



# CRYSTAL POOL TRAFFIC IMPACT ASSESSMENT + PARKING STUDY

Prepared for: City of Victoria

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## EXECUTIVE SUMMARY

The following summarizes the comprehensive Traffic Impact Assessment and Parking Study completed for the proposed new Crystal Pool facility. The proposed facility is immediately south of the current location and represents an approximately 30% increase in floor area.

## PARKING

Crystal Pool parking demand has been considered using observations of the current site, observations of nearby on-street parking and public off-street parking, a survey of staff and patron travel habits, and data from recreation centres elsewhere in the Capital Region. The study concludes that existing parking demand is 73 vehicles during busy periods, with up to 29 vehicles seeking parking off-site.

Future parking demand is projected based on a 30% increase in total floor area and growth in the floor area dedicated to specific activity areas (i.e., swimming pool, multi-purpose rooms, fitness room). The analysis concludes that the proposed new facility will experience a total parking demand of approximately 135 to 140 vehicles during busy periods.

Parking supply options are considered that balance the cost / land allocation of parking with potential impacts on neighbourhood parking conditions. The recommended option is a supply of 105 to 110 parking spaces to maintain current neighbourhood parking conditions (i.e., approximately 29 vehicles continue to park off-site during busy periods). This will result in satisfactory utilization of on-site parking throughout much of a typical day. Site parking would be under-utilized during much of a typical day if more than 105 to 110 parking spaces were provided – representing inefficient land allocation and cost – and the provision of less parking would put more pressure on nearby on-street and public off-street lots throughout much of a typical day thereby negatively impacting neighbourhood parking conditions.

Potential changes in parking demand associated with improvements to Central Park have not been considered in this study. A comprehensive planning initiative for Central Park is anticipated to commence in 2019 that will consider parking associated with the Park.

## TRAFFIC + ACCESS

Two options for the future site access were considered – Queens Avenue and Quadra Street / Princess Avenue. Despite conflicting with the City's *Highway Access Bylaw* which requires access from the more minor street, Princess Avenue is the preferred access location. This location directs motorists to access the site via Quadra Street, while minimizing traffic on Vancouver Street – an identified People Priority Greenway and All Ages and Abilities cycling route – and discouraging neighbourhood “short cutting”. The adjacent Quadra Street / Princess Avenue intersection (currently a pedestrian signal) should be upgraded to a full traffic signal to address PM peak hour operational issues and provide controlled pedestrian crossings on all four legs.

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Assuming the site access is located at Quadra Street / Princess Avenue and the intersection is upgraded to a full traffic signal, the primary building entrance should be oriented toward the Quadra Street / Princess Avenue intersection. This orientation would minimize walking distance to/from the on-site parking area, integrate with adjacent bus stops on Quadra Street, and further support a multi-use pathway through Central Park. A multi-use pathway through Central Park is proposed as a means to connect the two segments of Princess Avenue with an off-road dedicated walking and cycling facility, and provide a direct cycling route between the Crystal Pool site and the Vancouver Street cycling route.

### TRANSPORTATION DEMAND MANAGEMENT (TDM)

A series of transportation demand management (TDM) programs were identified to help manage site parking demand and encourage alternative travel modes. Options include short- and long-term bicycle parking, bus stop relocation for improved integration with the new building location, rideshare initiatives, and parking management approaches.

### RECOMMENDATIONS

The following is a summary of the recommendations of this study:

- That the on-site parking supply is 105 to 110 spaces;
- That 16 long-term and 64 short-term bicycle parking spaces are provided;
- That the primary motor vehicle access is located on Quadra Street immediately opposite Princess Avenue and the Quadra Street / Princess Avenue intersection is upgraded to a full traffic signal;
- That the primary building entrance is located adjacent the Quadra Street / Princess Avenue intersection;
- That a multi-use pathway is developed through Central Park connecting the two segments of Princess Avenue, subject to support from the Parks, Recreation and Facilities department; and
- That the northbound bus stop on Quadra Street is relocated approximately 40m to 60m south of the current location.

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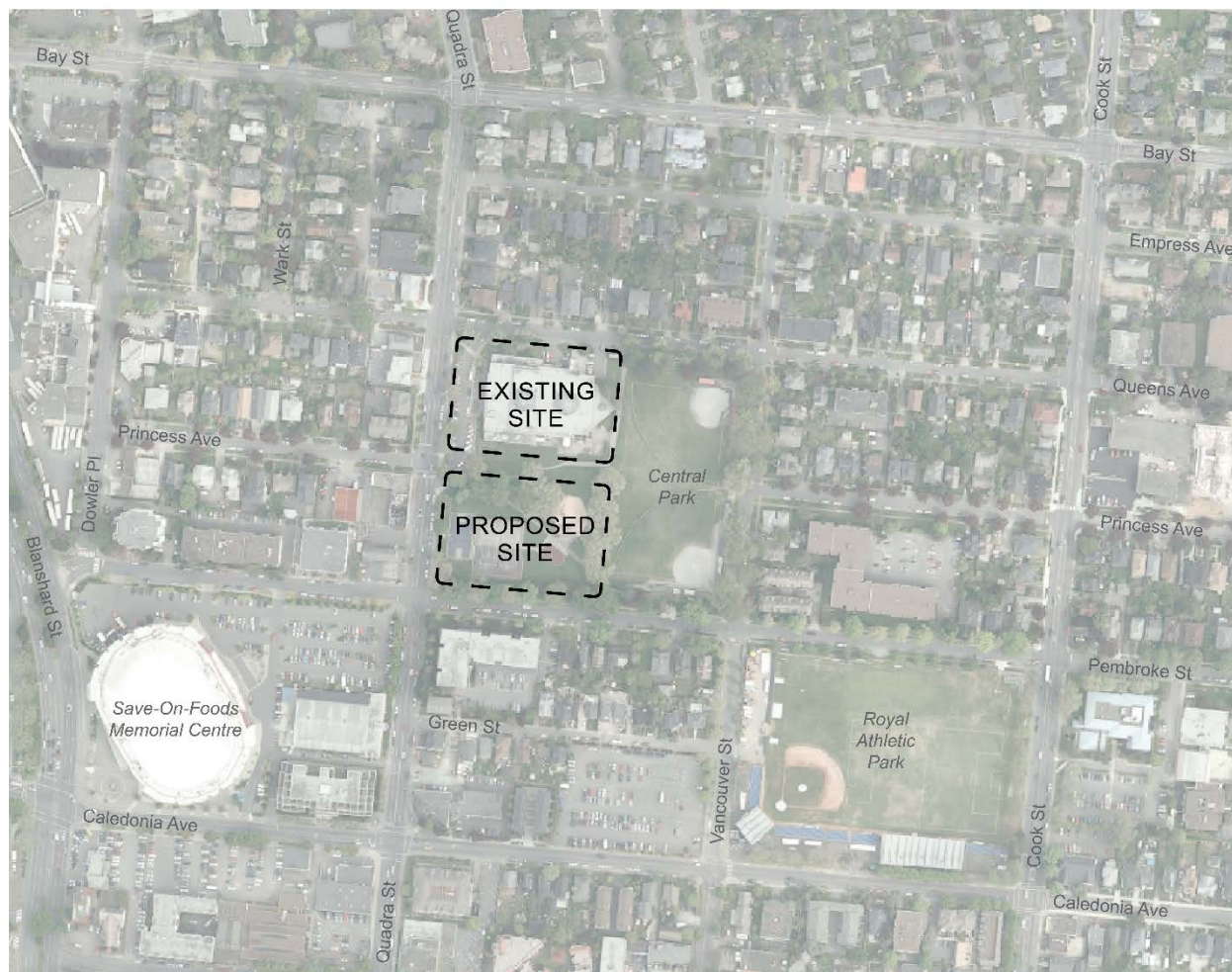
## 1.0 INTRODUCTION

Watt Consulting Group (“WATT”) was retained by the City of Victoria to complete a Traffic Impact Assessment and Parking Study for the proposed new Crystal Pool facility. The study includes assessments of site parking needs and neighbourhood parking impacts, neighbourhood traffic impacts and safety considerations, and management strategies to mitigate any parking or traffic impacts.

### 1.1 SUBJECT SITE

The proposed new site is immediately south of the existing Crystal Pool site. See **Figure 1**. The proposed site would have frontages on Quadra Street and Pembroke Street.

**Figure 1. Subject Site**





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## 1.2 STUDY AREA

The following provides a summary of site context including transportation options and facilities surrounding the site.

### 1.2.1 CONTEXT / LOCATION

Save-On-Foods Memorial Centre (SOFMC) and Royal Athletic Park (RAP) are both located approximately 300 meters from the Crystal Pool.

Save-On-Foods Memorial Centre is home to the Victoria Royals WHL hockey team, and also hosts various concerts, family shows, and recreational hockey divisions throughout the year. The hockey season typically starts in September and runs through to April with approximately 5 hockey games per month<sup>1</sup>. Concerts and family shows occur approximately once a month throughout the year. The events with the greatest attendance are Saturday hockey games and concerts.

Royal Athletic Park is home to the Victoria HarbourCats WCL baseball team and also hosts major events including Great Canadian Beer Festival, Rifflandia Festival, as well as local sports. Both major events occur on back-to-back weekends in September. The baseball season falls between May and August each year.

### 1.2.2 PEDESTRIAN NETWORK

Virtually all streets within the study area have sidewalks on both sides, providing for comfortable and safe walking conditions. Block lengths are between 100m and 200m and there are mid-block walking routes in certain locations (Central Park, SOFMC), minimizing walking distances.

**Table 1** identifies approximate walking times to major destinations or transportation options within a reasonable proximity to the site.

**TABLE 1. WALK TIMES TO NEARBY DESTINATIONS**

Destination	Walk Time <sup>2</sup>
SOFMC Parking Lot	3 minutes
Caledonia Ave Parking Lot	6 minutes
Royal Athletic Park Parking Lot	6 minutes
Quadra Village	7 minutes
Downtown Victoria	15 minutes
Closest Bus Stop on Douglas Street, Northbound	11 minutes
Closest Bus Stop on Douglas Street, Southbound	11 minutes

<sup>1</sup> Based on the Victoria Royals schedule 2016-2017

<sup>2</sup> Walking times were generated based on Google Maps



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### 1.2.3 CYCLING NETWORK

Vancouver Street is a designated All Ages and Abilities Route, designed to feel comfortable for a range of riders, and offer a low-stress and high-quality cycling experience. Improvements to Vancouver Street north of Pandora Avenue are included as Phase 2 (“Inter-Municipal Connections”) of the City’s #biketoria and scheduled for completion in 2019. See **Figure 2**. This route will be the primary north-south cycling route for Crystal Pool patrons and staff.

East-west cycling is facilitated via bike lanes on Caledonia Avenue from Blanshard Street to Quadra Street and on Bay Street between Vancouver Street and Chambers Street. Cycling facilities on Bay Street are proposed to extend west to Wharf Street in future.

### 1.2.4 TRANSIT

There are two bus stops directly adjacent the site (at Princess Avenue) on Quadra Street (northbound and southbound) served by Route 6 | Royal Oak/Downtown. See **Figure 2**. Both bus stops have adequate sidewalks and basic bus stop amenities (bench, shelter, garbage bin). Route 6 is considered a Frequent Route with a service frequency of 15 minutes or better from 7am to 7pm, Monday to Friday. It provides service along Quadra Street between downtown Victoria and the Royal Oak / Broadmead neighbourhoods in Saanich.



Quadra Street bus stops adjacent the Crystal Pool, northbound (left) and southbound (right) (credit: Google Earth).

Route 24 | Cedar Hill/Admirals Walk and Route 25 | Maplewood/Admirals Walk/Colwood Exchange can be accessed via bus stops on Cook Street at Princess Avenue, approximately 400m from the Pool. These routes provide service between McKenzie Avenue in Saanich, and Esquimalt and View Royal via downtown Victoria. Route 10 | Royal Jubilee/Songhees can be accessed via bus stops on Bay Street at Quadra Street, approximately 250m from the Pool, and provides service between the Royal Jubilee Hospital and Victoria West via Bay Street. The site is also approximately 600m to bus stops on Douglas Street – which are served by a large number of routes providing service throughout the Capital Region, including to the University of Victoria, the Saanich Peninsula, and the Western Communities.

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The Victoria Region Transit Future Plan identifies proposed routing, schedule and network changes to accommodate a growing region and future transit demands. The plan identifies Quadra Street as a “Frequent Transit Corridor” which will have a service frequency of 15 minutes or better between 7:00am to 10:00pm, seven days a week, allowing riders to utilize the transit service spontaneously, without consulting a schedule. Bay Street - approximately 250m away - is also a designated Frequent Transit Corridor.

### 1.2.5 ROAD NETWORK

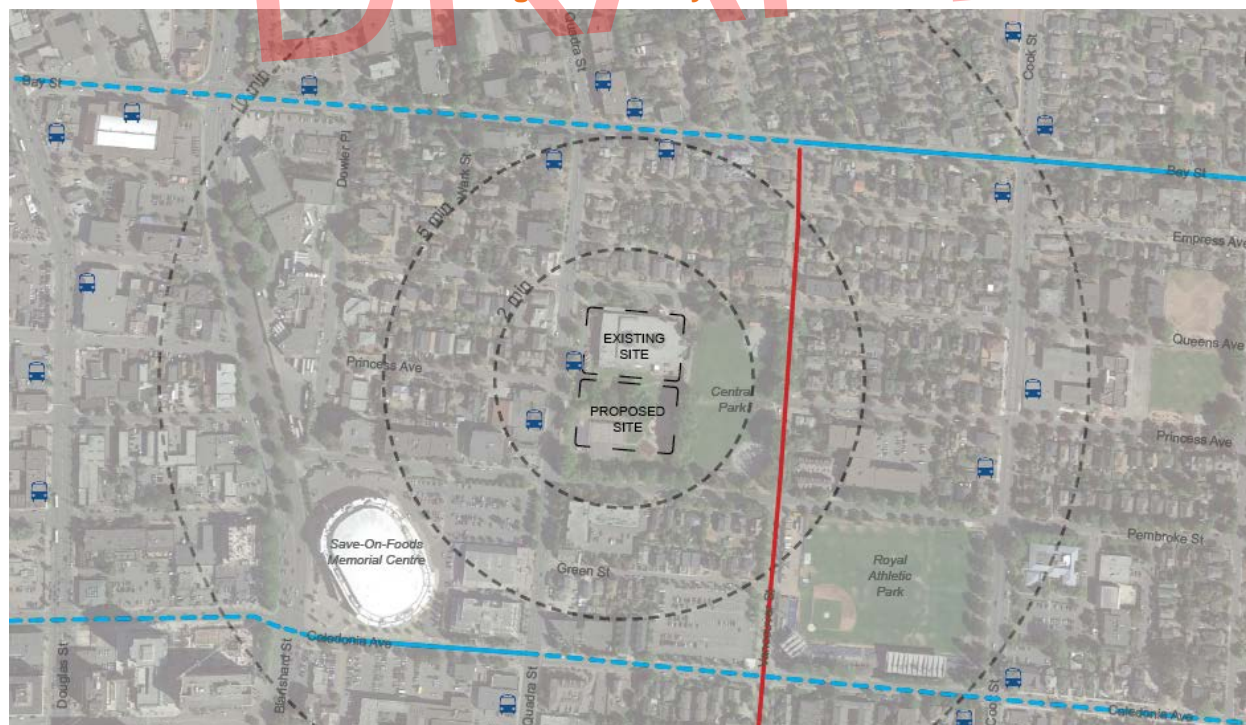
The road network surrounding the site consists of the following:






- Arterial Roads | Cook Street, Quadra Street, Bay Street and Blanshard Street. Arterial Roads typically emphasize a high level of traffic mobility at highest speeds and volumes and a low level of property access, serving longer distance trips including those between major activity centers and regional destinations.
- Collectors | Caledonia Avenue – Collector Roads balance traffic mobility with access to property, distributing trips from arterial streets through to ultimate destinations and collecting traffic from local streets in residential areas and channeling it to the arterial system
- Local Roads | Empress Avenue, Queens Avenue, Princess Avenue, Pembroke Street, Green Street, Vancouver Street – Local Roads are streets with low levels of traffic mobility and a high level of land access, serving residential, commercial and industrial areas

The exit from the parking lot, on Queens Avenue is a right out; however, an equal number of vehicles turn left as right. There is a pedestrian signal at Quadra Street / Princess Avenue. The access to the main parking lot for Crystal Pool is located off Quadra Street, immediately south of Princess Avenue. This access is restricted to a right in access; however, vehicles were observed turning left into the site.

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Figure 2. Study Area



- Transit
  -  Bus Stops
- Cycling
  -  Bike Lanes, Existing
  -  Bike Lanes, Future
  -  All Ages and Abilities
- Walking
  -  Walking Times

### 1.3 PROPOSED DEVELOPMENT

The proposed Crystal Pool redevelopment would result in the demolition of the existing facility and the construction of a new facility on an adjacent site (refer to Figure 1). The new facility would include a larger swimming pool, new multi-purpose rooms, and a fitness centre. The floor area of the proposed facility is 7,750m<sup>2</sup>, which is approximately 30% greater than the existing facility. See **Table 2**. Approximately 510,000 annual visits are anticipated with the new facility, an approximately 35% increase from current visitation<sup>3</sup>.

**TABLE 2. PROPOSED DEVELOPMENT**

	Existing		Proposed	
	Floor Area	Description	Floor Area	Description
Basement	970m <sup>2</sup>	Mechanical Fitness	1,200m <sup>2</sup>	Mechanical Service Spaces
Level 1	3,865m <sup>2</sup>	Lobby Administration Change Rooms Natatorium	4,650m <sup>2</sup>	Lobby Administration Change Rooms Natatorium
Level 2	1,200m <sup>2</sup>	Bleachers Fitness	1,900m <sup>2</sup>	Fitness Multi-Purpose Rooms
<b>Total</b>	<b>6,035m<sup>2</sup></b>		<b>7,750m<sup>2</sup> (+28%)</b>	

<sup>3</sup> Visitation estimates provided by City of Victoria staff via email dated July 10 2018

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## 2.0 PARKING ANALYSIS

The purpose of this section is to assess current and future parking conditions, and to understand parking impacts on the surrounding neighbourhood. The assessment is based on observations of the existing site and neighbourhood parking conditions, Pool patron and staff surveys, observations of other recreation centres, and forecasted increases due to the proposed increase in floor area.

### 2.1 PARKING REQUIREMENT

The site is subject to off-street parking regulations contained in the City's *Zoning Bylaw, Schedule C*. The required minimum parking supply rate is one space per 9.5m<sup>2</sup> of floor area used or intended to be used for assembly purposes<sup>4</sup>. It is unclear exactly which activity areas would be defined as "used for assembly purposes", but the total off-street parking requirement for the Pool could be as high as approximately 800 parking spaces.

The City is in the process of updating Schedule C. The forthcoming bylaw will include a use that better represents a pool / recreation centre and will likely contain a minimum parking supply rate that is lower than the current requirement.

### 2.2 NEIGHBOURHOOD PARKING CONDITIONS

Parking conditions were considered for all public parking in the area bound by Bay Street (north), Cook Street (east), Caledonia Avenue (south) and Blanshard Street (west). This area represents no more than an approximately 2- to 3-minute walk (i.e., 200 – 400m) to the Crystal Pool and may reasonably appeal to patrons and/or staff. The following sections summarize the public parking inventory and utilization rates for both on- and off-street parking.

#### 2.2.1 ON-STREET PARKING

##### Inventory

An inventory of on-street parking supply was created for all spaces within an approximately 2- to 3-minute walk of the site. See **Figure 3**. The study area contains a total of 570 on-street parking spaces<sup>5</sup>. See **Table 3**. Approximately 45% of spaces (257 spaces) are restricted to two hours (except Sunday) from 8:00am to 6:00pm and may appeal to Crystal Pool patrons. The two-hour spaces on Quadra Street (75 spaces) may not be used during the peak commute periods (7:00am-9:00am southbound, 4:00pm-6:00pm northbound). The remaining 55% of the available spaces are restricted to residents - either "Residential Parking Only" or "Residential Permit Parking".

<sup>4</sup> Assumes the applicable use is "Buildings for private club use, fraternal lodges, athletic instruction, social halls and similar uses"

<sup>5</sup> On-street parking count excludes short-term loading / passenger zones and dedicated carshare parking spaces

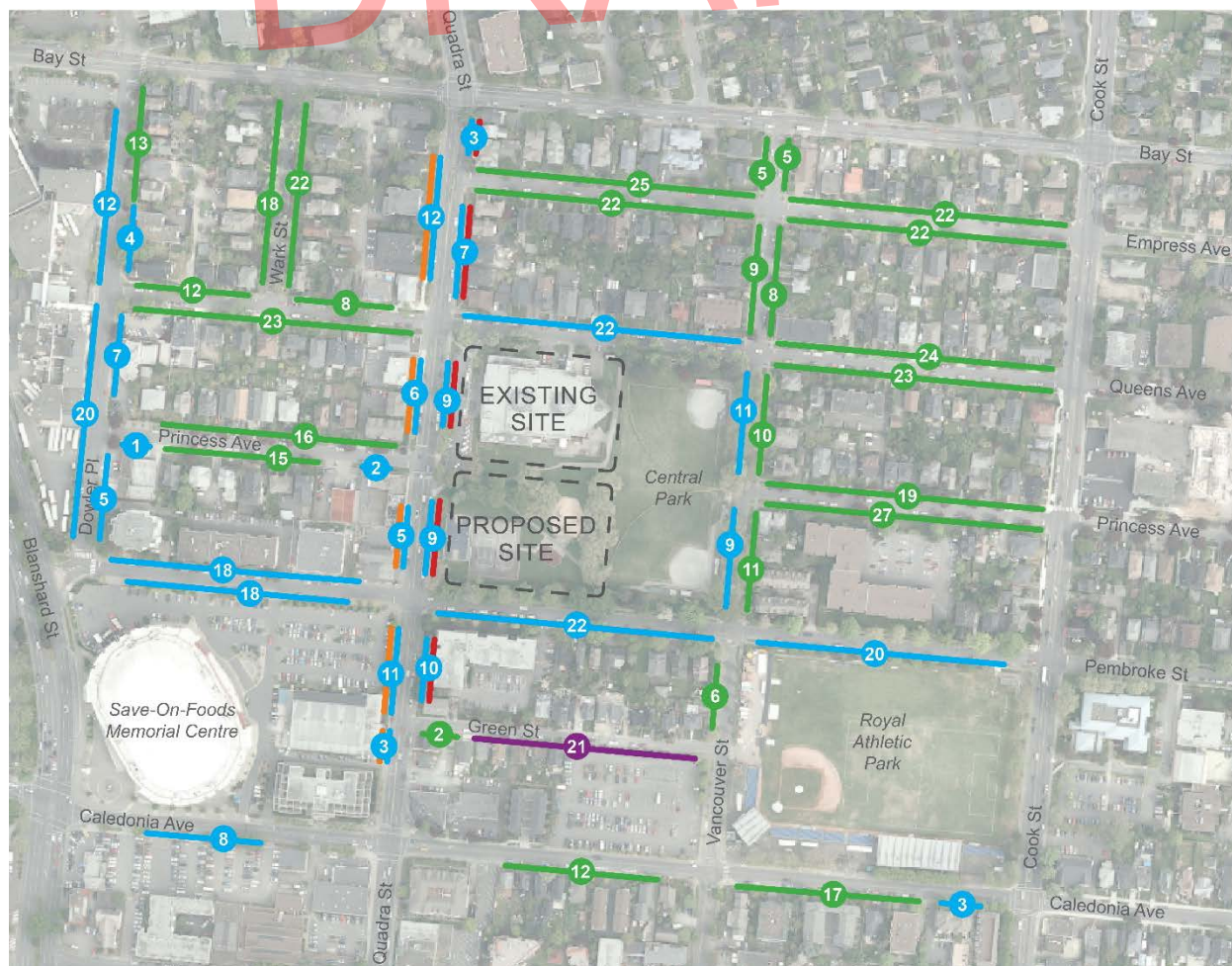
**TABLE 3. SUMMARY OF ON-STREET PARKING INVENTORY, BY RESTRICTION**

Restriction	Parking Supply	
	Total	Proportion of Total
2 Hour Maximum (8:00am–6:00pm, Mon–Sat)	182	31.9%
2 Hour Maximum (8:00am–6:00pm, Mon–Sat), No Stopping 7:00am-9:00am	37	6.5%
2 Hour Maximum (8:00am–6:00pm, Mon–Sat), No Stopping 4:00pm-6:00pm	38	6.7%
Residential Parking Only	292	51.2%
Residential Permit Parking	21	3.7%



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**Figure 3. On-Street Parking Inventory**





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### Utilization

On-street parking observations were conducted in the vicinity of the Pool site during four observation periods, as follows<sup>6</sup>:

1. Friday May 26, 9:00am
2. Monday May 29, 4:00pm
3. Monday June 5, 6:30pm (Victoria HarbourCats game night)
4. Saturday June 10, 9:00am

### Typical Conditions

During a typical day (excludes Monday June 5 at 6:30pm), total on-street parking occupancy was consistent at approximately 45% occupied and 370 to 379 spaces still available. See

#### **Appendix A.**

The peak observation period was Friday morning at 9:00am. During this observation the on-street parking supply available to Crystal Pool patrons and staff (excludes Residential Parking Only and Residential Permit Parking) was 35% occupied, with 168 parking spaces vacant.

On-Street parking that is the most “sought-after” for patrons of the Crystal Pool are those spaces restricted to 2-hour maximum on Queens Avenue between Quadra Street and Vancouver Street, Pembroke Street between Quadra Street and Vancouver Street, and Quadra Street between Queens Avenue and Pembroke Street. Peak total occupancy for these streets was 59% with 30 parking spaces still available. This peak occurred on Friday morning, when commercial businesses in the area are operating; occupancy was observed significantly less on Monday afternoon at 33% occupancy, when businesses are starting to shut down for the day.

### Event

On-Street parking conditions were observed during an event night at Royal Athletic Park (Monday June 5 at 6:30pm), which was the season opener game for the Victoria HarbourCats, to determine the impact on parking conditions in the surrounding streets.

Results suggest peak total occupancy was 64% with 240 spaces vacant, a 43% increase from on-street parking conditions during a typical day.

Total on-street parking available to Crystal Pool patrons had an occupancy of 66% with 88 spaces available.

The most sought-after parking spaces (Queens, Pembroke, Quadra) had an occupancy of 77% with 17 spaces available to patrons and staff of the site.

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<sup>6</sup> These time periods were selected based on Crystal Pool's staff understanding of peak periods.

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Observations were conducted as part of a previous study<sup>7</sup> for on-street and public off-street parking on streets bounded by Bay Street, Cook Street, Pandora Avenue and Douglas Street (larger study area than for this project). Observations suggested that during an event night at Save-on-Foods, parking demand is approximately three times that of a typical night. This is a larger impact compared to observations conducted as part of this project.

## 2.2.2 OFF-STREET PARKING

### Inventory

An inventory of the public off-street parking supply was created for parking lots within an approximately 2- to 3-minute walk of the site. The four lots given consideration are the Crystal Pool, Royal Athletic Park, Save-On-Foods Memorial Centre, and Caledonia Avenue lot immediately adjacent the Save-On-Foods Memorial Centre. See **Figure 4**.

The Crystal Pool Off-Street Parking Lot has a total of 50 parking spaces – 40 patron parking spaces (including one handicap space), three drop-off spaces, one loading space and six staff parking spaces. Other parking lots assessed have a parking supply of 122 to 220 parking spaces, with a combined total of 558 parking spaces.

**Figure 4. Public Off-Street Parking Supplies**



<sup>7</sup> Nanaimo Event Centre Feasibility Study, December 14 2016

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### Utilization

Parking observations were conducted at these four off-street parking lots during four observation periods, as follows:

- Friday May 26, 9:00am
- Monday May 29, 4:00pm
- Monday June 5, 6:30pm (Victoria HarbourCats game night)
- Saturday June 10, 9:00am

A summary of findings is provided below. See **Table 4**. Full results are included in **Appendix B**.

### Crystal Pool Parking

Results suggest peak occupancy is on Friday at 9:00am at the Crystal Pool lot with an occupancy of 88% and six parking spaces vacant. Parking available to patrons only (40 spaces, including handicap parking) are restricted to two hours and had a peak occupancy of 88% with five spaces vacant. Parking available to staff (6 spaces) was fully occupied, with no spaces vacant.

### Typical Conditions

Save-On-Foods Memorial Centre and the Caledonia Avenue Lot are both managed by Robbins Parking and have monthly, hourly, daily and evening parking rates available. Monthly parking is available until 5:30pm, accommodating demands of employees. The Royal Athletic Park Parking Lot is managed by the City of Victoria and has hourly, daily and monthly parking rates available. All parking lots have a waiting list for monthly parking passes.

SOFMC and the Caledonia Avenue Lot experienced peak occupancy on Friday morning with an occupancy of 49% and 95%, with 112 parking spaces and 6 parking spaces vacant, respectively. In these parking lots, parking spaces that are reserved had a total occupancy of 78% with nine parking spaces still available. SOFMC has an unreserved parking occupancy of 48% and Caledonia Avenue parking lot had an unreserved parking occupancy of 97%. Royal Athletic Park had a peak occupancy of 63% during a non-event observation period, with 81 parking spaces still available. Of this, unreserved parking had an occupancy of 64% with 72 spaces still available, and the reserved parking had an occupancy of 36% with nine spaces still available. These results suggest that there is available daily and hourly parking in the Save-on-Foods Memorial Centre and Royal Athletic Park parking lots.

### Event Night

Parking occupancy was observed during the opening night baseball game for the Victoria HarbourCats at Royal Athletic Park on Monday June 5. Occupancy of the RAP parking lot was 99% with only three reserved parking spaces unoccupied. SOFMC and Caledonia Avenue Lot was observed at much lower occupancies at 10% and 17% respectively, suggesting they are not impacted by large events at RAP.

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The Crystal Pool lot was observed at 84% occupied with 8 parking spaces vacant, however this is assumed to be attributed to the Pool site and not parking associated with Royal Athletic Park events.

**TABLE 4. SUMMARY OF OFF-STREET PARKING UTILIZATION**

Parking Lot		Parking Supply	Observed Vehicles + Occupancy							
			Friday May 26, 9:00am		Monday May 29, 4:00pm		Monday June 5, 6:30pm		Saturday June 10, 9:00am	
			Count	%	Count	%	Count	%	Count	%
A	Crystal Pool	50	44	88%	29	58%	42	84%	34	68%
B	Royal Athletic Park	216	135	63%	78	36%	213	99%	57	26%
C	Save-On-Foods Memorial Centre	220	108	49%	96	44%	23	10%	24	11%
D	Caledonia Avenue Lot	122	116	95%	68	56%	21	17%	24	20%

### 2.3 PARKING CONDITIONS AT REPRESENTATIVE SITES

Parking observations were completed at other recreation centres in the Capital Region to provide a comparison of parking demand at like facilities. Representative sites were selected that offer similar activities to the Crystal Pool (i.e., swimming pool). Consideration is given to their context / location, although none are in as urban a location as the Crystal Pool.

Observations were completed at the following recreation centres:

1. Oak Bay Recreation Centre, 1975 Bee Street, Oak Bay
2. Esquimalt Recreation Centre, 527 Fraser Street, Esquimalt
3. Saanich Commonwealth Place, 4636 Elk Lake Drive, Saanich
4. Gordon Head Recreation Centre, 4100 Lambrick Way, Saanich

Observations were completed during two observation periods:

1. Monday May 29, 9:00am
2. Saturday June 10, 10:00am

Observations were completed for off-street parking lots at each recreation center, as well as any nearby on-street parking where parked vehicles could be reasonably attributed to the site.

Parking demand was highest during the Monday AM observation when average parking demand among the four sites approximately one vehicle per 29m<sup>2</sup> GFA. See **Table 5**. Observed parking demand was as high as one vehicle per 24m<sup>2</sup> (Esquimalt) and as low as one vehicle per 48m<sup>2</sup> (Commonwealth). Full results are contained in **Appendix C**.

**TABLE 5. SUMMARY OF PARKING DEMAND AT REPRESENTATIVE SITES**

Representative Site	Floor Area (m <sup>2</sup> )	Monday May 29, 9:00am		Saturday June 10, 10:00am	
		Observed Vehicles	Parking Demand	Observed Vehicles	Parking Demand
Oak Bay Recreation Centre <sup>8</sup>	6,676	244	1 vehicle / 27m <sup>2</sup>	252	1 vehicle / 26m <sup>2</sup>
Esquimalt Recreation Centre <sup>9</sup>	3,500	146	1 vehicle / 24m <sup>2</sup>	121	1 vehicle / 29m <sup>2</sup>
Saanich Commonwealth Place <sup>10</sup>	13,006	324	1 vehicle / 40m <sup>2</sup>	270	1 vehicle / 48m <sup>2</sup>
Gordon Head Recreation Centre <sup>11</sup>	3,100	120	1 vehicle / 26m <sup>2</sup>	88	1 vehicle / 35m <sup>2</sup>
<b>Average</b>			<b>1 vehicle / 29 m<sup>2</sup></b>		<b>1 vehicle / 35m<sup>2</sup></b>

## 2.4 TRAVEL SURVEYS

Two distinct travel surveys were administered to understand current travel characteristics among Crystal Pool patrons and staff. Each is described below.

### 2.4.1 TRAVEL SURVEY, PATRONS

A travel survey was administered among Crystal Pool patrons to understand patron travel mode split and as a basis for projecting future parking demand. The survey was developed by WATT Consulting Group and administered by Crystal Pool front desk staff. When patrons checked-in at the registration desk, they were asked “how did you get here?”. The survey ran from Sunday, June 04 and Sunday June 11, 2017 (7 days). A total of 614 responses were received.

The patron travel survey and full results are included in **Appendix D**.

Results of the travel survey determined that 46% of Crystal Pool patrons drive to/from the site. Another 21% of trips are made by walking, and 13% are made by bicycle and as a passenger. Refer to **Figure 5**.

<sup>8</sup> Obtained from Building Services/Maintenance departments via phone call on June 16, 2017

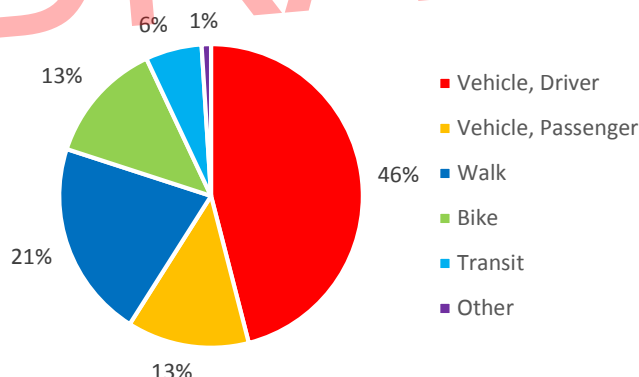
<sup>9</sup> Calculated using Google Earth

<sup>10</sup> Obtained from Building Services/Maintenance departments via phone call on June 16, 2017

<sup>11</sup> Calculated using Google Earth



**Figure 5. Crystal Pool Patron Travel Mode Split (614 responses)**



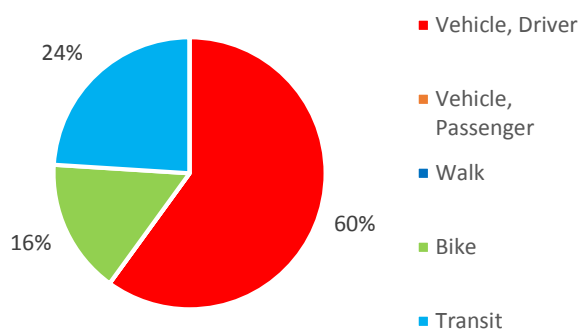
The overall mode split was also assessed for time-of-day and day-of-week. Results found that “Driver” mode share was 50% on weekdays and only 29% on weekends.

## 2.4.2 TRAVEL SURVEY, STAFF

A travel survey was administered among Crystal Pool staff to understand travel mode split and as a basis for projecting future parking demand. The survey was developed by WATT Consulting Group and administered by Crystal Pool administrative staff. The staff survey sought to understand staff travel mode over the course of a work week and where staff park their vehicles. Responses were received for 13 staff members. The staff travel survey and full results are included in **Appendix E**.

Results of the travel survey suggest that approximately 60% of staff drive to work, 24% use transit, and 16% ride a bicycle. Refer to **Figure 6**. Results are based on a small sample size (13 staff) and may not accurately represent overall staff mode split.

**Figure 6. Crystal Pool Staff Travel Mode Split (13 responses)**



Among staff who indicated they drive, 64% indicated they park in the Crystal Pool off-street parking lot, 32% indicated they park on-street surrounding the site, and 4% indicated they park in public off-street parking lots. These results suggest that the large majority of staff that do not park on the Crystal Pool site are parking in nearby on-street parking.

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## 2.5 CURRENT PARKING DEMAND

### 2.5.1 PATRON PARKING DEMAND

Applying the “Driver” mode share for the differing times-of-day / days-of-week to the estimated patron population during these periods, results suggest there is a patron parking demand of between 55 and 64 vehicles. See **Table 6**. As the Crystal Pool parking lot can accommodate 40 patron vehicles, this suggests that 15 to 24 vehicles seek parking elsewhere, likely on-street.

**TABLE 6. SUMMARY OF PATRON PARKING DEMAND**

Time Period	Peak Patron Population	Vehicle Mode Share	Patron Parking Demand (vehicles)
Weekdays 9:00am-11:00am	110	50%	55
Weekdays 1:00pm – 3:00pm	170	36%	61
Saturdays 8:30am – 11:00am	220	29%	64

### 2.5.2 STAFF PARKING DEMAND

Staff population varies throughout the week, however, “Driver” mode share remains constant. See **Table 7**. Results suggest staff vehicle demand ranges from 9 vehicles to 11 vehicles. The site contains six staff parking spaces, suggesting that up to five vehicles seek parking off-site.

**TABLE 7. SUMMARY OF STAFF PARKING DEMAND**

Time Period	Peak Staff Population	Vehicle Mode Share	Staff Parking Demand (vehicles)
Weekdays 9:00am-11:00am	18	60%	11
Weekdays 1:00pm – 3:00pm	17		10
Saturdays 8:30am – 11:00am	15		9



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### 2.5.3 SUMMARY OF CURRENT PARKING DEMAND

Total parking demand for the peak periods that were assessed range from 66 to 73 vehicles, and suggests that as many as 29 vehicles seek parking off-site (if both the patron and staff peaks are considered). See **Table 8**. It is assumed that the majority of these vehicles seek parking on-street and not in public off-street parking lots as on-street parking is available closer to the site (i.e., Queens Avenue, Quadra Street) and is free.

**TABLE 8. SUMMARY OF CURRENT PARKING DEMAND**

Peak Time	Staff Parking Demand (vehicles)	Patron Parking Demand (vehicles)	Total Parking Demand (vehicles)	Existing Floor Area	Parking Demand Rate
Weekdays 9:00am-11:00am	11	55	66	6,035m <sup>2</sup>	1 vehicle per 91m <sup>2</sup>
Weekdays 1:00pm – 3:00pm	10	61	71		1 vehicle per 85m <sup>2</sup>
Saturdays 8:30am – 11:00am	9	64	73		1 vehicle per 83m <sup>2</sup>

## 2.6 PROJECTED FUTURE PARKING DEMAND

The projected parking demand associated with the proposed new Crystal Pool facility is considered in the following sections.

### 2.6.1 FUTURE PARKING DEMAND, BY TOTAL FLOOR AREA

The proposed new Crystal Pool represents an approximately 30% increase in floor area over the existing facility. An increase in the current peak parking demand (66 to 73 vehicles) by 30% consistent with the increase in floor area suggests that the parking demand associated with the proposed new facility would be as high as approximately 95 vehicles.

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## 2.6.2 FUTURE PARKING DEMAND, BY ACTIVITY / AREAS

The Crystal Pool consists of three key activity areas that are the primary generators of parking demand. Each is considered below.

### Activity Area no.1: **Pool (Natatorium)**

The main level of the existing and future Crystal Pool consists of the same components – lobby, administration, change rooms and pool (“natatorium”). The proposed future pool space is approximately 20% larger than the existing space, suggesting an approximately 20% increase in parking demand from the current space.

The current pool, change rooms and administration/lobby constitutes approximately 90% of space that would generate parking demand<sup>12</sup>. This suggests 66 vehicles are currently associated with these spaces (65% of peak demand), an increase of 20% would result in approximately 79 vehicles in future.

### Activity Area no.2: **Fitness Room**

The fitness room in the proposed new facility is 712m<sup>2</sup>. This is approximately 2.5-times larger than the fitness room in the current facility (277m<sup>2</sup>)<sup>13</sup>.

The current fitness room constitutes 10% of space that generates parking. If it is assumed that 7 vehicles are currently associated with the fitness room (10% of peak demand), an increase of 2.5-times would result in 18 vehicles. This represents a parking supply rate of approximately one vehicle per 40m<sup>2</sup>.

### Activity Area no.3: **Multi-Purpose Rooms**

The proposed new facility includes three multi-purpose rooms with a combined 591m<sup>2</sup> floor area. The existing Crystal Pool does not have multi-purpose rooms. The Institute of Transportation Engineers (ITE) suggests a parking demand rate of 0.36 vehicles per person,<sup>14</sup> a combined parking demand of 39 vehicles for the three rooms. This represents a “worst case scenario” with all rooms at maximum capacity.

<sup>12</sup> Based on an estimate of space that generates parking – natatorium and fitness rooms.

<sup>13</sup> Estimated based on known floor areas for basement and level two, and approximate portion of floor area for each level.

<sup>14</sup> Based on ITE and a ratio of 5.5m<sup>2</sup> per person – this suggests an occupancy of 107 people.

### 2.6.3 SUMMARY OF FUTURE PARKING DEMAND

The proposed new Crystal Pool facility represents an approximately 30% increase in floor area over the existing facility. If the current peak parking demand (73 vehicles) were increased by 30%, the result suggests total future parking demand will be to 95 vehicles. A more detailed assessment of future parking demand for each of the three key activity areas concluded parking demand will be approximately 136 vehicles. This figure represents the number of vehicles anticipated to seek parking when the facility is at or near maximum capacity.

Potential changes in parking demand associated with improvements to Central Park have not been considered in this study. A comprehensive planning initiative for Central Park is anticipated to commence in 2019 that will consider parking associated with the Park.

## 2.7 FUTURE PARKING SUPPLY + IMPACTS

The following are three scenarios for how parking could be supplied at the proposed new Crystal Pool. The expected impact on neighbourhood parking conditions is identified for each scenario based on the projected parking demand figures from *Section 2.6*.

### Scenario A:

#### **All Parking is On-Site, 135-140 spaces**

It is anticipated that if approximately 135 to 140 parking spaces accompany the proposed new Crystal Pool facility that there will be little to no reliance on off-site parking. This would result in 29 less vehicles than currently park on-street during busy periods, and is likely to lead to on-site parking supply being under-utilized during all but the busiest periods.

### Scenario B:

#### **Neighbourhood Impact is Unchanged, 105-110 spaces**

It was determined in *Section 2.5.3* that the site currently contributes approximate 29 vehicles parking on-street during busy periods. In order to retain current neighbourhood parking conditions (i.e., the same number of vehicles parking on-street in future), approximately 105 to 110 parking spaces should accompany the proposed new Crystal Pool.

### Scenario C:

#### **Rely on On-Street Parking for Busy Periods, 85-90 spaces**

During peak periods (Saturday morning) the most sought-after parking spaces assessed in *Section 2.2.1*, may approach typical target occupancy of 85%<sup>15</sup>, suggesting the site would be contributing 48 vehicles to the on-street parking. This suggests the Crystal Pool lot should provide approximately 85 to 90 parking spaces to accommodate the remaining parking demand. On-street occupancy is only expected to reach target occupancy during the peak period, all other times occupancy will be lower.

<sup>15</sup> This is a commonly used target occupancy rate where parking supply meets demand but is not oversupplied.

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### 3.0 TRAFFIC ASSESSMENT

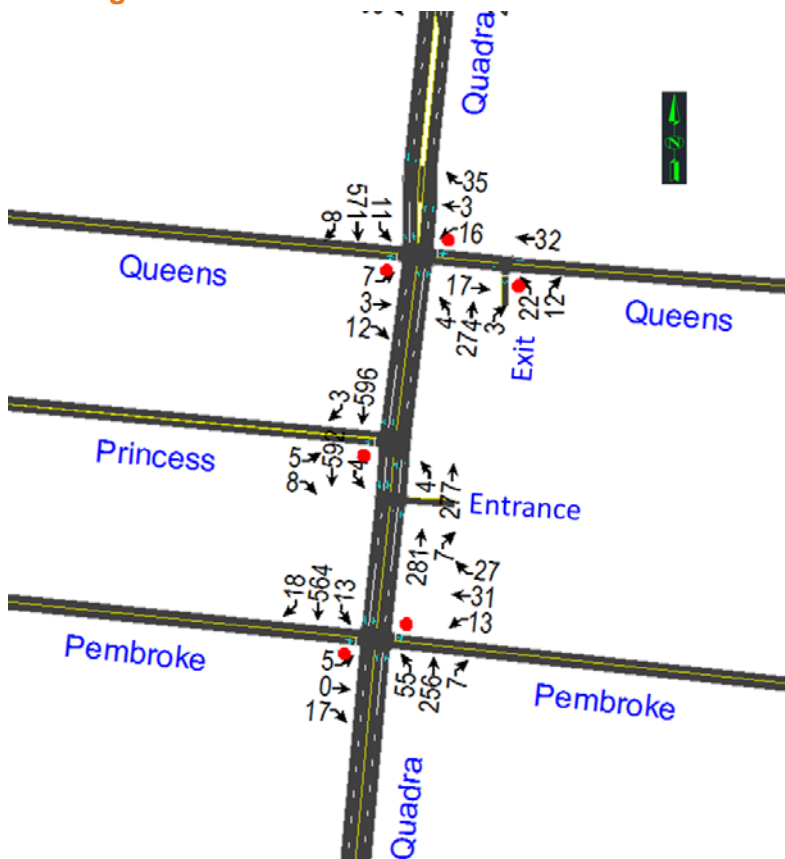
The purpose of this section is to assess site traffic impacts, giving specific consideration to motor vehicle traffic impacts on the surrounding road network, site access, walking and cycling network impacts, and commercial vehicle loading (i.e., trucks).

#### 3.1 EXISTING TRAFFIC OPERATIONS

##### 3.1.1 AM PEAK HOUR

Traffic counts were carried out on June 6, 2017 and June 7, 2017 from 8:00 AM to 9:00 AM to obtain AM peak hour volumes for Quadra Street at Queens Avenue, Princess Avenue, and Pembroke Street as well as the existing main parking lot. The AM peak traffic volumes are shown in **Figure 7**.

**Figure 7. 2017 AM Peak Hour Traffic Volumes**



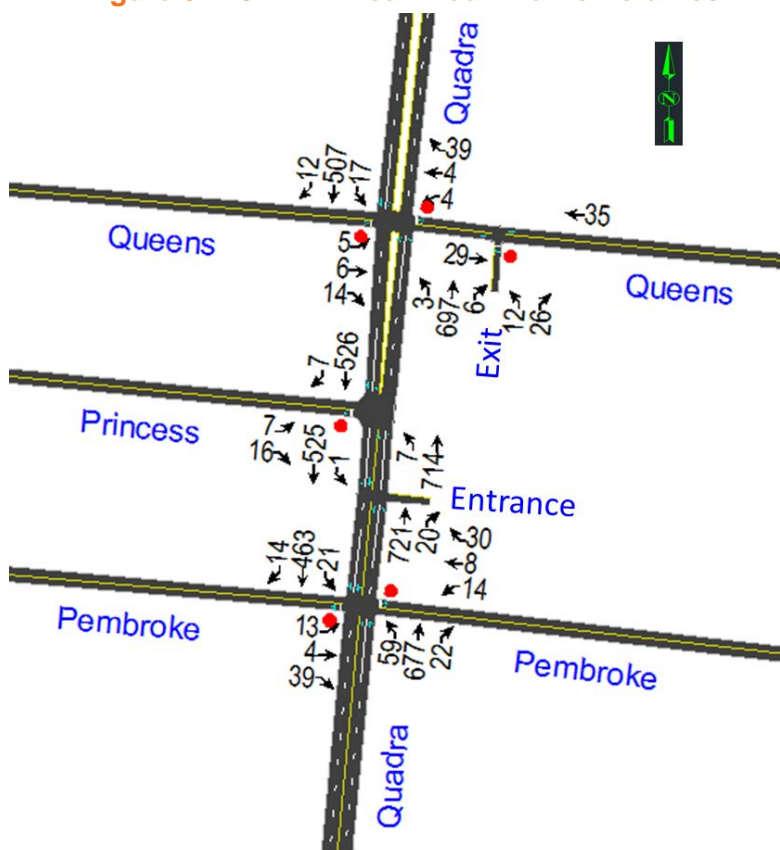
The results of the Synchro analysis demonstrate that at Quadra Street / Queens Avenue the westbound movement operates at LOS B and eastbound movement operates at LOS C. At the pedestrian signal at Princess Avenue the eastbound (stop sign) operates at LOS C. Quadra Street / Pembroke Street operates at a LOS D for the eastbound/westbound movements.

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### 3.1.2 PM PEAK HOUR

Traffic counts were carried out on June 6, 2017, June 7, 2017 and June 8, 2017 from 4:00 PM to 5:00 PM to obtain PM peak hour volumes for the three intersections on Quadra Street between Queens Avenue and Pembroke Street as well as the main parking lot. The peak traffic volumes are shown in **Figure 8**.

**Figure 8. 2017 PM Peak Hour Traffic Volumes**



The eastbound movement at Quadra Street / Queens Avenue operates at Level of Service D while the stop controlled eastbound movement at Quadra Street / Princess Avenue operates at LOS C. Due to the high volume of traffic on Quadra Street at Pembroke Street, the eastbound movement operates at a LOS E and the westbound at a LOS F under existing conditions.

### 3.1.3 TRAFFIC OPERATIONS OBSERVATIONS

The following observations were noted during site visits:

- Many cyclists were observed entering the Crystal Pool site via the Queens Avenue exit
- Some cyclists were observed entering the Crystal Pool site via the entrance on Quadra Street, having crossed Quadra Street using the pedestrian signal at Princess Avenue
- Between 12 and 22 vehicles were observed in one hour making a left turn from the Crystal Pool site onto Queens Avenue, despite the ban on the left turn movement
- Pedestrian crossings of Quadra Street at Pembroke Street were observed
- Southbound queues from the Quadra Street / Caledonia Avenue intersection during the PM peak hour occasionally block the Quadra Street / Pembroke Street intersection

## 3.2 MOTOR VEHICLE SITE ACCESS

Two possible site access (i.e., driveway) locations are considered below.

### 3.2.1 QUEENS AVENUE OPTION

In this option, the parking lot access would be on Queens Avenue mid-block between Quadra Street and Vancouver Street. Both entries and egresses would be facilitated at this location. This is the preferred option per the City's *Highway Access Bylaw no. 91-038, Section 12.1b* which dictates that the driveway crossing shall be sited on the street with the more minor classification, which in this case is Queens Avenue. This location encourages vehicles with origins / destinations to the east of the Crystal Pool site to use Queens Avenue and/or Vancouver Street, which presents neighbourhood "short cutting" issues and adds vehicular traffic to Vancouver Street - an identified All Ages and Abilities cycling route and People Priority Greenway route.

### 3.2.2 PRINCESS AVENUE OPTION

In this option, the parking lot access would be on Quadra Street directly opposite Princess Avenue, creating a fourth leg to the existing intersection. This option reduces the potential for vehicles to be travelling through and within the neighbourhood, and minimizes vehicular traffic on Vancouver Street - an identified All Ages and Abilities cycling route and People Priority Greenway route. This access option conflicts with the City's *Highway Access Bylaw no. 91-038, Section 12.1b* (see above), however *Section 12.2d* also clarifies that an alternate access location may be approved if the location results in traffic patterns that are inconsistent with a transportation plan approved by Council. The Queens Avenue driveway location conflicts with the objectives of the Greenways Plan to limit traffic on Vancouver Street. Accordingly, this study recommends the primary site access be located at Quadra Street / Princess Avenue.

### 3.3 TRIP GENERATION

The trip generation for the proposed new Crystal Pool facility was based on the Institute of Transportation Engineers ("ITE") *Trip Generation Manual* rates for Recreational Community Center. **Table 9** and **Table 10** summarize the results of the trip generation for the site.

**TABLE 9. AM PEAK HOUR TRIP GENERATION**

Land Use	Gross Floor Area	Trip Rate (/1000 sq. ft.)	IN	OUT	Total Trips	Trips IN	Trips OUT
Community Centre	73,000 sq. ft.	2.05	66%	34%	<b>150</b>	<b>99</b>	<b>51</b>

**TABLE 10. PM PEAK HOUR TRIP GENERATION**

Land Use	Gross Floor Area	Trip Rate (/1000 sq. ft.)	IN	OUT	Total Trips	Trips IN	Trips OUT
Community Centre	73,000 sq. ft.	2.74	49%	51%	<b>200</b>	<b>98</b>	<b>102</b>

### 3.4 TRIP ASSIGNMENT + DISTRIBUTION

The trip distribution for the site-generated traffic was established using existing traffic patterns entering and exiting the site, as well as the current traffic patterns in the vicinity of the site.

#### 3.4.1 QUEENS AVENUE OPTION

It was assumed that 67% of the AM peak traffic inbound would originate from west of the site and 33% from the east. 50% of the west side inbound traffic is coming from Quadra Street northbound traffic and 50% from Quadra Street southbound traffic. Outbound it was assumed that 67% will go to the west (turning onto Quadra Street) and 33% to the east. The percentages are reversed for PM peak inbound and outbound movements.

#### 3.4.2 PRINCESS AVENUE OPTION

In this option all of the traffic would utilize Quadra Street to access the site. It was assumed that 50% would be to/from the north and 50% to/from the south.



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### 3.5 OPENING DAY OPERATIONS

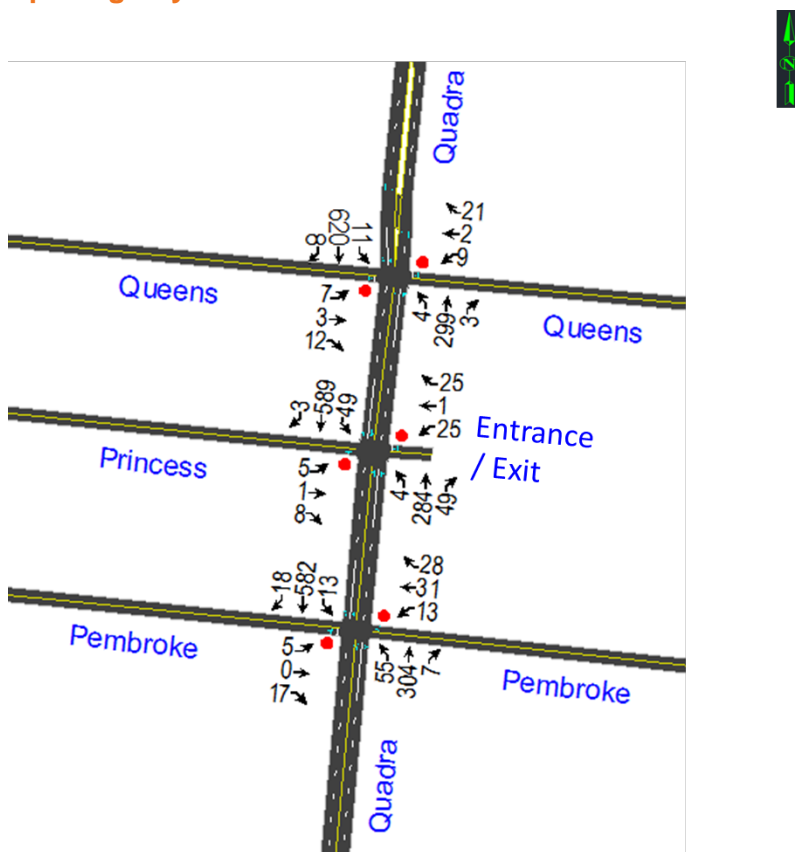
The opening day traffic volumes were determined by adding the site-generated volumes to the existing traffic volumes. The opening day peak hour traffic volumes and the resulting traffic operations are presented in the following sections for both the Princess Avenue access location (preferred) and the Queens Avenue access location (alternate).

#### 3.5.1 AM PEAK HOUR

##### Princess Avenue Option (Preferred)

**Figure 9** and **Table 11** shows the AM peak turning movements for the intersections in the study area.

**Figure 9. Opening Day AM Peak Hour Traffic Volumes – Princess Ave Option**



**TABLE 11. AM PEAK HOUR CONDITIONS - PRINCESS AVE OPTION**

Intersection / Movement			AM Peak Hour		
			LOS	Delay (s)	Queue (m)
Quadra St / Queens Ave (Unsignalized)	NB	Left/Through	A	9.2	8
		Through/Right	A	0	11.4
	SB	Left/Through	A	8.1	20.8
		Through/Right	A	0.1	17.4
	EB	Left/ Through/Right	C	20.4	11.8
	WB	Left/ Through/Right	B	14.8	13.7
Quadra St / Princess Ave- Entrance-Exit (Unsignalized)	NB	Left/Through	A	9.8	8.6
		Through/Right	A	0.1	9.7
	SB	Left/Through	A	8.3	17.8
		Through/Right	A	0.3	12.0
	EB	Left/ Through/Right	C	19.5	13.9
	WB	Left/ Through/Right	C	16.9	16.5
Quadra St / Pembroke St (Unsignalized)	NB	Left/Through	A	9.4	21.3
		Through/Right	A	0.4	7.7
	SB	Left/Through	A	8.5	15.6
		Through/Right	A	0.1	16.4
	EB	Left/ Through/Right	D	28.3	13.4
	WB	Left/ Through/Right	D	28.8	16.9

The proposed Princess Avenue access location will operate at a LOS C with the existing pedestrian signal. Travel time savings will be presented, however, as only one maneuver is required to access Quadra Street (rather than two movements under the Queens Avenue access option). There is not a significant operational difference in terms of delay between the two options. The Quadra Street / Princess Avenue location provides direct access to Quadra Street and does not encourage neighbourhood “short cutting” via Queens Avenue or other neighbourhood streets.

## Princess Avenue Option (Preferred), With Full Signal

**Table 12** shows the traffic assessment for AM peak hour at Quadra St / Princess Avenue-Driveway with the intersection converted to a full signal.

**TABLE 12. AM PEAK HOUR CONDITIONS - PRINCESS AVE OPTION, WITH FULL SIGNAL**

Intersection / Movement			PM Peak Hour		
			LOS	Delay (s)	Queue (m)
Quadra St / Princess Ave-Entrance-Exit (Signalized)	NB	Left/Through	A	3.9	23.5
		Through/Right	A	4.0	25.5
	SB	Left/Through	A	4.6	47.5
		Through/Right	A	4.7	48.6
	EB	Left/ Through/Right	B	18.1	13.1
	WB	Left/ Through/Right	B	18.6	17.3

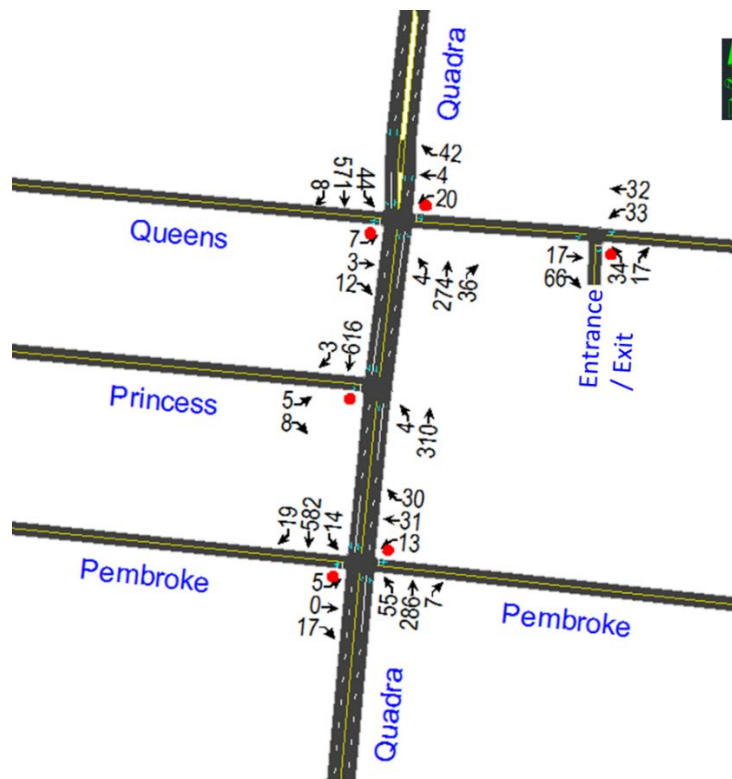
As shown in **Table 12**, both Princess Avenue and the Crystal Pool driveway will operate at LOS B with minimal delay added to the Quadra Street movements. This option also provides pedestrian crosswalks on all four legs.

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### Queens Avenue Option (Alternate)

**Figure 10** and **Table 13** shows the AM peak turning movements for the intersections in the study area.

**Figure 10. Opening Day AM Peak Hour Traffic Volumes – Queens Ave Option**



**TABLE 13. AM PEAK HOUR CONDITIONS - QUEENS AVE OPTION**

Intersection / Movement			AM Peak Hour		
			LOS	Delay (s)	Queue (m)
Quadra St / Queens Ave (Unsignalized)	NB	Left/Through	A	9.0	10.2
		Through/Right	A	0.0	12.7
	SB	Left/Through	A	8.4	28
		Through/Right	A	0.4	24.4
	EB	Left/ Through/Right	C	24.5	11.8
	WB	Left/ Through/Right	C	20.1	16.4
Quadra St / Princess Ave (Unsignalized)	NB	Left/Through	A	9.9	10.9
		Through	A	0.1	9.9
	SB	Through	-	-	15.8
		Through/Right	-	-	18.6
	EB	Left/Right	C	16.0	14.3
Quadra St / Pembroke St (Unsignalized)	NB	Left/Through	A	9.4	19.4
		Through/Right	A	0.3	6.4
	SB	Left/Through	A	8.4	13
		Through/Right	A	0.1	14.8
	EB	Left/ Through/Right	D	27.9	14.1
	WB	Left/ Through/Right	D	27.6	16
Queens St / Parking Lot Access (Unsignalized)	NB	Left/Right	A	9.4	15.7
	EB	Through/Right	A	0.0	1.2
	WB	Left/Through	A	7.5	4.9

From an operations perspective, the proposed access on Queens Avenue will operate at a LOS A with minimal delays. There is a slight increase in delay on the westbound approach at Queens Avenue / Quadra Street; however, all movements at the intersection operate at a LOS C or better. There are no issues in the AM Peak hour.

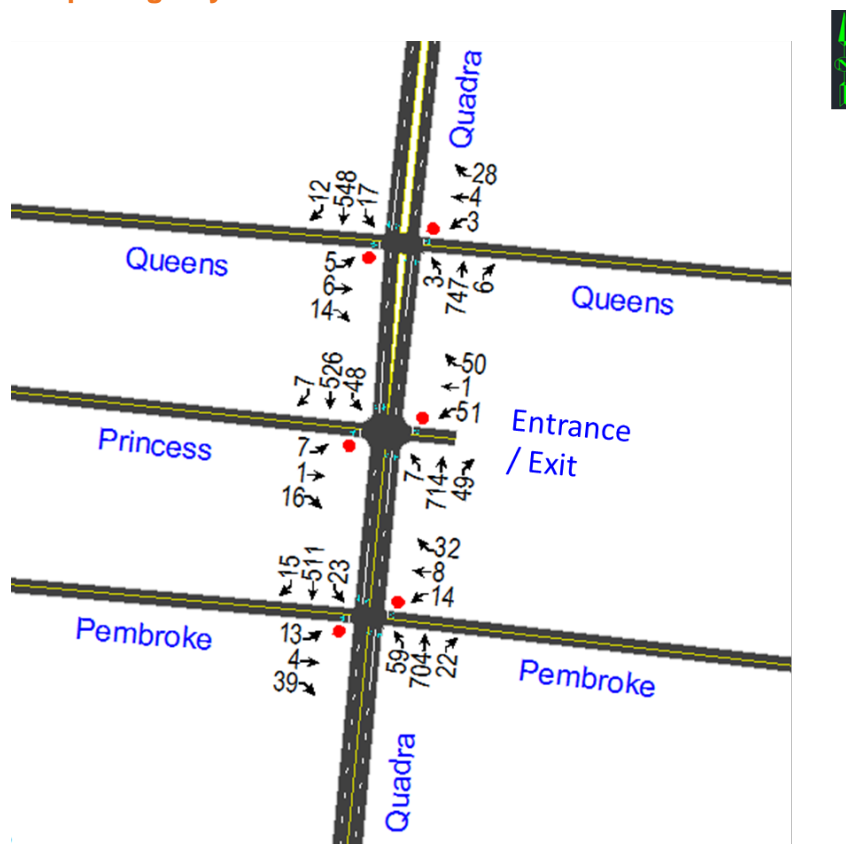
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### 3.5.2 PM PEAK HOUR

#### Princess Avenue Option (Preferred)

**Figure 11** and **Table 14** shows the PM peak turning movements for the intersections in the study area.

**Figure 11. Opening Day PM Peak Hour Traffic Volumes – Princess Ave Option**



**TABLE 14. PM PEAK HOUR CONDITIONS - PRINCESS AVE OPTION**

Intersection / Movement			PM Peak Hour		
			LOS	Delay (s)	Queue (m)
Quadra St / Queens Ave (Unsignalized)	NB	Left/Through	A	9.8	10.5
		Through/Right	A	0.1	15.7
	SB	Left/Through	A	9.8	17.9
		Through/Right	A	0.2	10.7
	EB	Left/ Through/Right	D	34.1	14.7
	WB	Left/ Through/Right	C	21.6	13.2
Quadra St / Princess Ave- Entrance-Exit (Unsignalized)	NB	Left/Through	A	9.2	16.9
		Through/Right	A	0.2	20.6
	SB	Left/Through	A	10	24.4
		Through/Right	A	0.5	18.4
	EB	Left/ Through/Right	D	26.1	13.2
	WB	Left/ Through/Right	F	72.8	26.2
Quadra St / Pembroke St (Unsignalized)	NB	Left/Through	A	9.2	21.3
		Through/Right	A	0.6	7.7
	SB	Left/Through	B	10.5	15.6
		Through/Right	A	0.4	16.4
	EB	Left/ Through/Right	F	56.5	13.4
	WB	Left/ Through/Right	F	78.1	16.9

With the parking lot access as the fourth leg of the Quadra Street / Princess Street intersection, the westbound movement (from the site) will operate at a LOS F and the eastbound movement will drop to a LOS D with the existing pedestrian signal / stop sign operation. There is also a drop for the eastbound movement at Quadra Street / Pembroke Street from a LOS E to LOS F with this option.



## Princess Avenue Option (Preferred), With Full Signal

**Table 15** shows the traffic assessment for PM peak turning movements at Quadra St / Princess Avenue-Driveway intersection with the installation of a full traffic signal.

**TABLE 15. PM PEAK HOUR CONDITIONS - PRINCESS AVE OPTION, WITH FULL SIGNAL**

Intersection / Movement			PM Peak Hour		
			LOS	Delay (s)	Queue (m)
Quadra St / Princess Ave-Entrance-Exit (Signalized)	NB	Left/Through	A	5.7	50.1
		Through/Right	A	6.0	57.4
	SB	Left/Through	A	5.3	47.0
		Through/Right	A	5.5	50.9
	EB	Left/ Through/Right	B	17.1	12.4
	WB	Left/ Through/Right	B	18.4	24.4

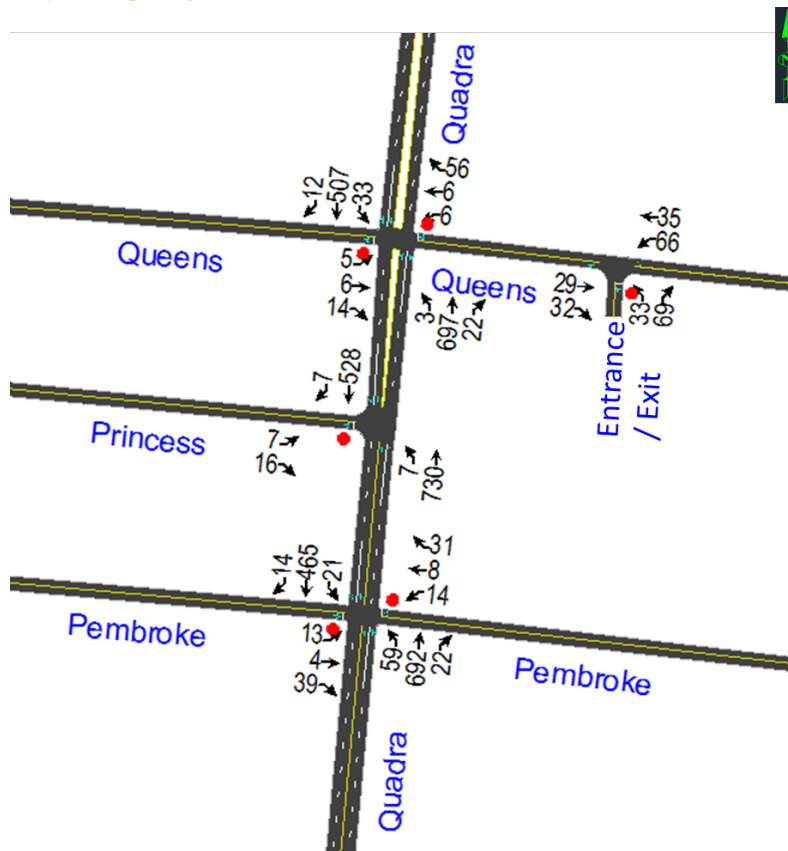
As shown in **Table 15**, both Princess Avenue and the Crystal Pool driveway will operate at LOS B with minimal delay added to vehicles on Quadra Street. Overall a full signal at this location will operate at a LOS A/B.

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### Queens Avenue Option (Alternate)

Figure 12 and Table 16 shows the PM peak turning movements for the intersections in the study area.

Figure 12. Opening Day PM Peak Hour Traffic Volumes – Queens Ave Option



**TABLE 16. PM PEAK HOUR CONDITIONS - QUEENS AVE OPTION**

Intersection / Movement			PM Peak Hour		
			LOS	Delay (s)	Queue (m)
Quadra St / Queens Ave (Unsignalized)	NB	Left/Through	A	9.6	12.2
		Through/Right	A	0.1	11.5
	SB	Left/Through	A	9.8	20.8
		Through/Right	A	0.4	11.6
	EB	Left/ Through/Right	E	36.9	13.3
	WB	Left/ Through/Right	D	26.5	15.3
Quadra St / Princess Ave (Unsignalized)	NB	Left/Through	A	9.2	15.6
		Through	A	0.2	18.3
	SB	Through	-	-	9.2
		Through/Right	-	-	16.4
	EB	Left/Right	C	18.1	13.4
Quadra St / Pembroke St (Unsignalized)	NB	Left/Through	A	9	35.3
		Through/Right	A	0.5	31.4
	SB	Left/Through	B	10.4	17.2
		Through/Right	A	0.3	13.0
	EB	Left/ Through/Right	E	44.5	15.4
	WB	Left/ Through/Right	F	64.2	17.9
Queens St / Entrance-Exit (Unsignalized)	NB	Left/Right	A	9.6	17.5
	EB	Through/Right	A	-	-
	WB	Left/Through	A	7.5	7.2

The parking lot access on Queens Avenue will operate at a LOS A in the PM peak hour; however, the westbound movement at the Quadra Street / Queens Avenue intersection drops to a LOS D and the eastbound movement drops from LOS D to LOS E (by 1.9 seconds). All other movements along Quadra Street will remain at the same LOS.

### 3.6 MITIGATION MEASURES

Princess Avenue is the recommended access location as it provides the most direct access to the site, minimizes traffic “short cutting” through the neighbourhood and on Vancouver Street (a AAA bicycle facility and identified People Priority Greenway), and maintains excellent pedestrian and transit access to the site. Assuming Princess Avenue is the ultimate access location, the Quadra Street / Princess Avenue intersection should be upgraded to a full traffic signal to provide pedestrian crossings on all four legs and mitigate poor traffic operations in the PM peak. The implementation of a full signal maintains excellent (LOS A) operations on Quadra Street.

No mitigation is required to address traffic operations if the access location is on Queens Avenue. However, if the primary building entrance is at the corner of Quadra Street and Pembroke Street – as is proposed as of the time this study was undertaken – the existing pedestrian signal at the Quadra Street / Princess Avenue intersection may be removed and a new full signalized intersection installed at Pembroke Street / Quadra Street to respond to altered pedestrian desire lines and mitigate poor traffic operations at this location.

### 3.7 ACTIVE TRANSPORTATION SITE ACCESS

The location of the primary building entrance will impact the walking distance to/from the on-site parking area, as well as walking and cycling connectivity within the neighbourhood. It is recommended that the primary building entrance is located adjacent the Quadra Street / Princess Avenue intersection. This location provides the following benefits:

1. Walking distance between the on-site parking area and the primary entrance is minimized;
2. Offers a more conventional patron experience with the primary entrance visible from the parking lot, aiding in navigation from the parking area to the building entrance and reducing the need for lighting and surveillance to maintain personal safety;
3. Adjacent Quadra Street bus stops are well integrated, with walking distance from the northbound location minimized and easy access to the southbound bus stop provided via the Princess Avenue crossing; and
4. Provides the opportunity for a multi-use pathway through Central Park (see *Section 4.1.4*) that connects the two segments of Princess Avenue, and with bicycle parking adjacent the pathway and oriented to the building entrance.

The primary building entrance was proposed to be at the Quadra Street / Pembroke Street intersection at the time this study was prepared. If this location is pursued, cyclists would have direct access from the Vancouver Street AAA route via Pembroke Street. Under this scenario, consideration should be given to installing a new full signalized intersection at Quadra Street / Pembroke Street, and removing the existing pedestrian signal at Quadra Street / Princess

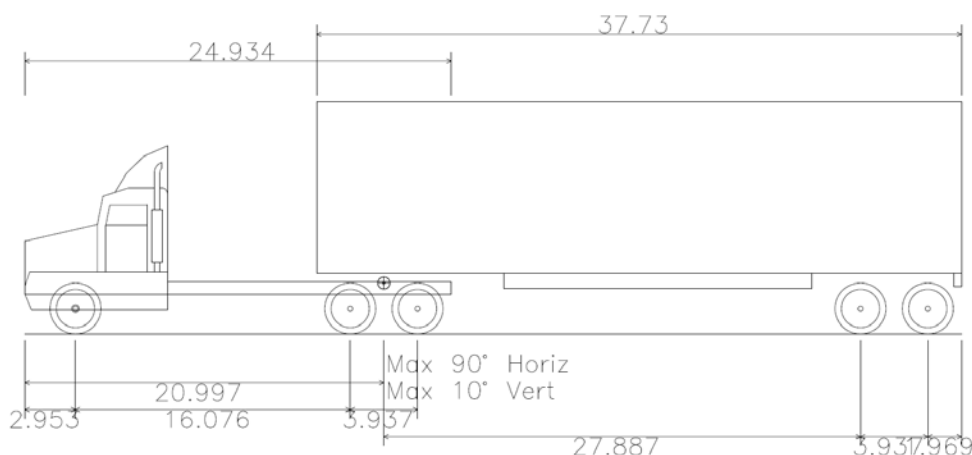
Avenue (see Section 3.6). Consideration may also be given to moving the Quadra Street bus stops south 100m to focus on the Pembroke Street intersection (rather than Princess Avenue).

### 3.8 TRUCK LOADING

A commercial vehicle (i.e., truck) loading facility is proposed at the rear of the Crystal Pool facility, accessed from Pembroke Street at approximately mid-block. The exact location and design had not been confirmed as of the time of this study.

Turning movement assessments were conducted for various truck sizes and configurations to determine the largest truck that can complete turns through the Quadra Street / Pembroke Street intersection in order to access the site. The largest vehicle that can be accommodated through the Quadra Street / Pembroke Street intersection is the WB-15 vehicle, as shown in **Figure 13**. The on-site loading area should therefore be designed to accommodate the WB-15 vehicle, as this is the largest truck that can reasonably access the site. A review of turning movements may be completed once the site design is complete.

**Figure 13. WB-15 Truck Dimensions**



WB-15 – Semitrailer Combination	
Overall Length	54.790ft
Overall Width	8.530ft
Overall Body Height	13.615ft
Min Body Ground Clearance	1.427ft
Track Width	8.530ft
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	44.948ft

## 4.0 DEMAND MANAGEMENT

Transportation demand management (TDM) refers to policies, programs and services that influence whether, why, when, where and how people travel.<sup>16</sup> TDM initiatives typically aim to reduce single-occupant vehicle (“SOV”) trips and encourage alternative travel options such as walking, cycling, public transit and shared rides. Ultimately, a carefully designed TDM program can mitigate parking demand by discouraging driving and incentivizing more sustainable forms of travel.

The TDM options presented in this section are targeted toward both employees and patrons of the Crystal Pool site. Employees are generally more easily targeted with TDM given their fixed and predictable commuting characteristics. Patrons are a more difficult target group, but have been given consideration in the following section given the large proportion of the site’s traffic and parking demand they represent.

### 4.1 CYCLING INITIATIVES

#### 4.1.1 LONG-TERM BICYCLE PARKING

Long-term bicycle parking is intended for long-term users of a building such as employees. This type of parking consists of attended facilities, lockers, or a secure and restricted access facility within a structure or building on the same property.<sup>17</sup>

The City of Victoria’s Off-Street Parking Regulations (Schedule C) dictates that the proposed new facility should include one bicycle parking space per 100 m<sup>2</sup> of assembly area, of which 20% must be for long-term parking (i.e., Class 1). This suggests that approximately 16 long-term bicycle parking spaces are required. Consideration should be given to providing long-term bicycle parking above and beyond the requirement in Schedule C.

Increasing the provision of long-term bicycle parking is strongly supported by local planning and policy goals. In fact, the City has plans to improve its cycling network and increase the number of trips made by bicycle where 70% of journey to work trips take place by walking, cycling, and public transit by 2041.<sup>18</sup> Current trends suggest that Victoria provides a bike-friendly environment. In 2011, the Victoria census metropolitan area (CMA) led the country with the highest proportion of its commuters travelling by bicycle (5.9%).<sup>19</sup> When isolated to the City of

<sup>16</sup> Definition based on Transport Canada, TDM for Canadian Communities, March 2011

<sup>17</sup> Additional information on bicycle parking facility design is available in the City’s Bicycle Parking Strategy, Chapter 6, available at: <http://www.victoria.ca/assets/Departments/Engineering-Public-Works/Documents/parking-bicycle-strategy.pdf>

<sup>18</sup> City of Victoria. (2012). Official Community Plan, p. 63. Available online at: [http://www.victoria.ca/assets/Departments/Planning-Development/Community-Planning/OCP/OCP\\_Book.pdf](http://www.victoria.ca/assets/Departments/Planning-Development/Community-Planning/OCP/OCP_Book.pdf)

<sup>19</sup> Statistics Canada. (2011). Proportion of workers commuting to work by car, truck or van, by public transit, on foot, or by bicycle, census metropolitan area, 2011. Available online at: <https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-012-x/2011003/tbl/tbl1a-eng.cfm>



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Victoria, the rate was higher at 11%.<sup>20</sup> The general “active” nature of Crystal Pool staff and the lifestyle associated with the services provided suggests staff may commute by bicycle more frequently than the general populous. Additionally, Crystal Pool is also located in an area that will benefit from the future Biketoria Network.<sup>21</sup> It is located approximately 670m from the existing Pandora Avenue two-way cycle track, and less than 200m from the “All Ages and Abilities” cycling facility that will be constructed on Vancouver Street.

The maximum number of Pool staff on-site at one time is 18<sup>22</sup>, and it is assumed that this figure could increase in future to up to 25 – 30 staff at one time. The provision of long-term bicycle parking for half of the total number of staff that may be present on the site at a given time would seem to be a sufficient provision for the peak demand periods (i.e., Summer, Bike to Work Week). Accordingly, it is recommended that the new Crystal Pool facility include long-term bicycle parking with capacity for 16 bicycles, consistent with the requirement.

#### 4.1.2 SHORT-TERM BICYCLE PARKING

Short-term bicycle parking, also referred to as “Class 2 bike parking”, refers to bicycle parking intended for short-term use by patrons and may consist of bicycle racks located at or near a building’s entrance. Short-term bicycle parking should be sheltered from weather, well-lit, and provide for passive surveillance to deter possible theft (i.e., “eyes on the street”)<sup>23</sup>.

The City of Victoria’s Off-Street Parking Regulations (Schedule C) dictates that the proposed new facility should include one bicycle parking space per 100 m<sup>2</sup> of assembly area, of which 80% must be for short-term parking (i.e., Class 2). This suggests that approximately 64 short-term bicycle parking spaces are required. Given the nature of the facility and the recreation activities that patrons typically engage in, a greater number of short-term bicycle parking spaces may be appropriate. This direction is supported by statements in the City’s Bicycle Parking Strategy that suggest the Crystal Pool is a recreation / community facility anticipated to generate higher than average demand for bicycle parking<sup>24</sup>.

<sup>20</sup> Statistics Canada. (2013). Victoria, CY, British Columbia (Code 5917034) (table). National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Available online at: <http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/index.cfm?Lang=E>

<sup>21</sup> City of Victoria. (2017). Biketoria: Background. Available online at: <http://www.victoria.ca/EN/main/residents/transportation/cycling/biketoria-background.html>

<sup>22</sup> Estimate provided by City of Victoria staff by email on June 16, 2017

<sup>23</sup> Additional information on bicycle parking facility design is available in the City’s Bicycle Parking Strategy, Chapter 6, available at: <http://www.victoria.ca/assets/Departments/Engineering~Public~Works/Documents/parking-bicycle-strategy.pdf>

<sup>24</sup> City of Victoria, Bicycle Parking Strategy, August 2011, Section 3.1, pg 7.

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There is currently capacity for approximately 32 bicycles in the bike racks adjacent the front entrance to the Crystal Pool. Up to 5 bicycles were observed using the bike racks<sup>25</sup>. The total number of patrons using the facility at a given time compared with the patron cycling mode share (established through the travel survey, see Section 2.4.1) suggests that current short-term bicycle parking demand is as high as approximately 35 - 40 bicycles. The current usage should be factored up by at least 30% to reflect to increased floor area. Accordingly, it is recommended that the short-term bicycle parking facility include capacity for approximately 64 bicycles, consistent with the requirement.

The design of short-term bicycle parking is important to achieving the objectives of safety, security and comfort. Consideration should be given to making the facility integral with the larger Pool building (i.e., using roof overhang for shelter). If this cannot be achieved, a high-quality stand-alone shelter may be put in-place to provide weather protection and lighting. Examples of good stand-alone shelters are at the Esquimalt Recreation Centre, Oak Bay Secondary School, and the shelter at Yates Street / Douglas Street in downtown Victoria. Costs for such a facility may vary greatly depending on the type and finish selected.

#### 4.1.3 TRIP-END FACILITIES

Bicycle trip-end facilities refers to showers, change rooms and lockers intended to allow cyclists (particularly those travelling long distances) to comfortably shower and change at the end of their trip. These facilities will be available at the Crystal Pool (as they currently are) and accessible to staff.

#### 4.1.4 CYCLING CONNECTIVITY

Vancouver Street is an identified People Priority Greenway route and will be constructed as an All Ages and Abilities route. This will be a key north-south cycling route and one of the primary routes by which patrons and staff access the Crystal Pool.

A multi-use pathway is recommended through Central Park to facilitate cycling between the new Crystal Pool site and Vancouver Street. See **Figure 14**. This would allow for an off-road cycling facility as an alternative to using Pembroke Street or Queens Avenue. Short-term bicycle parking should be located directly adjacent the pathway, and proximate to the primary building entrance (if located at Quadra Street / Princess Avenue, as recommended). This facility would also appeal to pedestrians, providing a direct walking route to/from the crossing at Princess Avenue / Quadra Street and a more direct walking route to the northbound bus stop on Quadra Street. City Parks, Recreation and Facilities department staff should be consulted prior to pursuing this multi-use pathway, as the alignment is expected to impact the existing sports fields and may impact or require route deviation to minimize impacts to existing mature trees.

<sup>25</sup> Observations were completed on Tuesday June 27 2017 at 3:45pm. The weather was sunny and warm all week, suggesting that patron cycling rates were at or near their peak.

**Figure 14. Proposed Central Park Multi-Use Pathway Alignment**



## 4.2 TRANSIT INITIATIVES

As discussed in *Section 1.2.3*, Crystal Pool is located on the route no. 6 (Royal Oak / Downtown), which currently provides weekday service approximately every 10-minutes during the peak periods. Moreover, Quadra Street has been identified as a “Frequent Transit Corridor” in the Victoria Region 25 Year Transit Future Plan and is expected to offer service every 15-minutes or better from 7:00am to 10:00pm, seven days per week.<sup>26</sup>

### 4.2.1 BUS STOP IMPROVEMENTS

Both the northbound and southbound bus stops adjacent the Crystal Pool site meet basic accessibility criteria and include basic bus stop amenities (bench, shelter, garbage bin). The northbound bus stop is not well integrated with the Crystal Pool site and requires that an individual take a circuitous routing south of the Crystal Pool access in order to travel between the bus stop and the front door of the Pool.

The recommendations of this study direct the proposed new Crystal Pool facility access to be on Quadra Street immediately opposite Princess Avenue and to orient the primary building entrance to the Quadra Street / Princess Avenue intersection. As part of the site reconfiguration, the northbound bus stop on Quadra Street should be moved 40m to 60m south of the current location. General guidance is to locate bus stops at the far-side of an intersection, however in this case the near-side location is preferred to more closely align the bus stop with the primary trip origin / destination (i.e., the Crystal Pool primary entrance) and minimize walking distance.

### 4.2.2 EMPLOYEE TRANSIT PASSES

Based on the site’s current transit access, and the planned improvements to transit frequency in the near future, consideration should be given to providing transit passes to employees through BC Transit’s ProPass program. The program requires at least 10 employees to participate. Passes are given to the employer at a discounted rate of \$875.50 per year per pass, or \$73 per month. The City may consider a partial or full subsidy, and would be pooled with all City employees (i.e., not only those employed at Crystal Pool). Island Health, as an example, offers an approximately 50% subsidy to its employees as a means to address parking challenges at the Royal Jubilee Hospital.

<sup>26</sup> Frequent transit service criteria based on the definition provided in the *Official Community Plan*, pg 259 and BC Transit’s *Transit Future Plan*, pg 5.

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### 4.3 RIDESHARE INITIATIVES

Carpooling, also known as ridesharing, has minimal incremental costs because it makes use of vehicle seats that would otherwise be unoccupied. Moreover, as more people participate in carpooling, the chances of finding a suitable carpool option increase substantially.<sup>27</sup>

#### 4.3.1 CARPOOL PARKING

Designating carpool vehicle parking spaces can encourage flexible modes of transportation that reduce the need for privately owned vehicles.<sup>28</sup> Consideration should be given to reserving one carpooling parking space. The space should have a time limitation (i.e., 7:00am to 10:00am), after which time it would be available as general parking.

#### 4.3.2 RIDE MATCHING

Two options may be pursued to help facilitate carpooling, as follows:

1. **External:** Encourage employees to sign up for Jack Bell RideShare<sup>29</sup>, which is a free ridesharing website that matches commuters with similar origin and destinations.
2. **Internal:** Post a sign-up sheet in the employee room that includes employee origin and approximate travel time, providing the opportunity to match compatible trips/employees.

### 4.4 PARKING MANAGEMENT

#### 4.4.1 PRICED PARKING

Priced parking is not supported for patron parking as it would encourage parking in the neighbourhood in 2-hour zones and act as a barrier to residents accessing recreation.

Given the urban location of Crystal Pool, and its good access to a number of transportation options, consideration should be given to priced parking for employees. Priced parking is the most impactful TDM approach that may be employed to reduce parking demand, though not always a popular and well received option. The reduction in employee parking demand resulting from priced parking will vary depending on price. Numerous studies have been conducted and results generally suggest parking demand reductions of 20% to 30% where employee parking is priced at market rates (varies by community), with reductions ranging anywhere from 10% to 50%.<sup>30</sup>

<sup>27</sup> Victoria Transport Policy Institute. (2015). Rideshare: Carpooling and Vanpooling. *TDM Encyclopedia*. Available online at: <https://www.vtpi.org/tdm/tdm34.htm>

<sup>28</sup> U.S. Green Building Council. LEED Reference Guide for Neighbourhood Development V4 Edition, pg. 235. Washington, DC.

<sup>29</sup> For more information about the Jack Bell RideShare, see: <https://online.ride-share.com/en/my/>

<sup>30</sup> The following references are provided as examples:

Transit Cooperative Research Program, Parking Pricing and Fees: Traveler Response to Transportation System Changes, Report 95, Chapter 13, 2005; Page 13-15, Table 13-9. Available online at: [www.trb.org/Publications/TCRPReport95.aspx](http://www.trb.org/Publications/TCRPReport95.aspx)



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The site is located in proximity to two Robbins Parking sites including the Save-On-Foods Memorial Centre and the parking lot across from Save-On-Foods on Caledonia Avenue. Parking rates at the Save-On-Foods Memorial Centre are \$125 for a monthly pass, \$1.50 per hour, \$9 per day, and \$3 from 5pm to 6am. Rates at the Caledonia Avenue Parking Lot are \$130 per month, \$2 per hour, and \$9 per day until 6pm.<sup>31</sup> Assuming \$130 is the market rate for monthly parking, a 20% reduction in employee parking demand is supported if employees pay market rates to access parking.

#### 4.4.2 TIME LIMITATIONS

Rather than price parking, time restrictions of two hours for patron parking should be retained on-site – consideration may be given to implementing time limits for all on-site parking. The current time limit of two hours is appropriate to accommodate all patron trips and deter staff from parking on-site. Staff would be expected to obtain parking in nearby off-street lots (i.e., Save-on-Foods Memorial Centre, Royal Athletic Park) at market rates. Any patrons who need more than the specified limit to complete their trip could obtain a permit from the front desk and place it in their dash.

This would serve to reduce staff parking demand by forcing them to pay market rates to park their vehicle, while also reducing the on-site parking supply by approximately 14 spaces by requiring that staff park elsewhere.

#### 4.4.3 PARKING CASH OUT

Consideration may be given to a staff travel fund or “parking cash out” that offers a cash incentive to staff who do not park a vehicle on-site. Research shows that when given the option to take cash instead of the parking space, many employees will take the cash and choose to carpool, take transit, or walk or bike to work.<sup>32</sup> This would reduce the number of parking spaces sought by staff, while also reducing the costs to construct and maintain on-site parking.

Research on California’s parking cash out law has reported that across a surveys of commuters, parking cash out reduced vehicle travel to work by 12 percent.<sup>33</sup> Applied to the Crystal Pool, this has potential to reduce staff parking demand by one or two vehicles.

Victoria Transport Policy Institute, Parking Pricing: Direct Charges for Using Parking Facilities. Available online: [www.vtpi.org/tdm/tdm26.htm](http://www.vtpi.org/tdm/tdm26.htm)

<sup>31</sup> Robbins parking rates for each location within the City of Victoria are available online at: <http://robbinsparking.com/parking-locator/>

<sup>32</sup> Ibid.

<sup>33</sup> Shoup, D. (2005). *Parking Cash Out*. American Planning Association: Chicago, Washington D.C.

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## **APPENDIX A: SUMMARY OF ON-STREET PARKING OBSERVATIONS**



Parking Occupancy

Summary, by Parking Restriction

	No. Spaces	Friday May 26, 9:00am				Monday June 5, 6:30pm		Saturday June 10, 9:00am		Average Occupancy
		17	0	25	7	12	10	20	217	
2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 4pm-6pm	38									21%
2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 7am-9am	37									22%
Residential Parking Only	396	202	206	248	217					37%
2 Hr Max, 8am-6pm, Mon-Sat	182	60	67	124	50					28%
Residential Permit Parking	21	13	17	17	15					49%
TOTAL	674	304	300	434	295					
		45%	45%	64%	44%					

Parking Occupancy

Summary, by Street

No. Spaces		Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am	Average Occupancy
Quadra Street	75	29	10	45	13	22%
Queens Avenue	112	47	54	69	60	34%
Pembroke Street	78	24	33	58	21	29%
Vancouver Street	74	28	30	55	30	32%
Princess Avenue	80	44	32	40	42	33%
Empress Avenue	91	53	52	69	57	42%
Green Street	23	13	17	19	15	46%
Caledonia Avenue	40	24	17	32	15	37%
Dowler Place	61	20	26	22	21	24%
Wark Street	40	22	29	25	21	40%
674		304	300	434	295	
		45%	45%	64%	44%	

Parking Occupancy

Quadra Street

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Bay St to Empress Ave	E	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 4pm-6pm	3	0	0	0	0
	E	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 4pm-6pm	7	0	0	1	1
	W	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 7am-9am	12	0	5	2	2
Queens Ave-Princess Ave	E	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 4pm-6pm	9	8	0	6	6
	W	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 7am-9am	6	6	0	4	2
	E	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 4pm-6pm	9	7	0	8	0
Pembroke Ave-Pembroke St	W	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 7am-9am	5	1	0	3	0
	E	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 4pm-6pm	10	2	0	10	0
	W	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 7am-9am	11	2	3	9	2
Green St-Midblock Driveway	W	2 Hr Max, 8am-6pm, Mon-Sat No Stopping, 7am-9am	3	3	2	2	0
				29 39%	10 13%	45 60%	13 17%

Parking Occupancy

Queens Avenue

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Dowler Pl-Wark St	N	Residential Parking Only	12	6	8	6	7
Wark St-Quadra St	N	Residential Parking Only	8	1	3	7	5
Dowler Pl-Quadra St	S	Residential Parking Only	23	12	13	13	10
Quadra St-Vancouver St	N	2 Hr Max, 8am-6pm, Mon-Sat	22	14	9	18	15
Vancouver St-Cook St	N	Residential Parking Only	24	9	10	10	12
	S	Residential Parking Only	23	5	11	15	11
			112	47	54	69	60
				42%	48%	62%	54%

Parking Occupancy

Pembroke Street

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Blanshard St-Quadra St	N	2 Hr Max, 8am-6pm, Mon-Sat	18	6	6	11	7
	S		18	8	8	10	2
Quadra St-Vancouver St	S	2 Hr Max, 8am-6pm, Mon-Sat	22	7	15	17	9
Vancouver St-Cook St	S	2 Hr Max, 8am-6pm, Mon-Sat	20	3	4	20	3
			78	24	33	58	21
				31%	42%	74%	27%

Parking Occupancy

Vancouver Street

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Bay St-Empress Ave	E	Residential Parking Only	5	3	3	4	3
	W	Residential Parking Only	5	2	2	1	4
Empress Ave-Queens Ave	E	Residential Parking Only	8	3	7	6	5
	W	Residential Parking Only	9	5	5	5	4
Queens Ave-Princess Ave	E	Residential Parking Only	10	5	5	5	7
	W	2 Hr Max, 8am-6pm, Mon-Sat	11	0	4	11	0
Princess Ave-Pembroke St	E	Residential Parking Only	11	10	3	11	5
	W	2 Hr Max, 8am-6pm, Mon-Sat	9	0	1	9	0
Pembroke St-Green St	W	Residential Parking Only	6	0	0	3	2
				28	30	55	30
				38%	41%	74%	41%

Parking Occupancy

Princess Avenue

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Dowler Pl-Quadra St	N	Residential Parking Only	16	9	6	6	6
		2 Hr Max, 8am-6pm, Mon-Sat	1	0	0	0	0
	S	Residential Parking Only	15	9	10	9	10
		2 Hr Max, 8am-6pm, Mon-Sat	2	0	0	1	1
Vancouver St-Cook St	N		19	10	7	9	12
		Residential Parking Only	27	16	9	15	13
	S						
			80	44	32	40	42
				55%	40%	50%	53%



Parking Occupancy

Empress Avenue

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Quadra St-Vancouver St	N	Residential Parking Only	25	14	19	18	18
	S		22	11	9	16	13
Vancouver St-Cook St	N	Residential Parking Only	22	15	10	17	15
	S		22	13	14	18	11
			91	53	52	69	57
				58%	57%	76%	63%

Parking Occupancy  
**Green Street**

Segment		Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Quadra St-Vancouver St	S	Residential Parking Only		2	0	0	2	0
		Residential Permit Parking		21	13	17	17	15
				23	13	17	19	15
					57%	74%	83%	65%

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Parking Occupancy  
**Caledonia Avenue**

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Blanshard St-Quadra St	S	2 Hr Max, 8am-6pm, Mon-Sat	8	4	3	7	0
Quadra St-Vancouver St	S	Residential Parking Only	12	11	7	11	6
Vancouver St-Cook St	S	Residential Parking Only	17	7	5	11	8
		2 Hr Max, 8am-6pm, Mon-Sat	3	2	2	3	1
			40	24	17	32	15
				60%	43%	80%	38%

Parking Occupancy  
**Dowler Place**

Segment	Side	Restrictions	No. Spaces	Friday May 26, 9:00am	Monday May 29, 4:00pm	Monday June 5, 6:30pm	Saturday June 10, 9:00am
Bay St-Queens Ave	E	Residential Parking Only	13	4	11	5	9
		2 Hr Max, 8am-6pm, Mon-Sat	4	3	2	1	1
	W	2 Hr Max, 8am-6pm, Mon-Sat	12	3	3	5	3
Queens Ave-Princess Ave	E	2 Hr Max, 8am-6pm, Mon-Sat	7	0	1	0	1
Princess Ave-Pembroke St	E	2 Hr Max, 8am-6pm, Mon-Sat	5	4	1	2	0
Queens Ave-Pembroke St	W	2 Hr Max, 8am-6pm, Mon-Sat	20	6	8	9	7
				20	26	22	21
				33%	43%	36%	34%

Parking Occupancy

Wark Street

Segment	Side		Restrictions	No. Spaces	Friday May 26, 9:00am		Monday May 29, 4:00pm		Monday June 5, 6:30pm		Saturday June 10, 9:00am	
Bay St-Queens Ave	E		Residential Parking Only	22	10		18		15		13	
	W			18	12		11		10		8	
				40	22		29		25		21	
					55%		73%		63%		53%	

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## **APPENDIX B: SUMMARY OF OFF-STREET PARKING OBSERVATIONS**

Crystal Pool - Transportation Demand Management Strategy  
 Crystal Pool Off-Street Parking Lot Observations

Parking Space Type	Parking Supply	Friday May 26, 9:00am		Monday May 29, 4:00pm		Monday June 5, 6:30pm		Saturday June 10, 9:00am	
		Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy
Staff Parking	6	6	100%	2	33%	4	67%	4	67%
Handicapped Parking	3	3	100%	2	67%	2	67%	1	33%
Loading Zone	1	1	100%	0	0%	0	0%	0	0%
3 Min. Drop-Off	3	2	67%	1	33%	3	100%	1	33%
2 hr, Patrons Only (front lot)	31	28	90%	22	71%	31	100%	26	84%
2 hr, Patrons Only (rear lot)	6	4	67%	2	33%	2	33%	2	33%
	50	44	88%	29	58%	42	84%	34	68%



Crystal Pool - Transportation Demand Management Strategy  
Public Off-Street Parking Lots Observations

Parking Lot	Parking Space Type	Parking Supply	Friday May 26, 9:00am		Monday May 29, 4:00pm		Monday June 5, 6:30pm		Saturday June 10, 9:00am	
			Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy
Save-On-Foods Memorial Centre	Staff Parking	23	17	74%	5	22%	0	0%	2	9%
	24 Hour Reserved									
	Handicapped	8	1	13%	0	0%	0	0%	0	0%
	Unreserved	189	90	48%	88	47%	23	12%	22	12%
	<b>Total</b>	<b>220</b>	<b>108</b>	<b>49%</b>	<b>93</b>	<b>42%</b>	<b>23</b>	<b>10%</b>	<b>24</b>	<b>11%</b>
Caledonia Ave Parking Lot	Reserved	17	14	82%	4	24%	10	59%	16	94%
	Unreserved	105	102	97%	64	61%	11	10%	8	8%
	<b>Total</b>	<b>122</b>	<b>116</b>	<b>95%</b>	<b>68</b>	<b>56%</b>	<b>21</b>	<b>17%</b>	<b>24</b>	<b>20%</b>
Royal Athletic Park	Reserved	14	5	36%	6	43%	11	79%	10	71%
	Handicapped	7	0	0%	1	14%	7	100%	1	14%
	Unreserved	195	130	67%	71	36%	195	100%	46	24%
	<b>Total</b>	<b>216</b>	<b>135</b>	<b>63%</b>	<b>78</b>	<b>36%</b>	<b>213</b>	<b>99%</b>	<b>57</b>	<b>26%</b>
<b>Total</b>			<b>359</b>	<b>64%</b>	<b>239</b>	<b>43%</b>	<b>257</b>	<b>46%</b>	<b>105</b>	<b>19%</b>

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## **APPENDIX C: SUMMARY OF PARKING CONDITIONS AT REPRESENTATIVE SITES**

Crystal Pool - Transportation Demand Management Strategy  
Parking Conditions at Representative Sites

Parking Lot	Parking Space Type	Parking Supply	Monday May 29, 9:00am		Saturday June 10, 10:00am	
			Vehicles Observed	Parking Occupancy	Vehicles Observed	Parking Occupancy
Gordon Head Recreation Centre	Reserved	3	3	100%	1	33%
	Handicapped	7	2	29%	3	43%
	Electric Vehicle	2	1	50%	1	50%
	Unrestricted	99	89	90%	62	63%
	Gravel Parking	46	25	54%	21	46%
	<b>Total</b>	<b>157</b>	<b>120</b>	<b>76%</b>	<b>88</b>	<b>56%</b>
Commonwealth Place Park	Handicapped	9	8	89%	3	33%
	Electric Vehicle	2	2	100%	0	0%
	Unreserved	394	306	78%	262	66%
	Gravel Parking	18	8	44%	5	28%
	<b>Total</b>	<b>423</b>	<b>324</b>	<b>77%</b>	<b>270</b>	<b>64%</b>
Oak Bay Recreation Centre	Handicapped	6	4	67%	3	50%
	Buses Only	2	0	0%	0	0%
	Unreserved	259	216	83%	220	85%
	On-Street	37	24	65%	29	78%
	<b>Total</b>	<b>304</b>	<b>244</b>	<b>80%</b>	<b>252</b>	<b>83%</b>
Esquimalt Recreation Centre	Handicapped	9	9	100%	2	22%
	Drop-Off	3	1	33%	2	67%
	Unreserved	105	102	97%	95	90%
	On-Street	44	34	77%	22	50%
	<b>Total</b>	<b>161</b>	<b>146</b>	<b>91%</b>	<b>121</b>	<b>75%</b>
<b>Total</b>		<b>1045</b>	<b>834</b>	<b>80%</b>	<b>610</b>	<b>58%</b>

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## **APPENDIX D: SUMMARY OF PATRON TRAVEL SURVEY RESULTS**

Crystal Pool - Transportation Demand Management Strategy  
Summary of Patron Travel Survey

Date	Time	Vehicle, Driver		Vehicle, Passenger		Walk		Bike		Transit		Other		Total
		Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
Sunday June 4	N/A	10	25%	7	18%	11	28%	7	18%	5	13%	0	0%	40
Monday June 5	7am	4	22%	0	0%	4	22%	9	50%	1	6%	0	0%	18
	8am	17	59%	3	10%	1	3%	6	21%	2	7%	0	0%	29
	9am	2	13%	2	13%	3	20%	6	40%	2	13%	0	0%	15
	10am	6	55%	1	9%	2	18%	1	9%	0	0%	1	9%	11
	11am	12	48%	3	12%	4	16%	3	12%	3	12%	0	0%	25
	12pm	4	25%	4	25%	5	31%	2	13%	1	6%	0	0%	16
	2pm	1	17%	0	0%	4	67%	0	0%	1	17%	0	0%	6
	3pm	3	33%	2	22%	4	44%	0	0%	0	0%	0	0%	9
	7pm	1	20%	2	40%	2	40%	0	0%	0	0%	0	0%	5
Tuesday June 6	6am	4	27%	0	0%	3	20%	6	40%	2	13%	0	0%	15
	8am	23	64%	3	8%	4	11%	4	11%	1	3%	1	3%	36
	9am	22	51%	10	23%	6	14%	2	5%	1	2%	2	5%	43
	10am	5	83%	0	0%	1	17%	0	0%	0	0%	0	0%	6
	11am	7	58%	2	17%	2	17%	0	0%	1	8%	0	0%	12
	12pm	1	33%	0	0%	2	67%	0	0%	0	0%	0	0%	3
	1pm	8	47%	0	0%	3	18%	4	24%	0	0%	2	12%	17
	2pm	5	63%	0	0%	1	13%	1	13%	1	13%	0	0%	8
	3pm	0	0%	0	0%	1	50%	1	50%	0	0%	0	0%	2
	4pm	0	0%	2	67%	0	0%	1	33%	0	0%	0	0%	3
	6pm	3	25%	5	42%	2	17%	2	17%	0	0%	0	0%	12
	8pm	1	50%	1	50%	0	0%	0	0%	0	0%	0	0%	2
Wednesday June 7	530am	9	45%	2	10%	3	15%	5	25%	0	0%	1	5%	20
	6am	12	55%	1	5%	5	23%	2	9%	2	9%	0	0%	22
	7am	6	46%	1	8%	4	31%	0	0%	2	15%	0	0%	13
	8am	3	25%	3	25%	4	33%	0	0%	2	17%	0	0%	12
	9am	23	58%	4	10%	7	18%	3	8%	3	8%	0	0%	40
	10am	12	44%	5	19%	5	19%	1	4%	4	15%	0	0%	27
	11am	3	43%	2	29%	2	29%	0	0%	0	0%	0	0%	7
	1pm	3	43%	1	14%	3	43%	0	0%	0	0%	0	0%	7
	2pm	1	17%	0	0%	5	83%	0	0%	0	0%	0	0%	6
	3pm	0	0%	0	0%	2	67%	0	0%	1	33%	0	0%	3
Thursday June 8	5am	3	50%	0	0%	1	17%	2	33%	0	0%	0	0%	6
	6am	5	56%	0	0%	0	0%	4	44%	0	0%	0	0%	9
	7am	6	86%	0	0%	1	14%	0	0%	0	0%	0	0%	7
	8am	21	70%	2	7%	6	20%	1	3%	0	0%	0	0%	30
	9am	19	58%	6	18%	4	12%	2	6%	1	3%	1	3%	33
	10am	7	50%	1	7%	6	43%	0	0%	0	0%	0	0%	14
	11am	1	17%	1	17%	2	33%	0	0%	2	33%	0	0%	6
	12pm	1	50%	0	0%	0	0%	0	0%	1	50%	0	0%	2
	1pm	2	67%	1	33%	0	0%	0	0%	0	0%	0	0%	3
	2pm	1	20%	0	0%	4	80%	0	0%	0	0%	0	0%	5
Saturday June 10	5am	2	67%	0	0%	0	0%	1	33%	0	0%	0	0%	3
	7am	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	1
	8am	2	100%	0	0%	0	0%	0	0%	0	0%	0	0%	2
Sunday June 11	11am	2	100%	0	0%	0	0%	0	0%	0	0%	0	0%	2
	1pm	0	0%	0	0%	0	0%	0	0%	0	0%	1	100%	1
Total		283	46%	77	13%	129	21%	77	13%	39	6%	8	1%	614

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## **APPENDIX E: SUMMARY OF STAFF TRAVEL SURVEY RESULTS**

Crystal Pool - Transportation Demand Management Strategy  
Summary of Staff Travel Survey

Employee ID	Vehicle, Driver		Vehicle, Passenger		Walk		Bike		Transit		Other		Total
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	
1	0	0%	0	0%	0	0%	0	0%	2	100%	0	0%	2
2	3	100%	0	0%	0	0%	0	0%	0	0%	0	0%	3
3	0	0%	0	0%	0	0%	4	100%	0	0%	0	0%	4
4	1	100%	0	0%	0	0%	0	0%	0	0%	0	0%	1
5	1	25%	0	0%	0	0%	3	75%	0	0%	0	0%	4
6	5	100%	0	0%	0	0%	0	0%	0	0%	0	0%	5
7	5	100%	0	0%	0	0%	0	0%	0	0%	0	0%	5
8	5	100%	0	0%	0	0%	0	0%	0	0%	0	0%	5
9	4	80%	0	0%	0	0%	1	20%	0	0%	0	0%	5
10	2	100%	0	0%	0	0%	0	0%	0	0%	0	0%	2
11	0	0%	0	0%	0	0%	0	0%	5	100%	0	0%	5
12	0	0%	0	0%	0	0%	0	0%	5	100%	0	0%	5
13	5	100%	0	0%	0	0%	0	0%	0	0%	0	0%	5
Total	31	60%	0	0%	0	0%	8	16%	12	24%	0	0%	51

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## **APPENDIX F: INTERSECTION PERFORMANCE EVALUATION**



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The operating conditions during the peak hour at the study intersection were evaluated using the Synchro/SimTraffic software package, which is based on the Highway Capacity Manual (HCM 2010) evaluation methodology.

For un-signalized (stop-controlled) intersections, the Level-of-Service (LOS) is based on the computed delays on each of the critical movements. LOS 'A' represents minimal delays for turning traffic movements, and LOS 'F' represents a scenario with an insufficient number of gaps are available for vehicles to complete their movements without significant delays.

For signalized intersections, the methodology considers the intersection geometry, traffic volumes, the traffic signal phasing/timing plan, and also pedestrian volumes. The average delay for each lane group movement is calculated, as well as the delay for the overall intersection. Another measure of effectiveness is volume to capacity (v/c) ratios. LOS criteria for both unsignalized and signalized intersections, as summarized in the Highway Capacity Manual, are illustrated below.

#### LOS Criteria for Intersections

Level of Service (LOS)	Average Delay for UNSIGNALIZED Intersection Movements	Average Delay for SIGNALIZED Intersection Movements
A	0 – 10 seconds per vehicle	0 – 10 seconds per vehicle
B	> 10 – 15 seconds per vehicle	> 10 – 20 seconds per vehicle
C	> 15 – 25 seconds per vehicle	> 20 – 35 seconds per vehicle
D	> 25 – 35 seconds per vehicle	> 35 – 55 seconds per vehicle
E	> 35 – 50 seconds per vehicle	> 55 – 80 seconds per vehicle
F	> 50 seconds per vehicle	> 80 seconds per vehicle