queue Length 95th (m)	0.3	0.0	0.4	2.6								
Control Delay (s)	3.7	0.0	9.5	9.2								
Lane LOS	A		A	A								
Approach Delay (s)	3.7	0.0	9.5	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			6.4									
Intersection Capacity Utilization			24.8%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.1
Total Del/Veh (s)	5.2	0.2	4.1	4.4	3.5	4.9	5.5	4.5

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0	0.0	0.3		0.2	0.2	0.2	0.1
Total Del/Veh (s)	4.1	1.2	1.0	3.3	1.3	1.1	8.6		5.3	10.6	8.9	5.0

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.0
Total Del/Veh (s)	2.7

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.6	0.5	0.1	0.1	0.3
Total Del/Veh (s)	1.7	0.3	1.8	5.5	5.5	2.4	2.3	3.8

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.1	0.1	0.1		0.1	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.0	0.1	0.0	0.2	0.0		3.3	1.9	4.4	1.1	3.4	2.1

Total Zone Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	57.0

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	23.7	16.4	25.1
Average Queue (m)	17.0	10.7	17.7
95th Queue (m)	25.1	17.1	26.1
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	11.6	26.0	23.8	17.5
Average Queue (m)	3.7	10.8	14.1	10.9
95th Queue (m)	13.9	26.8	23.1	19.0
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	19.5	38.6	13.9
Average Queue (m)	7.0	13.1	5.4
95th Queue (m)	20.5	38.2	14.8
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	NB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	8.9	17.3
Average Queue (m)	3.9	10.5
95th Queue (m)	11.1	17.5
Link Distance (m)	95.1	128.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - EX_2022_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	521	5.7	1425	0.366	100	2.9	LOSA	2.7	19.9	Full	500	0.0	0.0
Approach	521	5.7		0.366		2.9	LOSA	2.7	19.9				
NorthEast: Aspen Blvd													
Lane 1 ^d	65	4.9	770	0.085	100	4.5	LOSA	0.5	3.3	Full	300	0.0	0.0
Approach	65	4.9		0.085		4.5	LOSA	0.5	3.3				
West: Portage Road													
Lane 1 ^d	452	3.7	1401	0.322	100	0.7	LOSA	2.5	18.3	Full	200	0.0	0.0
Approach	452	3.7		0.322		0.7	LOSA	2.5	18.3				
Intersection	1038	4.7		0.366		2.1	LOSA	2.7	19.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov. From S To Exit:	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	452	70	521	5.7	1425	0.366	100	NA	NA	
Approach	452	70	521	5.7		0.366				
NorthEast: Aspen Blvd										
Mov. From NE To Exit:	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	30	35	65	4.9	770	0.085	100	NA	NA	
Approach	30	35	65	4.9		0.085				
West: Portage Road										
Mov. From W To Exit:	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	38	413	452	3.7	1401	0.322	100	NA	NA	
Approach	38	413	452	3.7		0.322				

	Total	%HV	Deg.Satn (v/c)
Intersection	1038	4.7	0.366

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

BG_AM_2025
 11-25-2022



















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	69	134	22	37	151	27
Future Volume (vph)	69	134	22	37	151	27
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	85	165	27	46	186	33

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	250	73	219
Volume Left (vph)	85	0	186
Volume Right (vph)	165	46	0
Hadj (s)	-0.17	-0.28	0.29
Departure Headway (s)	4.5	4.5	4.9
Degree Utilization, x	0.31	0.09	0.30
Capacity (veh/h)	762	744	699
Control Delay (s)	9.4	8.0	9.9
Approach Delay (s)	9.4	8.0	9.9
Approach LOS	A	A	A

Intersection Summary			
Delay		9.4	
Level of Service		A	
Intersection Capacity Utilization	36.1%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

BG_AM_2025
11-25-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	187	4	31	220	11	12	2	38	8	0	0
Future Volume (Veh/h)	0	187	4	31	220	11	12	2	38	8	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	0	246	5	41	289	14	16	3	50	11	0	0
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	325			253			638	658	254	703	653	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	325			253			638	658	254	703	653	328
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			96	99	93	96	100	100
cM capacity (veh/h)	1223			1322			361	367	761	310	370	699
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	251	344	69	11								
Volume Left	0	41	16	11								
Volume Right	5	14	50	0								
cSH	1223	1322	584	310								
Volume to Capacity	0.00	0.03	0.12	0.04								
Queue Length 95th (m)	0.0	0.8	3.2	0.9								
Control Delay (s)	0.0	1.2	12.0	17.0								
Lane LOS		A	B	C								
Approach Delay (s)	0.0	1.2	12.0	17.0								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			40.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















BG_AM_2025
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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	13	221	216	104	106	45
Future Volume (veh/h)	13	221	216	104	106	45
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	16	276	270	130	132	56
Approach Volume (veh/h)	292			400	188	
Crossing Volume (veh/h)	132			16	270	
High Capacity (veh/h)	1249			1367	1121	
High v/c (veh/h)	0.23			0.29	0.17	
Low Capacity (veh/h)	1038			1146	922	
Low v/c (veh/h)	0.28			0.35	0.20	
Intersection Summary						
Maximum v/c High			0.29			
Maximum v/c Low			0.35			
Intersection Capacity Utilization			55.5%		ICU Level of Service	B

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

BG_AM_2025
11-25-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	6	0	2	1	14	0	6	1	4	25	37
Future Volume (Veh/h)	14	6	0	2	1	14	0	6	1	4	25	37
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	17	7	0	2	1	17	0	7	1	5	31	46
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	21			7			117	66	7	62	58	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	21			7			117	66	7	62	58	14
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	99	100	99	96	96
cM capacity (veh/h)	1584			1607			787	811	1072	911	820	1060
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	24	20	8	82								
Volume Left	17	2	0	5								
Volume Right	0	17	1	46								
cSH	1584	1607	836	946								
Volume to Capacity	0.01	0.00	0.01	0.09								
Queue Length 95th (m)	0.3	0.0	0.2	2.3								
Control Delay (s)	5.2	0.7	9.3	9.2								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.2	0.7	9.3	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.2									
Intersection Capacity Utilization			18.4%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1
Total Del/Veh (s)	4.6	0.3	3.6	4.3	3.4	4.7	4.8	4.0

2: Frontier Street & Birch Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.0
Total Del/Veh (s)	0.9	0.7	2.3	0.8	0.4	7.7	9.9	3.7	7.4	1.5

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.4	0.4	0.2	0.3	0.2
Total Del/Veh (s)	1.5	0.3	1.8	3.8	4.0	2.0	2.4	2.7

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1		0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.3	0.0		0.0	4.5	1.5	4.9	2.3	3.2	2.3

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	33.8

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	25.1	17.2	27.1
Average Queue (m)	17.6	9.5	18.0
95th Queue (m)	25.3	17.2	27.7
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	5.9	18.0	15.4	7.3
Average Queue (m)	1.0	4.9	9.7	2.4
95th Queue (m)	7.4	17.2	17.3	9.0
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	17.2	22.1	17.3
Average Queue (m)	7.1	8.0	8.8
95th Queue (m)	17.7	23.3	20.4
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	2.8	7.9	15.1
Average Queue (m)	0.4	2.0	10.0
95th Queue (m)	3.5	8.1	15.8
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - BG_2025_AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	400	6.0	1493	0.268	100	2.2	LOSA	1.9	13.7	Full	500	0.0	0.0
Approach	400	6.0		0.268		2.2	LOSA	1.9	13.7				
NorthEast: Aspen Blvd													
Lane 1 ^d	189	5.0	914	0.206	100	4.0	LOSA	1.2	8.6	Full	300	0.0	0.0
Approach	189	5.0		0.206		4.0	LOSA	1.2	8.6				
West: Portage Road													
Lane 1 ^d	293	4.2	1101	0.266	100	1.4	LOSA	1.8	13.0	Full	200	0.0	0.0
Approach	293	4.2		0.266		1.4	LOSA	1.8	13.0				
Intersection	881	5.2		0.268		2.3	LOSA	1.9	13.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	270	130	400	6.0	1493	0.268	100	NA	NA	
Approach	270	130	400	6.0		0.268				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	133	56	189	5.0	914	0.206	100	NA	NA	
Approach	133	56	189	5.0		0.206				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	16	276	293	4.2	1101	0.266	100	NA	NA	
Approach	16	276	293	4.2		0.266				










	Total	%HV	Deg.Satn (v/c)
Intersection	881	5.2	0.268

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

















HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	89	178	44	46	218	41
Future Volume (vph)	89	178	44	46	218	41
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	99	198	49	51	242	46
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	297	100	288			
Volume Left (vph)	99	0	242			
Volume Right (vph)	198	51	0			
Hadj (s)	-0.30	-0.27	0.21			
Departure Headway (s)	4.6	4.7	5.0			
Degree Utilization, x	0.38	0.13	0.40			
Capacity (veh/h)	739	700	687			
Control Delay (s)	10.3	8.5	11.2			
Approach Delay (s)	10.3	8.5	11.2			
Approach LOS	B	A	B			
Intersection Summary						
Delay			10.4			
Level of Service			B			
Intersection Capacity Utilization			44.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 2: Frontier Street & Birch Road

BG_PM_2025
 11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	249	27	86	276	94	12	2	139	51	11	5
Future Volume (Veh/h)	13	249	27	86	276	94	12	2	139	51	11	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	14	268	29	92	297	101	13	2	149	55	12	5
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	415			307			900	920	292	1009	884	402
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	415			307			900	920	292	1009	884	402
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			93			94	99	80	65	95	99
cM capacity (veh/h)	1138			1243			221	244	741	159	256	624
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	311	490	164	72								
Volume Left	14	92	13	55								
Volume Right	29	101	149	5								
cSH	1138	1243	612	179								
Volume to Capacity	0.01	0.07	0.27	0.40								
Queue Length 95th (m)	0.3	1.9	8.6	14.2								
Control Delay (s)	0.5	2.2	13.0	37.9								
Lane LOS	A	A	B	E								
Approach Delay (s)	0.5	2.2	13.0	37.9								
Approach LOS			B	E								
Intersection Summary												
Average Delay			5.9									
Intersection Capacity Utilization			71.3%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















BG_PM_2025
 11-24-2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	36	391	427	66	29	33
Future Volume (veh/h)	36	391	427	66	29	33
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	40	439	480	74	33	37
Approach Volume (veh/h)	479		554		70	
Crossing Volume (veh/h)	33		40		480	
High Capacity (veh/h)	1349		1342		948	
High v/c (veh/h)	0.35		0.41		0.07	
Low Capacity (veh/h)	1129		1123		768	
Low v/c (veh/h)	0.42		0.49		0.09	
Intersection Summary						
Maximum v/c High			0.41			
Maximum v/c Low			0.49			
Intersection Capacity Utilization			67.7%		ICU Level of Service	C

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

BG_PM_2025
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	17	2	0	11	19	2	9	2	30	3	58
Future Volume (Veh/h)	19	17	2	0	11	19	2	9	2	30	3	58
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	21	19	2	0	12	21	2	10	2	33	3	64
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	40			21			151	102	20	98	92	30
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	40			21			151	102	20	98	92	30
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	99			100			100	99	100	96	100	94
cM capacity (veh/h)	1535			1608			756	776	1064	841	786	1031
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	42	33	14	100								
Volume Left	21	0	2	33								
Volume Right	2	21	2	64								
cSH	1535	1608	804	951								
Volume to Capacity	0.01	0.00	0.02	0.11								
Queue Length 95th (m)	0.3	0.0	0.4	2.8								
Control Delay (s)	3.7	0.0	9.6	9.2								
Lane LOS	A		A	A								
Approach Delay (s)	3.7	0.0	9.6	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			6.4									
Intersection Capacity Utilization			25.7%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.1
Total Del/Veh (s)	5.3	0.2	4.3	5.0	3.5	5.5	5.1	4.9

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.1	0.2	0.1
Total Del/Veh (s)	2.4	1.2	0.9	2.9	1.1	1.0	9.7	10.2	5.4	10.3	10.2	5.0

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	2.7

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.6	0.6	0.1	0.2	0.3
Total Del/Veh (s)	1.8	0.7	1.8	5.1	4.8	2.1	2.4	3.5

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.2	0.1		0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.1	0.0	0.1	0.0		3.3	2.7	3.8	1.1	3.4	2.1

Total Zone Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	58.3

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	24.4	15.9	31.2
Average Queue (m)	17.7	10.1	19.9
95th Queue (m)	25.6	17.2	31.2
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	13.4	21.6	27.2	19.0
Average Queue (m)	3.6	9.6	15.3	11.5
95th Queue (m)	13.1	25.0	26.5	19.3
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	21.1	34.1	12.7
Average Queue (m)	6.4	11.3	6.1
95th Queue (m)	20.8	31.6	14.9
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	1.8	8.9	16.4
Average Queue (m)	0.3	3.3	10.1
95th Queue (m)	2.7	10.2	16.2
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - BG_2025_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	554	5.7	1422	0.390	100	3.0	LOSA	3.0	21.9	Full	500	0.0	0.0
Approach	554	5.7		0.390		3.0	LOSA	3.0	21.9				
NorthEast: Aspen Blvd													
Lane 1 ^d	70	4.9	749	0.093	100	4.8	LOSA	0.5	3.7	Full	300	0.0	0.0
Approach	70	4.9		0.093		4.8	LOSA	0.5	3.7				
West: Portage Road													
Lane 1 ^d	480	3.7	1396	0.344	100	0.7	LOSA	2.8	20.1	Full	200	0.0	0.0
Approach	480	3.7		0.344		0.7	LOSA	2.8	20.1				
Intersection	1103	4.7		0.390		2.1	LOSA	3.0	21.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov. From S To Exit:	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	480	74	554	5.7	1422	0.390	100	NA	NA	
Approach	480	74	554	5.7		0.390				
NorthEast: Aspen Blvd										
Mov. From NE To Exit:	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	33	37	70	4.9	749	0.093	100	NA	NA	
Approach	33	37	70	4.9		0.093				
West: Portage Road										
Mov. From W To Exit:	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	40	439	480	3.7	1396	0.344	100	NA	NA	
Approach	40	439	480	3.7		0.344				

	Total	%HV	Deg.Satn (v/c)
Intersection	1103	4.7	0.390

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1
Total Del/Veh (s)	4.8	0.3	4.0	3.8	3.1	4.7	4.3	4.0

2: Frontier Street & Birch Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	All
Denied Del/Veh (s)	0.1	0.0	0.1	0.0	0.0	0.1	0.3	0.1	0.1	0.1
Total Del/Veh (s)	0.9	0.7	2.1	0.8	0.6	6.0	8.6	3.7	6.7	1.3

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.4	0.4	0.2	0.3	0.2
Total Del/Veh (s)	2.2	0.2	2.4	4.3	4.2	2.2	2.5	3.2

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1				0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.0	0.3				0.0	3.2	5.3	2.3	3.2	2.2

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	37.2

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	28.1	17.9	26.6
Average Queue (m)	19.4	10.6	18.0
95th Queue (m)	29.1	17.8	27.3
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	2.3	12.4	18.1	9.2
Average Queue (m)	0.3	3.8	10.6	3.1
95th Queue (m)	3.8	13.2	18.6	10.0
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	22.2	26.4	21.4
Average Queue (m)	11.2	10.9	9.3
95th Queue (m)	23.4	28.5	21.9
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	0.9	8.7	13.4
Average Queue (m)	0.1	2.3	9.4
95th Queue (m)	1.9	9.0	15.3
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

BG_AM_2030
 11-25-2022



















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	76	148	25	41	166	29
Future Volume (vph)	76	148	25	41	166	29
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	94	183	31	51	205	36

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	277	82	241
Volume Left (vph)	94	0	205
Volume Right (vph)	183	51	0
Hadj (s)	-0.17	-0.28	0.29
Departure Headway (s)	4.5	4.6	5.0
Degree Utilization, x	0.35	0.11	0.33
Capacity (veh/h)	747	721	685
Control Delay (s)	10.0	8.2	10.4
Approach Delay (s)	10.0	8.2	10.4
Approach LOS	A	A	B

Intersection Summary			
Delay		9.9	
Level of Service		A	
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

BG_AM_2030
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	206	5	34	243	12	13	2	42	9	0	0
Future Volume (Veh/h)	0	206	5	34	243	12	13	2	42	9	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	0	271	7	45	320	16	17	3	55	12	0	0
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	358			280			704	724	280	774	720	360
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	358			280			704	724	280	774	720	360
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			95	99	93	96	100	100
cM capacity (veh/h)	1190			1292			325	335	735	274	337	671
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	278	381	75	12								
Volume Left	0	45	17	12								
Volume Right	7	16	55	0								
cSH	1190	1292	551	274								
Volume to Capacity	0.00	0.03	0.14	0.04								
Queue Length 95th (m)	0.0	0.9	3.8	1.1								
Control Delay (s)	0.0	1.2	12.6	18.7								
Lane LOS		A	B	C								
Approach Delay (s)	0.0	1.2	12.6	18.7								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			42.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	14	244	239	115	117	49
Future Volume (veh/h)	14	244	239	115	117	49
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	18	305	299	144	146	61
Approach Volume (veh/h)	323		443		207	
Crossing Volume (veh/h)	146		18		299	
High Capacity (veh/h)	1235		1365		1095	
High v/c (veh/h)	0.26		0.32		0.19	
Low Capacity (veh/h)	1025		1144		899	
Low v/c (veh/h)	0.31		0.39		0.23	
Intersection Summary						
Maximum v/c High			0.32			
Maximum v/c Low			0.39			
Intersection Capacity Utilization			59.3%		ICU Level of Service	B

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

BG_AM_2030
11-25-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	7	0	2	1	15	0	7	1	5	27	41
Future Volume (Veh/h)	15	7	0	2	1	15	0	7	1	5	27	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	19	9	0	2	1	19	0	9	1	6	33	51
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	23			9			130	74	9	70	64	14
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	23			9			130	74	9	70	64	14
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	99	100	99	96	95
cM capacity (veh/h)	1582			1604			765	802	1070	898	811	1059
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	28	22	10	90								
Volume Left	19	2	0	6								
Volume Right	0	19	1	51								
cSH	1582	1604	822	942								
Volume to Capacity	0.01	0.00	0.01	0.10								
Queue Length 95th (m)	0.3	0.0	0.3	2.5								
Control Delay (s)	5.0	0.7	9.4	9.2								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.0	0.7	9.4	9.2								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.2									
Intersection Capacity Utilization			20.1%		ICU Level of Service				A			
Analysis Period (min)			15									

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - BG_2030_AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	443	6.0	1492	0.297	100	2.2	LOSA	2.2	16.1	Full	500	0.0	0.0
Approach	443	6.0		0.297		2.2	LOSA	2.2	16.1				
NorthEast: Aspen Blvd													
Lane 1 ^d	208	5.0	888	0.234	100	4.3	LOSA	1.4	9.9	Full	300	0.0	0.0
Approach	208	5.0		0.234		4.3	LOSA	1.4	9.9				
West: Portage Road													
Lane 1 ^d	323	4.2	1078	0.299	100	1.6	LOSA	2.1	15.0	Full	200	0.0	0.0
Approach	323	4.2		0.299		1.6	LOSA	2.1	15.0				
Intersection	973	5.2		0.299		2.4	LOSA	2.2	16.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE			Cap. veh/h					
Lane 1	299	144	443	6.0	1492	0.297	100	NA	NA	
Approach	299	144	443	6.0		0.297				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W			Cap. veh/h					
Lane 1	146	61	208	5.0	888	0.234	100	NA	NA	
Approach	146	61	208	5.0		0.234				
West: Portage Road										
Mov.	L1	R2	Total	%HV		Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S			Cap. veh/h					
Lane 1	18	305	323	4.2	1078	0.299	100	NA	NA	
Approach	18	305	323	4.2		0.299				

	Total	%HV	Deg.Satn (v/c)
Intersection	973	5.2	0.299

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.2
Total Del/Veh (s)	5.3	0.3	4.5	4.6	3.7	5.4	6.1	5.0

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.2	0.1
Total Del/Veh (s)	4.1	1.3	1.4	3.3	1.4	1.3	13.2	7.9	7.0	13.1	13.9	18.5

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	3.4

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.6	0.5	0.2	0.1	0.3
Total Del/Veh (s)	2.6	0.6	2.2	5.6	5.6	3.0	2.9	4.1

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.1	0.2	0.1		0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.8	0.0	0.0	0.2	0.0		3.3	1.7	4.1	1.1	3.4	2.0

Total Zone Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	68.5

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	28.8	18.0	31.3
Average Queue (m)	19.5	11.8	21.1
95th Queue (m)	29.7	18.8	31.9
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	18.6	28.8	25.4	21.2
Average Queue (m)	5.2	14.3	16.5	12.0
95th Queue (m)	17.2	31.6	27.5	20.2
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	24.9	34.6	15.8
Average Queue (m)	9.0	13.5	7.5
95th Queue (m)	27.9	38.5	18.4
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	NB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	10.2	15.3
Average Queue (m)	4.3	9.9
95th Queue (m)	12.1	15.8
Link Distance (m)	95.1	128.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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














Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	98	197	48	50	240	46
Future Volume (vph)	98	197	48	50	240	46
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	109	219	53	56	267	51

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	328	109	318
Volume Left (vph)	109	0	267
Volume Right (vph)	219	56	0
Hadj (s)	-0.30	-0.27	0.21
Departure Headway (s)	4.7	4.9	5.1
Degree Utilization, x	0.43	0.15	0.45
Capacity (veh/h)	722	676	672
Control Delay (s)	11.1	8.8	12.2
Approach Delay (s)	11.1	8.8	12.2
Approach LOS	B	A	B

Intersection Summary			
Delay		11.2	
Level of Service		B	
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	275	29	95	305	104	13	2	153	56	12	6
Future Volume (Veh/h)	14	275	29	95	305	104	13	2	153	56	12	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	15	296	31	102	328	112	14	2	165	60	13	6
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	457			337			989	1012	322	1112	972	438
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	457			337			989	1012	322	1112	972	438
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			92			93	99	77	53	94	99
cM capacity (veh/h)	1099			1212			189	213	713	129	225	595
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	342	542	181	79								
Volume Left	15	102	14	60								
Volume Right	31	112	165	6								
cSH	1099	1212	575	148								
Volume to Capacity	0.01	0.08	0.31	0.53								
Queue Length 95th (m)	0.3	2.2	10.7	21.1								
Control Delay (s)	0.5	2.3	14.1	54.4								
Lane LOS	A	A	B	F								
Approach Delay (s)	0.5	2.3	14.1	54.4								
Approach LOS			B	F								
Intersection Summary												
Average Delay			7.2									
Intersection Capacity Utilization			77.6%		ICU Level of Service				D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	40	431	471	73	32	36
Future Volume (veh/h)	40	431	471	73	32	36
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	45	484	529	82	36	40
Approach Volume (veh/h)	529		611		76	
Crossing Volume (veh/h)	36		45		529	
High Capacity (veh/h)	1346		1337		912	
High v/c (veh/h)	0.39		0.46		0.08	
Low Capacity (veh/h)	1126		1118		735	
Low v/c (veh/h)	0.47		0.55		0.10	
Intersection Summary						
Maximum v/c High			0.46			
Maximum v/c Low			0.55			
Intersection Capacity Utilization			73.2%		ICU Level of Service	D

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

BG_PM_2030
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	19	2	0	12	21	2	10	2	33	3	64
Future Volume (Veh/h)	21	19	2	0	12	21	2	10	2	33	3	64
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	23	21	2	0	13	23	2	11	2	37	3	71
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	43			23			166	111	22	107	100	32
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	43			23			166	111	22	107	100	32
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	98			100			100	99	100	96	100	93
cM capacity (veh/h)	1531			1605			733	767	1061	829	777	1029
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	46	36	15	111								
Volume Left	23	0	2	37								
Volume Right	2	23	2	71								
cSH	1531	1605	791	944								
Volume to Capacity	0.02	0.00	0.02	0.12								
Queue Length 95th (m)	0.4	0.0	0.5	3.2								
Control Delay (s)	3.7	0.0	9.6	9.3								
Lane LOS	A		A	A								
Approach Delay (s)	3.7	0.0	9.6	9.3								
Approach LOS			A	A								
Intersection Summary												
Average Delay			6.5									
Intersection Capacity Utilization			27.3%		ICU Level of Service				A			
Analysis Period (min)			15									

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - BG_2030_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	611	5.7	1413	0.432	100	3.0	LOSA	3.5	25.8	Full	500	0.0	0.0
Approach	611	5.7		0.432		3.0	LOSA	3.5	25.8				
NorthEast: Aspen Blvd													
Lane 1 ^d	76	4.9	710	0.108	100	5.3	LOSA	0.6	4.3	Full	300	0.0	0.0
Approach	76	4.9		0.108		5.3	LOSA	0.6	4.3				
West: Portage Road													
Lane 1 ^d	529	3.7	1388	0.381	100	0.8	LOSA	3.2	23.4	Full	200	0.0	0.0
Approach	529	3.7		0.381		0.8	LOSA	3.2	23.4				
Intersection	1217	4.7		0.432		2.2	LOSA	3.5	25.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov. From S To Exit:	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	529	82	611	5.7	1413	0.432	100	NA	NA	
Approach	529	82	611	5.7		0.432				
NorthEast: Aspen Blvd										
Mov. From NE To Exit:	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	36	40	76	4.9	710	0.108	100	NA	NA	
Approach	36	40	76	4.9		0.108				
West: Portage Road										
Mov. From W To Exit:	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	45	484	529	3.7	1388	0.381	100	NA	NA	
Approach	45	484	529	3.7		0.381				

	Total	%HV	Deg.Satn (v/c)
Intersection	1217	4.7	0.432

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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














Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	84	163	27	45	184	32
Future Volume (vph)	84	163	27	45	184	32
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	104	201	33	56	227	40

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	305	89	267
Volume Left (vph)	104	0	227
Volume Right (vph)	201	56	0
Hadj (s)	-0.17	-0.28	0.29
Departure Headway (s)	4.6	4.8	5.1
Degree Utilization, x	0.39	0.12	0.38
Capacity (veh/h)	732	699	672
Control Delay (s)	10.6	8.4	11.1
Approach Delay (s)	10.6	8.4	11.1
Approach LOS	B	A	B

Intersection Summary			
Delay		10.5	
Level of Service		B	
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 2: Frontier Street & Birch Road

BG_AM_2035
 11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	228	5	38	268	13	14	3	47	10	0	0
Future Volume (Veh/h)	0	228	5	38	268	13	14	3	47	10	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	0	300	7	50	353	17	18	4	62	13	0	0
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	392			309			777	798	308	854	792	394
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	392			309			777	798	308	854	792	394
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			96			94	99	91	95	100	100
cM capacity (veh/h)	1156			1261			289	303	708	237	305	642
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	307	420	84	13								
Volume Left	0	50	18	13								
Volume Right	7	17	62	0								
cSH	1156	1261	515	237								
Volume to Capacity	0.00	0.04	0.16	0.05								
Queue Length 95th (m)	0.0	1.0	4.6	1.4								
Control Delay (s)	0.0	1.3	13.3	21.0								
Lane LOS		A	B	C								
Approach Delay (s)	0.0	1.3	13.3	21.0								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			45.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	16	269	264	127	129	54
Future Volume (veh/h)	16	269	264	127	129	54
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	20	336	330	159	161	68
Approach Volume (veh/h)	356		489		229	
Crossing Volume (veh/h)	161		20		330	
High Capacity (veh/h)	1221		1363		1069	
High v/c (veh/h)	0.29		0.36		0.21	
Low Capacity (veh/h)	1012		1142		875	
Low v/c (veh/h)	0.35		0.43		0.26	
Intersection Summary						
Maximum v/c High			0.36			
Maximum v/c Low			0.43			
Intersection Capacity Utilization			63.6%		ICU Level of Service	B

HCM Unsignalized Intersection Capacity Analysis
 4: Aster Street & Prospect Street

BG_AM_2035
 11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	8	0	3	1	17	0	8	1	5	30	45
Future Volume (Veh/h)	17	8	0	3	1	17	0	8	1	5	30	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	21	10	0	4	1	21	0	10	1	6	37	56
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	25			10			147	85	10	80	74	16
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	25			10			147	85	10	80	74	16
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			100	99	100	99	95	95
cM capacity (veh/h)	1579			1603			737	789	1068	881	799	1057
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	31	26	11	99								
Volume Left	21	4	0	6								
Volume Right	0	21	1	56								
cSH	1579	1603	808	933								
Volume to Capacity	0.01	0.00	0.01	0.11								
Queue Length 95th (m)	0.3	0.1	0.3	2.8								
Control Delay (s)	5.0	1.1	9.5	9.3								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.0	1.1	9.5	9.3								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.2									
Intersection Capacity Utilization			20.3%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.1
Total Del/Veh (s)	5.1	0.4	4.1	4.5	3.7	4.7	4.8	4.1

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Del/Veh (s)		0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.1		0.1
Total Del/Veh (s)		0.9	0.4	2.6	1.0	0.7	10.2	12.0	4.6	8.7		1.7

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.5	0.4	0.2	0.2	0.3
Total Del/Veh (s)	2.1	0.3	2.2	5.7	5.7	2.6	2.7	3.9

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.0	0.8	0.0	0.0	3.3	1.8	3.9	2.5	3.4	2.1

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	40.9

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	31.9	21.6	26.9
Average Queue (m)	20.9	12.2	17.1
95th Queue (m)	32.0	21.0	26.6
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	8.3	21.2	19.0	10.4
Average Queue (m)	1.2	6.1	11.6	3.3
95th Queue (m)	8.7	18.9	20.0	11.0
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	25.8	34.6	20.3
Average Queue (m)	11.6	16.5	11.5
95th Queue (m)	26.4	41.1	23.9
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	2.7	9.5	16.6
Average Queue (m)	0.4	2.6	10.3
95th Queue (m)	3.4	9.5	16.2
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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














Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	109	217	53	56	265	50
Future Volume (vph)	109	217	53	56	265	50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	121	241	59	62	294	56

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	362	121	350
Volume Left (vph)	121	0	294
Volume Right (vph)	241	62	0
Hadj (s)	-0.30	-0.27	0.21
Departure Headway (s)	4.8	5.1	5.2
Degree Utilization, x	0.49	0.17	0.51
Capacity (veh/h)	703	646	655
Control Delay (s)	12.4	9.2	13.6
Approach Delay (s)	12.4	9.2	13.6
Approach LOS	B	A	B

Intersection Summary			
Delay		12.4	
Level of Service		B	
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	304	32	105	336	115	14	3	169	62	13	6
Future Volume (Veh/h)	16	304	32	105	336	115	14	3	169	62	13	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	17	327	34	113	361	124	15	3	182	67	14	6
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	502			371			1087	1116	354	1228	1071	477
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	502			371			1087	1116	354	1228	1071	477
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			90			91	98	73	33	93	99
cM capacity (veh/h)	1058			1178			158	182	684	101	194	566
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	378	598	200	87								
Volume Left	17	113	15	67								
Volume Right	34	124	182	6								
cSH	1058	1178	530	116								
Volume to Capacity	0.02	0.10	0.38	0.75								
Queue Length 95th (m)	0.4	2.5	14.0	33.4								
Control Delay (s)	0.5	2.5	15.9	96.2								
Lane LOS	A	A	C	F								
Approach Delay (s)	0.5	2.5	15.9	96.2								
Approach LOS			C	F								
Intersection Summary												
Average Delay			10.5									
Intersection Capacity Utilization			85.0%		ICU Level of Service				E			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	44	476	520	80	35	40
Future Volume (veh/h)	44	476	520	80	35	40
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	49	535	584	90	39	45
Approach Volume (veh/h)	584			674	84	
Crossing Volume (veh/h)	39			49	584	
High Capacity (veh/h)	1343			1333	873	
High v/c (veh/h)	0.43			0.51	0.10	
Low Capacity (veh/h)	1123			1114	701	
Low v/c (veh/h)	0.52			0.61	0.12	
Intersection Summary						
Maximum v/c High			0.51			
Maximum v/c Low			0.61			
Intersection Capacity Utilization			79.3%		ICU Level of Service	D

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	21	3	0	13	23	3	11	3	37	3	71
Future Volume (Veh/h)	23	21	3	0	13	23	3	11	3	37	3	71
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	26	23	3	0	14	26	3	12	3	41	3	79
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	47			26			185	124	24	120	112	35
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	47			26			185	124	24	120	112	35
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	98			100			100	98	100	95	100	92
cM capacity (veh/h)	1526			1601			705	753	1058	810	764	1025
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	52	40	18	123								
Volume Left	26	0	3	41								
Volume Right	3	26	3	79								
cSH	1526	1601	782	935								
Volume to Capacity	0.02	0.00	0.02	0.13								
Queue Length 95th (m)	0.4	0.0	0.6	3.6								
Control Delay (s)	3.8	0.0	9.7	9.4								
Lane LOS	A		A	A								
Approach Delay (s)	3.8	0.0	9.7	9.4								
Approach LOS			A	A								
Intersection Summary												
Average Delay			6.6									
Intersection Capacity Utilization			27.7%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.1
Total Del/Veh (s)	6.3	0.4	5.5	4.6	3.8	6.0	5.7	5.6

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.2	0.2	0.1	0.3
Total Del/Veh (s)	4.5	1.5	1.1	3.8	1.9	1.5	14.7	19.2	7.7	15.8	20.1	16.0

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	4.1

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.7	0.7	0.2	0.2	0.4
Total Del/Veh (s)	2.0	0.2	2.4	6.5	7.1	3.4	3.0	4.6

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.1	0.1	0.1		0.1	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.2	0.1	0.0	0.1	0.1		3.4	3.0	4.4	1.2	3.3	2.1

Total Zone Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	82.7

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	38.5	18.3	35.5
Average Queue (m)	22.2	11.6	21.9
95th Queue (m)	39.0	18.2	34.8
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	19.9	36.1	28.0	23.3
Average Queue (m)	7.3	15.1	19.3	13.3
95th Queue (m)	21.6	34.9	30.8	25.7
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	25.9	43.0	15.7
Average Queue (m)	9.1	17.0	7.5
95th Queue (m)	26.8	43.7	18.0
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	3.3	9.0	13.9
Average Queue (m)	0.5	4.4	10.0
95th Queue (m)	4.3	11.6	14.7
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - BG_2035_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	674	5.7	1407	0.479	100	3.1	LOSA	4.2	30.7	Full	500	0.0	0.0
Approach	674	5.7		0.479		3.1	LOSA	4.2	30.7				
NorthEast: Aspen Blvd													
Lane 1 ^d	84	4.9	671	0.126	100	5.8	LOSA	0.7	5.2	Full	300	0.0	0.0
Approach	84	4.9		0.126		5.8	LOSA	0.7	5.2				
West: Portage Road													
Lane 1 ^d	584	3.7	1383	0.423	100	0.8	LOSA	3.8	27.6	Full	200	0.0	0.0
Approach	584	3.7		0.423		0.8	LOSA	3.8	27.6				
Intersection	1343	4.7		0.479		2.3	LOSA	4.2	30.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	584	90	674	5.7	1407	0.479	100	NA	NA	
Approach	584	90	674	5.7		0.479				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	39	45	84	4.9	671	0.126	100	NA	NA	
Approach	39	45	84	4.9		0.126				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	49	535	584	3.7	1383	0.423	100	NA	NA	
Approach	49	535	584	3.7		0.423				

	Total	%HV	Deg.Satn (v/c)
Intersection	1343	4.7	0.479

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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














Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	84	134	25	53	151	29
Future Volume (vph)	84	134	25	53	151	29
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	104	165	31	65	186	36

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	269	96	222
Volume Left (vph)	104	0	186
Volume Right (vph)	165	65	0
Hadj (s)	-0.14	-0.31	0.29
Departure Headway (s)	4.5	4.5	5.0
Degree Utilization, x	0.34	0.12	0.31
Capacity (veh/h)	746	736	685
Control Delay (s)	9.9	8.2	10.2
Approach Delay (s)	9.9	8.2	10.2
Approach LOS	A	A	B

Intersection Summary			
Delay		9.7	
Level of Service		A	
Intersection Capacity Utilization	36.8%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	202	4	32	234	11	12	2	40	8	0	1
Future Volume (Veh/h)	1	202	4	32	234	11	12	2	40	8	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	1	266	5	42	308	14	16	3	53	11	0	1
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	344			273			682	700	274	749	696	347
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	344			273			682	700	274	749	696	347
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			97			95	99	93	96	100	100
cM capacity (veh/h)	1204			1300			336	346	741	287	349	682
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	272	364	72	12								
Volume Left	1	42	16	11								
Volume Right	5	14	53	1								
cSH	1204	1300	564	301								
Volume to Capacity	0.00	0.03	0.13	0.04								
Queue Length 95th (m)	0.0	0.8	3.5	1.0								
Control Delay (s)	0.0	1.2	12.3	17.4								
Lane LOS	A	A	B	C								
Approach Delay (s)	0.0	1.2	12.3	17.4								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.1									
Intersection Capacity Utilization			42.1%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	14	237	231	104	106	46
Future Volume (veh/h)	14	237	231	104	106	46
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	18	296	289	130	132	58
Approach Volume (veh/h)	314		419		190	
Crossing Volume (veh/h)	132		18		289	
High Capacity (veh/h)	1249		1365		1104	
High v/c (veh/h)	0.25		0.31		0.17	
Low Capacity (veh/h)	1038		1144		907	
Low v/c (veh/h)	0.30		0.37		0.21	
Intersection Summary						
Maximum v/c High			0.31			
Maximum v/c Low			0.37			
Intersection Capacity Utilization			57.4%		ICU Level of Service	B

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

Tot_AM_2025
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	8	0	2	3	14	0	6	1	4	25	55
Future Volume (Veh/h)	33	8	0	2	3	14	0	6	1	4	25	55
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	41	10	0	2	4	17	0	7	1	5	31	68
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	24			10			193	120	10	116	112	16
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	24			10			193	120	10	116	112	16
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			100	99	100	99	96	94
cM capacity (veh/h)	1580			1603			677	746	1068	830	754	1056
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	51	23	8	104								
Volume Left	41	2	0	5								
Volume Right	0	17	1	68								
cSH	1580	1603	775	932								
Volume to Capacity	0.03	0.00	0.01	0.11								
Queue Length 95th (m)	0.6	0.0	0.3	3.0								
Control Delay (s)	5.9	0.6	9.7	9.3								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.9	0.6	9.7	9.3								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.3									
Intersection Capacity Utilization			24.1%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.1
Total Del/Veh (s)	4.9	0.4	3.8	4.0	3.1	4.8	4.9	3.9

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Del/Veh (s)		0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1		0.1
Total Del/Veh (s)		0.9	0.5	2.2	0.8	0.8	7.7	4.4	3.7	5.1		1.4

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.4	0.4	0.2	0.2	0.2
Total Del/Veh (s)	1.7	0.2	1.8	4.2	4.0	2.5	2.1	3.0

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2		0.1	0.1	0.1		0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.0	0.0		0.0	0.0	4.8	1.5	4.1	2.4	3.3	2.2

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	38.5

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	29.3	20.0	27.8
Average Queue (m)	19.8	11.7	17.3
95th Queue (m)	30.8	20.3	28.3
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	3.3	17.9	19.5	9.2
Average Queue (m)	0.5	6.0	10.7	2.8
95th Queue (m)	3.7	18.0	19.2	9.8
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	17.1	26.5	18.1
Average Queue (m)	7.8	9.4	9.4
95th Queue (m)	18.3	27.7	20.5
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	0.9	7.8	16.5
Average Queue (m)	0.1	2.1	10.7
95th Queue (m)	1.9	8.2	16.5
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - Tot_2025_AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	438	6.0	1484	0.295	100	2.3	LOSA	2.1	15.8	Full	500	0.0	0.0
Approach	438	6.0		0.295		2.3	LOSA	2.1	15.8				
NorthEast: Aspen Blvd													
Lane 1 ^d	191	5.1	880	0.217	100	4.3	LOSA	1.2	9.1	Full	300	0.0	0.0
Approach	191	5.1		0.217		4.3	LOSA	1.2	9.1				
West: Portage Road													
Lane 1 ^d	329	4.2	1103	0.298	100	1.5	LOSA	2.1	15.1	Full	200	0.0	0.0
Approach	329	4.2		0.298		1.5	LOSA	2.1	15.1				
Intersection	958	5.2		0.298		2.4	LOSA	2.1	15.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	308	130	438	6.0	1484	0.295	100	NA	NA	
Approach	308	130	438	6.0		0.295				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	133	59	191	5.1	880	0.217	100	NA	NA	
Approach	133	59	191	5.1		0.217				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	19	310	329	4.2	1103	0.298	100	NA	NA	
Approach	19	310	329	4.2		0.298				










	Total	%HV	Deg.Satn (v/c)
Intersection	958	5.2	0.298

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

















HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

Tot_PM_2025
 11-24-2022

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	119	178	49	73	218	47
Future Volume (vph)	119	178	49	73	218	47
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	132	198	54	81	242	52
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	330	135	294			
Volume Left (vph)	132	0	242			
Volume Right (vph)	198	81	0			
Hadj (s)	-0.25	-0.33	0.21			
Departure Headway (s)	4.7	4.8	5.1			
Degree Utilization, x	0.43	0.18	0.42			
Capacity (veh/h)	714	687	664			
Control Delay (s)	11.3	8.9	11.8			
Approach Delay (s)	11.3	8.9	11.8			
Approach LOS	B	A	B			
Intersection Summary						
Delay			11.1			
Level of Service			B			
Intersection Capacity Utilization			54.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

Tot_PM_2025
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	276	27	89	304	94	12	2	142	51	11	7
Future Volume (Veh/h)	14	276	27	89	304	94	12	2	142	51	11	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	15	297	29	96	327	101	13	2	153	55	12	8
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	445			336			972	988	322	1082	952	432
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	445			336			972	988	322	1082	952	432
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			92			93	99	79	60	95	99
cM capacity (veh/h)	1110			1213			195	221	713	138	232	600
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	341	524	168	75								
Volume Left	15	96	13	55								
Volume Right	29	101	153	8								
cSH	1110	1213	579	162								
Volume to Capacity	0.01	0.08	0.29	0.46								
Queue Length 95th (m)	0.3	2.1	9.6	17.2								
Control Delay (s)	0.5	2.2	13.7	45.0								
Lane LOS	A	A	B	E								
Approach Delay (s)	0.5	2.2	13.7	45.0								
Approach LOS			B	E								
Intersection Summary												
Average Delay			6.3									
Intersection Capacity Utilization			74.8%		ICU Level of Service				D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















Tot_PM_2025
 11-24-2022



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	38	418	456	66	29	35
Future Volume (veh/h)	38	418	456	66	29	35
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	43	470	512	74	33	39
Approach Volume (veh/h)	513			586	72	
Crossing Volume (veh/h)	33			43	512	
High Capacity (veh/h)	1349			1339	925	
High v/c (veh/h)	0.38			0.44	0.08	
Low Capacity (veh/h)	1129			1120	747	
Low v/c (veh/h)	0.45			0.52	0.10	
Intersection Summary						
Maximum v/c High			0.44			
Maximum v/c Low			0.52			
Intersection Capacity Utilization			71.1%		ICU Level of Service	C

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

Tot_PM_2025
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	20	2	0	14	19	2	9	2	30	3	94
Future Volume (Veh/h)	52	20	2	0	14	19	2	9	2	30	3	94
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	58	22	2	0	16	21	2	10	2	33	3	104
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	44			24			272	183	23	180	174	34
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	44			24			272	183	23	180	174	34
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	96			100			100	99	100	95	100	90
cM capacity (veh/h)	1530			1604			592	684	1060	730	692	1026
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	82	37	14	140								
Volume Left	58	0	2	33								
Volume Right	2	21	2	104								
cSH	1530	1604	704	928								
Volume to Capacity	0.04	0.00	0.02	0.15								
Queue Length 95th (m)	0.9	0.0	0.5	4.2								
Control Delay (s)	5.4	0.0	10.2	9.6								
Lane LOS	A		B	A								
Approach Delay (s)	5.4	0.0	10.2	9.6								
Approach LOS			B	A								
Intersection Summary												
Average Delay			7.0									
Intersection Capacity Utilization			29.5%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.1
Total Del/Veh (s)	5.7	0.3	4.5	4.5	3.8	5.5	5.6	4.9

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	0.2		0.2	0.1	0.2	0.2
Total Del/Veh (s)	3.8	1.2	1.0	3.3	1.4	1.2	13.4		6.8	11.0	11.5	5.3

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	3.1

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.5	0.4	0.1	0.1	0.3
Total Del/Veh (s)	2.0	0.6	2.2	5.5	5.3	2.3	2.4	3.8

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1		0.1	0.1		0.1		0.0	0.0	0.0	0.0
Total Del/Veh (s)	1.1	0.0		0.0	0.0		3.6		4.8	1.0	3.7	2.3

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	67.6

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	29.7	21.2	29.4
Average Queue (m)	19.2	12.3	19.6
95th Queue (m)	29.6	20.6	30.7
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	14.2	23.0	25.8	17.3
Average Queue (m)	4.7	11.5	16.1	10.9
95th Queue (m)	14.8	26.8	28.0	18.8
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	24.8	40.3	12.3
Average Queue (m)	9.0	14.7	5.4
95th Queue (m)	25.7	38.6	14.6
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	7.4	8.9	19.6
Average Queue (m)	1.1	2.5	11.6
95th Queue (m)	7.0	9.1	19.4
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - Tot_2025_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	587	5.6	1419	0.413	100	3.0	LOSA	3.3	24.0	Full	500	0.0	0.0
Approach	587	5.6		0.413		3.0	LOSA	3.3	24.0				
NorthEast: Aspen Blvd													
Lane 1 ^d	72	4.8	727	0.099	100	5.0	LOSA	0.5	4.0	Full	300	0.0	0.0
Approach	72	4.8		0.099		5.0	LOSA	0.5	4.0				
West: Portage Road													
Lane 1 ^d	512	3.7	1402	0.366	100	0.7	LOSA	3.1	22.1	Full	200	0.0	0.0
Approach	512	3.7		0.366		0.7	LOSA	3.1	22.1				
Intersection	1171	4.7		0.413		2.1	LOSA	3.3	24.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	512	74	587	5.6	1419	0.413	100	NA	NA	
Approach	512	74	587	5.6		0.413				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	33	39	72	4.8	727	0.099	100	NA	NA	
Approach	33	39	72	4.8		0.099				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	43	470	512	3.7	1402	0.366	100	NA	NA	
Approach	43	470	512	3.7		0.366				

	Total	%HV	Deg.Satn (v/c)
Intersection	1171	4.7	0.413

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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














Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	91	148	28	57	166	32
Future Volume (vph)	91	148	28	57	166	32
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	112	183	35	70	205	40

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	295	105	245
Volume Left (vph)	112	0	205
Volume Right (vph)	183	70	0
Hadj (s)	-0.15	-0.30	0.29
Departure Headway (s)	4.6	4.7	5.1
Degree Utilization, x	0.38	0.14	0.34
Capacity (veh/h)	732	713	672
Control Delay (s)	10.5	8.4	10.7
Approach Delay (s)	10.5	8.4	10.7
Approach LOS	B	A	B

Intersection Summary			
Delay		10.2	
Level of Service		B	
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	221	5	36	257	12	13	2	44	9	0	1
Future Volume (Veh/h)	1	221	5	36	257	12	13	2	44	9	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	1	291	7	47	338	16	17	3	58	12	0	1
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	376			300			750	768	300	821	764	378
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	376			300			750	768	300	821	764	378
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			96			94	99	92	95	100	100
cM capacity (veh/h)	1172			1270			302	315	716	253	317	655
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	299	401	78	13								
Volume Left	1	47	17	12								
Volume Right	7	16	58	1								
cSH	1172	1270	531	265								
Volume to Capacity	0.00	0.04	0.15	0.05								
Queue Length 95th (m)	0.0	0.9	4.1	1.2								
Control Delay (s)	0.0	1.3	12.9	19.3								
Lane LOS	A	A	B	C								
Approach Delay (s)	0.0	1.3	12.9	19.3								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.2									
Intersection Capacity Utilization			44.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	15	260	254	115	117	50
Future Volume (veh/h)	15	260	254	115	117	50
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	19	325	318	144	146	62
Approach Volume (veh/h)	344			462	208	
Crossing Volume (veh/h)	146			19	318	
High Capacity (veh/h)	1235			1364	1079	
High v/c (veh/h)	0.28			0.34	0.19	
Low Capacity (veh/h)	1025			1143	884	
Low v/c (veh/h)	0.34			0.40	0.24	
Intersection Summary						
Maximum v/c High			0.34			
Maximum v/c Low			0.40			
Intersection Capacity Utilization			61.2%		ICU Level of Service	B

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

Tot_AM_2030
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	9	0	2	3	15	0	7	1	5	27	59
Future Volume (Veh/h)	35	9	0	2	3	15	0	7	1	5	27	59
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	43	11	0	2	4	19	0	9	1	6	33	73
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	26			11			205	127	11	123	118	18
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	26			11			205	127	11	123	118	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			100	99	100	99	96	93
cM capacity (veh/h)	1578			1602			659	738	1067	819	747	1055
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	54	25	10	112								
Volume Left	43	2	0	6								
Volume Right	0	19	1	73								
cSH	1578	1602	762	928								
Volume to Capacity	0.03	0.00	0.01	0.12								
Queue Length 95th (m)	0.7	0.0	0.3	3.3								
Control Delay (s)	5.9	0.6	9.8	9.4								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.9	0.6	9.8	9.4								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.4									
Intersection Capacity Utilization			25.5%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.1
Total Del/Veh (s)	5.0	0.4	4.1	4.3	3.4	4.7	5.0	4.1

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Del/Veh (s)		0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.2	0.1		0.1
Total Del/Veh (s)		0.9	0.7	2.8	0.9	0.7	9.7	5.9	4.2	7.0		1.5

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.5	0.4	0.2	0.3	0.3
Total Del/Veh (s)	2.9	0.5	2.3	5.1	5.4	2.5	2.8	3.7

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2		0.1	0.1	0.1		0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.3		0.1	0.0	4.2		5.2	2.8	3.5	2.3

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	47.5

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	30.6	18.5	29.4
Average Queue (m)	20.7	11.1	18.1
95th Queue (m)	30.6	17.3	28.9
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	7.8	21.7	22.1	9.1
Average Queue (m)	1.2	6.6	11.9	2.3
95th Queue (m)	7.6	19.8	22.1	8.6
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	24.8	41.1	21.1
Average Queue (m)	11.3	15.3	11.0
95th Queue (m)	25.5	42.5	22.4
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	1.8	8.5	17.5
Average Queue (m)	0.3	2.8	11.1
95th Queue (m)	2.8	9.7	17.8
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - Tot_2030_AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	479	6.0	1483	0.323	100	2.3	LOSA	2.5	18.1	Full	500	0.0	0.0
Approach	479	6.0		0.323		2.3	LOSA	2.5	18.1				
NorthEast: Aspen Blvd													
Lane 1 ^d	210	5.0	857	0.245	100	4.6	LOSA	1.4	10.5	Full	300	0.0	0.0
Approach	210	5.0		0.245		4.6	LOSA	1.4	10.5				
West: Portage Road													
Lane 1 ^d	359	4.2	1085	0.331	100	1.6	LOSA	2.4	17.3	Full	200	0.0	0.0
Approach	359	4.2		0.331		1.6	LOSA	2.4	17.3				
Intersection	1048	5.2		0.331		2.5	LOSA	2.5	18.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	335	144	479	6.0	1483	0.323	100	NA	NA	
Approach	335	144	479	6.0		0.323				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	146	64	210	5.0	857	0.245	100	NA	NA	
Approach	146	64	210	5.0		0.245				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	20	339	359	4.2	1085	0.331	100	NA	NA	
Approach	20	339	359	4.2		0.331				










	Total	%HV	Deg.Satn (v/c)
Intersection	1048	5.2	0.331

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

















HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

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Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	128	197	53	78	240	52
Future Volume (vph)	128	197	53	78	240	52
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	142	219	59	87	267	58
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total (vph)	361	146	325			
Volume Left (vph)	142	0	267			
Volume Right (vph)	219	87	0			
Hadj (s)	-0.25	-0.32	0.21			
Departure Headway (s)	4.9	5.0	5.3			
Degree Utilization, x	0.49	0.20	0.48			
Capacity (veh/h)	697	659	649			
Control Delay (s)	12.5	9.3	13.0			
Approach Delay (s)	12.5	9.3	13.0			
Approach LOS	B	A	B			
Intersection Summary						
Delay			12.1			
Level of Service			B			
Intersection Capacity Utilization			57.9%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

Tot_PM_2030
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	301	29	98	333	104	13	3	156	56	12	8
Future Volume (Veh/h)	16	301	29	98	333	104	13	3	156	56	12	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	17	324	31	105	358	112	14	3	168	60	13	9
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	487			365			1060	1080	350	1184	1040	468
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	487			365			1060	1080	350	1184	1040	468
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			91			92	98	76	46	94	98
cM capacity (veh/h)	1071			1184			166	193	688	112	204	573
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	372	575	185	82								
Volume Left	17	105	14	60								
Volume Right	31	112	168	9								
cSH	1071	1184	538	133								
Volume to Capacity	0.02	0.09	0.34	0.62								
Queue Length 95th (m)	0.4	2.3	12.2	25.7								
Control Delay (s)	0.5	2.4	15.2	68.0								
Lane LOS	A	A	C	F								
Approach Delay (s)	0.5	2.4	15.2	68.0								
Approach LOS			C	F								
Intersection Summary												
Average Delay			8.2									
Intersection Capacity Utilization			81.2%		ICU Level of Service				D			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	42	458	500	73	32	38
Future Volume (veh/h)	42	458	500	73	32	38
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	47	515	562	82	36	43
Approach Volume (veh/h)	562		644		79	
Crossing Volume (veh/h)	36		47		562	
High Capacity (veh/h)	1346		1335		888	
High v/c (veh/h)	0.42		0.48		0.09	
Low Capacity (veh/h)	1126		1116		714	
Low v/c (veh/h)	0.50		0.58		0.11	
Intersection Summary						
Maximum v/c High			0.48			
Maximum v/c Low			0.58			
Intersection Capacity Utilization			76.6%		ICU Level of Service	D

HCM Unsignalized Intersection Capacity Analysis
 4: Aster Street & Prospect Street

Tot_PM_2030
 11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	22	2	0	15	21	2	10	2	33	3	100
Future Volume (Veh/h)	54	22	2	0	15	21	2	10	2	33	3	100
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	24	2	0	17	23	2	11	2	37	3	111
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	47			26			287	192	25	188	182	36
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	47			26			287	192	25	188	182	36
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	96			100			100	98	100	95	100	89
cM capacity (veh/h)	1526			1601			574	675	1057	719	684	1023
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	86	40	15	151								
Volume Left	60	0	2	37								
Volume Right	2	23	2	111								
cSH	1526	1601	692	919								
Volume to Capacity	0.04	0.00	0.02	0.16								
Queue Length 95th (m)	1.0	0.0	0.5	4.7								
Control Delay (s)	5.3	0.0	10.3	9.7								
Lane LOS	A		B	A								
Approach Delay (s)	5.3	0.0	10.3	9.7								
Approach LOS			B	A								
Intersection Summary												
Average Delay			7.1									
Intersection Capacity Utilization			31.1%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.1
Total Del/Veh (s)	5.8	0.3	4.9	4.3	3.7	5.7	5.3	5.0

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.2	0.2	0.2	0.1
Total Del/Veh (s)	3.7	1.2	1.0	3.6	1.8	1.3	15.0	8.9	7.0	13.8	17.8	6.5

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	3.4

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.6	0.5	0.1	0.1	0.3
Total Del/Veh (s)	1.8	0.1	2.0	6.6	6.0	3.7	3.3	4.4

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.3	0.1	0.1	0.1		0.1	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.2	0.3	0.0	0.1	0.0		3.4	1.6	4.8	1.3	3.6	2.3

Total Zone Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	71.3

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	30.7	18.1	29.6
Average Queue (m)	20.4	11.8	20.1
95th Queue (m)	30.6	18.3	30.8
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	13.2	36.4	31.6	21.0
Average Queue (m)	4.3	14.2	16.8	11.1
95th Queue (m)	15.0	33.5	31.0	20.6
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	25.4	43.9	15.6
Average Queue (m)	8.6	17.4	8.0
95th Queue (m)	25.0	47.2	17.6
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	11.4	8.7	19.2
Average Queue (m)	2.0	3.0	12.4
95th Queue (m)	10.0	10.1	19.9
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - Tot_2030_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	644	5.6	1411	0.456	100	3.1	LOSA	3.8	28.2	Full	500	0.0	0.0
Approach	644	5.6		0.456		3.1	LOSA	3.8	28.2				
NorthEast: Aspen Blvd													
Lane 1 ^d	79	4.8	688	0.114	100	5.6	LOSA	0.6	4.7	Full	300	0.0	0.0
Approach	79	4.8		0.114		5.6	LOSA	0.6	4.7				
West: Portage Road													
Lane 1 ^d	562	3.7	1393	0.403	100	0.8	LOSA	3.6	25.7	Full	200	0.0	0.0
Approach	562	3.7		0.403		0.8	LOSA	3.6	25.7				
Intersection	1284	4.7		0.456		2.2	LOSA	3.8	28.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	562	82	644	5.6	1411	0.456	100	NA	NA	
Approach	562	82	644	5.6		0.456				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	36	43	79	4.8	688	0.114	100	NA	NA	
Approach	36	43	79	4.8		0.114				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	47	515	562	3.7	1393	0.403	100	NA	NA	
Approach	47	515	562	3.7		0.403				

	Total	%HV	Deg.Satn (v/c)
Intersection	1284	4.7	0.456

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

Tot_AM_2035
 11-24-2022



















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	99	163	30	61	184	35
Future Volume (vph)	99	163	30	61	184	35
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	122	201	37	75	227	43

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	323	112	270
Volume Left (vph)	122	0	227
Volume Right (vph)	201	75	0
Hadj (s)	-0.15	-0.31	0.29
Departure Headway (s)	4.7	4.8	5.2
Degree Utilization, x	0.42	0.15	0.39
Capacity (veh/h)	718	691	659
Control Delay (s)	11.2	8.6	11.4
Approach Delay (s)	11.2	8.6	11.4
Approach LOS	B	A	B

Intersection Summary			
Delay		10.9	
Level of Service		B	
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 2: Frontier Street & Birch Road

Tot_AM_2035
 11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	243	5	39	282	13	14	3	48	10	0	1
Future Volume (Veh/h)	1	243	5	39	282	13	14	3	48	10	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Hourly flow rate (vph)	1	320	7	51	371	17	18	4	63	13	0	1
Pedestrians		10			3			2			22	
Lane Width (m)		3.6			3.6			3.6			3.6	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		1			0			0			2	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	410			329			820	840	328	897	834	412
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	410			329			820	840	328	897	834	412
tC, single (s)	4.1			4.1			7.2	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			96			93	99	91	94	100	100
cM capacity (veh/h)	1138			1240			269	285	690	221	287	628
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	328	439	85	14								
Volume Left	1	51	18	13								
Volume Right	7	17	63	1								
cSH	1138	1240	494	231								
Volume to Capacity	0.00	0.04	0.17	0.06								
Queue Length 95th (m)	0.0	1.0	4.9	1.5								
Control Delay (s)	0.0	1.3	13.8	21.6								
Lane LOS	A	A	B	C								
Approach Delay (s)	0.0	1.3	13.8	21.6								
Approach LOS			B	C								
Intersection Summary												
Average Delay			2.4									
Intersection Capacity Utilization			47.2%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















Tot_AM_2035
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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	17	285	279	127	129	55
Future Volume (veh/h)	17	285	279	127	129	55
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	21	356	349	159	161	69
Approach Volume (veh/h)	377		508		230	
Crossing Volume (veh/h)	161		21		349	
High Capacity (veh/h)	1221		1362		1053	
High v/c (veh/h)	0.31		0.37		0.22	
Low Capacity (veh/h)	1012		1141		861	
Low v/c (veh/h)	0.37		0.45		0.27	
Intersection Summary						
Maximum v/c High			0.37			
Maximum v/c Low			0.45			
Intersection Capacity Utilization			65.5%		ICU Level of Service	C

HCM Unsignalized Intersection Capacity Analysis
 4: Aster Street & Prospect Street

Tot_AM_2035
 11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	10	0	3	3	17	0	8	1	5	30	63
Future Volume (Veh/h)	36	10	0	3	3	17	0	8	1	5	30	63
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	44	12	0	4	4	21	0	10	1	6	37	78
Pedestrians		1									3	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	28			12			220	136	12	132	126	18
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			12			220	136	12	132	126	18
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			100	99	100	99	95	93
cM capacity (veh/h)	1575			1600			637	728	1066	806	738	1053
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	56	29	11	121								
Volume Left	44	4	0	6								
Volume Right	0	21	1	78								
cSH	1575	1600	750	919								
Volume to Capacity	0.03	0.00	0.01	0.13								
Queue Length 95th (m)	0.7	0.1	0.4	3.6								
Control Delay (s)	5.8	1.0	9.9	9.5								
Lane LOS	A	A	A	A								
Approach Delay (s)	5.8	1.0	9.9	9.5								
Approach LOS			A	A								
Intersection Summary												
Average Delay			7.4									
Intersection Capacity Utilization			26.0%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.1
Total Del/Veh (s)	5.1	0.4	4.1	4.5	3.7	4.7	4.8	4.1

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Del/Veh (s)		0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.1		0.1
Total Del/Veh (s)		0.9	0.4	2.6	1.0	0.7	10.2	12.0	4.6	8.7		1.7

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.5	0.4	0.2	0.2	0.3
Total Del/Veh (s)	2.1	0.3	2.2	5.7	5.7	2.6	2.7	3.9

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.9	0.0	0.8	0.0	0.0	3.3	1.8	3.9	2.5	3.4	2.1

Total Zone Performance

Denied Del/Veh (s)	0.3
Total Del/Veh (s)	40.9

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	31.9	21.6	26.9
Average Queue (m)	20.9	12.2	17.1
95th Queue (m)	32.0	21.0	26.6
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	8.3	21.2	19.0	10.4
Average Queue (m)	1.2	6.1	11.6	3.3
95th Queue (m)	8.7	18.9	20.0	11.0
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	25.8	34.6	20.3
Average Queue (m)	11.6	16.5	11.5
95th Queue (m)	26.4	41.1	23.9
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	2.7	9.5	16.6
Average Queue (m)	0.4	2.6	10.3
95th Queue (m)	3.4	9.5	16.2
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - Tot_2035_AM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	525	6.0	1483	0.354	100	2.3	LOSA	2.8	20.8	Full	500	0.0	0.0
Approach	525	6.0		0.354		2.3	LOSA	2.8	20.8				
NorthEast: Aspen Blvd													
Lane 1 ^d	231	5.0	833	0.278	100	5.0	LOSA	1.7	12.1	Full	300	0.0	0.0
Approach	231	5.0		0.278		5.0	LOSA	1.7	12.1				
West: Portage Road													
Lane 1 ^d	391	4.2	1066	0.367	100	1.8	LOSA	2.7	19.9	Full	200	0.0	0.0
Approach	391	4.2		0.367		1.8	LOSA	2.7	19.9				
Intersection	1148	5.2		0.367		2.7	LOSA	2.8	20.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov.	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From S To Exit:	W	NE								
Lane 1	366	159	525	6.0	1483	0.354	100	NA	NA	
Approach	366	159	525	6.0		0.354				
NorthEast: Aspen Blvd										
Mov.	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From NE To Exit:	S	W								
Lane 1	161	70	231	5.0	833	0.278	100	NA	NA	
Approach	161	70	231	5.0		0.278				
West: Portage Road										
Mov.	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
From W To Exit:	NE	S								
Lane 1	21	370	391	4.2	1066	0.367	100	NA	NA	
Approach	21	370	391	4.2		0.367				

	Total	%HV	Deg.Satn (v/c)
Intersection	1148	5.2	0.367

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									

HCM Unsignalized Intersection Capacity Analysis
 1: Prospect Street & Birch Road

Tot_PM_2035
 11-24-2022



















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	139	217	58	83	265	56
Future Volume (vph)	139	217	58	83	265	56
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	154	241	64	92	294	62

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	395	156	356
Volume Left (vph)	154	0	294
Volume Right (vph)	241	92	0
Hadj (s)	-0.25	-0.32	0.21
Departure Headway (s)	5.0	5.2	5.4
Degree Utilization, x	0.55	0.23	0.54
Capacity (veh/h)	681	632	633
Control Delay (s)	14.0	9.7	14.5
Approach Delay (s)	14.0	9.7	14.5
Approach LOS	B	A	B

Intersection Summary			
Delay		13.5	
Level of Service		B	
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
2: Frontier Street & Birch Road

Tot_PM_2035
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	330	32	108	365	115	14	3	172	62	13	8
Future Volume (Veh/h)	17	330	32	108	365	115	14	3	172	62	13	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	18	355	34	116	392	124	15	3	185	67	14	9
Pedestrians		37						10			17	
Lane Width (m)		3.6						3.6			3.6	
Walking Speed (m/s)		1.2						1.2			1.2	
Percent Blockage		3						1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	533			399			1157	1183	382	1298	1138	508
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	533			399			1157	1183	382	1298	1138	508
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			90			89	98	72	24	92	98
cM capacity (veh/h)	1030			1150			139	165	660	88	175	544
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	407	632	203	90								
Volume Left	18	116	15	67								
Volume Right	34	124	185	9								
cSH	1030	1150	500	105								
Volume to Capacity	0.02	0.10	0.41	0.86								
Queue Length 95th (m)	0.4	2.7	15.6	39.7								
Control Delay (s)	0.6	2.6	17.1	127.4								
Lane LOS	A	A	C	F								
Approach Delay (s)	0.6	2.6	17.1	127.4								
Approach LOS			C	F								
Intersection Summary												
Average Delay			12.6									
Intersection Capacity Utilization			88.5%		ICU Level of Service				E			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 3: Pemberton Portage Road/Aspen Blvd & Birch Road

















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Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	46	503	549	80	35	42
Future Volume (veh/h)	46	503	549	80	35	42
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	52	565	617	90	39	47
Approach Volume (veh/h)	617			707	86	
Crossing Volume (veh/h)	39			52	617	
High Capacity (veh/h)	1343			1330	850	
High v/c (veh/h)	0.46			0.53	0.10	
Low Capacity (veh/h)	1123			1111	680	
Low v/c (veh/h)	0.55			0.64	0.13	
Intersection Summary						
Maximum v/c High				0.53		
Maximum v/c Low				0.64		
Intersection Capacity Utilization	82.7%			ICU Level of Service		E

HCM Unsignalized Intersection Capacity Analysis
4: Aster Street & Prospect Street

Tot_PM_2035
11-24-2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	24	3	0	16	23	3	11	3	37	3	107
Future Volume (Veh/h)	56	24	3	0	16	23	3	11	3	37	3	107
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	62	27	3	0	18	26	3	12	3	41	3	119
Pedestrians		1									7	
Lane Width (m)		3.6									3.6	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									1	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	51			30			305	204	28	200	192	39
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	51			30			305	204	28	200	192	39
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.3
p0 queue free %	96			100			99	98	100	94	100	88
cM capacity (veh/h)	1521			1596			553	664	1052	704	674	1020
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	92	44	18	163								
Volume Left	62	0	3	41								
Volume Right	3	26	3	119								
cSH	1521	1596	683	909								
Volume to Capacity	0.04	0.00	0.03	0.18								
Queue Length 95th (m)	1.0	0.0	0.6	5.2								
Control Delay (s)	5.1	0.0	10.4	9.8								
Lane LOS	A		B	A								
Approach Delay (s)	5.1	0.0	10.4	9.8								
Approach LOS			B	A								
Intersection Summary												
Average Delay			7.1									
Intersection Capacity Utilization			31.5%		ICU Level of Service				A			
Analysis Period (min)			15									

1: Prospect Street & Birch Road Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.1
Total Del/Veh (s)	6.6	0.5	5.8	5.2	4.3	6.3	6.6	5.8

2: Frontier Street & Birch Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.2	0.2
Total Del/Veh (s)	4.6	1.5	1.4	3.6	1.7	1.3	16.7	12.6	6.9	23.7	20.3	15.9

2: Frontier Street & Birch Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	4.1

3: Pemberton Portage Road/Aspen Blvd & Birch Road Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.0		0.0	0.7	0.6	0.1	0.1	0.4
Total Del/Veh (s)	2.3	0.2	2.2	7.4	7.9	2.8	3.0	4.9

4: Aster Street & Prospect Street Performance by movement

Movement	EBL	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.1	0.1	0.1		0.1	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.2	0.4	0.1	0.1	0.1		4.0	2.3	5.2	1.2	3.5	2.3

Total Zone Performance

Denied Del/Veh (s)	0.4
Total Del/Veh (s)	76.2

Intersection: 1: Prospect Street & Birch Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (m)	37.0	21.5	33.8
Average Queue (m)	23.0	14.0	22.4
95th Queue (m)	38.0	22.4	36.2
Link Distance (m)	95.9	128.2	257.3
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Frontier Street & Birch Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	19.6	28.9	27.6	28.2
Average Queue (m)	6.0	15.2	16.8	14.2
95th Queue (m)	19.5	32.6	28.2	31.7
Link Distance (m)	95.9	63.9	117.9	134.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Pemberton Portage Road/Aspen Blvd & Birch Road

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	24.6	56.4	17.5
Average Queue (m)	7.7	24.2	8.1
95th Queue (m)	22.9	61.3	19.3
Link Distance (m)	63.9	527.6	142.6
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Aster Street & Prospect Street

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	8.8	8.9	17.5
Average Queue (m)	1.5	3.3	12.2
95th Queue (m)	9.2	10.3	18.7
Link Distance (m)	104.8	95.1	128.2
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 0

LANE SUMMARY

Site: 101 [Portage Rd & Aspen Blvd - Tot_2035_PM (Site Folder: General)]

New Site
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
	[Total veh/h	HV %]						[Veh	Dist] m				
South: Portage Road													
Lane 1 ^d	707	5.6	1404	0.504	100	3.1	LOSA	4.6	33.5	Full	500	0.0	0.0
Approach	707	5.6		0.504		3.1	LOSA	4.6	33.5				
NorthEast: Aspen Blvd													
Lane 1 ^d	87	4.8	648	0.133	100	6.2	LOSA	0.8	5.6	Full	300	0.0	0.0
Approach	87	4.8		0.133		6.2	LOSA	0.8	5.6				
West: Portage Road													
Lane 1 ^d	617	3.7	1387	0.445	100	0.8	LOSA	4.2	30.1	Full	200	0.0	0.0
Approach	617	3.7		0.445		0.8	LOSA	4.2	30.1				
Intersection	1410	4.7		0.504		2.3	LOSA	4.6	33.5				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Roundabout LOS Method: Same as Signalised Intersections.
 Lane LOS values are based on average delay per lane.
 Intersection and Approach LOS values are based on average delay for all lanes.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Geometric Delay is included).
 Queue Model: SIDRA Standard.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: Portage Road										
Mov. From S To Exit:	L2	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	617	90	707	5.6	1404	0.504	100	NA	NA	
Approach	617	90	707	5.6		0.504				
NorthEast: Aspen Blvd										
Mov. From NE To Exit:	L1	R1	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	39	47	87	4.8	648	0.133	100	NA	NA	
Approach	39	47	87	4.8		0.133				
West: Portage Road										
Mov. From W To Exit:	L1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.	
Lane 1	52	565	617	3.7	1387	0.445	100	NA	NA	
Approach	52	565	617	3.7		0.445				

	Total	%HV	Deg.Satn (v/c)
Intersection	1410	4.7	0.504

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis											
	Exit Lane Number	Short Lane Length m	Percent Opng in Lane % veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
NorthEast Exit: Aspen Blvd Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									
West Exit: Portage Road Merge Type: Not Applied											
Full Length Lane	1	Merge Analysis not applied.									