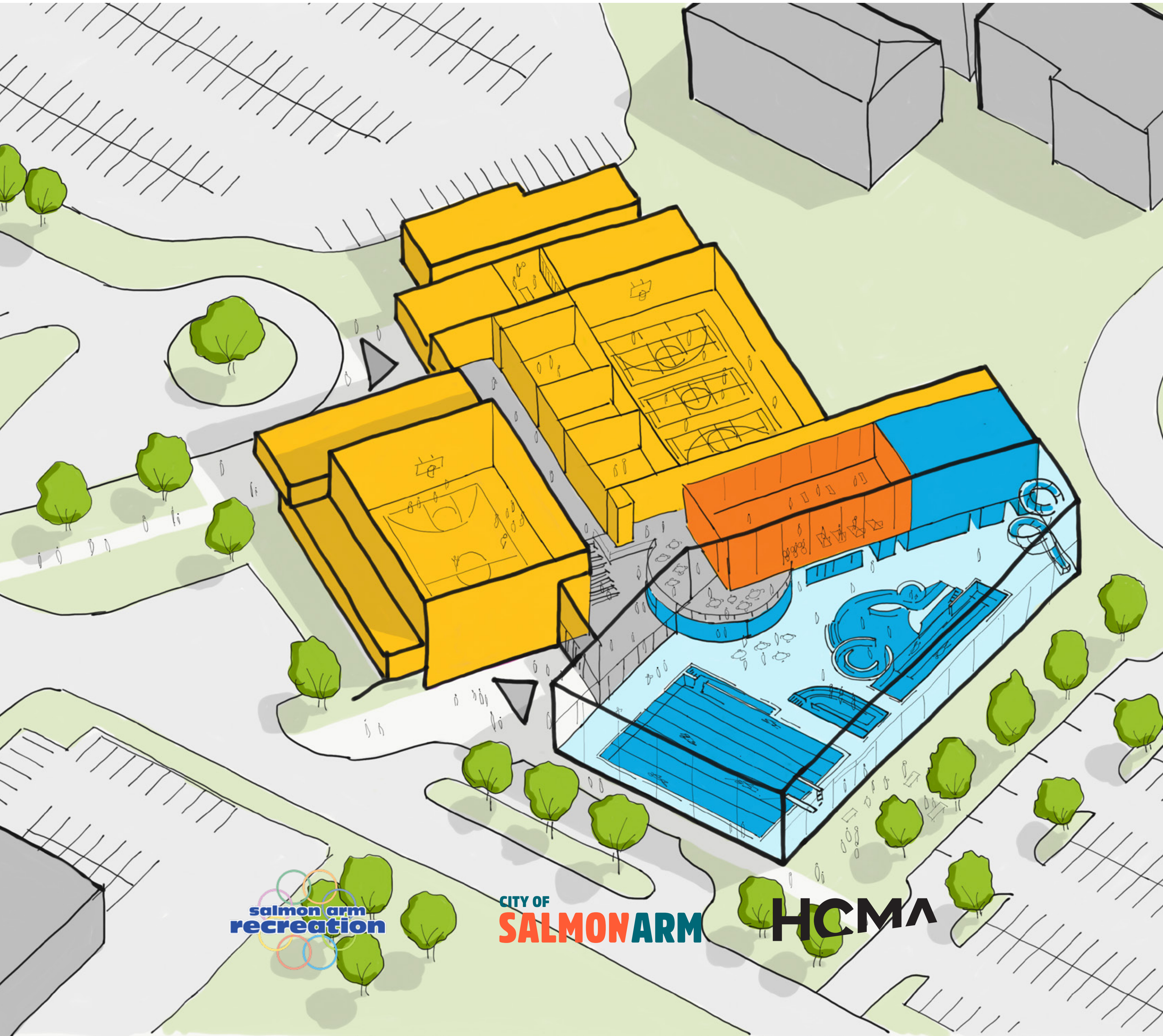
Salmon Arm Recreation Campus Redevelopment Feasibility Study

City of Salmon Arm

Issued: April 2019



"A facility that is suited to all users, young and old. Accessible to all."

Quote from **Shuswap Swims** - Public Engagement, Fall 2018

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PROJECT CONSULTANTS

Architectural Design:
HCMA Architecture + Design

Quantity Surveyor:
Ross Templeton + Associates

Building Condition Assessment + Energy Modeling:
Morrison Hershfield

1.0 Executive Summary

1.0 Executive Summary

The current SASCU Recreation Centre is aging. As a result, the Shuswap Recreation Society and City of Salmon Arm are exploring ideas around future aquatic, recreation and performing arts spaces for the Shuswap community. In the Spring of 2018, Shuswap Recreation Society hired HCMA Architecture + Design to undertake a feasibility study to explore ideas around future aquatic, recreation, and performing arts spaces for the Shuswap community. The purpose of the study was to assess the current context and building conditions, as well as the future demographics and aspirations of the community in order to develop an approach to maximize current assets to meet future needs.

▲ SASCU Recreation Centre and recreation centre expansion lands

BUILDING CONDITIONS ASSESSMENT

The study began with a building condition assessment carried out by Morrison Hershfield. Based on the outcome of the building condition assessment, it was determined that, with required upgrades, the existing building has enough remaining life expectancy to warrant renovation of the existing building as an option to consider.

PUBLIC ENGAGEMENT - PHASE 1

The City of Salmon Arm and the Shuswap Recreation Society wanted to understand the interests and preferences of residents and users of the current facility. To do so, two phases of public engagement were carried out, the first of which ran concurrently with the building condition assessment (Summer 2018 - Fall 2018). The initial phase was intended to define community values and needs. This phase informed the selection of the program components included in the concept options explored. Phase 2 (Winter 2019) was intended to report back on how community input informed recommended conceptual design options and to seek feedback on a preferred option. The results of the open house held on February 10, 2019 and the associated community feedback form informed the final proposed concept option.

▲ Shuswap Swims public engagement campaign

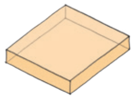
PROGRAM

In order to determine the proposed program, the decision making process was divided into three component groups:

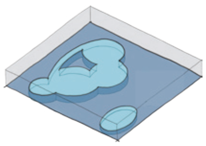
- Base Program - meets core building functions
- Main Aquatic Tank - addresses demand capacity, programmatic needs and aquatic focus
- Optional Aquatic Components - that meet community priorities
- Optional Recreation Components - that meet community priorities
- Optional Performing Arts Components - that meet community priorities

PROPOSED PROGRAM

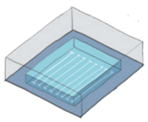
Facility Support (lobby, staff areas)



Leisure Tank & Hot Pool

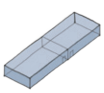


Program Tank [25m x 8 lane]

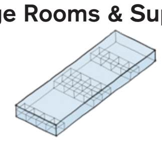


Waterslide

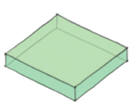
Sauna & Steam



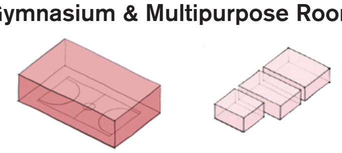
Change Rooms & Support Spaces



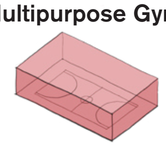
Fitness Studio



Renovate Existing Pool into Gymnasium & Multipurpose Rooms



Renovate Existing Auditorium into Multipurpose Gymnasium



Maintain Existing Racquet Courts

To assist with the initial discussions, areas and high-level costs were provided for each program element. The decision making framework was presented in the form of a 'menu' card that key decision makers were asked to review and make their selection from each group of program components.

These 'menu' results, along with the demand analysis study, and public engagement results were used to determine the proposed building program. The proposed program was developed to provide:

- Community needs for aquatic, recreation, and performing arts programs, as identified by the public engagement results and through consultation with key decision makers.
- Current and projected capacity requirements for aquatic facilities and usage trends based on the demand analysis.
- Flexibility of aquatic programming through different subdividable pool tanks that can accommodate leisure, fitness length swim and competitive swim training.
- Maximize the potential of the existing building to provide new or renovated aquatic, recreation, and performing arts program spaces.
- Provide other social and community needs through amenities like additional social spaces.

CONCEPT OPTIONS

A demand analysis, costing analysis, and the results of the public engagement informed the selection of program and, subsequently, the development of two concept options. Two different concept design options were developed.

OPTION A - RENOVATE + EXPAND

A lower budget option proposed renovating and maintaining as much of the existing aquatic centre as possible and expanding where necessary to include additional aquatic, recreation, and performing arts components.

- Renovate + Expand the Pool
- New Multi-purpose Gymnasium
- Convert Multi-purpose auditorium into dedicated Performing Arts Space
- New Fitness Centre

OPTION B - REBUILD + RENOVATE

A higher budget option proposed building a new aquatic centre adjacent to the existing building, and renovating the existing facility in order to convert it into recreational and performing arts program.

- New Pool + Fitness Centre
- Convert existing pool into gymnasium + multi-purpose
- Convert multi-purpose auditorium into dedicated Performing Arts Space

PUBLIC ENGAGEMENT - PHASE 2

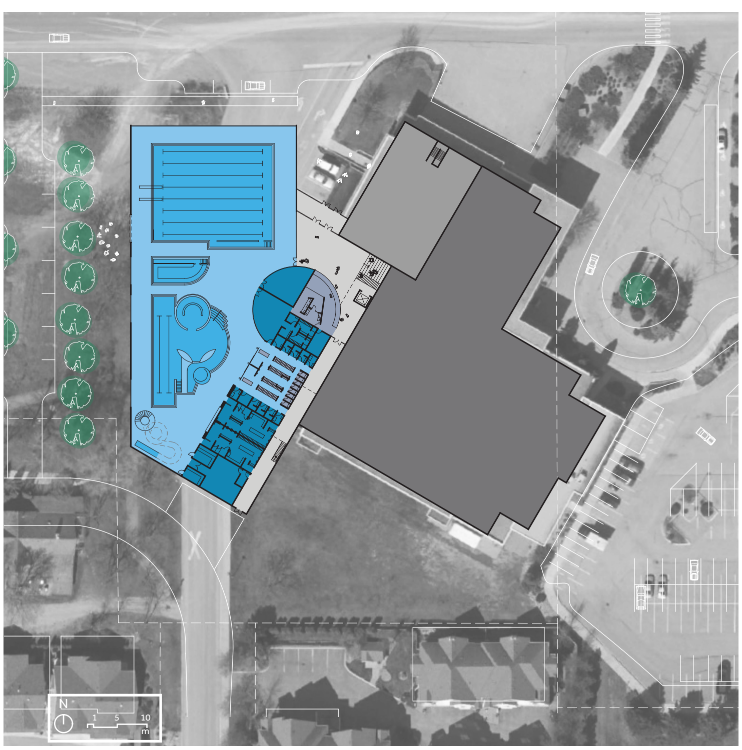
Phase 2 of the public engagement (Winter 2019) was intended to report back on how community input informed recommended conceptual design options and to seek feedback on a preferred option. The results of the open house held on February 10, 2019 and the associated community feedback form resulted in three key messages.

- 8-Lane pool is required to meet the needs of the community
- The chosen option needs to ensure that the existing pool remains open during the construction of a new facility
- There was a lack of support to include performing arts space from both the general public and key local performing arts stakeholders stemming from a belief that the renovated auditorium into purpose built performing arts space did not accommodate a large enough audience or meet the users needs

FINAL PROPOSED CONCEPT

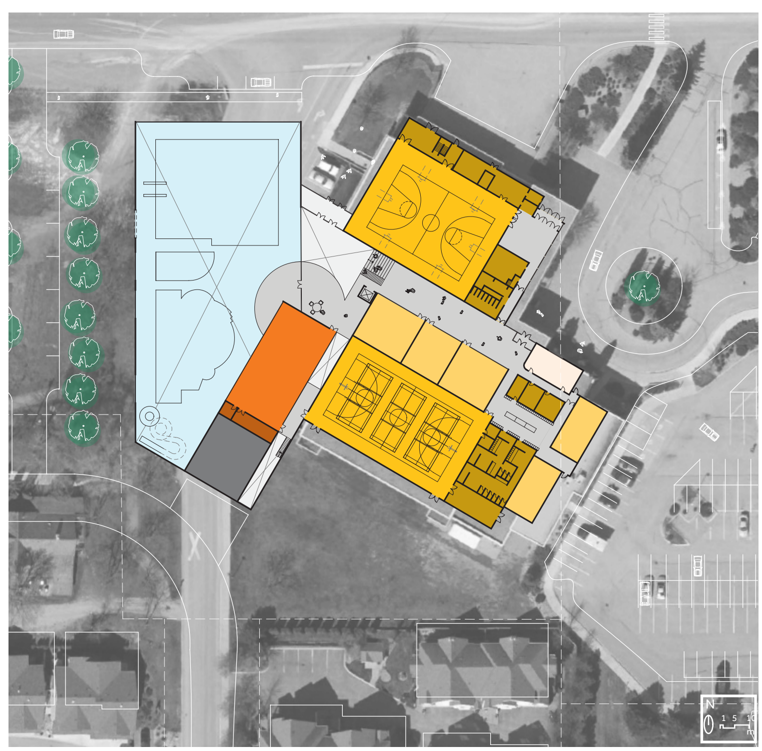
Feedback from the Open House indicated a preference for Option B while prompting several adjustments to the initial proposed program. The final proposed concept includes an 8-lane lap pool. Although the concept of Performing Arts was addressed in the consultation process and was identified by the general public as a community need, the feedback for converting the multipurpose auditorium into a dedicated Performing Arts Space was not supported to the degree necessary to include this concept in the Final Report. Therefore, the proposed concept invests less into the renovation of this space, for it to become a multi-use gymnasium, meeting room, sports court and play space. In consultation with the City, through a current Cultural Master Plan, this initiative will continue to be addressed and the community will be better positioned to consider the feasibility of a Performing Arts space within the Facility. The emergence of a collective, unified position from the Arts community will provide more direction for this concept. The final proposed concept involves rebuilding a new aquatic facility, to the west of the existing building. This allows the existing pool to remain in operation during construction of the new facility. The existing natatorium will then be converted into a gymnasium and multipurpose spaces. Other existing building areas, including the racquet courts, will remain with minor upgrades. A social spine will connect the facilities and allow for unprogrammed space, not only for improved navigation and circulation, but for enhanced social interaction.

Lower Level



▲ Final Concept Lower Level Plan

Ground Level



▲ Final Concept Upper Level Plan

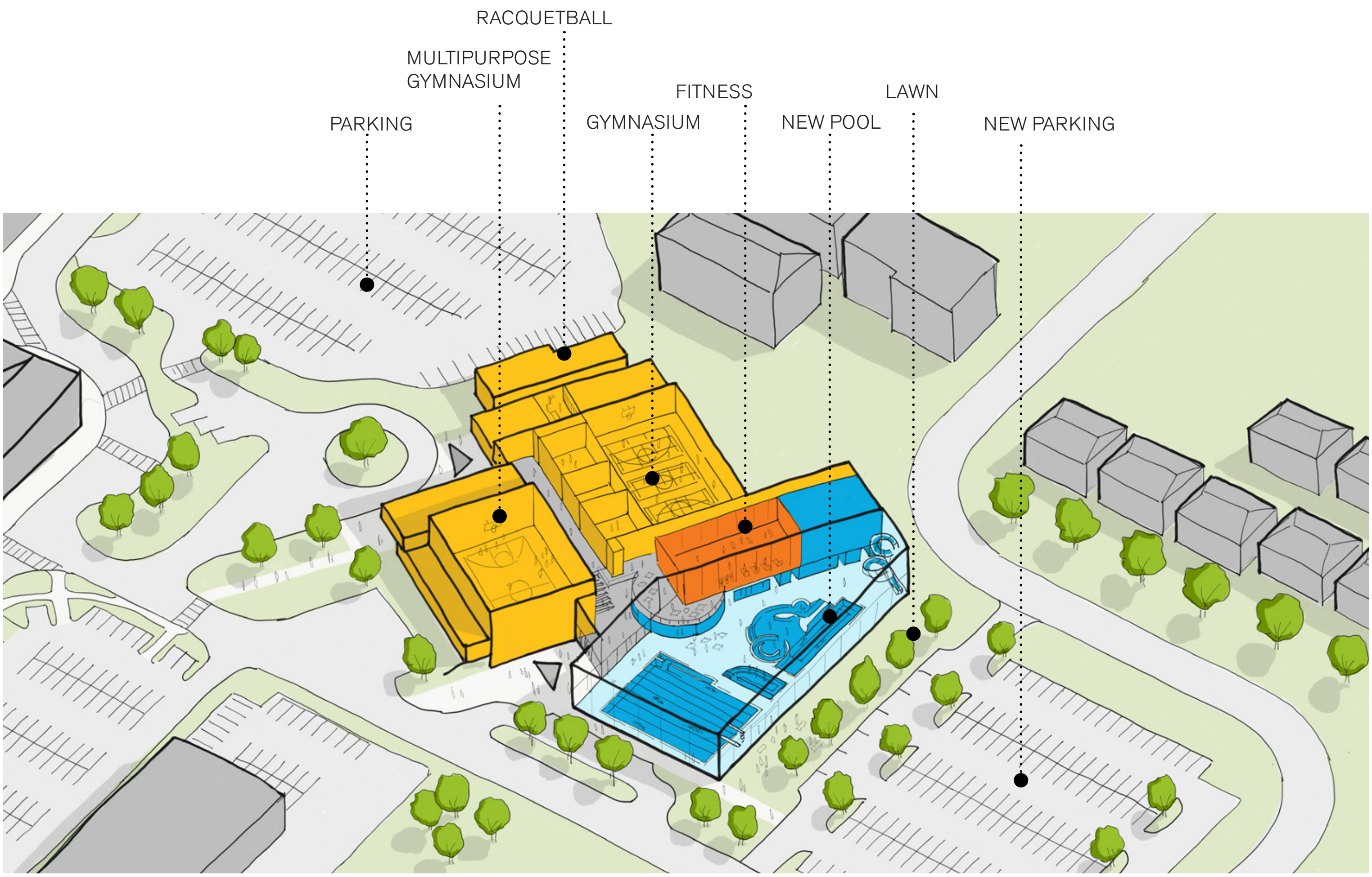
CAPITAL COSTING ANALYSIS

It is anticipated that the complete project costs will be approximately $45.5 million based on a Preliminary Class D Estimate conducted in February 2019. This estimate includes typical contingencies that are reflective of the early stage of the project development and assumes a construction start in the year 2020. The following identifies three proposed project phases and its associated project costs.

Phase 1: New Pool + Fitness Centre	~$38,400,000
Phase 2: Convert existing pool into Gymnasium + Multi-purpose	~$5,500,000
Phase 3: Renovate multi-purpose auditorium	~$1,500,000
Total	**~$45,400,000**

NEXT STEPS

The objective of the feasibility process was to produce a building program and concept options that have been guided by public input, tested by careful analysis and are programmatically, functionally and financially supportable. The information contained within this report can be used to make key decisions for the future progression of this project and should be used as the basis for the commencement of schematic design.



▲ The Final Proposed Complete Concept

2.0 Project Background

2.1 Project Introduction

Salmon Arm's parks and recreation system is actively supported by a rich tradition of community-led recreation.

The most recent Parks and Recreation Master Plan (2012) indicated that the most crucial "Big Move" is the need to undertake a substantial renovation or replacement of the SASCU Recreation Centre and Pool.

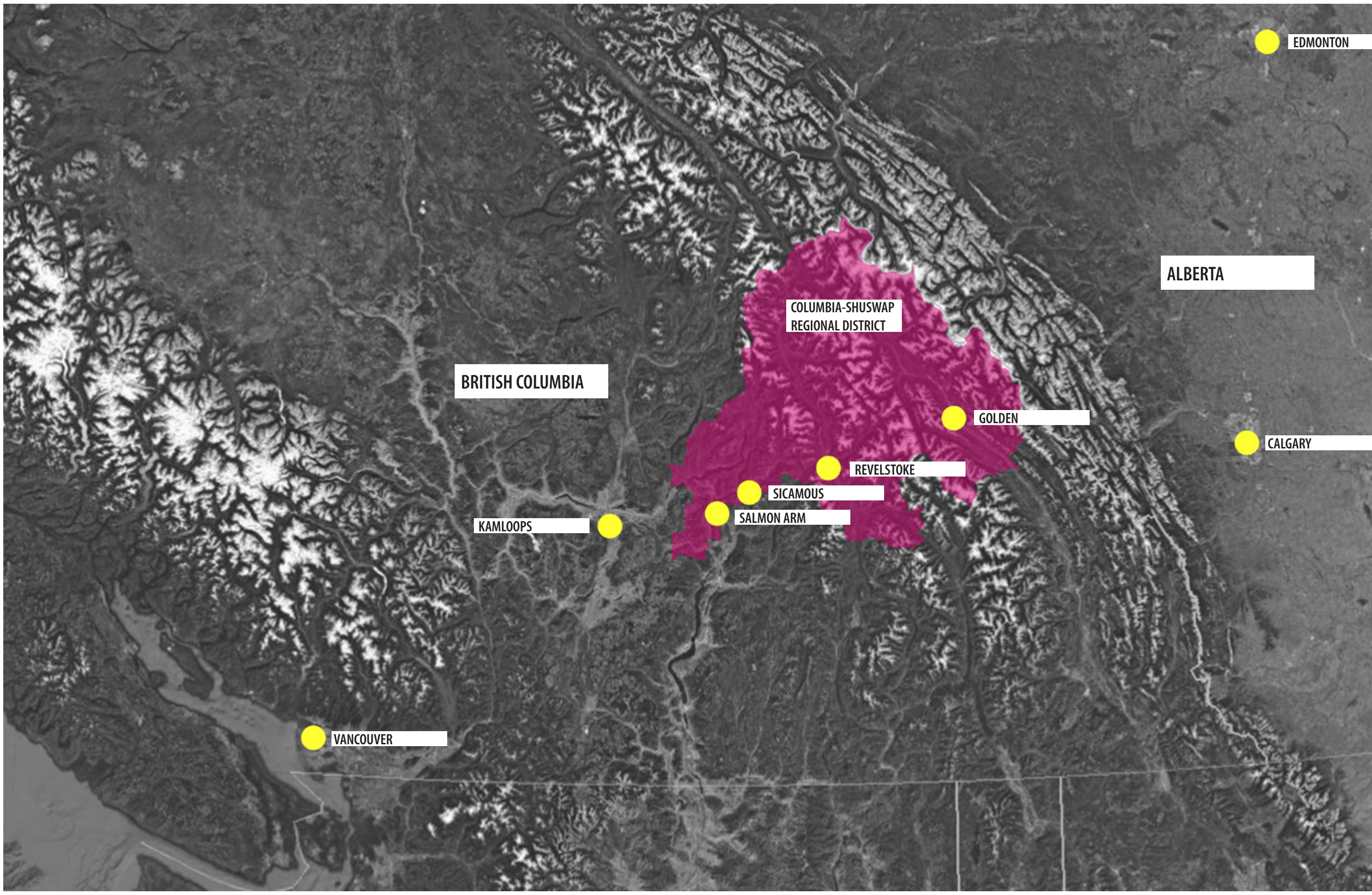
From the PRMP (2012):

"This facility is vitally important to residents and has served the community well for decades, but it is at a point where minor repairs and upgrades may not be adequate to ensure uninterrupted operation. In addition to the condition of the facility, there are also space constraints that limit the number and range of programs that can be offered. This is both a challenge, in terms of developing a financial strategy, and an opportunity in terms of the potential to create a facility that can better meet the growing community needs."

In the Spring of 2018, Shuswap Recreation Society (SRS) hired HCMA Architecture + Design to conduct a feasibility study to explore ideas around future aquatic, recreation, and performing arts spaces for the Shuswap community, the findings of which are outlined in this report. The purpose of this study was to assess the current context and building conditions, as well as the future demographics and aspirations of the community, and to develop a redevelopment scheme that will maximize current assets to meet future needs.

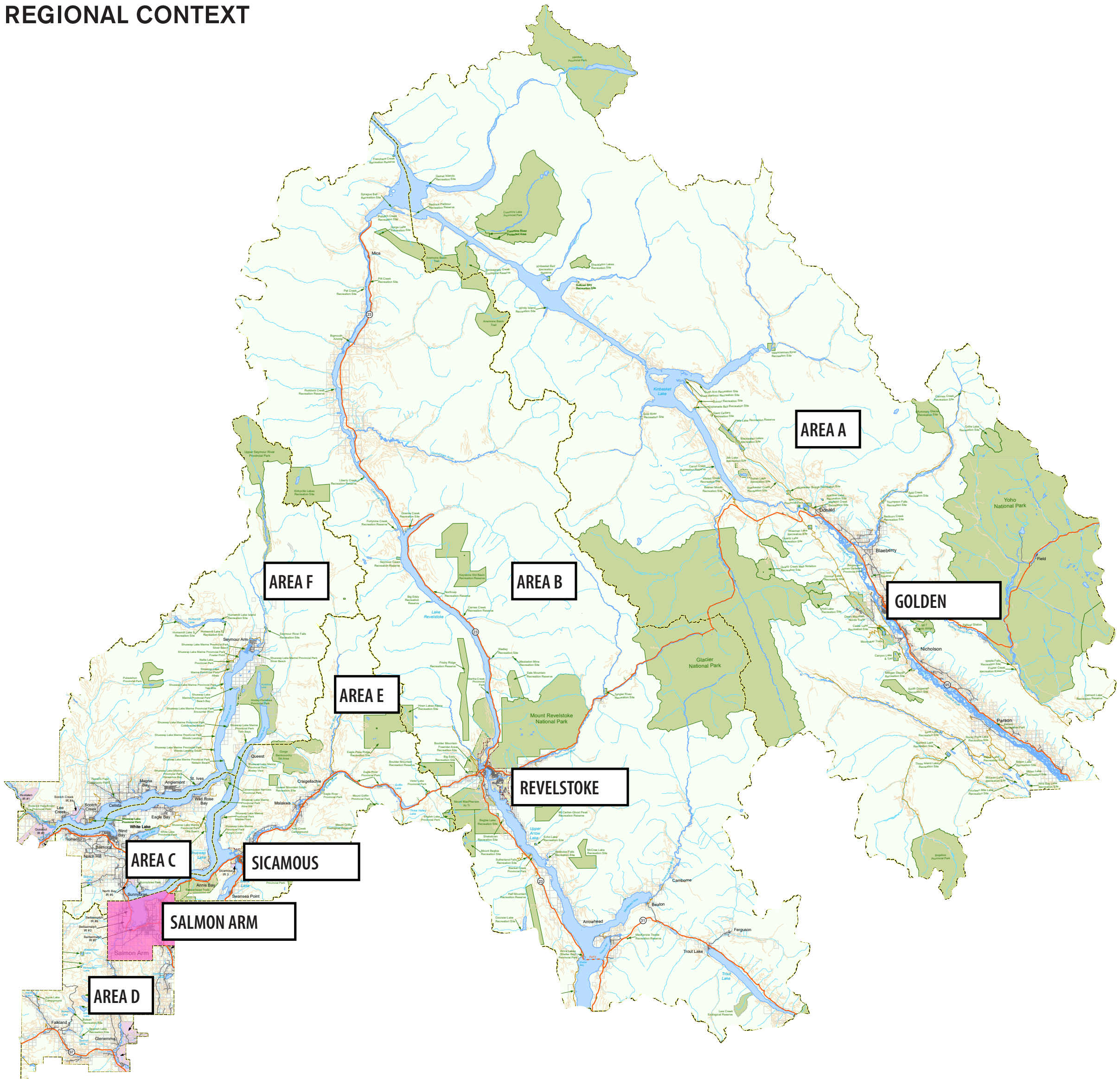
2.2 Context

GEOGRAPHICAL CONTEXT



▲ Nearby cities

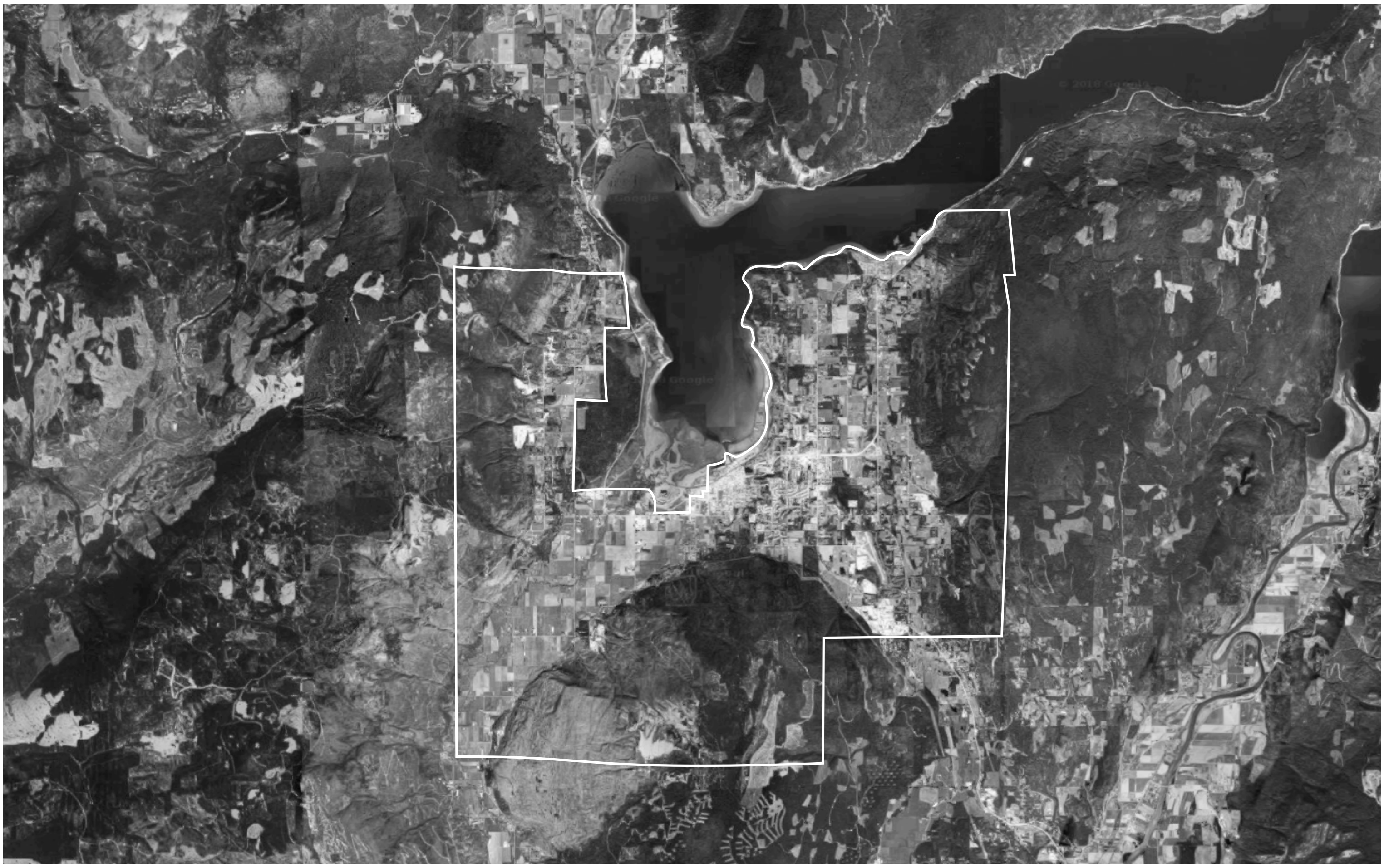
REGIONAL CONTEXT



▲ **Columbia-Shuswap Regional District**

MUNICIPALITIES	ELECTORAL AREAS	CSRD BOARD
SICAMOUS	ELECTORAL AREA A	11 DIRECTORS:
REVELSTOKE	ELECTORAL AREA B	6 electoral area directors
GOLDEN	ELECTORAL AREA C	5 municipal directors
SALMON ARM	ELECTORAL AREA D	(one from each municipality, two from Salmon Arm)
	ELECTORAL AREA E	
	ELECTORAL AREA F	

MUNICIPAL CONTEXT



▲ City of Salmon Arm

CITY OF SALMON ARM DEMOGRAPHICS

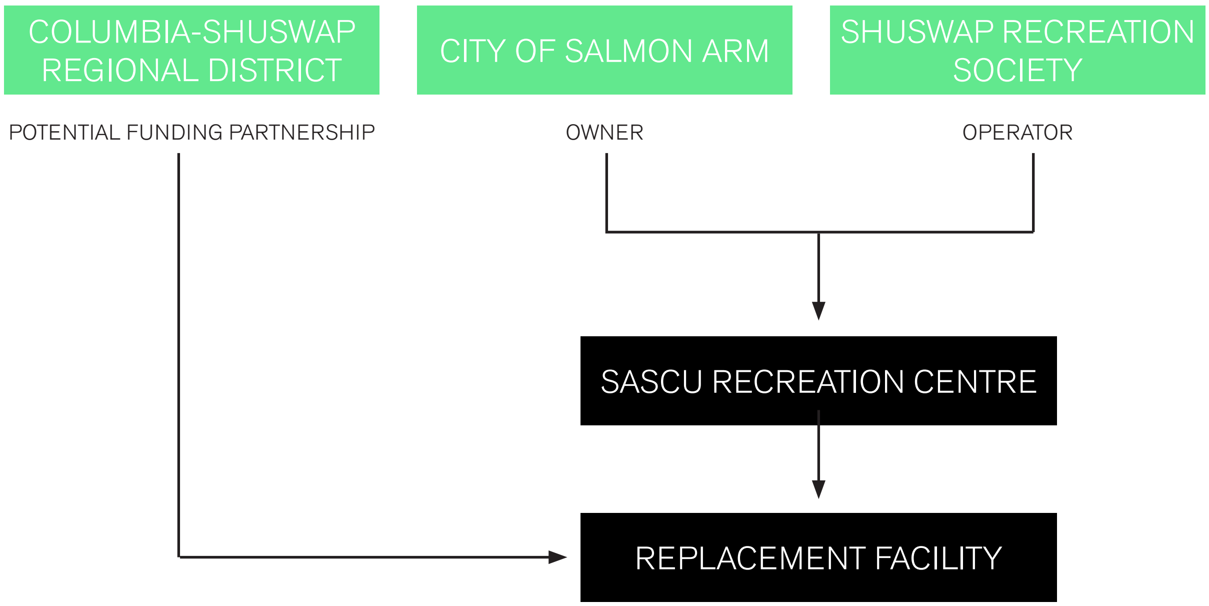
POPULATION	17, 464	[2011 Census]
PROJECTED	21,800-26,800	By 2032
MEDIAN AGE	48.2 yrs	B.C 41.9 yrs
INDIGENOUS POPULATION	6%	
IMMIGRANT POPULATION	10%	B.C 27%
	70%	live in single family homes
AVERAGE HOUSEHOLD	2.4	
MEDIUM INCOME	$55,000	B.C $62,000
	resource industry	seen as leader of economy
	sales & service trades business	top economic statistics
	architecture / engineering health / parks / recreation / fitness business / management / public administration	top three fields of study

Source: Parks + Recreation Master Plan (2012) City of Salmon Arm

BUILDING SITE CONTEXT

▲ SASCU Recreation Centre and surrounding site

OWNERSHIP & OPERATIONS



The SASCU Recreation Centre is owned by the City of Salmon Arm and operated by the Shuswap Recreation Society (SRS). The SRS, a registered charity, is responsible for providing recreational and leisure activities through its management of SASCU, along with a number of other facilities with Salmon Arm.

While the City has an internal Parks department, they have a long-standing contract with the Shuswap Recreation Society to provide recreation programming, to operate the main recreation facilities and to coordinate booking of indoor and outdoor amenities.

In addition to the SASCU Recreation Centre, the current inventory of indoor recreation facilities includes:

- Shaw Centre Ice Facility
- Little Mountain Field House and
- Other minor park service buildings:
    - Klahani Park service buildings
    - Marine Peace Park band shell, visitors centre & service buildings
    - Fletcher Park service building
    - Canoe Beach concession and change rooms.

2.3 Building Condition Assessment

Morrison Hershfield conducted a condition assessment of the SASCU Recreation Centre to assess the existing building electrical, mechanical, and structural systems of the facility. This condition assessment report (Appendix 8.4) describes the findings of that assessment, along with engineering recommendations for upgrading or repairing the building systems, as necessary. Overall, the intent of this work was to assist in decision-making regarding maintenance budgets and planning for the potential future use of the facility in upcoming years.

The report identifies items in the electrical, mechanical, and structural systems that would need to be replaced/fixed within 1 year, 1-3 years, 5, years, or at client discretion. The highest priority items are:

- Repair sub-grade insulation and provide protective covering
- Locally repair damaged metal wall cladding
- Replace the damaged and corroded vents on the roof
- Repair flashing at boiler roof vent.
- Replace the metal door frames in the pool office area, after floor drainage has been improved
- Replace the ceiling in the pool office shower, after ventilation issues have been addressed
- Replace the ceiling tiles in the lobby area
- Perform thorough repairs to the swimming pool concrete surfaces, particularly at perimeter drains and at walls to lower level mechanical rooms
- Conduct a drainage study for the facility, considering observed issues with water ingress at perimeter walls and basement columns
- Replace hydronic expansion tank with bladder type / diaphragm expansion tank

The cost associated with all required electrical, mechanical, and structural systems upgrades required to maintain the existing building totals approximately $4, 200,000.

3.0 Public Engagement

3.1 Engagement Strategy

HCMA Architecture + Design was contracted by the Shuswap Recreation Society to conduct a feasibility study on the aging SASCU Recreation Centre. Engagement with stakeholder groups and the wider public was a key part of the feasibility study, assisting the City of Salmon Arm and the SRS to understand the interests and preferences of residents and users of the current facility. The engagement helped to ensure future decisions reflect the needs, values, and identity of the region.

The engagement and communications activities for the SASCU Recreation Centre were conducted in two phases:

+ **Phase 1 (Summer 2018 - Fall 2018)**
  Define the community values and needs associated with the regional facility
+ **Phase 2 (Winter 2019)**
  Report back on how community input has informed recommended conceptual design options, and seek input on a preferred design solution

The overall engagement approach is guided by the following principles:

+ Offer multiple ways to provide input
+ Communicate information and input opportunities through multiple channels to reach as many community members as possible
+ Methods selected focus on increasing potential reach, not on achieving a statistically representative sample of the population
+ Go to locations where the community is, rather than asking them to come to us
+ Encourage a range of community members to get involved, including those who are often hard to reach
+ Provide a range of 'inform' to 'involve' opportunities per the International Association of Public Participation (IAP2) Spectrum of Public Participation
+ Follow the IAP2 principles of inclusiveness, clarity, flexibility, honesty, respect, and integrity

3.2 Engagement and Communication Methods

Engagement and outreach activities were customized based on the group(s) from whom input was being sought. All activities were led by HCMA in collaboration with Shuswap Recreation Society staff.

Activities included:

+ social media and e-mail blasts
+ posters and postcards
+ stakeholder group interviews
+ aquatics workshop
+ online survey
+ ideas fair and fall fair pop-up
+ open house

Social Media and E-mail Blasts

Events and survey were advertised using Facebook (@SARecreation), Twitter (@SalmonArmRec)

Posters and Postcards

Posters and postcards were posted and available at a variety of locations throughout Salmon Arm.

Stakeholder Group Interviews

A series of meetings with key users and stakeholder groups were held to engage in meaningful dialogue to better understand user needs. Meetings took place in June and August 2018. We engaged 16+ user groups and 75 participants.

Aquatics Workshop

An Aquatics Workshop was held to establish vision, priorities, program needs as well as aquatic tank and facility options. Participants included elected officials and key members of the Shuswap Recreation Society.

News Coverage

The project received news coverage in the Salmon Arm Observer covering a number of aspects of the project including.

+https://www.saoobserver.net/news/public-input-wanted-on-redevelopment-of-salmon-arm-rec-centre/

+https://www.saoobserver.net/news/salmon-arm-council-recreation-society-seek-input-on-facility-upgrades

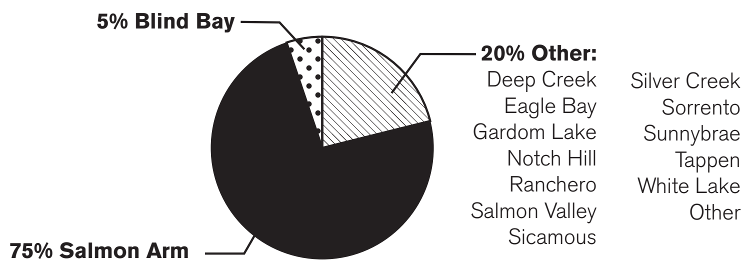
+ https://www.bclocalnews.com/news/eight-lane-pool-identified-as-a-priority/

Online Survey

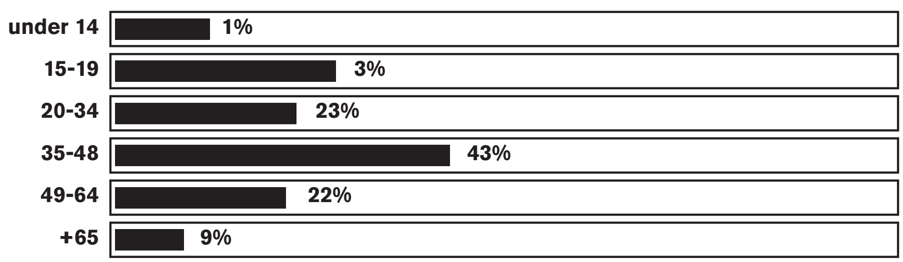
An online survey was available from August 7 to September 30, 2018 via an open access link from the Salmon Arm Recreation Website (salmonarmrecreation.ca/survey). The survey included questions about how the community uses the existing facility, barriers to use, and what they would value in a future facility. There were 2,167 responses to the survey. The complete survey, as well as the results, are included in Appendix 8.1.

ONLINE SURVEY DEMOGRAPHICS

COMMUNITY OF RESPONDENTS



AGE OF RESPONDENTS



▲ **Ideas Fair, WOW!, August 22, 2018**

Ideas Fair and Fall Fair Pop-Up (Phase 1)

Two interactive open house events were held during Phase 1 of the engagement.. The first was held at Wednesdays On the Wharf ('WOW!') on August 22, 2018 and the second was held at the Salmon Arm Fall Fair on September 8 & 9, 2018. In addition to providing general information about the project, participants had an opportunity to rank their aquatic, recreation, and performing arts priorities for a new or upgraded facility.

▲ **Open House, SASCU Recreation Centre, February 10, 2019**

Open House (Phase 2)

An open house was held at the SASCU Recreation Centre on February 10, 2019, to present two developed concepts to the public. Attendees were able to ask questions, leave comments, and indicate their preferred option. Between 400-500 people attended the open house. There were 165 responses to a questionnaire developed for the Open House. Following the Open House, the questionnaire was also available on social media which resulted in an additional 199 responses.

See Section **5.6 Open House Feedback** for further information.

Stakeholder Engagement

HCMA met with key stakeholders to better understand how they currently use the facility, constraints, barriers, and opportunities for their user groups, as well as their priorities for a new or upgraded facility. These meetings were held in June and August 2018.

Overview

- Most stakeholders attribute their **biggest challenge** with the existing facility to a **lack of capacity**. In relation to aquatics, this refers to **inadequate pool size**, the **lack of a leisure pool** so that activities can occur simultaneously, and a lack of space for dry-land training/activities. In relation to other recreational activities, this refers to the **quality and size of meeting rooms and multi-purpose spaces.**

- Most stakeholders were **generally supportive** of a new facility.

- Stakeholders recognize the community's need to **include more non-aquatic spaces and amenities**. There is a desire to expand recreational programs in order to **encompass the needs of diverse user groups.**

- **Diverse perspectives on specific amenities and space needs** (e.g. whether or not 50m lanes should be included, capacity for performance space to accommodate large audiences, etc.)

- Interest in **future partnerships**

List of Stakeholders

After School Daycare
Aqua-fit members
Chamber of Commerce
Discover Kids Club
Masters Swim Club
Okanagan College
Pickleball members
Rotary Club
Scouts Salmon Arm
Selkirks Swim Club
Shuswap Community Foundation
Shuswap Society for Arts & Culture
Shuswap Theatre
Staff of SASCU Recreation Centre
Trail Alliance
Elected Officials

3.3 What We Heard

The most commonly cited **future facility requirements**, based on input from the stakeholder meetings, Ideas Fair, Pop-Up, and Online Survey were:

1. **Enhanced leisure pool facilities**
   Lazy river, slides, wave pool, rock wall, tot pool, reduced chlorine use and a comfortable viewing/social area for parents and families
2. **Enhanced recreational aquatics facilities**
   Lane swimming and aqua-fit
3. **Enhanced performing arts facilities**
   Especially music, but also dance, theatre, and comedy

Other facility requirements

- Competitive swimming facilities, indoor track and field facilities (including soccer) and fitness facilities all received similar levels of support
- Much smaller numbers of respondents indicated interest in a number of other types of sporting activities including climbing gym, gymnastics, basketball, pickleball, volleyball, squash, tennis, baseball, ice skating, trampoline
- Respondents were near universal in their support for an updated or new facility
- The only indication of opposition was in relation to competitive swimming and performing arts facilities, where a small number of comments indicated opposition
- Frequently mentioned facilities that were suggested as potential models for this facility include Revelstoke, Kelowna, Kamloops, Vernon and Nanaimo
- In terms of programming, the top issues/barriers to use indicated were operating hours, program availability, scheduling of swimming lessons, and scheduling for lane swimming and aqua-fit

BIGGER
INCLUSIVE
ACCESSIBLE
FLEXIBLE
MODERN

-General principles derived from Public + Stakeholder Engagement Phase 1

General principles that are broadly supported include:

Bigger
Increased capacity to reflect the increased demand from a fast-growing community

Inclusive
A multi-use family friendly facility for all ages, including family-friendly and inclusive changerooms

Accessible
Including physical access for those with disabilities and in terms of cost

Flexible
Range of uses as well as the ability to grow with the community

Modern
Up to date design and technology

> **"A facility that is suited to all users, young and old. Accessible to all."**

-From 2018 Shuswap Swims!

DEFINING PRIORITIES FOR AQUATIC SPACE

The first and second **priorities for a future facility** pertain to aquatic space:

1. **Enhanced leisure pool facilities**
   Lazy river, slides, wave pool, rock wall, tot pool, reduced chlorine use and a comfortable viewing/social area for parents and families
2. **Enhanced recreational aquatics facilities**
   Lane swimming and aqua-fit with salt water or reduced chlorine use

From the Survey

We asked:

In terms of relative importance, where a ranking of 1 is the most important aquatic activity and 6 is the least important aquatic activity, I rank:

+ Swim competitively
+ Swim for personal fitness
+ Take swimming lessons / develop skills
+ Swim for fun
+ Undertake Rehabilitation / therapy
+ Socialize with friends and family

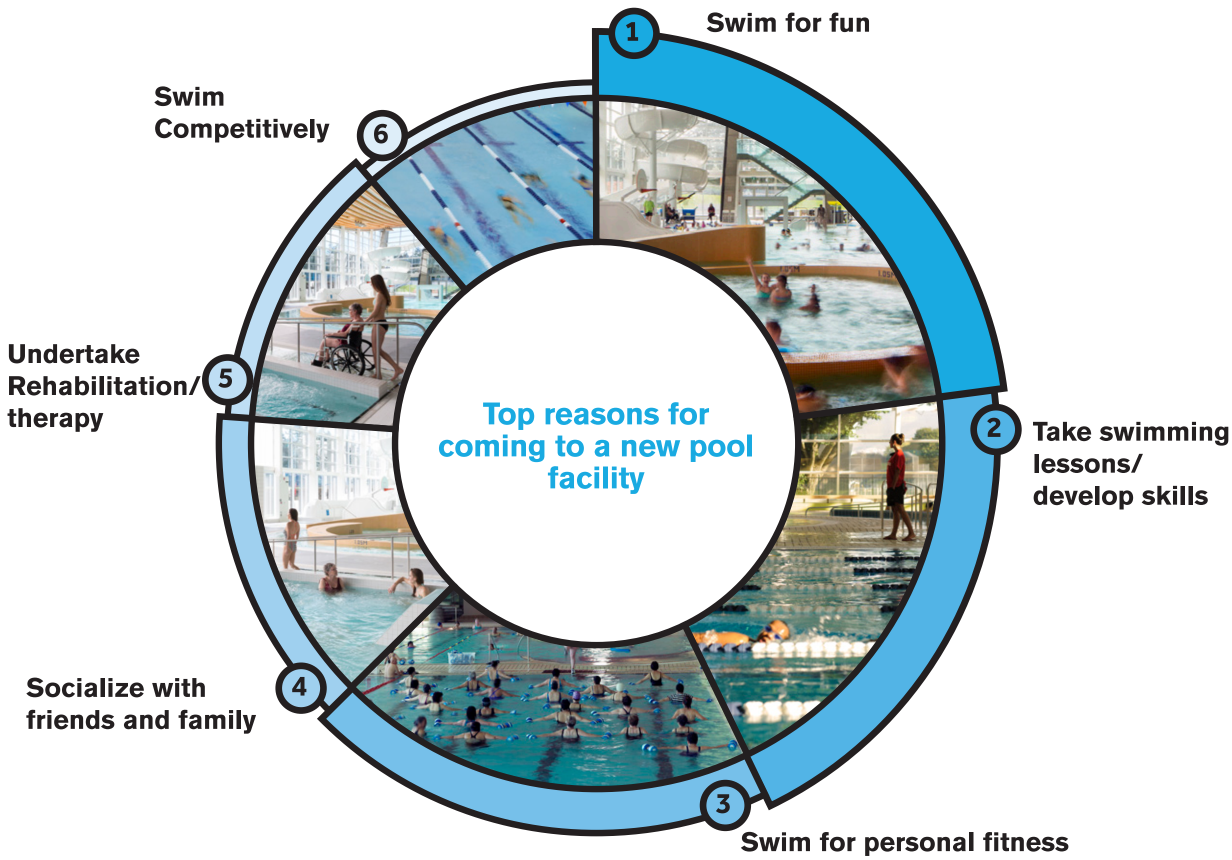
We heard:

1. Swim for fun
2. Take swimming lessons / develop skills
3. Swim for personal fitness
4. Socialize with friends and family
5. Undertake rehabilitation / therapy
6. Swim competitively

"A bigger pool so lessons and fun can happen at the same time."

-From 2018 Shuswap Swims!

Each aquatic activity was given an overall score, based on the cumulative ranking of the participants. This diagram shows in order of priority the top reasons for the Shuswap community to come to a future pool facility. The majority of respondents indicated a need for leisure, skill development and fitness activities, and a notable group indicated a need for socializing. Competitive swimming ranked as the lowest priority.



People took the time to tell us the kinds of **aquatic** activities that are important to them in a new facility. The most common activities highlighted were:

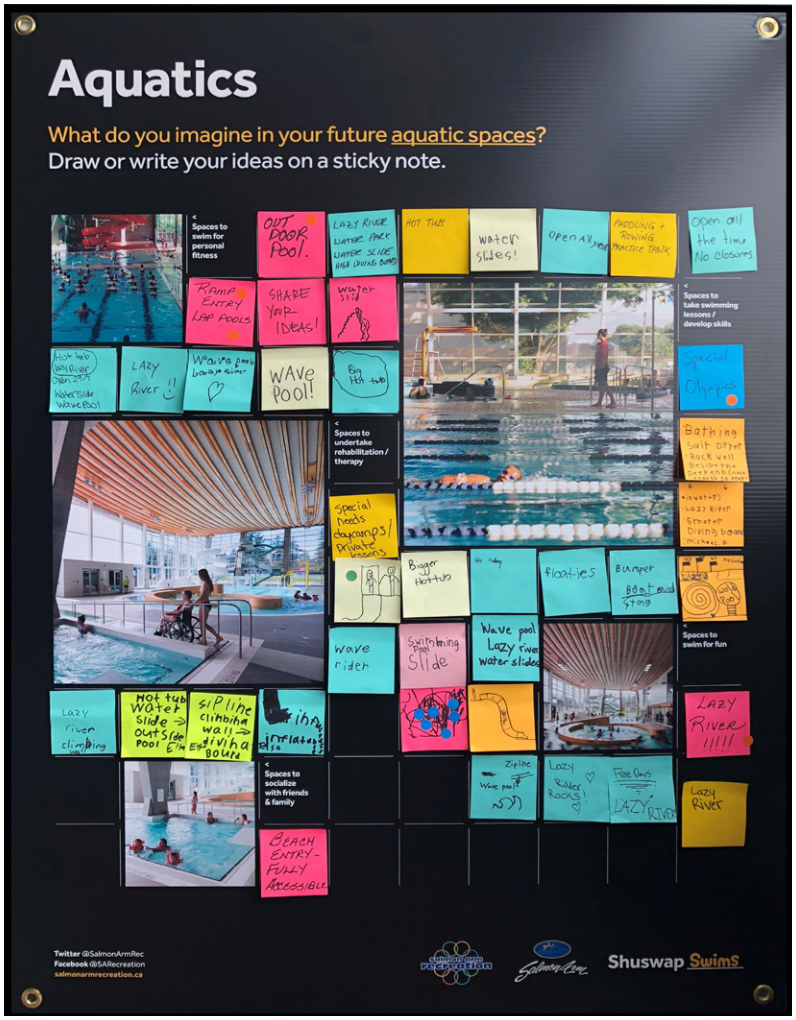
LAZY RIVER
SLIDES
WAVEPOOL
ROCK WALL
TOT POOL
REDUCE CHLORINE
COMFORTABLE VIEWING AREA/ SOCIAL AREA FOR PARENTS & FAMILIES

< CITED MORE

LANE SWIMMING
AQUA-FIT

< CITED LESS

From the Ideas Fair and Pop-Up



We asked:

What do you imagine in your future aquatic spaces?

Comments focused on leisure aquatic components such as water slides, lazy rivers, and hot pools. Several comments identified accessibility and inclusivity as a priority.

We asked:

What's most important to you about aquatic spaces in a future Shuswap recreation centre?

Answers largely coincided with what we heard from the online survey.

DEFINING PRIORITIES FOR PERFORMING ARTS SPACE

The third **priority for a future facility** pertain to performing arts space:

3. **Enhanced performing arts facilities**
   Especially music, but also dance, theatre, and comedy

From the Survey

We asked:

In terms of relative importance, where a ranking of 1 is the most important recreation activity and 6 is the least important recreation activity, I rank:

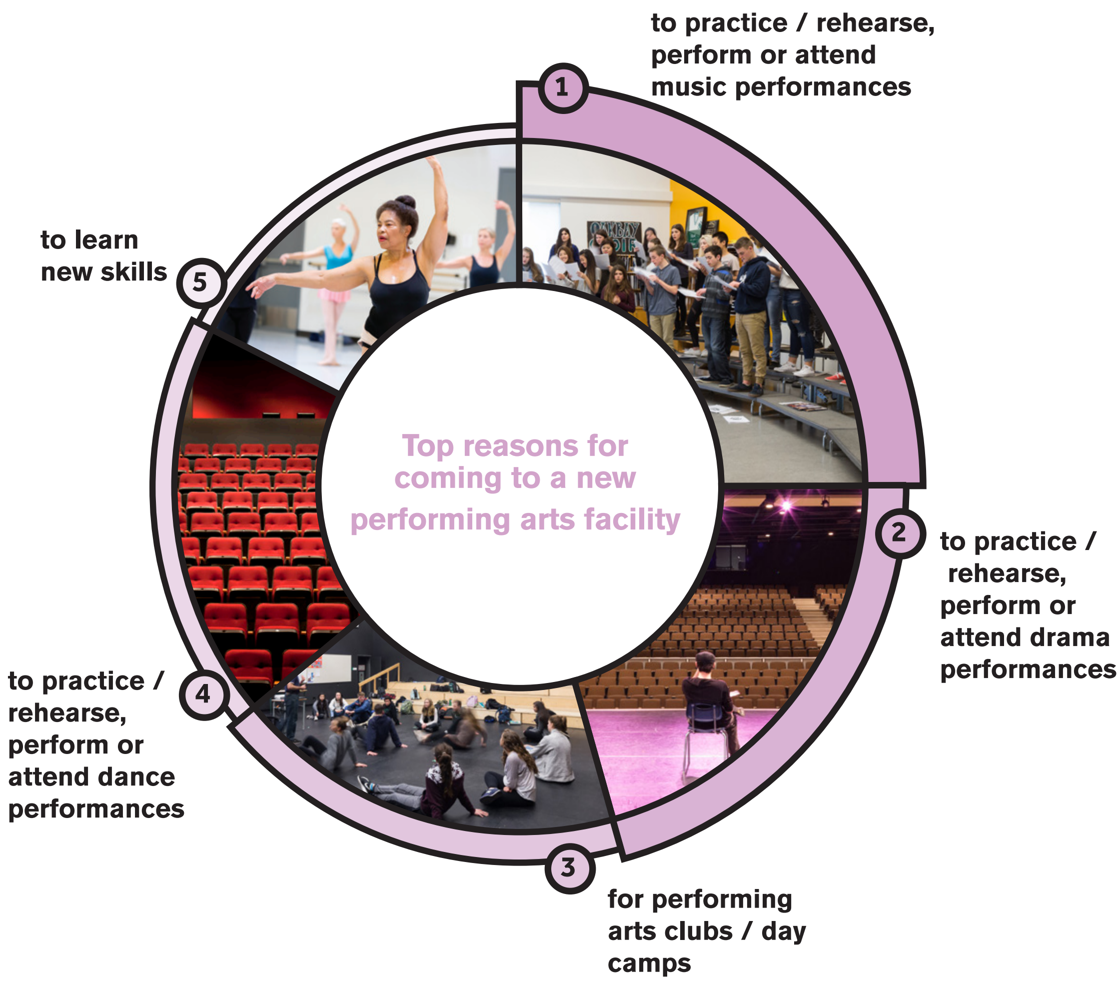
+ to practice/rehearse, perform or attend drama performances
+ to learn new skills
+ to practice/rehearse, perform or attend music performances
+ for performing arts clubs / day camps
+ to practice/rehearse, perform or attend dance performances

We heard:

1. to practice/rehearse, perform, or attend music performances
2. to practice/rehearse, perform or attend drama performances
3. for performing arts clubs / day camps
4. to practice/rehearse, perform or attend dance performances
5. to learn new skills

> **"Have many different activities happening at the same time at the rec centre so that it is truly a community facility"**
>
> -From 2018 Shuswap Swims!

Each performing arts activity was given an overall score, based on the cumulative ranking of the participants. This diagram shows in order of priority the top reasons for the Shuswap community to come to an enhanced performing arts facility. The majority of respondents indicated a need for spaces dedicated to music and drama. A notable group ranked spaces for clubs and day camps relatively important to include in a new facility.



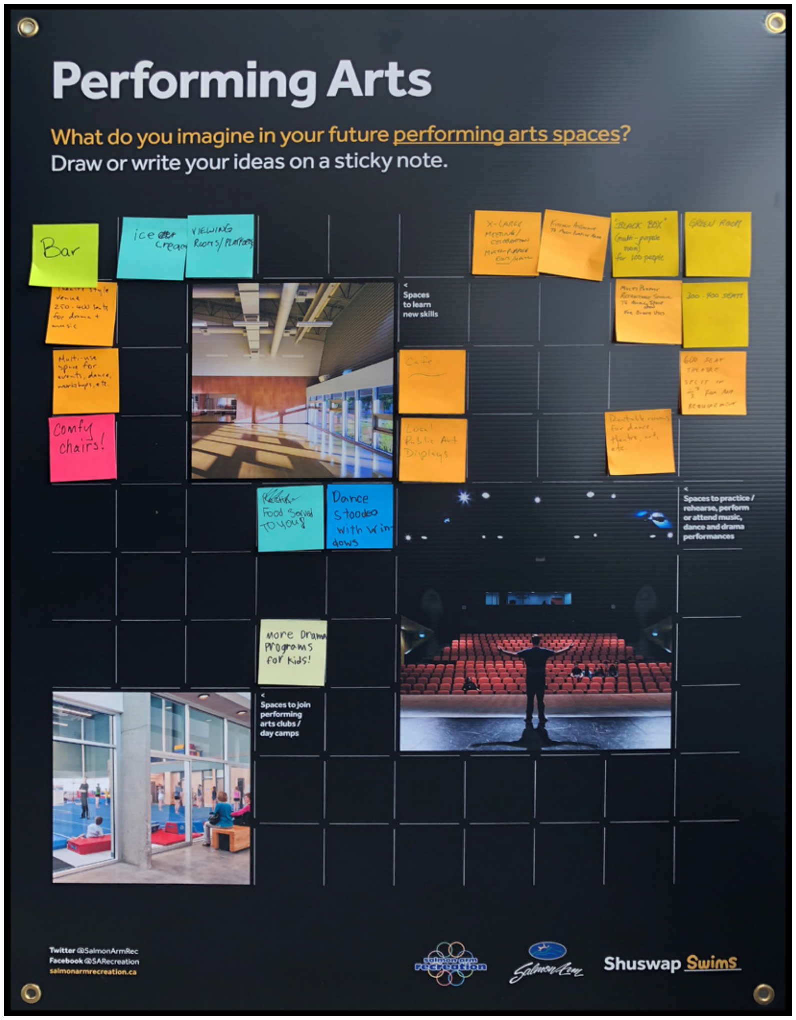
People took the time to tell us the kinds of **performing arts** activities that are important to them in a new facility. The most common activities highlighted were:

MUSIC

DANCE
THEATRE
COMEDY

<
CITED MORE
<
CITED LESS

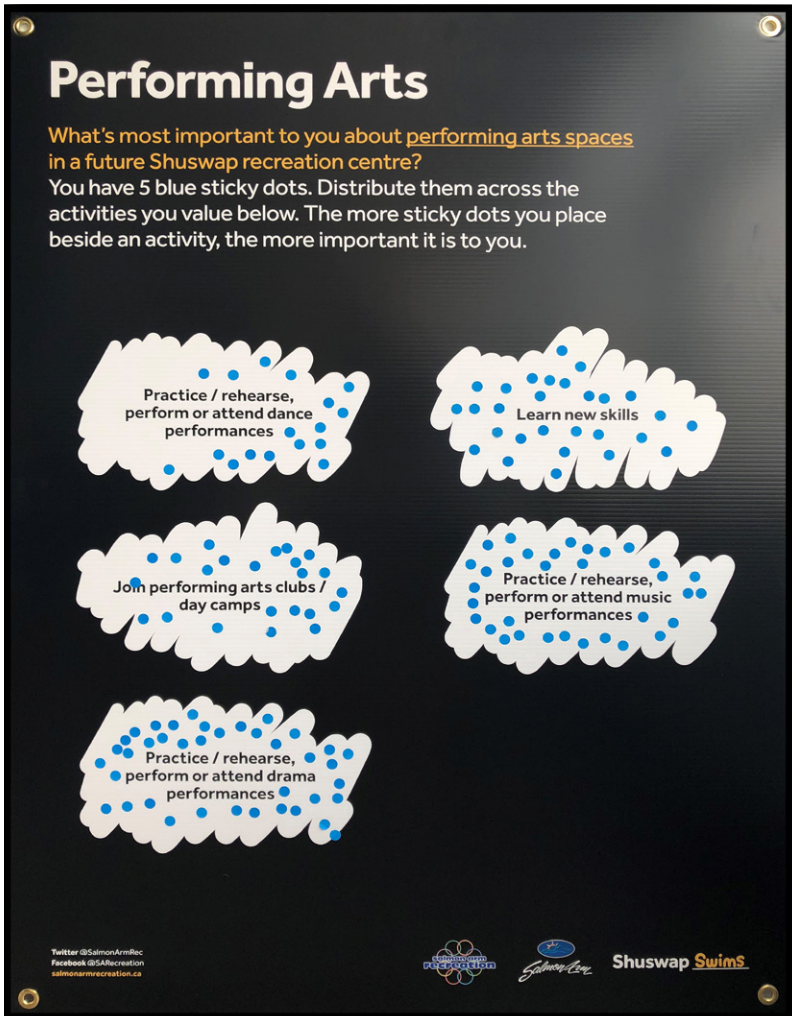
From the Ideas Fair and Pop-Up



We asked:

What do you imagine in your future performing arts spaces?

There were fewer comments on performing arts spaces than an aquatic and recreation spaces. Several comments indicated multi-purpose spaces to rent, host events workshops etc. Several comments asked for specific capacity, from 100 to 400 to 600 people.



We asked:

What's most important to you about recreation spaces in a future Shuswap recreation centre?

Answers collected at the Ideas Fair slightly differed from the online survey results.

Highest priorities remained:
to practice/rehearse, perform, or attend drama performances

to practice/rehearse, perform or attend music performances

Medium priorities were:
Learn new skills
Join performing arts clubs / day camps

Lower priorities were:
to practice/rehearse, perform, or attend dance performances

DEFINING PRIORITIES FOR RECREATION SPACE

While the focus of the public engagement feedback was on aquatic and performing arts spaces, including and enhancing spaces for recreational activities is recommended to meet the needs of the future Shuswap community.

From the Survey

We asked:

In terms of relative importance, where a ranking of 1 is the most important recreation activity and 6 is the least important recreation activity, I rank:

+ Play
+ Socialize with friends and family
+ Do group activities
+ Enjoy sport for recreation
+ Learn a new skill
+ Train for competitive sports
+ Host or attend an event

We heard:

1. Enjoy sport for recreation
2. Play
3. Do group activities
4. Socialize with friends and family
5. Learn a new skill
6. Train for competitive sports
7. Host or attend an event

> **"More programming to get ALL ages moving together."**
>
> -From 2018 Shuswap Swims! Survey

Each recreation activity was given an overall score, based on the cumulative ranking of the participants. This diagram shows in order of priority the top reasons for the Shuswap community to come to an enhanced recreation facility. The majority of respondents indicated a need for spaces for the community to play, to play recreational sports and to do group activities. A notable group ranked spaces to socialize with friends + family relatively important to include in a new facility. Spaces to train competitively and to host or attend an event were indicated as the lowest priority.

People took the time to tell us the kinds of **recreation** activities that are important to them in a new facility. The most common activities highlighted were:

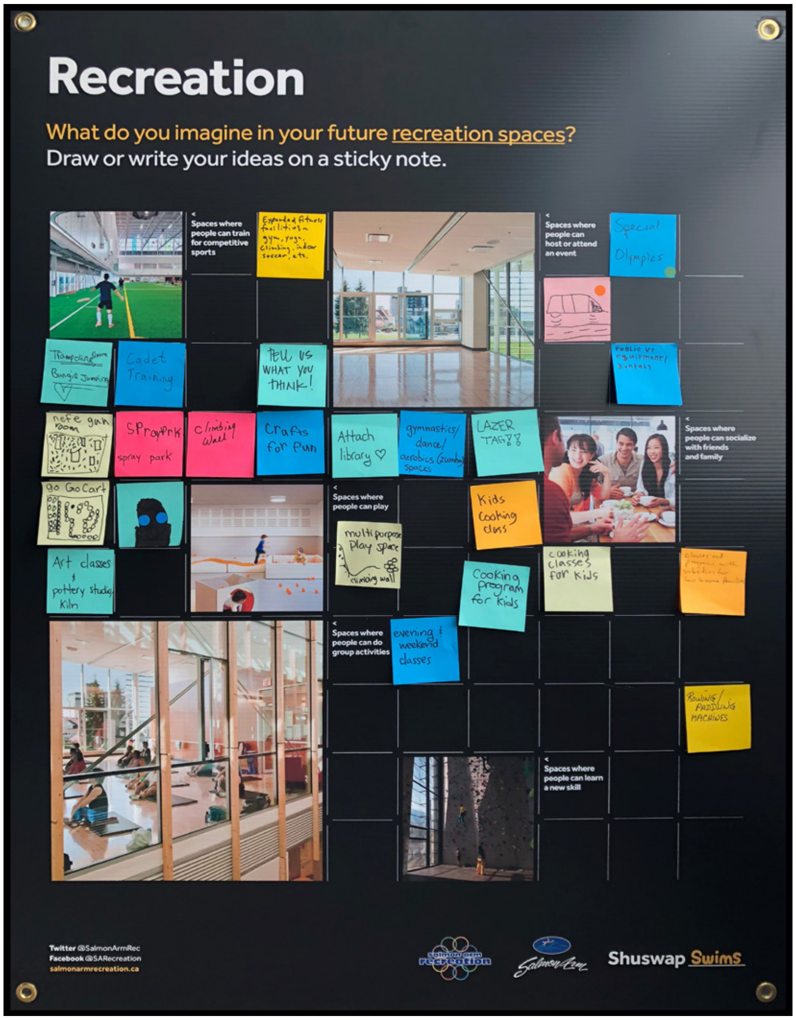
INDOOR TRACK & FIELD
SOCCER

<
CITED MORE

FITNESS
CLIMBING GYM
GYMNASTICS
BASKETBALL
PICKLEBALL
VOLLEYBALL
SQUASH
TENNIS
BASEBALL
ICE SKATING
TRAMPOLINE

<
CITED LESS

From the Ideas Fair and Pop-Up



We asked:

What do you imagine in your future recreation spaces?

Comments indicated educational and recreation programming eg. cooking, arts, and crafts classes as well as a climbing wall.

We asked:

What's most important to you about recreation spaces in a future Shuswap recreation centre?

Answers collected at the Ideas Fair slightly differed from the online survey results.

Highest priority remained:
Enjoy sport for recreation

Medium priorities were:
Play
Learn a new skill
Host or attend an event

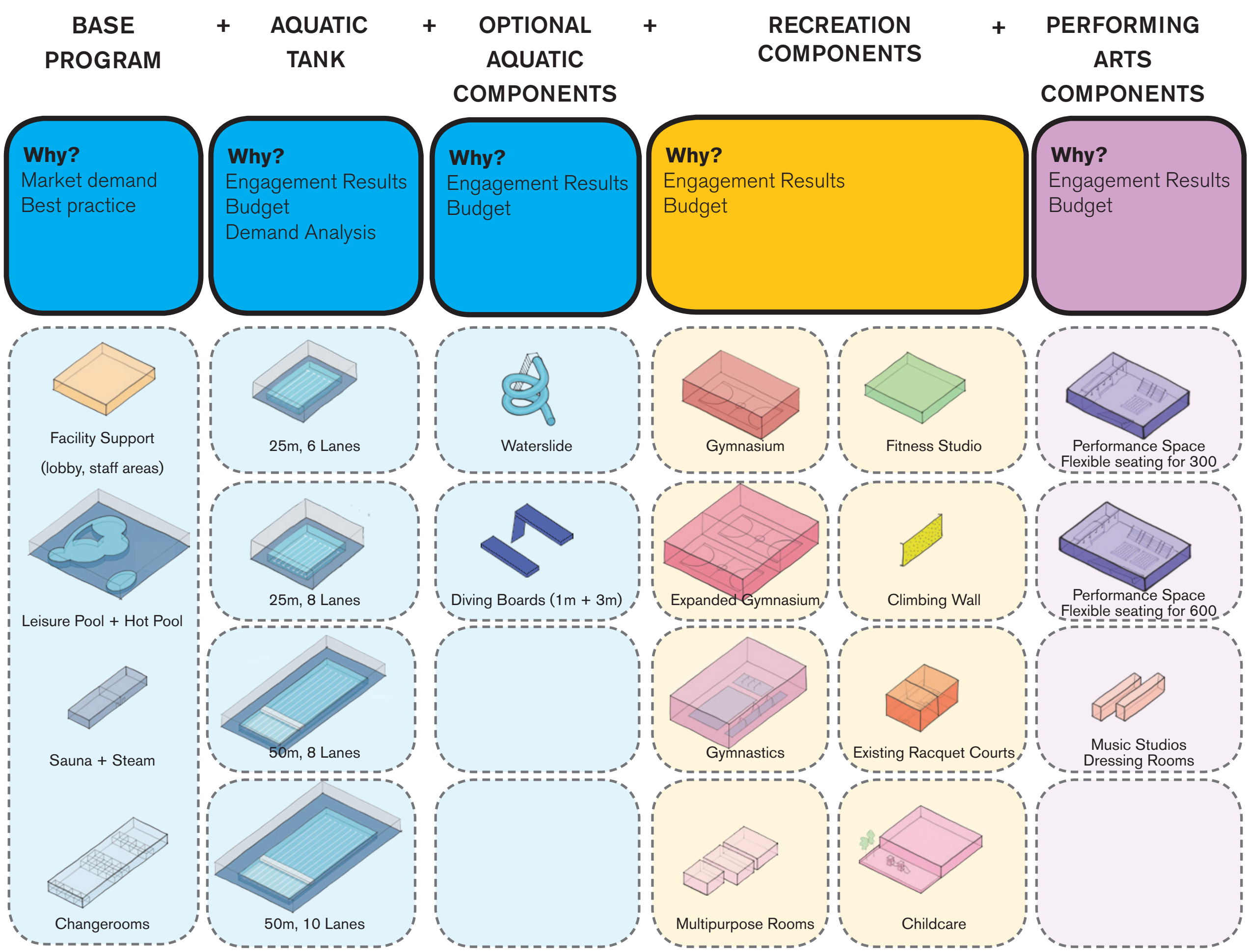
Lower priorities were:
Socialize with friends and family
Train for competitive sports
Do group activities

4.0 Program

4.1 Decision Making Process
4.2 Demand Analysis
4.3 Initial Proposed Program
4.4 Program Options

4.1 Decision Making Process

The feasibility study took place between May 2018 and February 2019 and involved regular meetings with the Shuswap Recreation Society, as well as several workshops with elected officials. One of the primary objectives of the study was to determine the building program and budget. Deciding on a proposed aquatic program can be a complex process, based on a number of factors including current and future use demand, future needs and emerging trends, as well as a community's identity, aquatic priorities, and aspirations. In order to assist the Shuswap Recreation Society and key decision makers with this process, we formulated a decision making framework and program menu by breaking down programmatic components into distinct groups: Base Program, Aquatic Tank, and Optional Aquatic Components. We also carried out a similar approach to recreation and performing arts program spaces, breaking them down into Recreation Components, and Performing Arts Components. Each menu item was associated with a cost and an area, and was used to assist decision-makers in establishing priorities and developing a suitable program.



▲ Decision Making Framework & Menu

BASE PROGRAM

The base program represents a core component of recommended spaces that are included as best practice in almost all modern aquatic facilities. The base program includes facility support (reception and lobby, social gathering space, cafe, and staff areas), changing rooms, hot pools, steam & sauna, and leisure pool.

AQUATIC TANK

The next category in the decision making process involved the selection of the main aquatic tank. This decision is usually based on demand capacity and programmatic needs, as well as the desired aquatic focus of the facility (e.g. competitive, leisure, wellness or fitness and training). The aquatic focus is significant because it will determine the tank sizes and configurations, which will impact how the new building will fit on the site. It is also significant because this space is the most expensive to build and operate and as such has the largest potential impact on the project budget. Based on the initial demand analysis (section 4.2), three options were outlined and comparative examples were given from similar facilities in the region.

OPTIONAL AQUATIC COMPONENTS

There were several optional components to consider relating to other associated community and fitness programmatic needs, as identified by key decision makers and the public engagement process. Selection of these components has minimal impact on other aquatic programmatic elements, but larger spaces like a gymnasium and gymnastics centre will impact the proposed site layout options.

RECREATION COMPONENTS

Key decision makers expressed a desire to include recreation components outside the aquatic program for consideration in the future SASCU Recreation Centre. The public supported the inclusion of spaces for recreational sports, group activities, and play. Possible recreation components included gymnasium, gymnastics, multipurpose rooms, fitness centre, climbing wall, existing racquet courts, existing childcare, etc.

PERFORMING ARTS COMPONENTS

The existing SASCU Recreation Centre houses a multi-purpose gymnasium that functions as an auditorium for select community events or performances. Key decision makers have requested an exploration of the suitability of a performing arts centre in the future facility. Purpose-built spaces for 300 and 600 seats were explored.

4.2 Demand Analysis

The primary goal of the demand analysis is to confirm an appropriate capacity requirement for the aquatic spaces, and what size and arrangement of pool tanks would best accommodate that capacity. Capacity in pools should be considered from two perspectives: firstly, from the perspective of accommodating a certain number of swimmers on an annual basis, and secondly, from the perspective of accommodating the range and quantity of desired program types.

Determining capacity involves identifying a target for annual swims per capita. Annual swims per capita refers to the amount of times in a given year that a person visits the pool, and it is important to note that this is averaged over the entire population (i.e 50% of the population may use the pool, and 50% may not, but the combined visits between these two groups represents an average for the entire population). The goal is to ensure that the pool tanks are large enough to afford a reasonable amount of swims for the population of Salmon Arm and a portion of CSRD.

EXISTING USE

	2017
Admissions Public Swim	34,325
Admissions Aqua-fit	10,049
Access Pass Check-Ins	2,320
Total Annual Swims	**46,694**

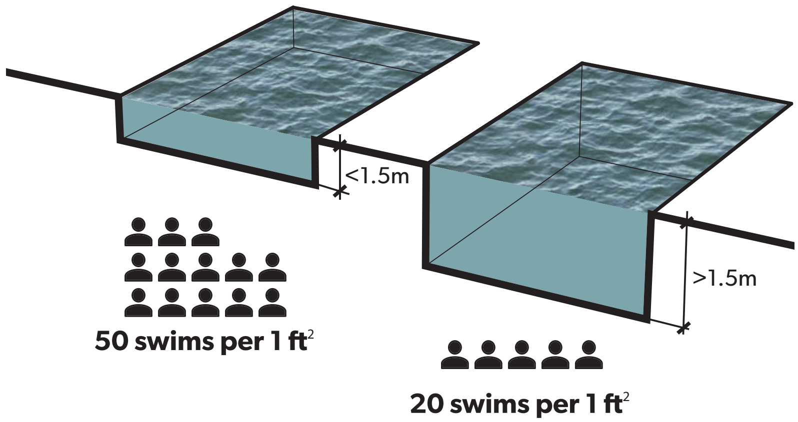
Source: Shuswap Recreation Society Recreation Master Plan Statistics

Based on the Shuswap Recreation Society Master Plan Statistics, in 2017, there were 46,694 annual swims at the existing SASCU Recreation Centre.

SWIM CAPACITY

City of Vancouver Aquatic Services Review (2001) specifies 65 swims/year for each square foot of water area shallower than 5ft (1.5m) and 25 swims/year for each square foot of water area deeper than 5ft (1.5m) with 4900 operating hours / year. The existing SASCU pool is open for 3666 hours / year (~75%), therefore the numbers have been interpolated for this study.

Square foot of water surface area is a standard unit of measurement for measuring capacity and revenues.



EXISTING CAPACITY

	# of swims
Swim Capacity <1.5m	117,100
Swim Capacity >1.5m	28,640
Total Annual Swim Capacity	**145,740**

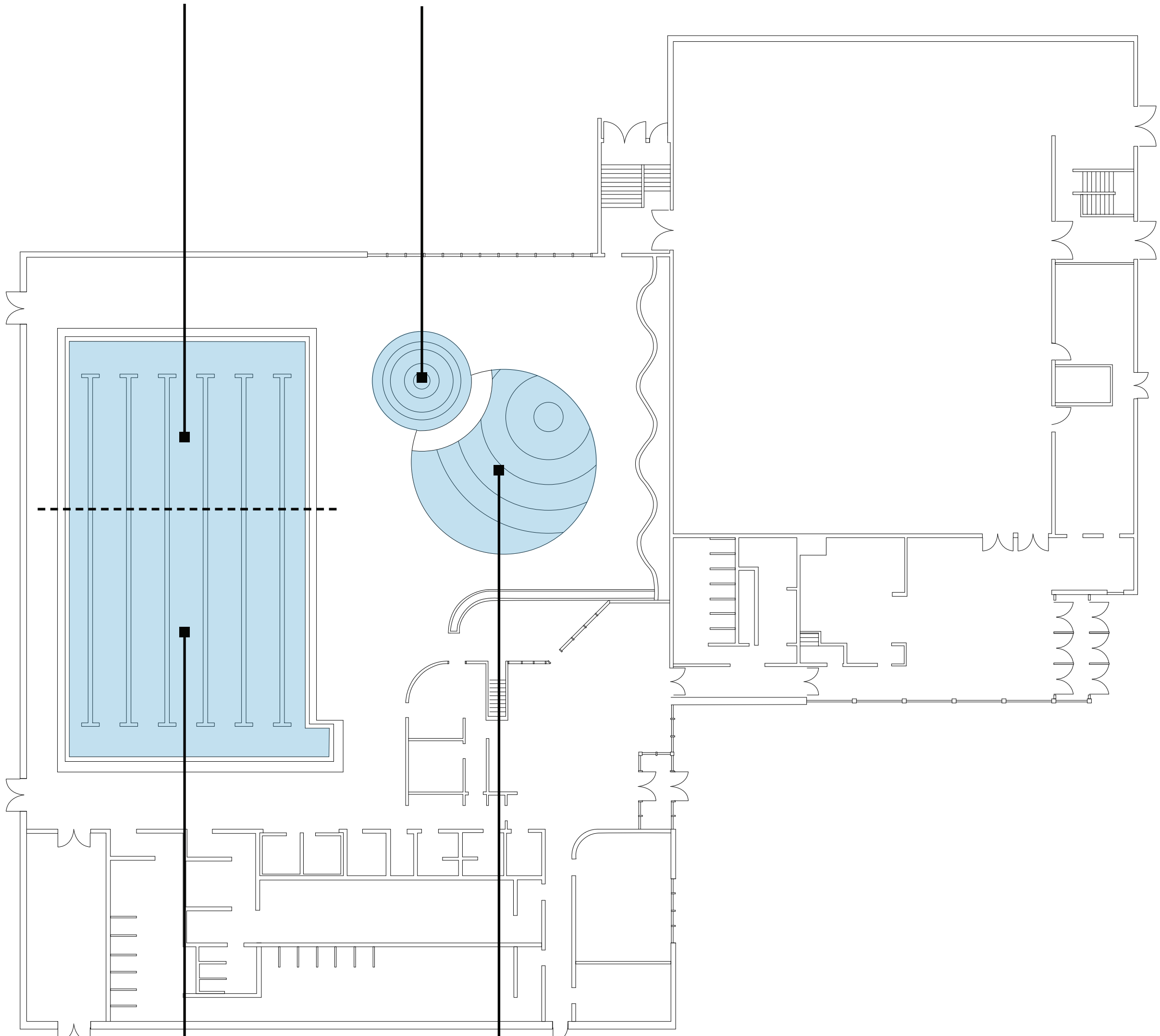
Based on water area of the existing pool

The swim capacity of the existing pool is ~145, 740 annual swims. There is a discrepancy of ~100,000 annual swims between the existing capacity of the pool and how much it actually gets used. Based on an analysis of public engagement results, there are several reasons the existing use is not meeting capacity.

- Lack of leisure pool
- Operating hours (at peak demand time, pool is closed for lessons / clubs)
- Lack of lane swimming capacity (at peak demand time, pool is closed for lessons / clubs)
- Pool temperature (without leisure pool, there is no alternative temperature)
- Lack of access (wading pool and hot pool are not accessible) (lap pool is not deep enough for diving)

1432ft² >1.5m deep
20 swims/ft²
28,640 annual swims

17ft² <1.5m deep
50 swims/ft²
850 annual swims



2,325ft² <1.5m deep
50 swims/ft²
116,250 annual swims

915ft² <2ft deep
N/A

▲ Existing Capacity
SASCU Recreation Centre Pool

Based on existing use and population, the annual swim count is currently 2.7 swims / year / person. The next step in determining an appropriate size tank is to determine the projected demand based on projected population and an increase in annual swim count.

ANNUAL SWIMS PER PERSON

	2017
Salmon Arm Population	17,464
Total Annual Swims	46, 694
Swims / Person / Year	**2.7**

PROJECTED DEMAND

Year	2011	2032
SA Population	17,464	21,800 - 26,800
Assumed Annual Swims/year*	7	7
Total Projected Annual Swims	122,250	**187,600**

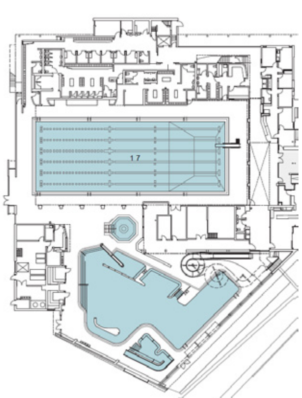
* An increase in annual swim count is assumed (7 swims / year / person). An increase in annual swim count beyond historical use is due to expansion, new amenities, or modernization of the key activity, fitness and pool components. This is demonstrated through facilities such as Hillcrest Centre and Killarney Community Centre, which are the newest facilities in the Metro Vancouver Parks Board area and have the highest number of annual swims i.e. "Build it and they will come." As a context for this target, smaller communities tend to achieve swims per capita of close to 7.0 or 8.0, where as urban centres generally see a swim per capita rate of 2.0 - 4.0. Furthermore, as full pools can be perceived by some as over-crowded, designing to a highly aspirational target of 7.0 ensures comfort in the pool.

In determining the size and configuration of pool tank to best meet a projected annual swim count of 200,000 it is important to note that this approach is based on observed usage across Canada, and is a rule of thumb dictating the amount of people per / square feet. It is important to note that other factors such as the depth and temperature of water will create variation in these numbers. A more reliable method of determining capacity is to benchmark the annual swim counts against other facilities in a similar geographic area and compare the corresponding tank sizes. This provides an approximate benchmark for how many annual swims a pool tank of a certain size will historically accommodate. Three other facilities offer the following data:

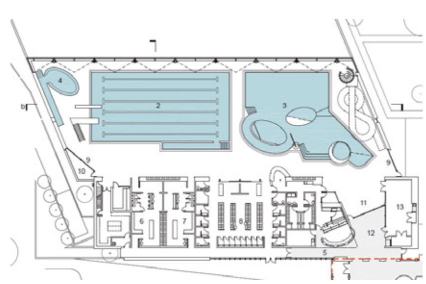
BENCHMARKING DEMAND

Facility	Annual Swims*	Pool Size
West Vancouver Aquatic Centre	382,430	6 lane 35m lap pool + 3600 ft^2 leisure pool + 375 ft^2 hot pool
Killarney Community Pool	233,000	6 lane 25m lap pool + 2600 ft^2 leisure pool + 370 ft^2 hot pool
Chimo Aquatic Centre	312,600	6 lane 25m lap pool + 3000 ft^2 leisure pool + 430 ft^2 hot pool

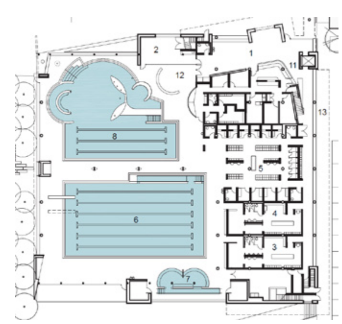
*Includes Lessons, Drop-in & Other programs



West Vancouver Aquatic Centre



Killarney Community Pool



Chimo Aquatic Centre

▲ Benchmarking based on

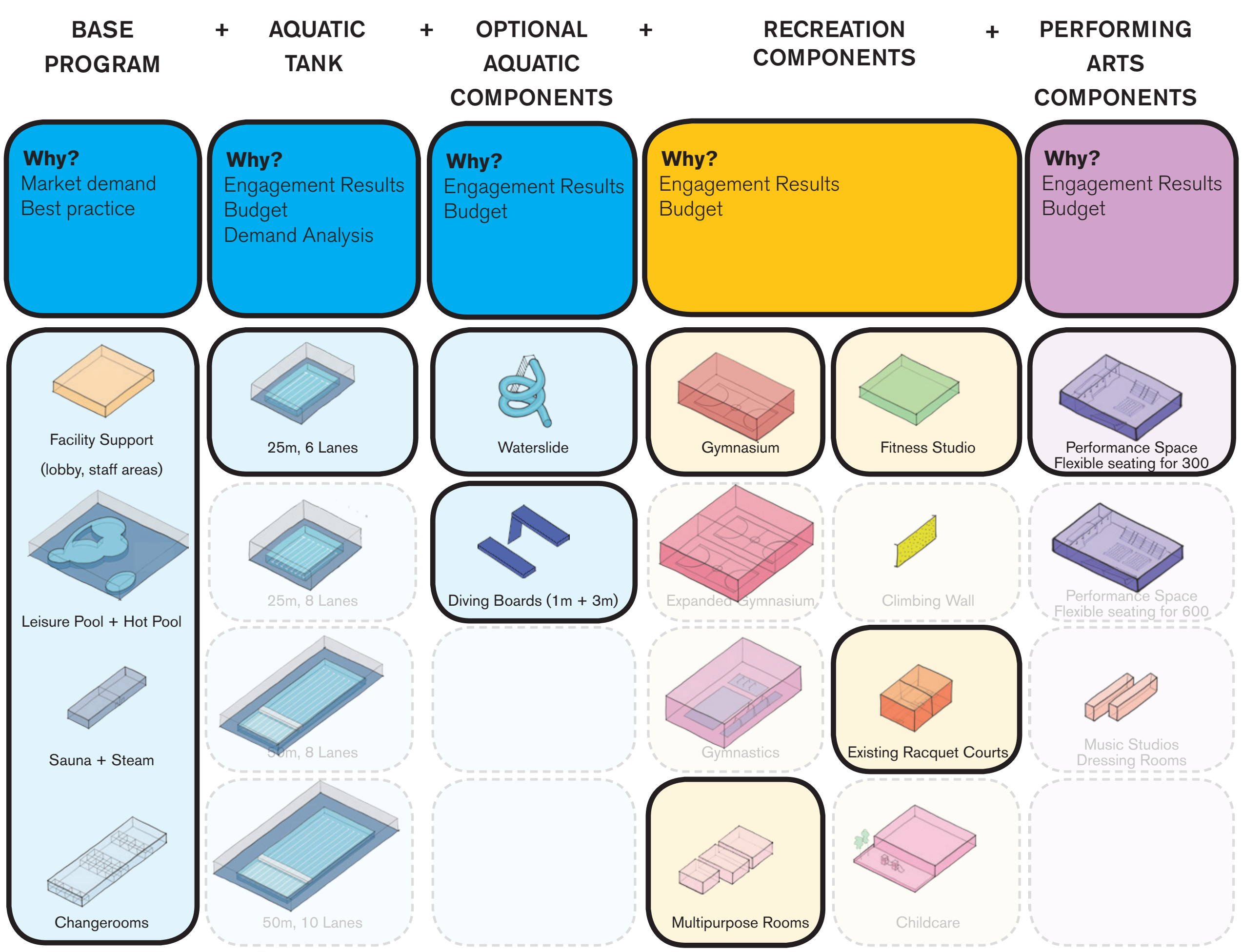
This data indicates that the proposed tank size should theoretically be similar to Killarney to accommodate the projected annual swim count of ~200,000. It is reasonable to assume that a tank configuration that includes a **6 lane 25m** tank and a **leisure pool (~2800ft^2) with two warm 25m lanes** would meet the projected demand and allow for variation.

It is important to note that while determining an appropriate capacity level is an important and critical step in selecting a pool tank size and configuration, there are other factors that should be given equal consideration. For the City of Salmon Arm a critical factor is the use of the current facility by prominent swim clubs and the desire to invest in a future facility that would be able to host swim meets and larger competitive events. The role of the elected officials, staff and stakeholders involved is to evaluate the value of this use relative to the increased operational and capital cost of building a larger facility.

4.3 Initial Proposed Program

INITIAL PROPOSED PROGRAM

The initial proposed program was assembled based on market demand, best practice, engagement results, demand analysis, budget, site, and through discussion with SRS and key decision makers. The initial proposed program included the components identified in the program menu below.



▲ Decision Making Framework & Initial Proposed Program Menu

4.4 Program Options

RENOVATE + EXPAND VS. REBUILD + RENOVATE

The decision was made to develop two options to suit the budget range. A lower budget option would involve renovating and maintaining as much of the existing aquatic centre as possible and expanding where necessary to include additional aquatic, recreation, and performing arts components. A higher budget option would involve building a new aquatic centre adjacent to the existing building, and renovating the existing in order to convert it into recreational and performing arts program.

The following two options involve these two basic strategies for redeveloping the SASCU Recreation Centre site into a future facility.

OPTION A

- Renovate + Expand the Pool
- New Multi-purpose Gymnasium
- Convert Multi-purpose auditorium into dedicated Performing Arts Space
- New Fitness Centre

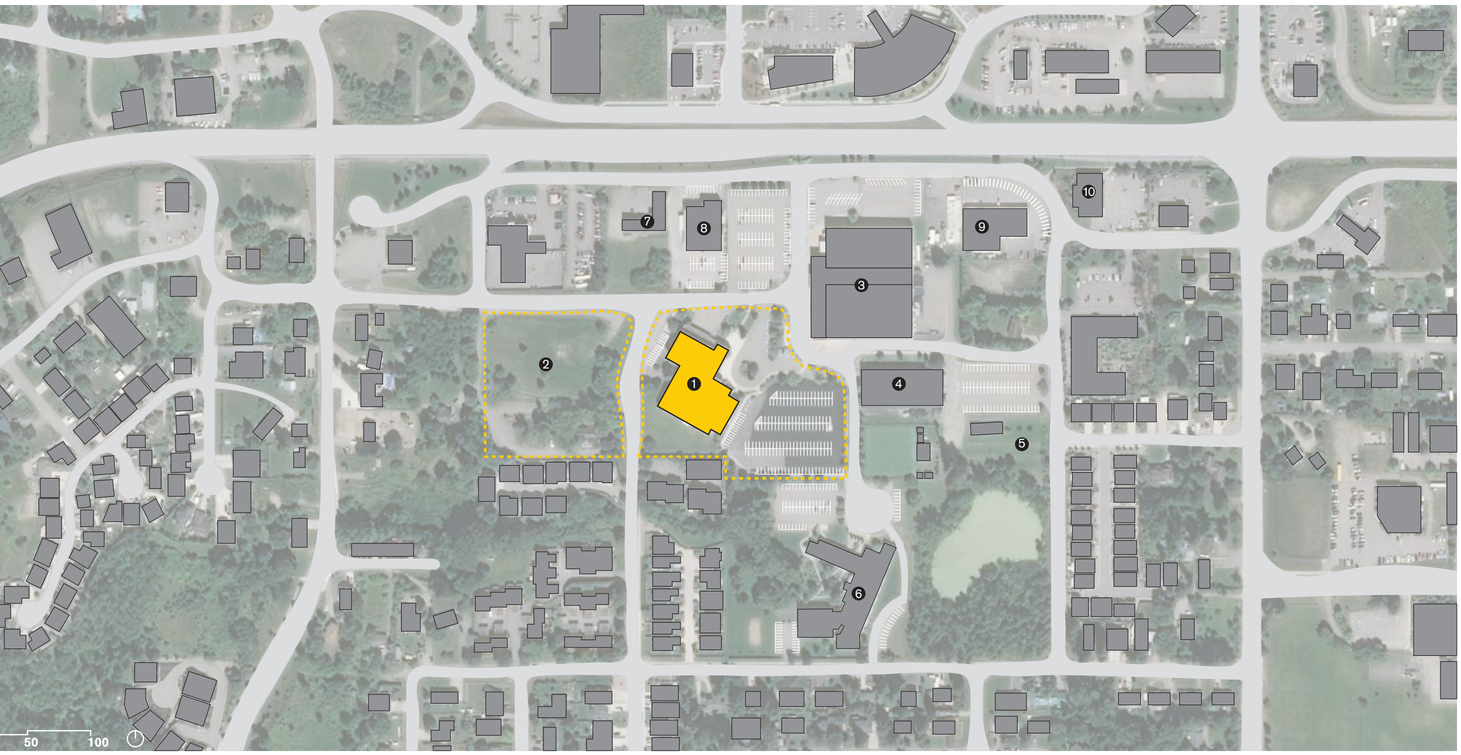
OPTION B

- New Pool + Fitness Centre
- Convert existing pool into gymnasium + multi-purpose
- Convert multi-purpose auditorium into dedicated Performing Arts Space

5.0 Concept Development

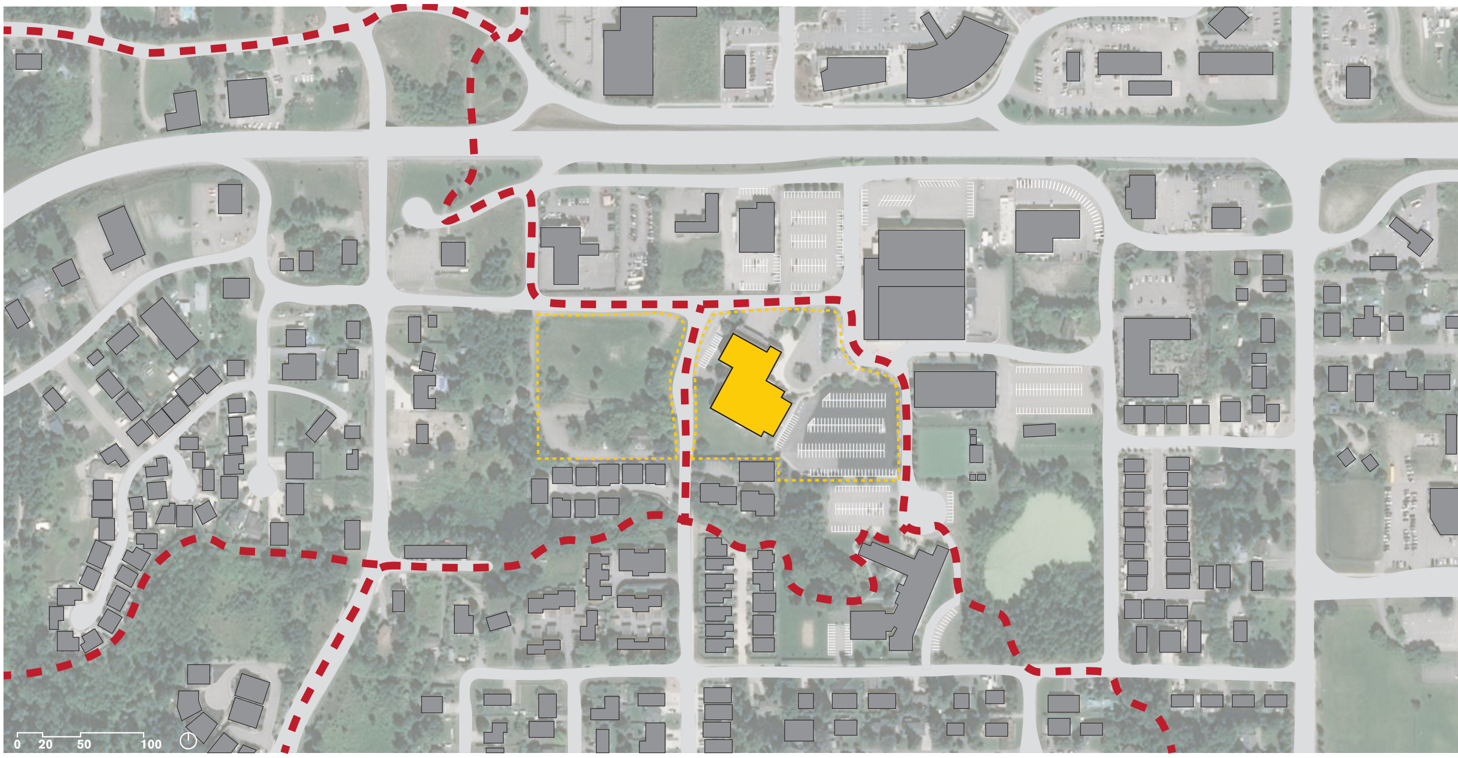
5.1 Site Analysis

EXISTING BUILDINGS + SITE CONSTRAINTS



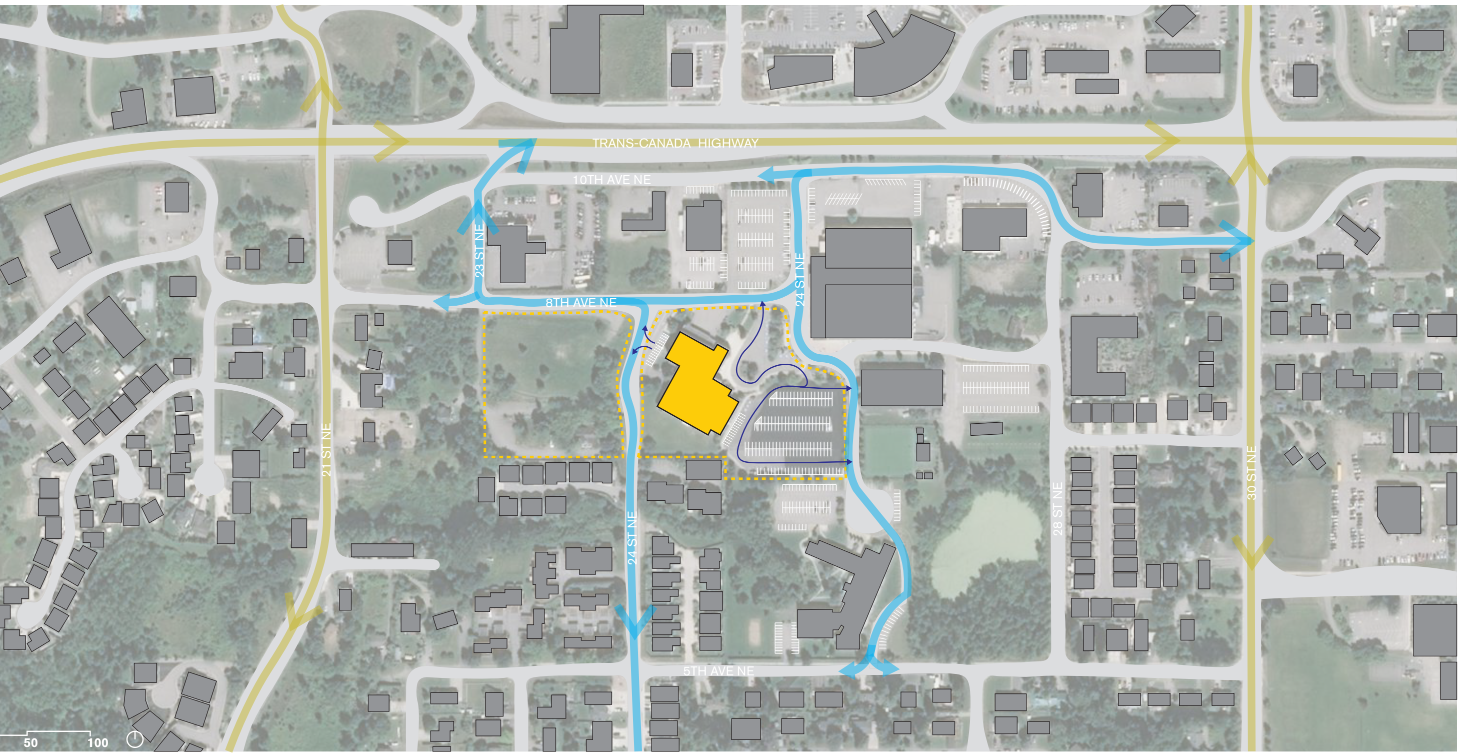
1. Existing SASCU Recreation Centre
2. Recreation Centre Expansion Lands
3. Shaw Centre
4. Salmon Arm Curling Club
5. Lawn Bowling
6. Okanagan College Salmon Arm - Revelstoke
7. Crossfit Salmon Arm
8. Shuswap's Total Fitness
9. Proactive Fitness Ltd.
10. Anytime Fitness

PEDESTRIAN AND CYCLIST ACCESS



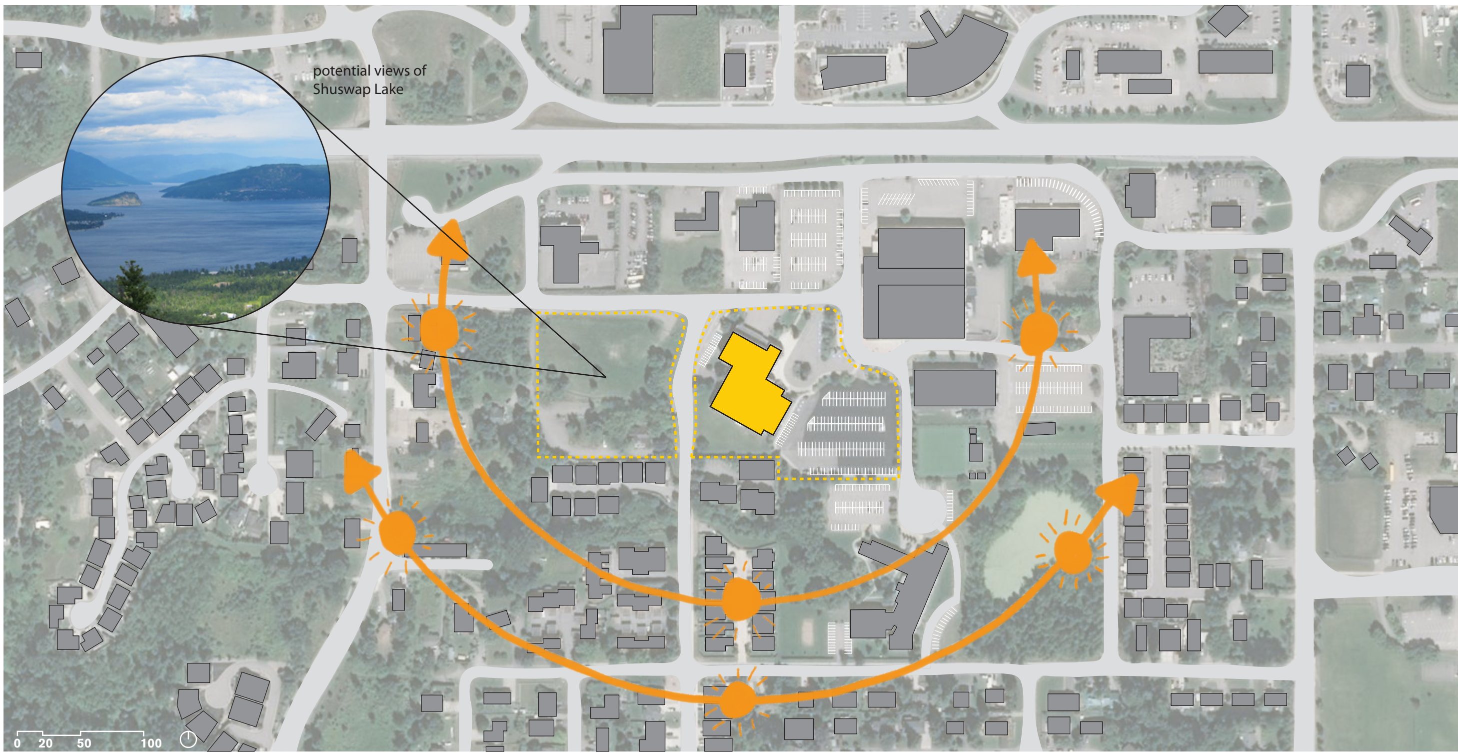
Pedestrian / Bike Route Priorities

VEHICULAR ACCESS

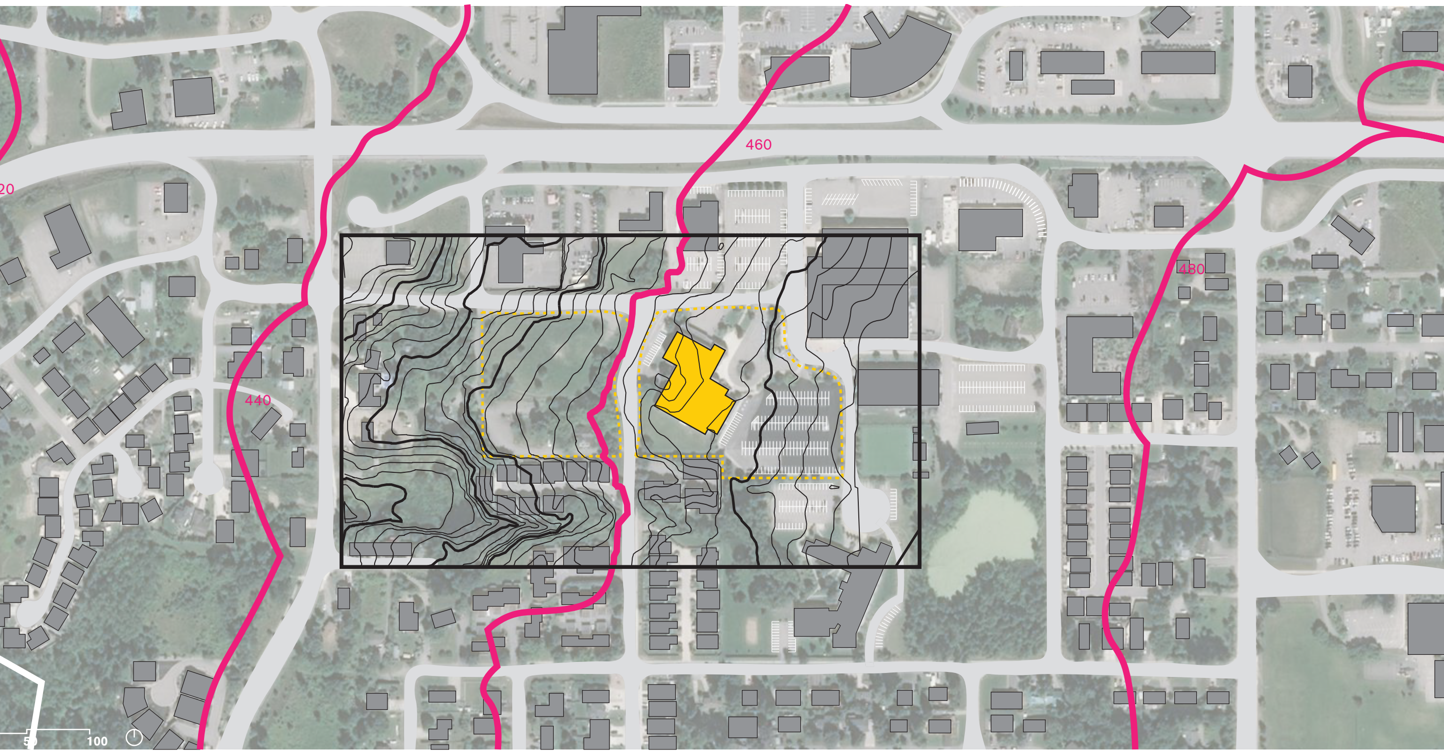


Major Arteries
Site Access
Parking Loops

SUN PATH + DAYLIGHTING



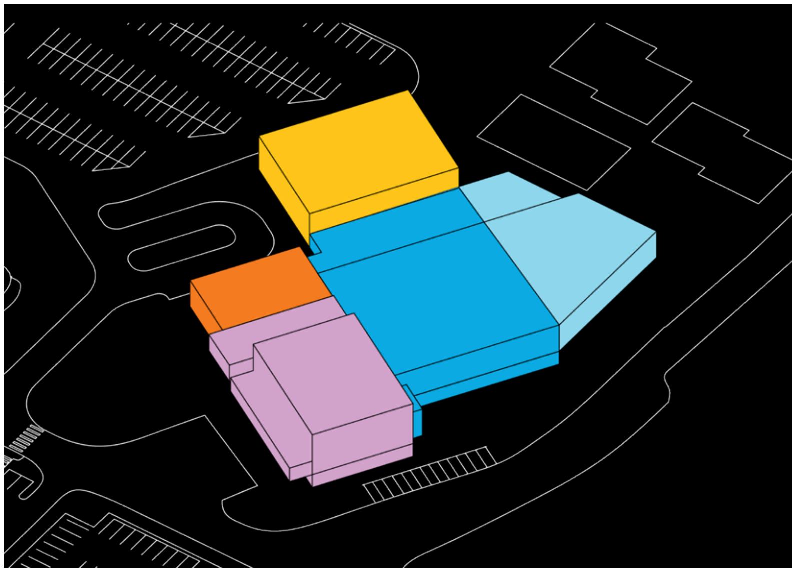
TOPOGRAPHY



20m
5m
1m

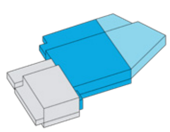
5.2 Option A

RENOVATE + EXPAND

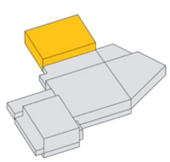


Option A involves renovating the existing natatorium and expanding it to the south to include a leisure pool, waterslide, and hot pool in addition to the existing 6-lane lap pool. The existing racquet courts will be replaced with a multipurpose gymnasium and a new fitness centre will be added to the north. The existing multipurpose auditorium will be renovated into a dedicated performing arts space with flexible seating configurations for up to 300 audience members. The existing lobby will be renovated and expanded to enhance the welcome area of the facility.

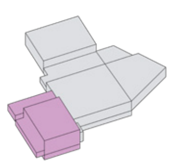
PHASE 1
Renovate + Expand the Pool



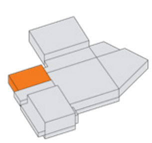
PHASE 2
New Multi-purpose Gymnasium



PHASE 3
Convert multi-purpose auditorium into dedicated Performing Arts Space



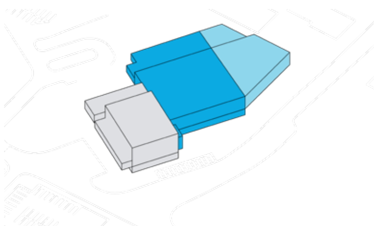
PHASE 4
New Fitness Centre



Phase 1: Renovate + Expand Pool.

Aerial View

- Renovated Pool
- New Pool

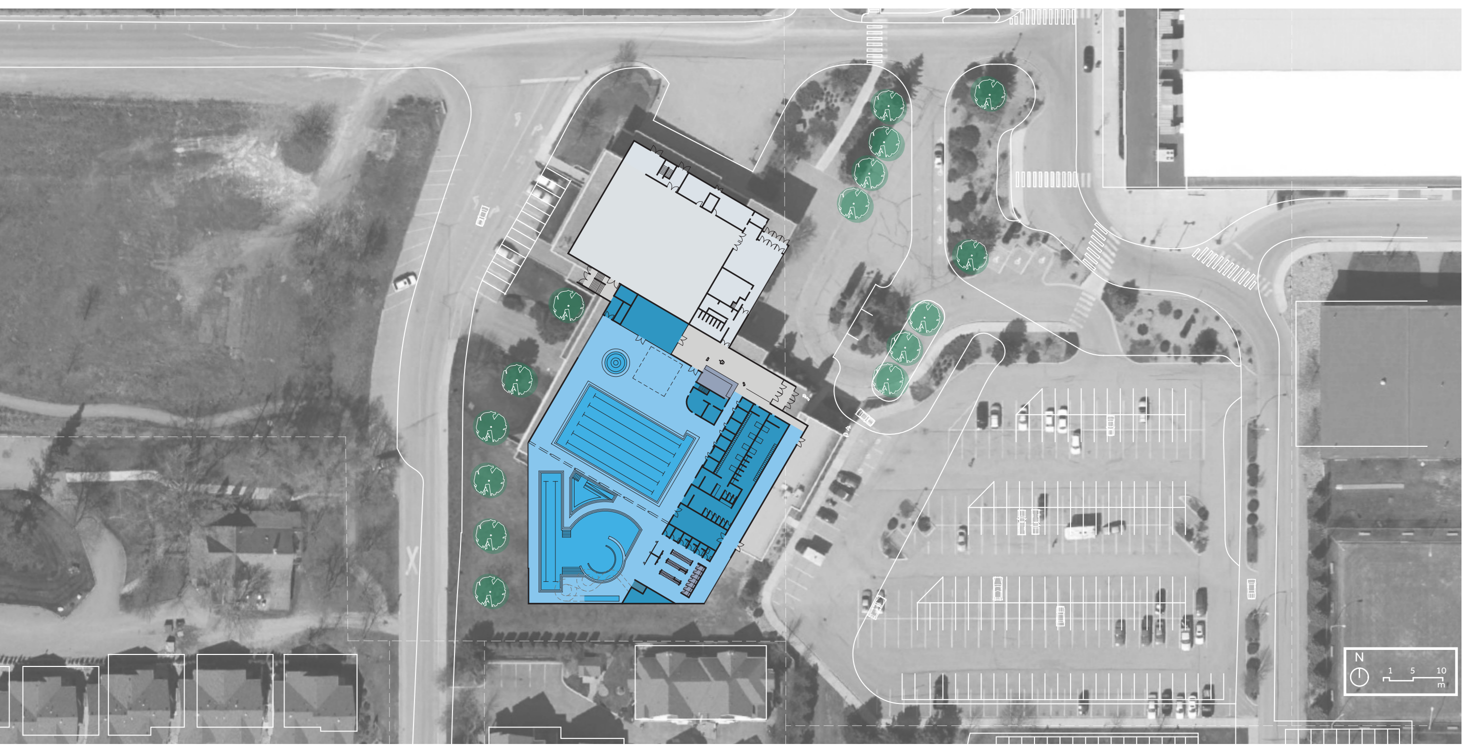


Details

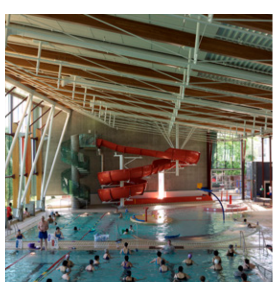
Renovate pool
- Renovate lap pool
  + 6x 25m lanes
- Renovate hot pool
- Remove tot pool
- Addition of wet multi-purpose room
- Renovate changerooms
- Renovate sauna & steam
- Exterior envelope upgrades and structural, mechanical, and electrical upgrades
- Renovate + expand lobby for social interaction

Expand pool
- Add new leisure pool
  + lazy river
  + zero-entry
  + 2x 25m lanes
- Add new hot pool
- Add new waterslide
- Add new universal changeroom
- *Pool closed for ~1year during renovation*
- *Remove existing racquetball courts*

Level 1



Leisure pool with integrated warm water lanes



Waterslide and water features

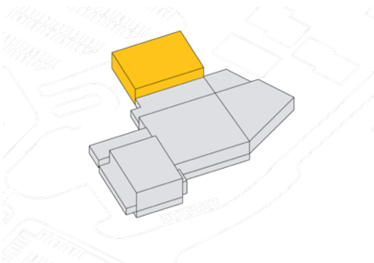
Leisure pool with lazy river

Hot pool with zero entry ramp

Phase 2: New Multi-purpose Gymnasium.

Aerial View

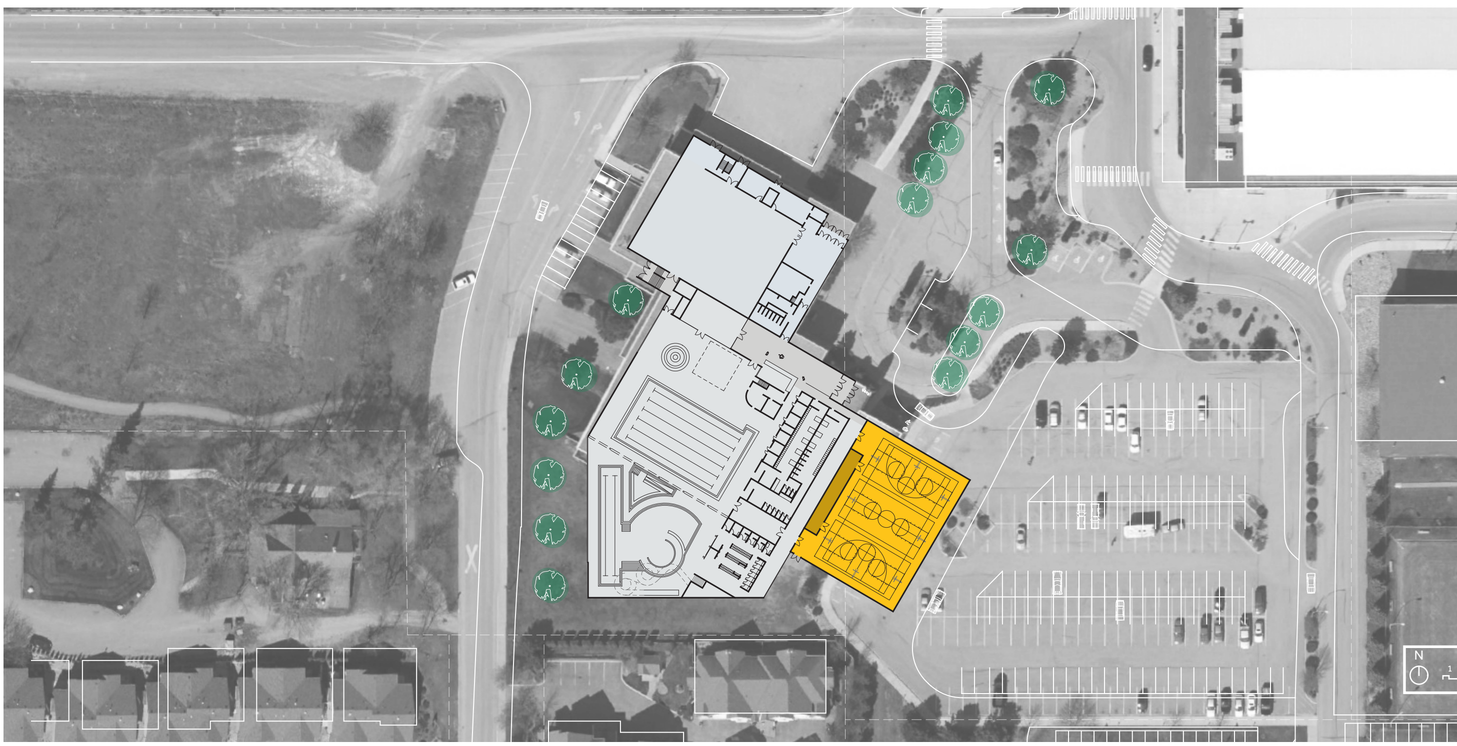
Gymnasium

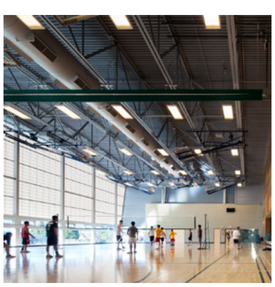


Details

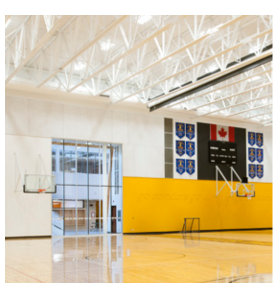
Gymnasium
- + 1x full-length basketball court
- + 1x full-length volleyball court
- + 3x cross-court basketball courts
- + 2x cross-court volleyball courts
- + 3x cross-court badminton courts
- + 3x cross-court pickleball courts
- + storage room

Level 1





Gymnasium for group activities

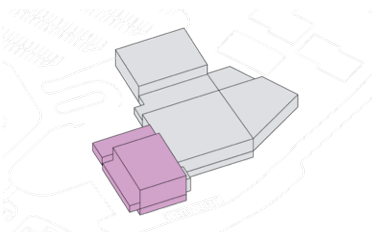


Gymnasium for organized sports

Phase 3: Convert multi-purpose auditorium into dedicated Performing Arts Space.

Aerial View

Performing Arts

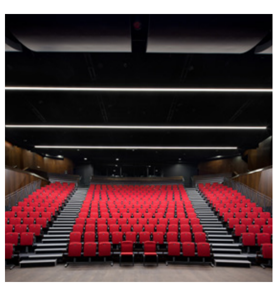


Details

- Retractable seating to accommodate 300 people
- Upgraded acoustics
- Theatre drapes
- Lighting grid
- Renovated dressing rooms
- Provide light and sound lock entrances
- Remove existing stage

Level 1

1) Retractable seating arranged in proscenium configuration



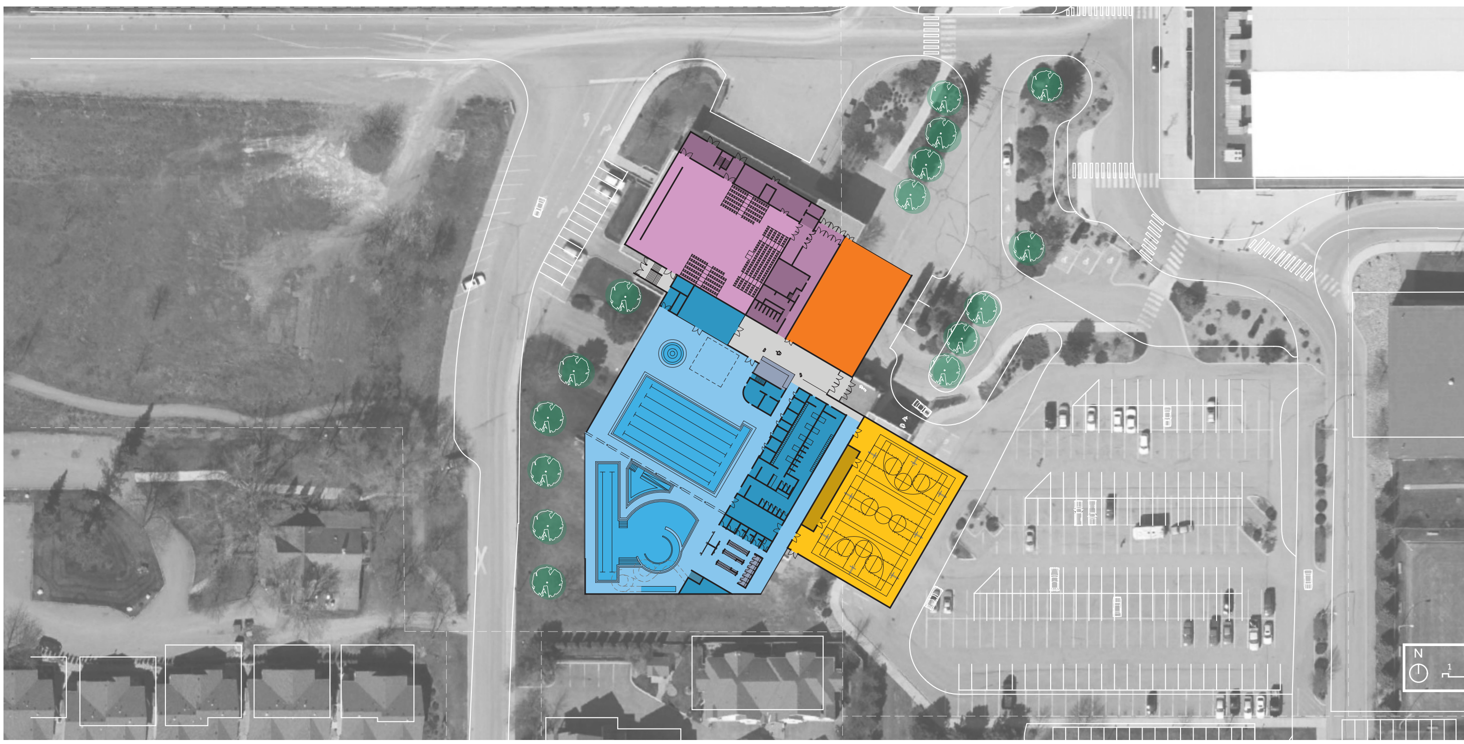
2) Retractable seating arranged as a formal auditorium

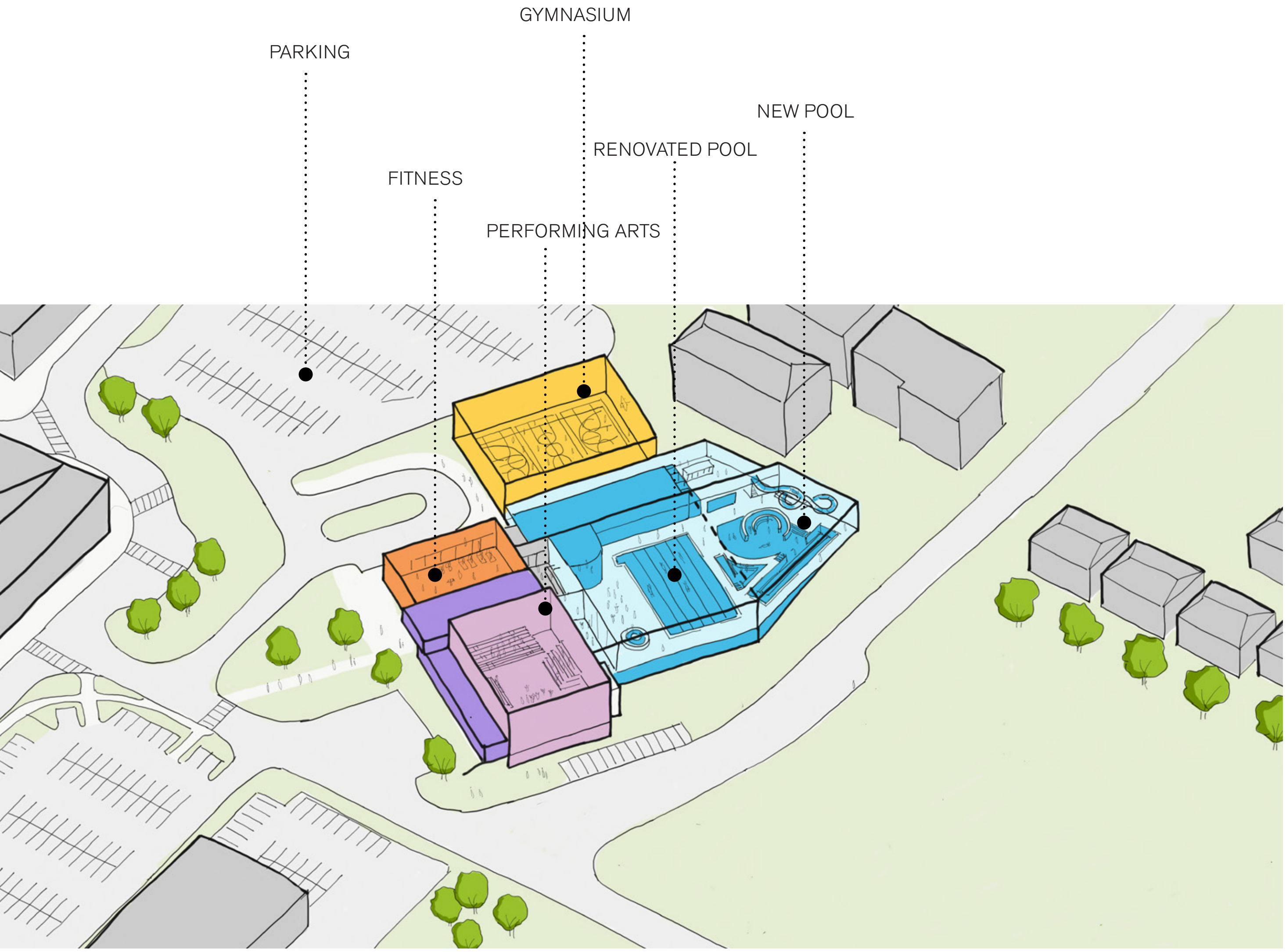
3) Seating retracts to create multi-use venue

Rehearsal Space

The Complete Concept

Level 1

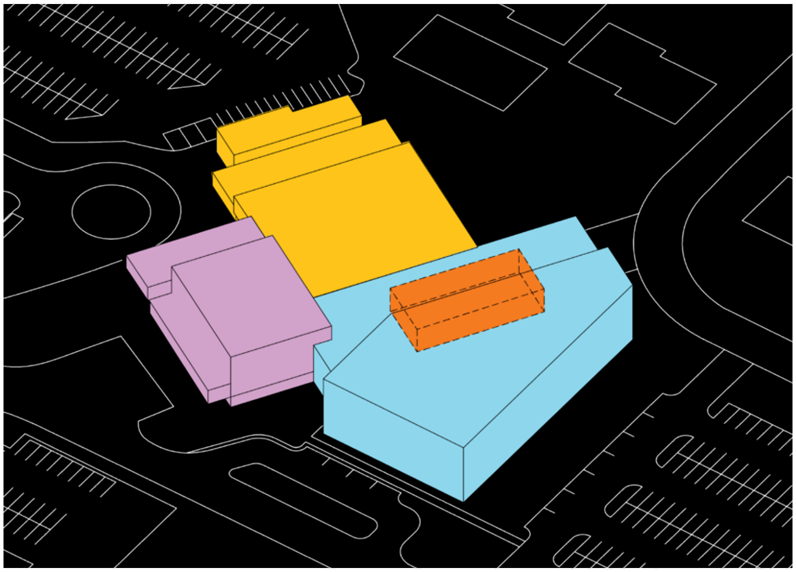




▲ The Complete Concept
Option A

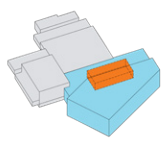
5.3 Option B

REBUILD + RENOVATE

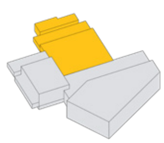


Option B involves rebuilding a new aquatic facility, west adjacent to the existing building. This allows the existing pool to remain in operation during construction of the new facility. The new natatorium and supporting spaces will be state-of-the-art. The existing natatorium will then be converted into a gymnasium and multipurpose spaces. Other existing building areas, including the racquet courts, will remain with minor upgrades. The existing multipurpose auditorium will be renovated into a dedicated performing arts space with flexible seating configurations for up to 300 audience members. A social spine will connect the facilities and allow for unprogrammed space, not only for improved navigation and circulation, but for enhanced social interaction.

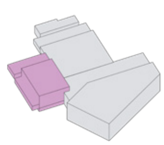
PHASE 1
New Pool + Fitness Centre



PHASE 2
Convert existing pool into Gymnasium + Multi-purpose



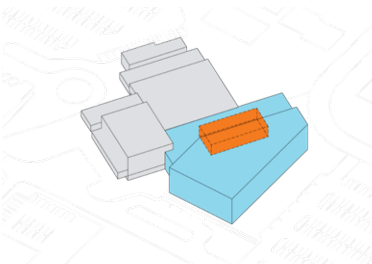
PHASE 3
Convert multi-purpose auditorium into dedicated Performing Arts Space



Phase 1: New Pool + Fitness Centre.

Aerial View

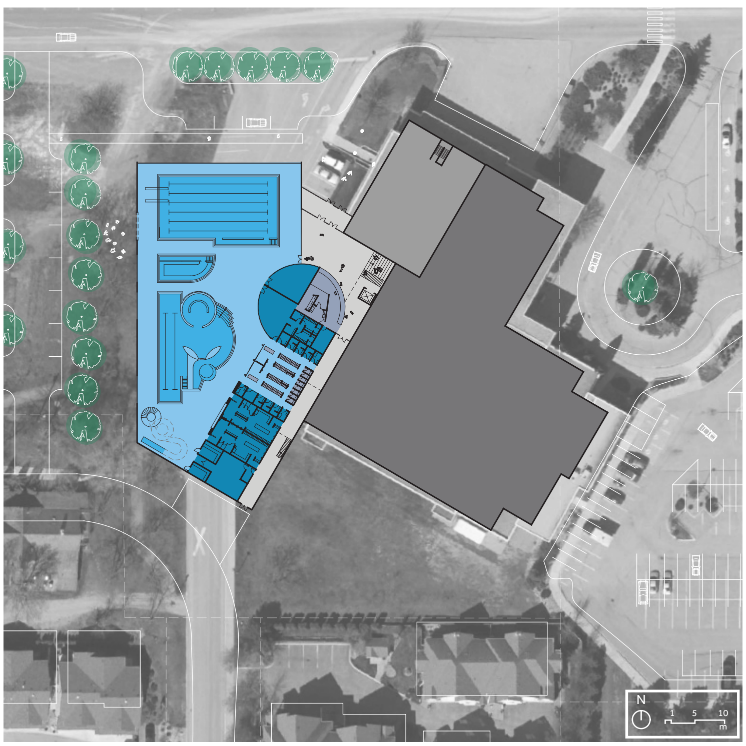
New Pool
Fitness



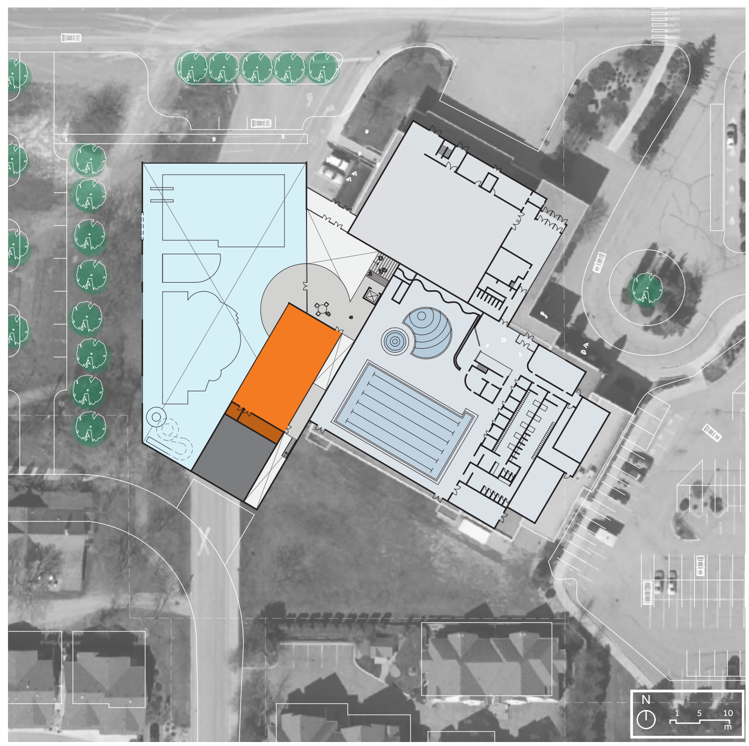
Details

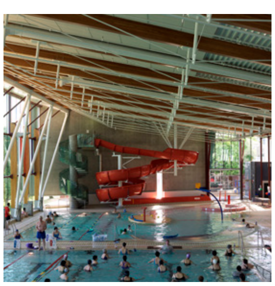
- Leisure pool
  + lazy river
  + zero-entry
  + 2x 25m lanes
- Lap pool
  + 6x 25m lanes
  + zero entry ramp
- Hot pool
- Waterslide
- Spectator seating
- On-deck viewing
- Wet multi-purpose room
- Universal, men's, women's changerooms
- Sauna & steam
- Connection to outdoor lawn
- Connection to social spine
- Fitness centre
  + 800ft2
  + fitness equipment
  + functional fitness
- Existing pool remains open during construction

Lower Level



Ground Level





Waterslide and water features

Leisure pool with lazy river

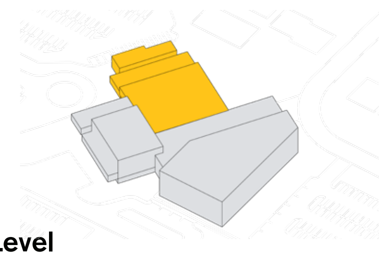
Hot pool with zero entry ramp

Fitness centre

Phase 2: Convert existing pool into Gymnasium +Multi-purpose.

Aerial View

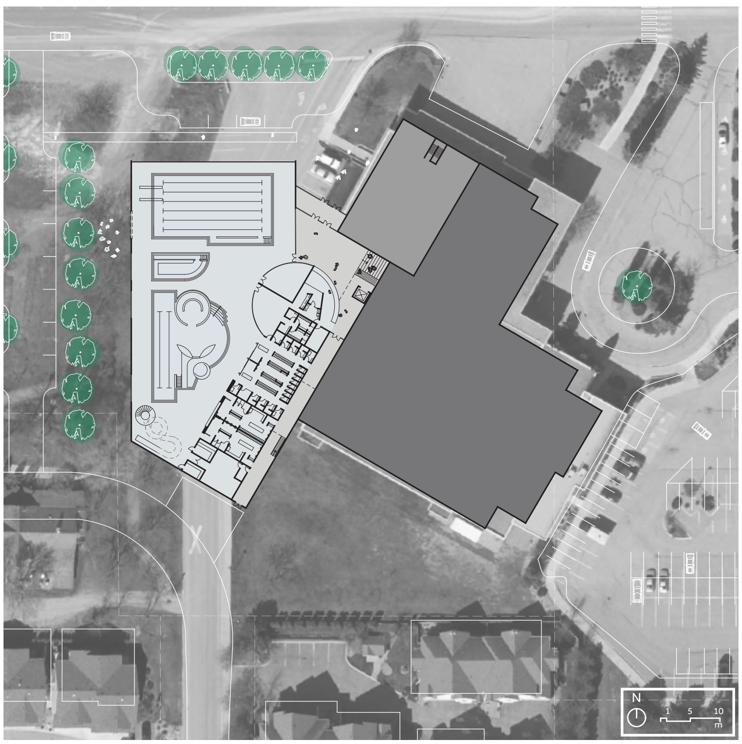
Gymnasium + Multi-Purpose



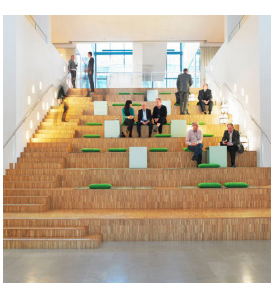
Details

- Gymnasium
  + 1x full-length basketball court
  + 3x cross-court basketball courts
  + 3x cross-court badminton courts
  + 3x cross-court pickleball courts
  + storage room
  + 1x full-length volleyball court (restricted height)
- Racquetball courts remain
- 3x multi-purpose rooms
- Renovate changerooms
- Expand lobby to connect to pool with social stair

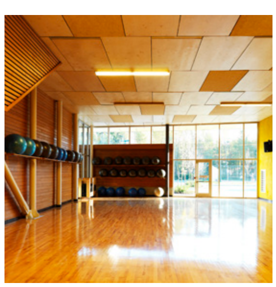
Lower Level



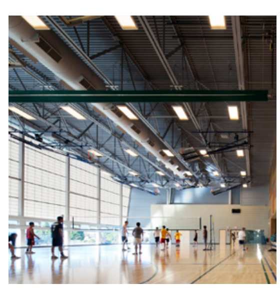
Ground Level



Expanded lobby + social stair provides spaces to socialize, meet, gather, wait etc.



Multi-purpose space



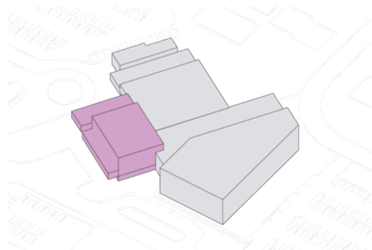
Multi-purpose gymnasium

Expanded lobby provides viewing areas into recreation spaces

Phase 3: Convert multi-purpose auditorium into dedicated Performing Arts Space.

Aerial View

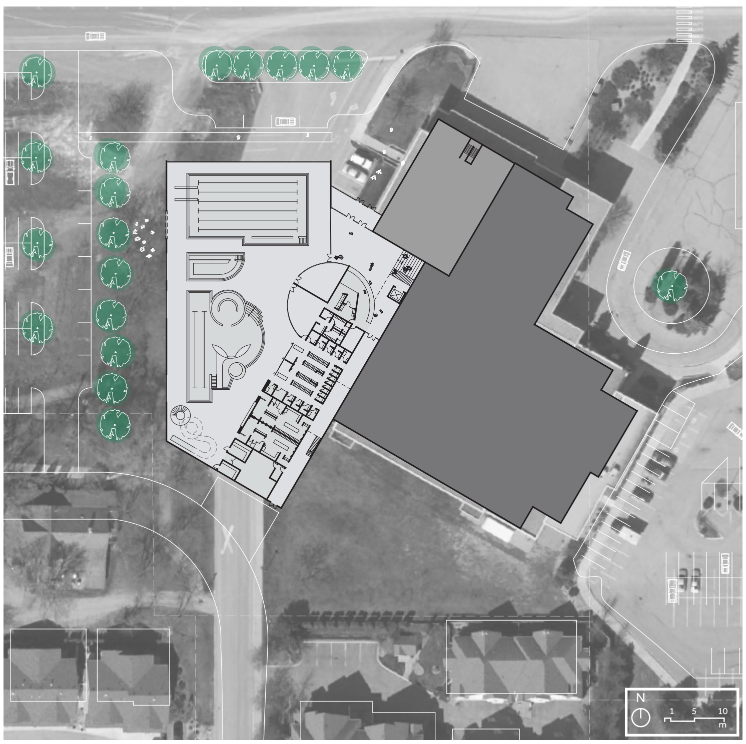
Performing Arts



Details

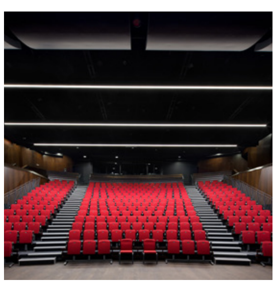
- Retractable seating to accommodate 300 people
- Upgraded acoustics
- Theatre drapes
- Lighting grid
- Dressing rooms
- Provide light and sound lock entrances
- Remove existing stage

Lower Level



Ground Level

1) Retractable seating arranged in proscenium configuration



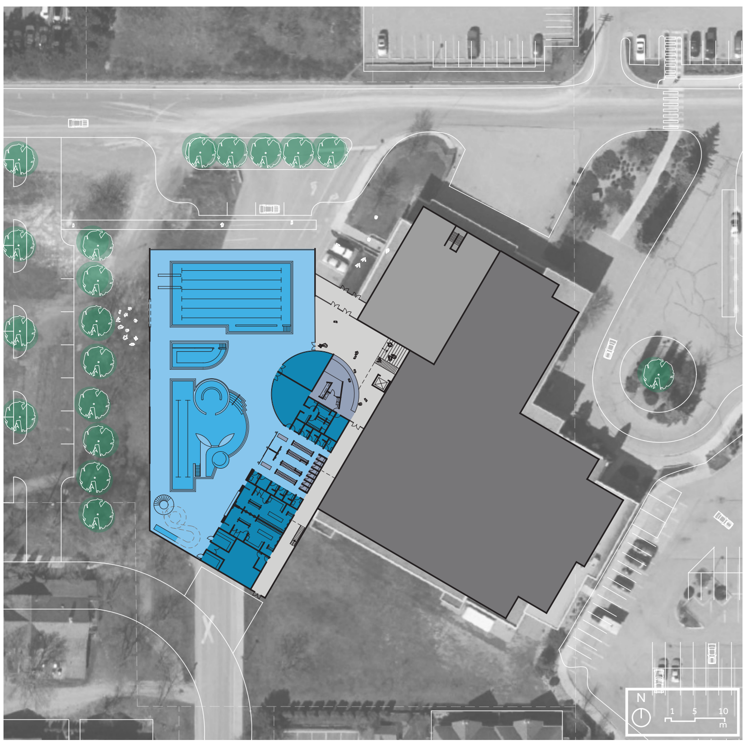
2) Retractable seating arranged as a formal auditorium

3) Seating retracts to create multi-use venue

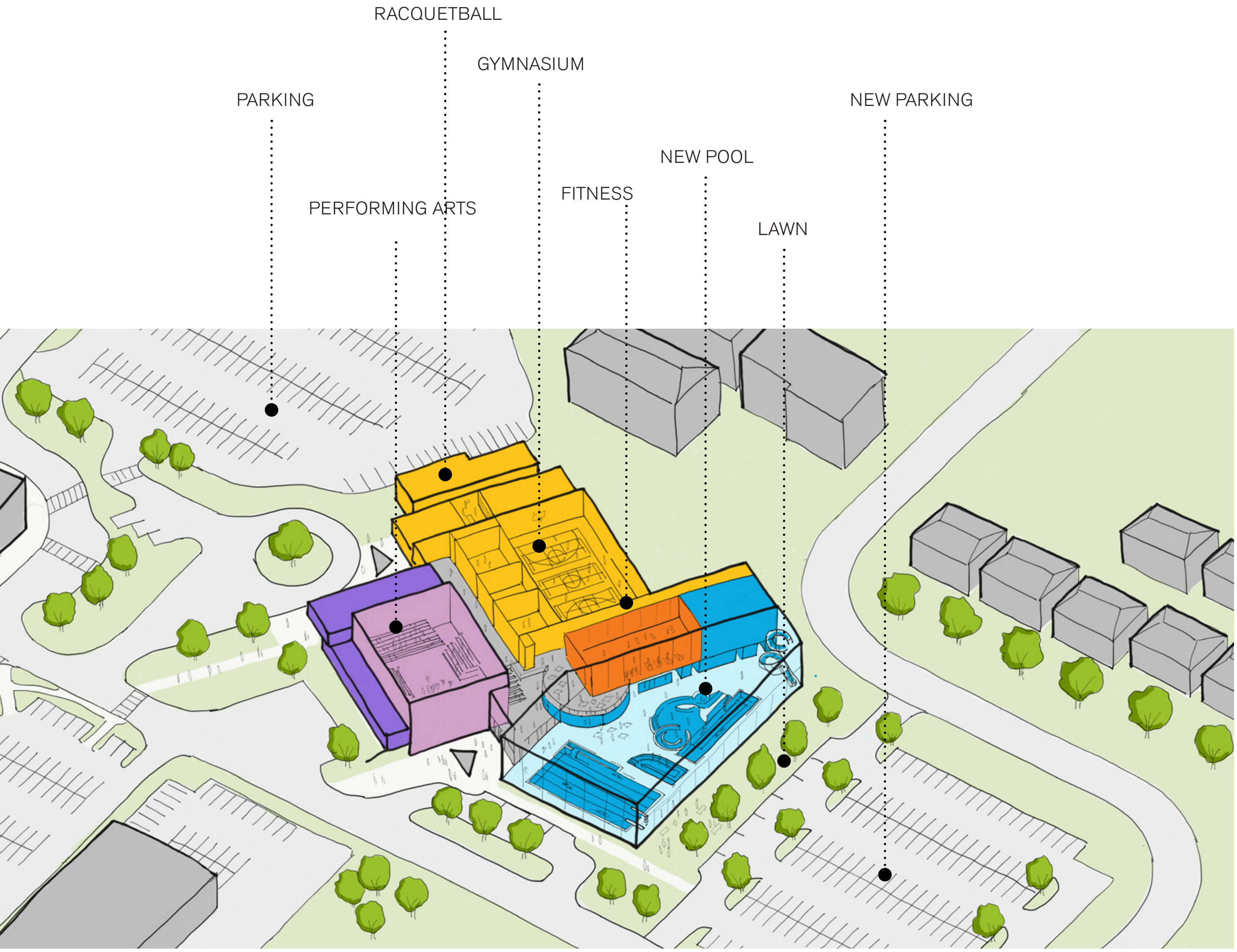
Rehearsal Space

The Complete Concept

Lower Level



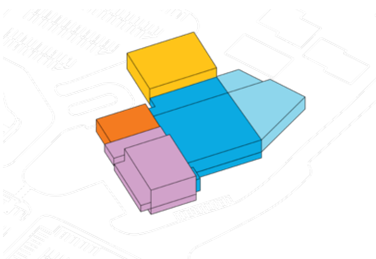
Ground Level



▲ The Complete Concept
Option B

5.4 Capital Costing

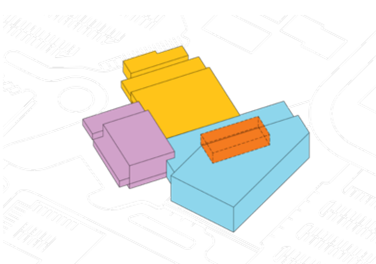
Option A



Potential Enhancements Capital Cost Summary

Phase 1: Renovate + expand Pool	~$21,300,000
Phase 2: New Multi-purpose Gymnasium	~$6,400,000
Phase 3: Convert multi-purpose auditorium into dedicated Performing Arts Space	~$5,500,000
Phase 4: New Fitness Centre	~$2,500,000
Total	**~$35,700,000**

Option B



Potential Enhancements Capital Cost Summary

Phase 1: New Pool + Fitness Centre	~$36,400,000
Phase 2: Convert existing pool into Gymnasium + Multi-purpose	~$5,500,000
Phase 3: Convert multi-purpose auditorium into dedicated Performing Arts Space	~$5,500,000
Total	**~$47,400,000**

5.5 Energy Modeling

In order to assist in decision making, energy modeling of both Option A and B were completed by Morrison Hershfield. The intent of this exercise is to inform the design team and client on the long-term energy implications of design decisions for each of the two massing options. The potential design options considered in the analysis include variations on the walls and roof thermal performance, the glazing ratio and properties and the use of heat recovery system and outdoor air economizer.

Overall outcomes:

While Option B shows an overall higher annual energy use compared to Option A, the Energy Use Intensity (EUI - area unit based metric) is significantly lower. The annual energy use difference between the two options is mainly due to a bigger building floor area in Option B - having additional gymnasium space, multi-purpose areas, squash courts, and aquatic centre space. As these spaces have lower energy intensity than the pool areas, the pool energy use in Option B is spread over a larger area, leading to reduced EUI despite higher energy use.

Fuel source:

The scenarios compared above consider a gas boiler plant for heating and cooling. Overall, switching from a natural gas plant to an electric plant significantly reduces the total annual energy use. Another advantage of switching to an electric plant is a substantial decrease in greenhouse gases emissions due to a much lower emissions factor for electricity compared to natural gas; natural gas has a GHG emissions factor over 10 times that of electricity.

Roof mounted PV:

Based on preliminary calculations, it was estimated that a standard fixed roof mount photovoltaic (PV) system size of 274 kW and 333 kW could be installed for Option A and Option B respectively. The calculated energy production represents potential savings of about 32% and 35% of annual electricity use for Option A and Option B respectively.

Comparing the proposed to the existing:

Using the existing facility utility bills from 2018, a comparison was made with the energy modeling results for the base case scenario for each option. The current options show a significantly larger floor area and very similar total energy use compared with the existing building. The EUI of the proposed designs is expected to be reduced compared with the existing building, allowing a significant increase in space and programming with a much smaller increase in energy use than the increased area would suggest.

The complete energy modeling report is available in Appendix

Massing Option	Electricity (GJ)	Natural Gas (GJ)	Annual Energy (GJ)	Annual Energy Cost ($)	Floor Area (m^2)	EUI (kWh/m^2)
Existing	2,142	8,126	10,268	$114,439	3,888	733.5
Option A**	2,443	8,165	10,608	$122,696*	6,175	477.3
Option B**	2,760	8,639	11,399	$134,466*	7,830	404.3

*assumes $0.10/kWh of electricity and $7.10/GJ of natural gas. Unit energy costs were calculated as yearly averages from the existing facility electricity and gas bills for 2018, respectively.

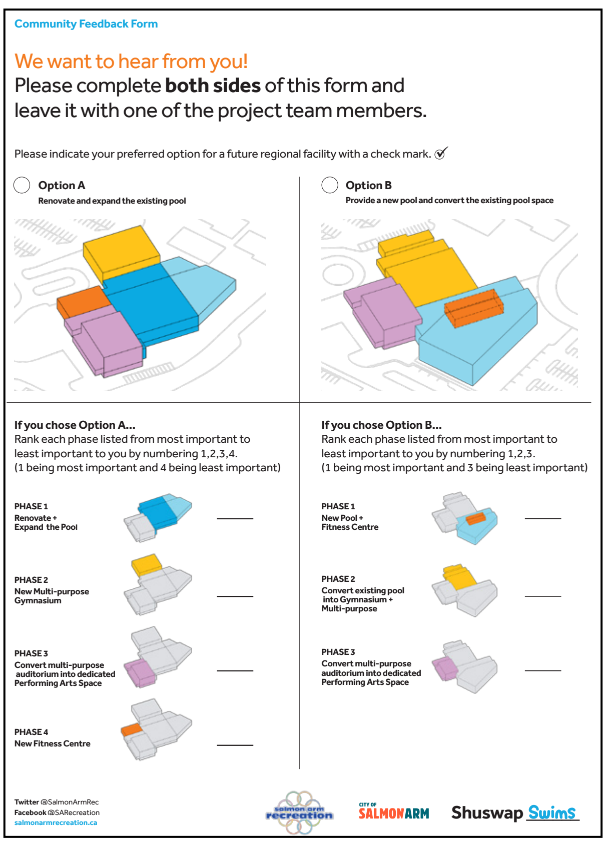
▲ Summary of Existing Facility Utility Bills for 2018 and Comparison with Energy Modelling Results for each Massing Option (Table 4: Energy Modelling Report)

5.6 Open House Feedback

Option A and B were presented to the public at an Open House, held at the SASCU Recreation Centre on February 10, 2019. HCMA representatives and SRS staff were present to answer questions and provide clarification. Attendees were asked to choose their preferred option, rank the components in terms of their proposed phasing, and provide any additional feedback. The boards and feedback form were then posted online to ensure a broad audience was given the opportunity to vote and comment. 165 feedback forms were filled out at the Open House and an additional 119 were filled out online. Of the 284 feedback forms that were completed, 231 preferred Option B, while 53 identified that they preferred Option A.

Option B - New Pool

Over 80% of the feedback forms identified a preference for a new pool and to convert this existing pool space as opposed to renovating and expanding the existing pool. This would allow the existing pool to remain in operation during the construction of the adjacent addition.



Community Feedback Form

We want to hear from you!
Please complete **both sides** of this form and leave it with one of the project team members.

Please indicate your preferred option for a future regional facility with a check mark. ✓

○ **Option A**
Renovate and expand the existing pool

○ **Option B**
Provide a new pool and convert the existing pool space

If you chose Option A...
Rank each phase listed from most important to least important to you by numbering 1,2,3,4.
(1 being most important and 4 being least important)

PHASE 1 Renovate + Expand the Pool ______

PHASE 2 New Multi-purpose Gymnasium ______

PHASE 3 Convert multi-purpose auditorium into dedicated Performing Arts Space ______

PHASE 4 New Fitness Centre ______

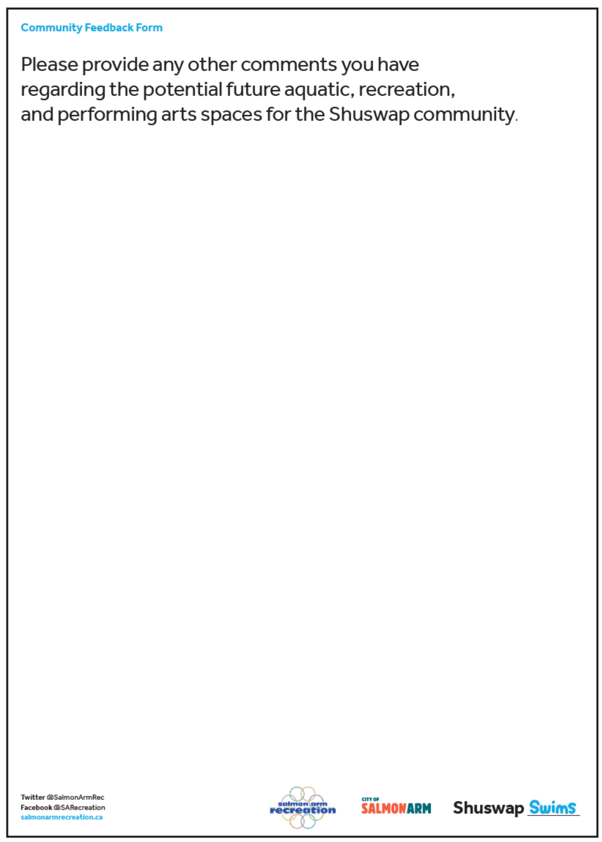
If you chose Option B...
Rank each phase listed from most important to least important to you by numbering 1,2,3.
(1 being most important and 3 being least important)

PHASE 1 New Pool + Fitness Centre ______

PHASE 2 Convert existing pool into Gymnasium + Multi-purpose ______

PHASE 3 Convert multi-purpose auditorium into dedicated Performing Arts Space ______

Twitter @SalmonArmRec
Facebook @SARecreation
salmonarmrecreation.ca



Community Feedback Form

Please provide any other comments you have regarding the potential future aquatic, recreation, and performing arts spaces for the Shuswap community.

Twitter @SalmonArmRec
Facebook @SARecreation
salmonarmrecreation.ca

▲ Open House Feedback Form

Concept Development

Open House Key Messages

The feedback provided the public an opportunity to provide any other comments they have regarding the potential future aquatic, recreation, and performing arts spaces for the Shuswap community. The top three messages from open answers provided have been summarized below.

8-Lane Pool

Based on public engagement results, budget, and demand analysis, it was determined over the course of this feasibility study that a 6-lane, 25m lap pool is a sufficiently-sized aquatic tank to serve the community. Feedback from swim club stakeholders and from the open house feedback form indicated that a 6-lane lap pool would not be sufficient to meet their needs. A decision to increase the aquatic tank capacity to include an 8-lane, 25m, tank was decided by key decision makers as a result of the feedback from the open house.

Keep the Pool Open During Construction

There was an overwhelming number of responses from the public noting that the option chosen needs to ensure that the existing pool can remain open during the construction of a new facility.

Performing Arts Component - Different Location

There was a lack of support to include performing arts space in this facility from both the general public and key local performing arts stakeholders. The lack of support stemmed from a belief that the renovated auditorium into purpose built performing arts space did not accommodate a large enough audience or meet the needs of the performing arts users. Moving forward, SRS and key decision makers have decided not to include the renovation of the multi-use auditorium into a dedicated performing arts space and instead allocate this area for large meeting space, courts, and play space.

These changes are reflected in the final proposed scheme, described in the following section.

Other Messages Heard

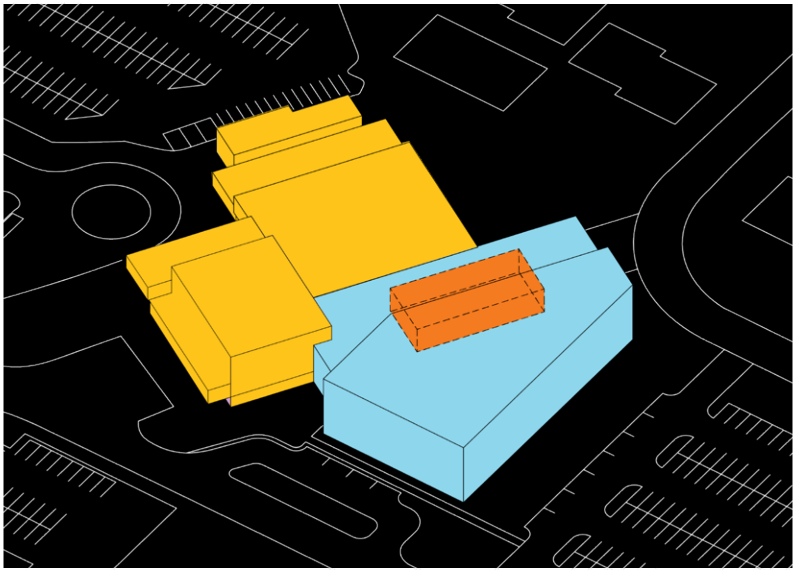
Other messages from the feedback form identified to a lesser extent include:

- Inclusion of Gymnastics
- Need for a 50m pool tank
- Larger fitness centre
- Volleyball, pickleball, indoor soccer
- Walking track

6.0 Final Proposed Concept

6.1 Proposed Concept

REBUILD + RENOVATE

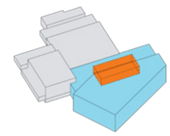


Feedback from the Open House indicated a preference for Option B while prompting several adjustments to the initial proposed program. The final proposed concept includes an 8-lane lap pool, in order to meet the increasing needs of local swim clubs, as well as allow the future Shuswap recreation Centre to host competitive meets. Although the concept of Performing Arts was addressed in the consultation process and was identified by the general public as a community need, the feedback for converting the multipurpose auditorium into a dedicated Performing Arts Space was not supported to the degree necessary to include this concept in the Final Report. Therefore, the proposed concept invests less into the renovation of this space, for it to become a multi-use gymnasium, meeting room, sports court and play space. In consultation with the City, through a current Cultural Master Plan, this initiative will continue to be addressed and the community will be better positioned to consider the feasibility of a Performing Arts space within the Facility. The emergence of a collective, unified position from the Arts community will provide more direction for this concept. The final proposed concept involves rebuilding a new aquatic facility, to the west of the existing building. This allows the existing pool to remain in operation during construction of the new facility. The new natatorium and supporting spaces will be state-of-the-art. The existing natatorium will then be converted into a gymnasium and multipurpose spaces. Other existing building areas, including the racquet courts, will remain with minor upgrades. A social spine will connect the facilities and allow for unprogrammed space, not only for improved navigation and circulation, but for enhanced social interaction.

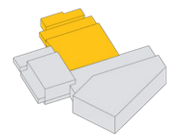
Phasing

The phasing of the proposed scheme allows the existing pool to remain open during the construction of the new aquatic facility. The renovation of the existing natatorium into a gymnasium and multipurpose rooms will follow and the final phase will be the renovation of the multi-purpose auditorium.

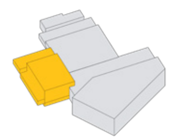
PHASE 1
New Pool + Fitness Centre



PHASE 2
Convert existing pool into Gymnasium + Multi-purpose



PHASE 3
Renovate multi-purpose auditorium



Siting

The new aquatic centre will be built adjacent to the existing building. The fitness centre and the new changerooms are oriented parallel and directly adjacent to the existing building. This allows users to easily navigate between the existing and new spaces. It also allows the new changerooms to be shared by users of aquatic, recreation, and fitness facilities.

The natatorium is situated perpendicular to 10th Ave, in order to enhance the building's street presence. There is an opening from the natatorium west to the lawn, where user groups can make use of expanded outdoor space.

Parking + Entry

The existing parking lot is maintained and an additional lot is proposed on the adjacent land to the west of the natatorium, to accommodate for the expected increased number of users.

The existing entry to the building is maintained and an additional entry point is proposed to the north, in the crevice between the existing and new building.

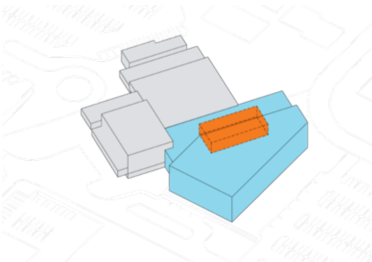
Social Spine

To ensure connectivity between the new facility and the renovated one, the proposed scheme includes a "social spine", i.e. linear area through the centre of the agglomerated building intended for circulation from both entry points as well as unprogrammed space for the community to socialize, meet, gather, wait, rest, etc.

Final Concept Lower Level

Aerial View

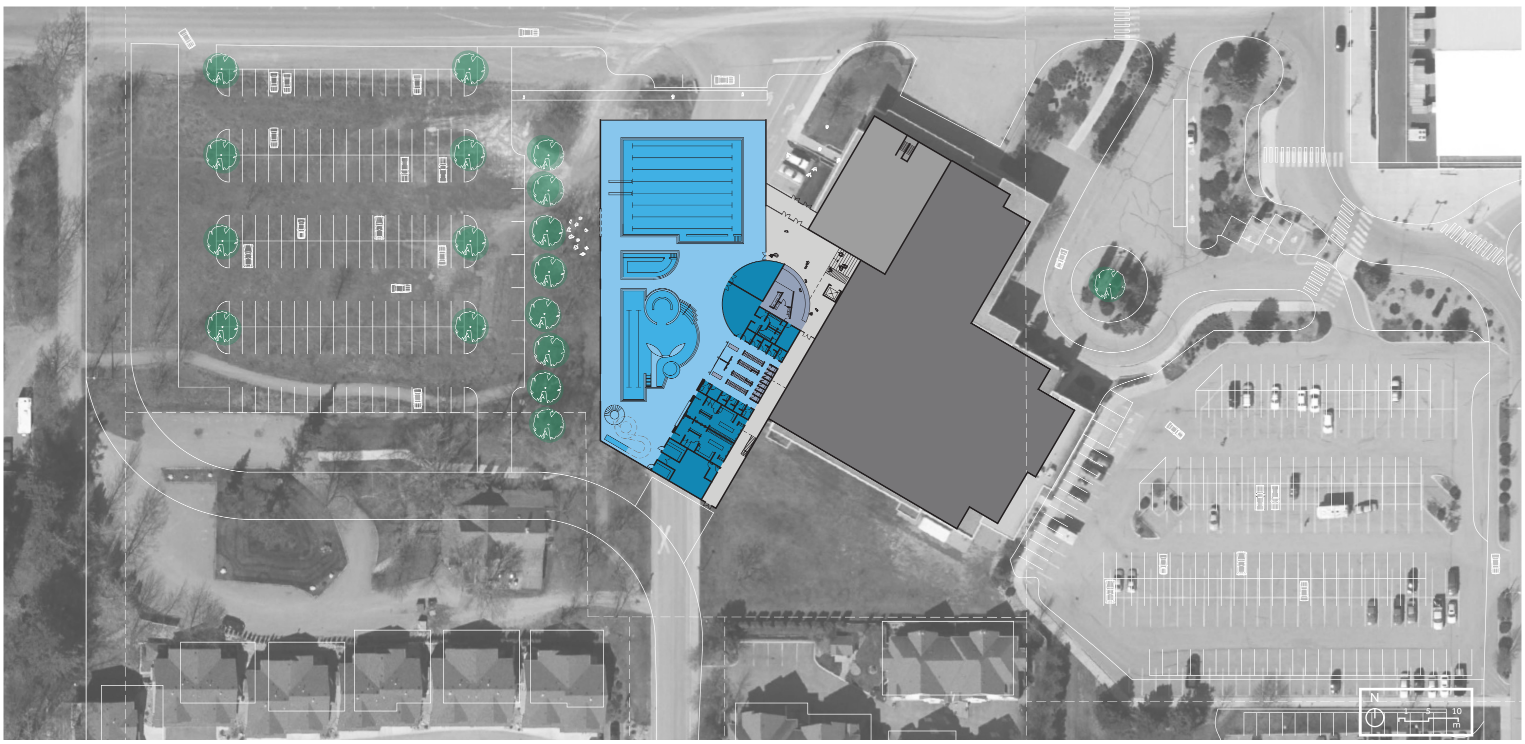
New Pool
Fitness

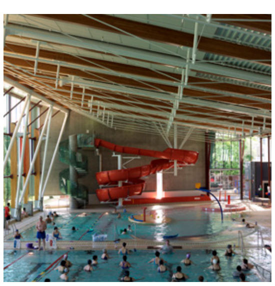


Details

- Leisure pool
  + lazy river
  + zero-entry
  + 2x 25m lanes
- Lap pool
  + 8x 25m lanes
  + zero entry ramp
- Hot pool
- Waterslide
- Spectator seating
- On-deck viewing
- Wet multi-purpose room
- Universal, men's, women's changerooms
- Sauna & steam
- Connection to outdoor lawn
- Connection to social spine
- Fitness centre
  + 800ft2
  + fitness equipment
  + functional fitness
- Existing pool remains open during construction

Lower Level





Waterslide and water features

Leisure pool with lazy river

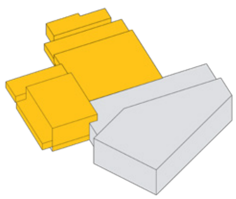
Hot pool with zero entry ramp

Fitness centre

Final Concept Ground Level

Aerial View

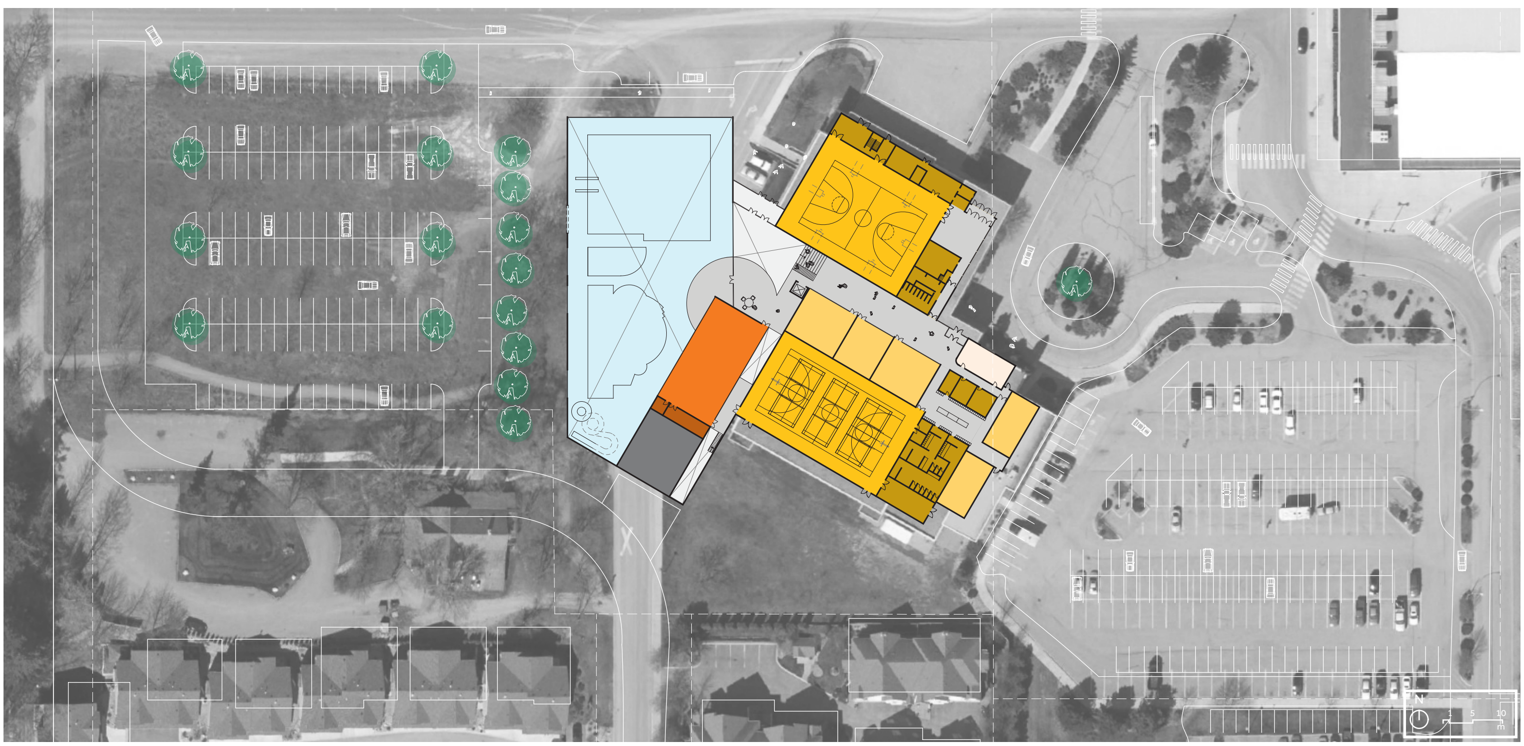
■ Gymnasium + Multi-Purpose

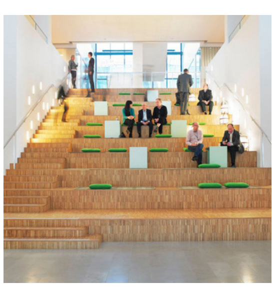


Details

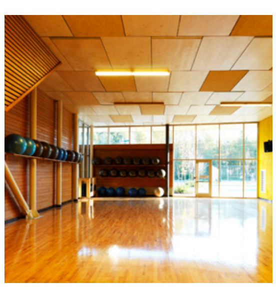
- Gymnasium
  + 1x full-length basketball court
  + 3x cross-court basketball courts
  + 3x cross-court badminton courts
  + 3x cross-court pickleball courts
  + storage room
  + 1x full-length volleyball court (restricted height)
- Racquetball courts remain
- 3x multi-purpose rooms
- Renovate changerooms
- Expand lobby to connect to pool with social stair
- Auditorium renovated into Multi-purpose Gymnasium
  + Remove performance stage
  + non-regulation basketball court
  + 2 cross-court basketball court
  + storage
  + washrooms

Ground Level

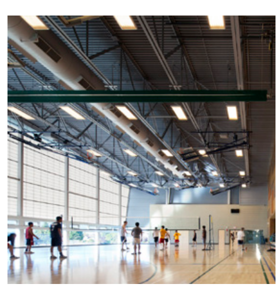




Expanded lobby + social stair provides spaces to socialize, meet, gather, wait etc.

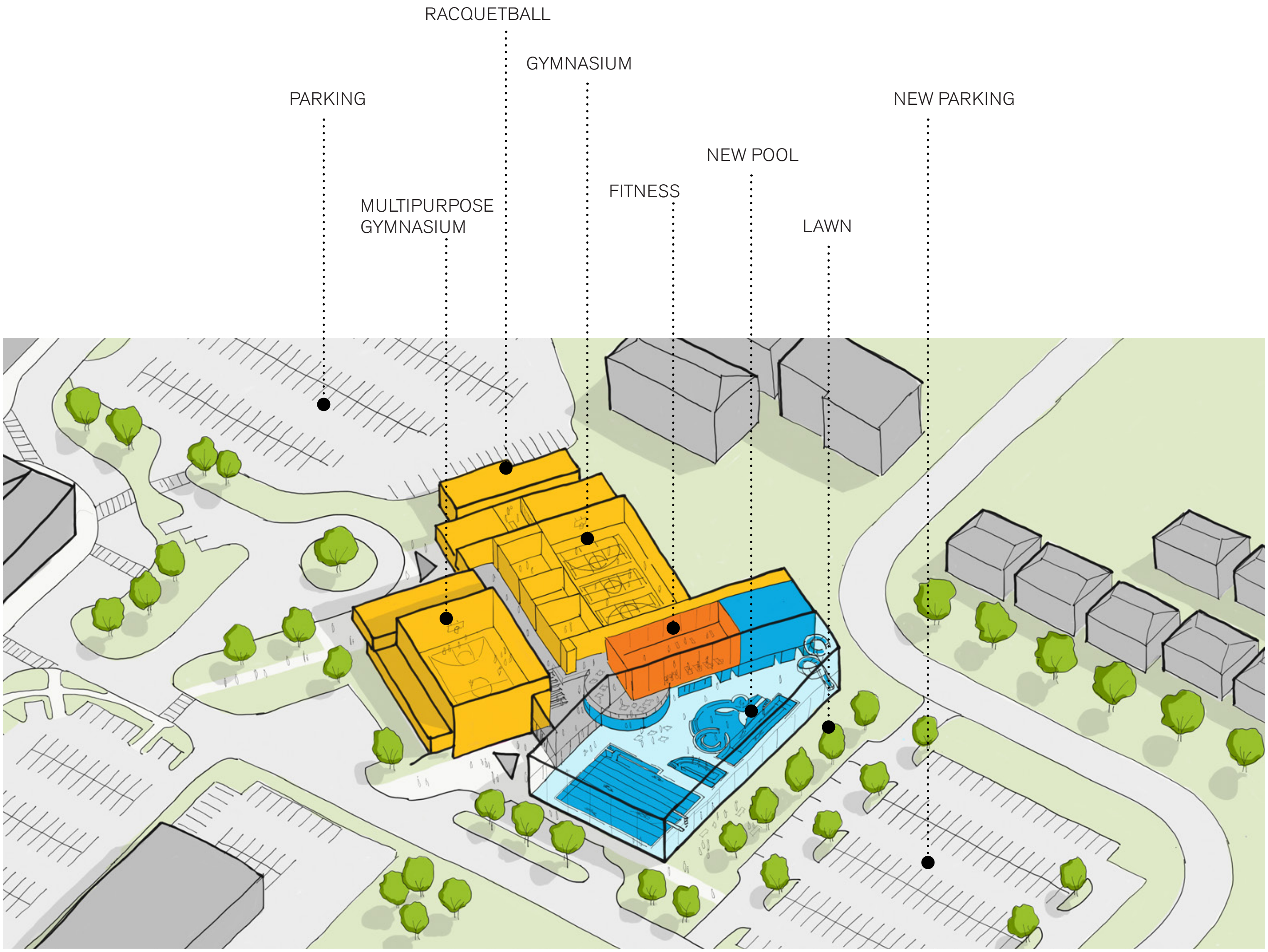


Multi-purpose space



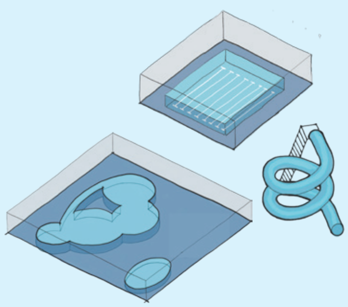
Multi-purpose gymnasium

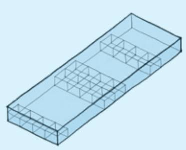
Expanded lobby provides viewing areas into recreation spaces

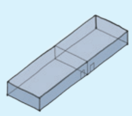


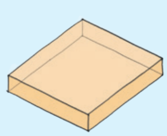
▲ The Final Proposed Complete Concept

6.2 Proposed Concept Program



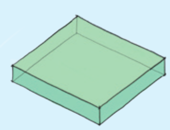


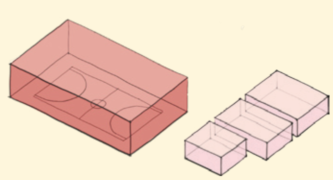




PROPOSED SCHEME DETAILED PROGRAM		
	M²	FT²
NATATORIUM		
25M 8LANE MAIN LAP POOL	520	5,600
DECK FOR MAIN LAP POOL	420	4,520
LEISURE POOL	245	2,637
DECK FOR LEISURE POOL	200	2,153
HOT POOL(S)	35	377
DECK FOR HOT POOL	65	700
WATER SLIDE	100	1,076
ON DECK VIEWING	80	861
SUB-TOTAL NATATORIUM	**1,665**	**17,922**
CHANGEROOMS		
UNIVERSAL CHANGE	195	2,099
WOMENS CHANGE	75	807
MENS CHANGE	75	807
SUB-TOTAL CHANGE ROOMS	**345**	**3,714**
NATATORIUM SUPPORT		
STORAGE ROOM(S)	50	538
CLASSROOM	55	592
SAUNA	15	161
STEAM ROOM	15	161
STAFF CHANGE	40	431
WET OFFICES	30	323
POOL CONTROL / LIFEGUARD ROOM	20	215
FIRST AID ROOM	10	108
SUB-TOTAL NATATORIUM SUPPORT	**235**	**2,530**
ENTRY / LOBBY AREAS		
LOBBY (LOWER)	150	1,615
LOBBY (UPPER)	150	1,615
CONTROL RECEPTION	30	323
STAFF ROOM	20	215
SUB-TOTAL ENTRY / LOBBY AREAS	**350**	**3,767**

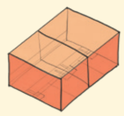
▲ Program Area Breakdown

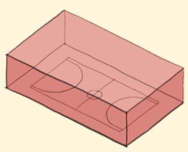




PROPOSED SCHEME DETAILED PROGRAM		
	M²	**FT²**
POOL MECHANICAL		
BOILER ROOM	40	431
RECEIVING	30	323
CHEMICAL/FILTER ROOM	140	1,507
ELECTRICAL ROOM	62	667
HVAC (INTERIOR AHU'S)	374	4,026
CRAW SPACE (ACCESS AREA SURROUNDING POOLS)	120	1,292
POOL BASEMENT (PUMPS ETC.)	270	2,906
SUB-TOTAL POOL MECHANICAL	**1,036**	**11,151**
OTHER		
FITNESS ROOM	320	3,444
SPECTACTOR SEATING	90	969
ELEVATOR (3 STOPS)		
SUB-TOTAL OTHER	**410**	**4,413**
OVERALL NEW AQUATIC PROGRAM AREA	***4,040***	***43,497***
PRO-RATED BUILDING MECHANICAL/ELECTRICAL 5%	**202**	**2,175**
PRO-RATED WALLS AND STRUCTURE 2%	**80**	**870**
COMPONENT INTERNAL CIRCULATION 15%	**606**	**6,525**
GROSS NEW AQUATIC PROGRAM AREA	**4,930**	**53,067**
RENOVATE/CONVERT NATATORIUM		
GYMNASIUM (1 HS-SIZE BASKETBALL COURTS; SUBDIVIDABLE)	700	7,535
GYMNASIUM STORAGE	50	538
MULTIPURPOSE ROOMS (3)	325	3,498
SOCIAL SPINE	165	1,776
SUB-TOTAL RENOVATE/CONVERT NATATORIUM	**1,240**	**13,347**
RENOVATE CHANGEROOMS		
CHANGEROOMS	300	3,229
SUB-TOTAL RENOVATE CHANGEROOMS	**300**	**3,229**

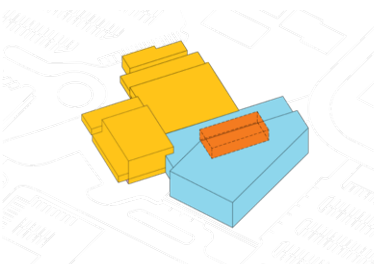
PROPOSED SCHEME DETAILED PROGRAM		
	M²	**FT²**
MINOR RENOVATIONS		
RACQUET COURTS REMAIN (2)	160	1,722
CIRCULATION REMAIN	90	969
FITNESS CONVERTED TO STAFF AREA	65	700
SUB-TOTAL MINOR RENOVATIONS	**315**	**3,391**
RENOVATE MAIN ENTRY & CIRCULATION		
SOCIAL SPINE	90	969
SUB-TOTAL RENOVATE MAIN ENTRY & CIRCULATION	**90**	**969**
GROSS RENOVATED RECREATION PROGRAM AREA	**1,945**	**20,936**
RENOVATE MULTI-PURPOSE AUDITORIUM		
AUDITORIUM	685	7,373
LOBBY	114	1,227
PUBLIC WASHROOMS	58	624
STORAGE	70	753
SUPPORTING SPACES	115	1238
SUB-TOTAL MULTI-PURPOSE AUDITORIUM	**1,042**	**11,216**
TOTAL GROSS RENOVATED AREA	**2,987**	**32,152**
TOTAL GROSS NEW AREA	**4,930**	**53,067**
TOTAL BUILDING AREA	**7,917**	**85,217**





6.2 Proposed Concept Capital Cost

Final Concept



Potential Enhancements Capital Cost Summary

Phase 1: New Pool + Fitness Centre	~$38,400,000
Phase 2: Convert existing pool into Gymnasium + Multi-purpose	~$5,500,000
Phase 3: Renovate multi-purpose auditorium	~$1,500,000
Total	**~$45,400,000**

It is anticipated that the project costs will be approximately $45.5 million based on a Preliminary Class D Estimate conducted in February 2019. This estimate includes typical contingencies that are reflective of the early stage of the project development and assumes a construction start in the year 2020. Class D estimates have a degree of variability that reflects the early stage of the design process.

Additional sustainability design features beyond LEED Gold considerations were excluded from this cost estimate pending further review and discussion regarding the City's objectives for this project. In addition, there are other cost elements that are likely to be associated with the project that are currently not accounted for in the above figure. Accordingly, it is recommended that the City include additional cost allowances in its overall financial planning for the project. These allowances should be adjusted over time as more certainty with respect to the project design and other site conditions is achieved.

Should the project proceed under a phased construction scenario, a 5% premium should be added to the entire project cost, as well as an additional escalation rate allowance of 3% per annum.

7.0 Next Steps

7.0 Next Steps

The objective of the feasibility process was to produce a building program and concept options that have been guided by public input, tested by careful analysis and are programmatically, functionally and financially supportable. The information contained within this report can be used to make key decisions for the future progression of this project and should be used as the basis for the commencement of schematic design.

The following studies should also be completed prior to commencement of schematic design:

- Legal & topographical site surveys - this will be especially important as the proposed site has a significant slope, determining the appropriate elevation height of the proposed new pool component will need to consider its relationship to the street and the adjacent lower level spaces in the SASCU Recreation Centre, and determining loading access to a mechanical basement level under the proposed pool component.
- Geotechnical report and surveys - the ground conditions are currently unknown and the soil conditions need to be assessed to gain a better understanding of any associated excavation and foundation costs.
- Environmental Assessment Report - this will also help in the understanding of costing relating to any issues surrounding the proposed facility location
- A full transportation impact assessment (TIA) - to determine the wider effects of a new expanded facility on the site, parking requirements, the realignment of 24th Street NE, intersection treatments, and required signalizing.
- In order to determine the direction prior to commencing schematic and detailed design, the City should also consider conducting a business case study.
- Determine the sustainability targets for the project as part of the City's wider green building objectives.

8.0 Appendix

8.1 Engagement Results
8.2 Engagement Materials
8.3 Cost Estimate Report
8.4 Building Conditions Assessment
8.5 Massing Energy Model Report

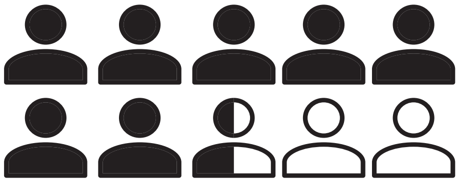
8.1 Engagement Results

Online Survey

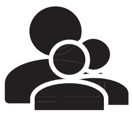
An online survey was available from August 7 to September 30, 2018 via an open access link from the Salmon Arm Recreation Website (salmonarmrecreation.ca/survey). The survey included questions about how the community uses the existing facility, barriers to use, and what they would value in a future facility. There were 2,167 responses to the survey. The following summarizes the complete results of the online survey.

ABOUT THE EXISTING FACILITY

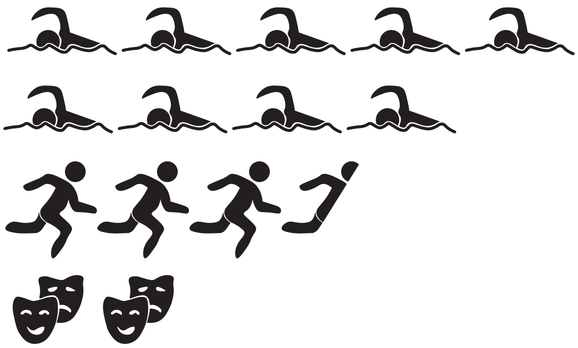
76% have visited the SASCU Recreation Centre in the past 6 months...



... 60% go with family...



... to use aquatic, recreation, performing arts facilities...



~90% AQUATIC FACILITIES

~35% RECREATION FACILITIES

~20% PERFORMING ARTS FACILITIE

of those who use aquatics facilities:

~75% use **LAP POOL**
~75% use **HOT POOL**
~50% use **WADING POOL**
<50% are **SPECTATORS**
<50% use **SAUNA**

of those who use recreational facilities:

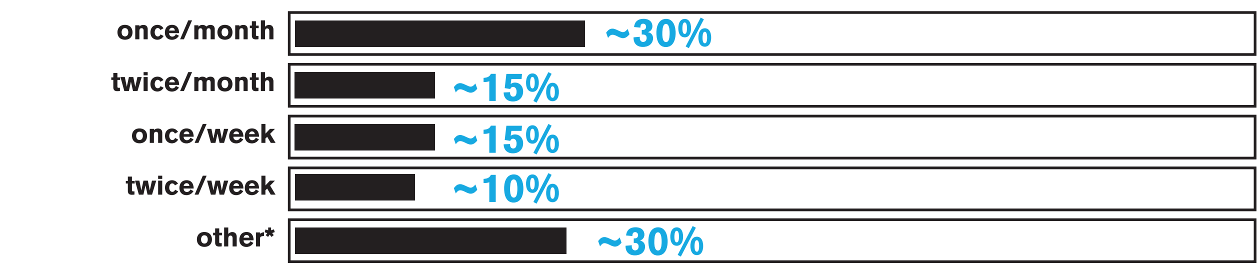
~50% use **GYMNASIUM**
~40% use **FITNESS ROOM**
<25% use **CHILDCARE**
<25% use **MULTIPURPOSE**

of those who use performing arts facilities:

most **WATCH A PERFORMANCE**

<25% use **PRACTICE/ REHEARSE**

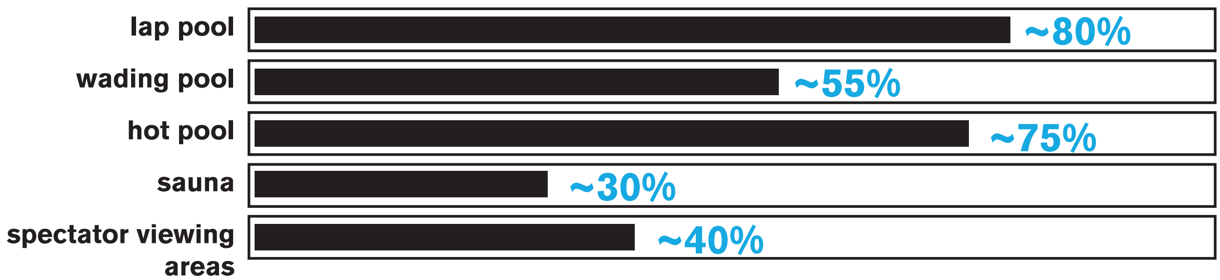
Over the past six months, I have used the facilities at the SASCU Recreation Centre:



*many indicated that they use the facility 3x/week, 5x/week, and a few times a year

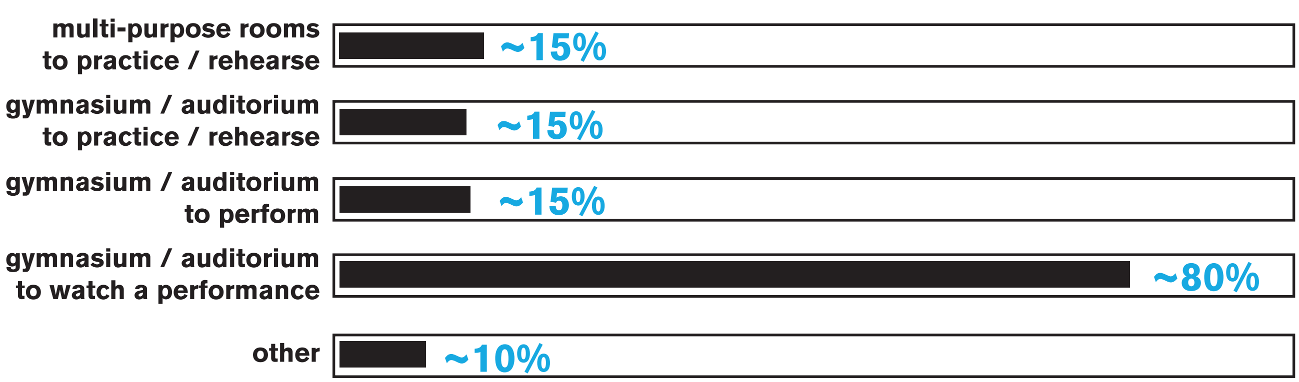
When I go to the SASCU Recreation Centre, I usually go:

On a typical visit to the current SASCU Recreation Centre I use the following facilities for AQUATICS:



On a typical visit to the current SASCU Recreation Centre I use the following facilities for RECREATION:

On a typical visit to the current SASCU Recreation Centre I use the following facilities for PERFORMING ARTS:



(When) I don't use AQUATIC and RECREATION facilities (it's) because of:

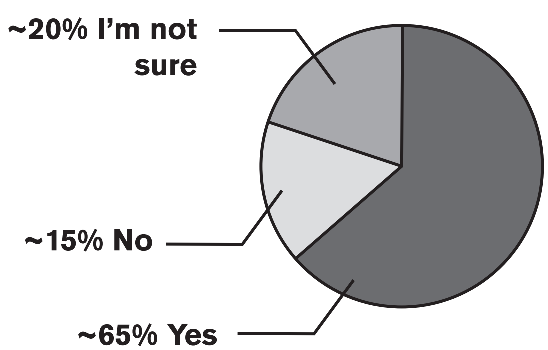
~50% operating hours*
~50% lack of leisure pool
~25% lack of lane swimming capacity
~20% pool temperature
~20% inadequate fitness / training spaces

* Based on additional comments provided throughout the engagement, the term 'operating hours' may be interpreted to mean daily facility open/close times, scheduling of swimming lessons/swim clubs, and access to open swimming.

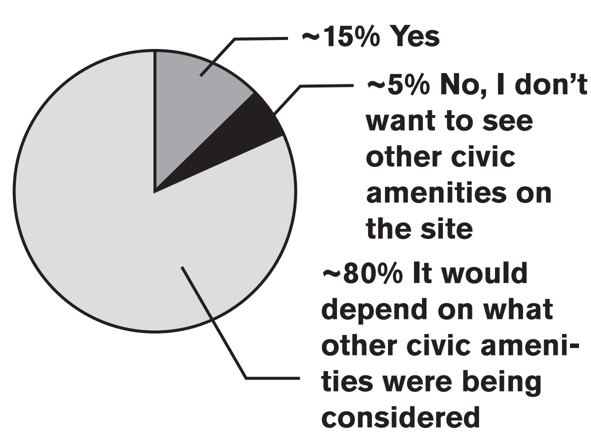
(When) I don't use PERFORMING ARTS facilities (it's) because of:

~50% inadequate performance seating
~40% poor acoustics
~30% lack of capacity
~20% inadequate site lines
~20% poor lighting

Given the existence of several civic facilities on the site, would you support investigating the possibility of relocating the library to this site in the future?

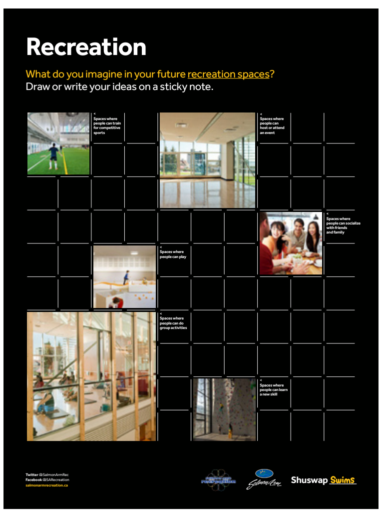


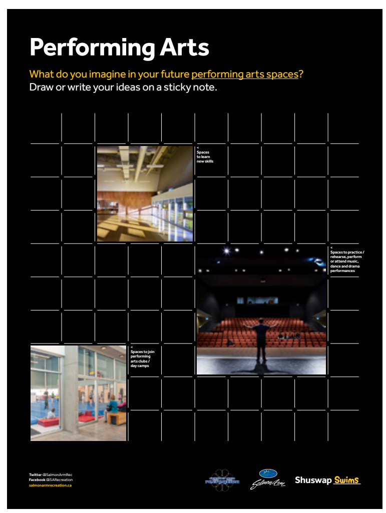
Would you support investigating the possibility of locating any other type of civic building on the SASCU Recreation Centre site in the future?

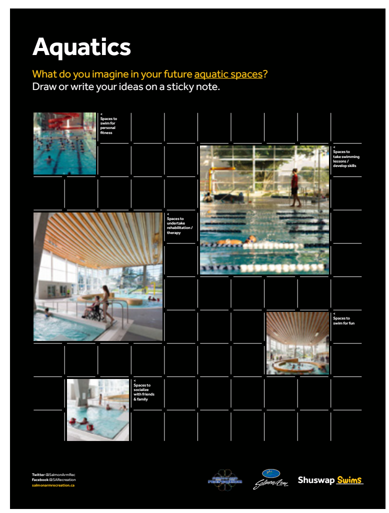


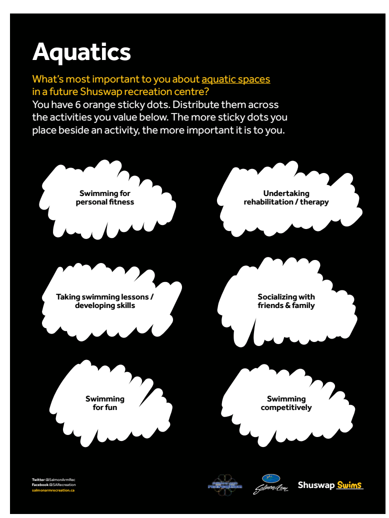
8.2 Engagement Materials

IDEAS FAIR AND POP-UP BOARDS

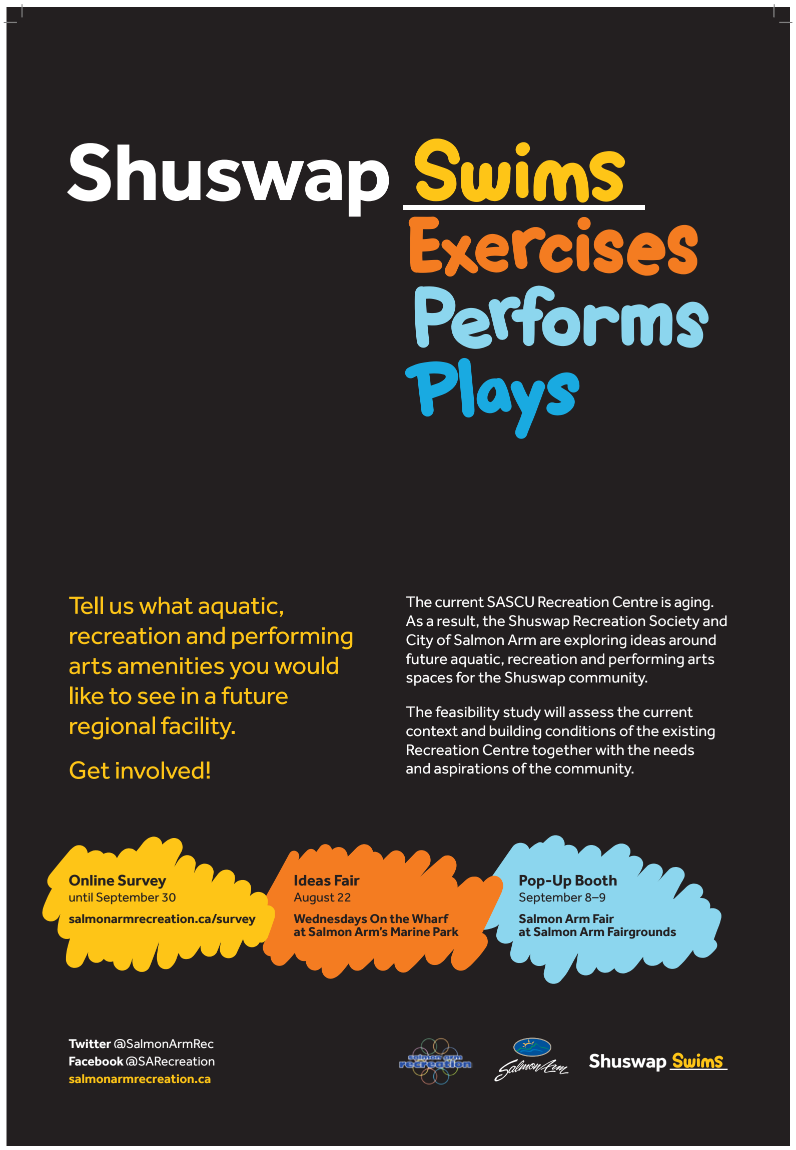








POSTER
(11X17")



POSTCARDS
(4X6")

▲ Front

▲ Back

8.3 Cost Estimate Report

ROSS TEMPLETON
+ ASSOCIATES

205 – 1777 56th Street
Tsawwassen (Delta)
BC V4L 0A6
Canada

T: 604.616.0406
E: ross@rtaqs.com
W: www.rtaqs.com

January 18, 2019

HCMA ARCHITECTURE + Design
400 - 675 West Hastings Street
Vancouver BC V6B 1N2

Attention: AIDEN CALLISON
Associate Architect AIBC, LEED AP

SALMON ARM RECREATION CAMPUS
SALMON ARM, BC
CLASS D PROJECT ESTIMATE

We have reviewed the design documents, prepared a Class 'D' project estimate (based on concept functional program design information), and enclose our report.

Please note the conditions on which the costs are based, and the items excluded.

Yours very truly,

Ross Templeton MRICS, PQS
Principal

1177

PROJECT DESCRIPTION

The project involves the two options for the new build and re-purpose of the Salmon Arm Recreation Campus in Salmon Arm, BC as described fully in the HCMA Architecture + Design concept design priced in local dollars.

PROJECT COST SUMMARY

Please refer to the appended Class D estimate for the estimate detail.

Element		Option 1	Option 2
		$	$
A.	Land Costs	Excluded	Excluded
B.	Construction Costs Q4 2020 (including design & construction contingency)	21,182,600	32,785,800
C.	Allowance for Site Works	1,694,600	2,622,900
D.	Soft Costs	6,354,800	9,835,700
E.	GST	Excluded	Excluded
		---------------	---------------
F.	Total Project Cost (Excluding GST & Financing)	$ 29,232,000	$ 45,244,400

Class D Order of Magnitude conceptual estimates are typically +/- 25% in accuracy with many variables influencing the final construction price including most importantly the final design scope parameters, final specifications, final drawings, contractors contractual obligations, extent of supplementary conditions, number of compliant bidders and the market activity at time of tender.

AREA ANALYSIS

Gross Floor Areas HCMA Architecture + Design concept design

	Option 1	Option 2
Gross Floor Area (Gross Building Area)	68,503 sqft	81,410 sqft

PROJECT CALENDAR

We have included projected construction escalation to the anticipated mid-point of construction in Q4 2020.

CONTRACT CONDITIONS

The costs are based on the work being executed through a fixed lump sum competitive tender contract on standard form documents with no onerous supplementary conditions. Tenders will be received from at least five qualified bidders with tenders received from three sub-contractors for each major sub-trade (concrete, mechanical, pool equipment, electrical, envelope, drywall, framing etc).

EXCLUSIONS

- Legal, financing, land costs are all excluded
- Unforeseen existing buildings, ground and dewatering conditions
- Potential unknown true cost impact of recently imposed USA tariff on steel and aluminium and potential trade war
- Out of hours working premium / restricted working hours / restricted noise conditions
- Off-site utility upgrades
- Site works outside the defined scope
- Construction works outside the defined scope
- LEED, Passive House design or certification (is included)
- Hazmat Abatement (if any)
- Phasing of the works or Accelerated Schedule
- CAC's, Public Art or other Municipal Contributions
- Moving or decanting costs
- Pricing based on BCBC 2018
- Goods & Services Tax (GST)
- Extraordinary Market Conditions
- Cost escalation allowance included (calculated to mid-point of construction in Q4 2020)
- Items listed as 'excluded' in the estimate detail

DESIGN PRICING CONTINGENCY

The project is at concept design stage and a design pricing contingency of ten percent (10%) has been included to cover pricing variances that may occur with specification changes and design detailing clarifications. This contingency will ultimately reduce to zero at tender stage.

CONSTRUCTION CONTINGENCY

Construction projects are rarely completed without some level of change and often additional scopes of work are required. We recommend the owner carry an additional sum in their budget to help offset any unforeseen costs that may arise during construction. We recommend an amount of five percent (5%) of the construction cost is carried in a separate owner-owned budget which has been included in this estimate.

INFLATION AND MARKET CONDITIONS

Construction industry escalation of twelve percent (12%) has been included in the estimate to cover projected construction escalation to the current anticipated mid-point of construction in Q4 2020 using 7% for 2019, 5% for 2020.

DOCUMENTS AND DATA

This cost plan estimate has been prepared using the following:

- 190116 SARC SCHEMATIC PLANS
- 19.01.14 SARC Program Area Phases

OPTION 1

Phase	Program Area- Salmon Arm	sm	sf	$/sf	Escalated Construction Cost (Q4 2020 $)	Notes
PHASE 1 Renovate Existing	Renovate Existing Natatorium	sm	sf	$/sf		Notes
	Main Lap Pool	350	3,767	296	1,115,900	Upgrade of existing natatorium deck, painting of walls.
NEW Leisure	deck for main lap pool	294	3,165	212	671,800	Upgrade of existing natatorium deck, painting of walls.
	deck converted to Multipurpose Room	100	1,076	354	380,800	Remove wave and convert to a wet mutlipurpose room
	Remove Tot Pool	85	915	22	20,300	Remove/fill tot pool and convert to deck
	deck for tot pool	100	1,076	212	228,500	Upgrade of existing natatorium deck, painting of walls.
	deck for tot pool convert to expanded lobby	46	495	296	146,700	Expand lobby
	Hot Pool	17	183	299	54,700	Upgrade of existing hot pool finishes
	deck for hot pool(s)	62	667	212	141,700	Upgrade of existing natatorium deck, painting of walls.
	On deck viewing	77	829	197	163,700	Upgrade of existing natatorium deck, painting of walls.
	Sub-total Natatorium	1,131	12,174	240	2,924,100	
	New Natatorium	sm	sf			Expand building to 260m2 leisure pool, 35m2 hot pool and waterslide
	Leisure Pool	260	2,799	875	2,447,400	
	Hot Pool	35	377	853	321,500	
	Leisure Pool Deck	315	3,391	607	2,056,500	
	Water slide(s)	100	1,076	1,048	1,127,900	
	Sub-total Natatorium	710	7,642	779	5,953,300	
	Renovate Existing Change Rooms					
	Family cubicles rooms (x2)	15	161	138	22,200	Upgrade finishes
	womens change	150	1,615	138	222,000	Upgrade finishes
	mens change	110	1,184	138	162,800	Upgrade finishes
	Sub-total Change Rooms	275	2,960	137	407,000	
	New Change Rooms					
	Demolish existing racquetball			58,126	58,100	
	universal change	220	2,368	578	1,369,500	
	Change Corridor	100	1,076	520	560,200	
	Sub-total Change Rooms	320	3,444	577	1,987,800	
	Renovate Existing Natatorium Support					
	Storage Room(s)	64	689	95	65,600	Upgrade finishes
	Sauna	8	81	129	10,400	Upgrade finishes
	Steam Room	8	81	136	11,000	Upgrade finishes
	Staff Change	20	215	106	22,800	Upgrade finishes
	Wet Offices	20	215	134	28,800	Upgrade finishes
	Pool Control / Lifeguard Room	21	226	134	30,300	Upgrade finishes
	First Aid Room	8	81	106	8,500	Upgrade finishes
	Sub-total Natatorium Support	148	1,588	112	177,400	
	Renovate Entry / Lobby Areas					
	Lobby	101	1,087	123	134,200	Upgrade finishes
	Control Reception	18	194	275	53,300	Expand reception desk
	Staff Room	29	312	93	29,200	
	Public Washrooms	7	75	106	8,000	
	Sub-Total Entry / Lobby Areas	155	1,668	135	224,700	
	Covert Existing Fitness into Lobby				0	
	Fitness Room	73	786	197	155,200	Convert fitness room into expanded lobby
	Sub-Total Other	73	786	198	155,200	
	Existing Pool Mechanical				0	
	Pool mechanical	185	1,991	99	196,600	
	electrical room (shared with Auditorium)	25	269	99	26,600	
	Sub-Total Mechanical	210	2,260	99	223,200	
	New Pool Mechanical				0	
	Expanded pool mechanical	420	4,521	395	1,785,500	
	Sub-Total Mechanical	630	6,781	263	1,785,500	
	Gross Renovated Aquatic Program Area	1,992	21,436	192	4,111,600	
	Overall New Aquatic Program Area	1,660	17,868	544	9,726,600	
	Pro-Rated Building Mechanical/Electrical 5%	83	893	381	340,200	
	Pro-Rated Walls and Structure 2%	33.2	357	381	136,100	
	Component Internal Circulation 15%	249	2,680	409	1,096,300	
	Gross New + Renovated Aquatic Program Area	4,017	43,235	356	15,410,800	
PHASE 2 NEW Recreation	New Gymnasium					
	Gymnasium (1 HS-size basketball court; subdividable)	700	7,535	244	1,838,000	
	Gymnasium Storage	50	538	178	95,800	
	Sub-Total Recreation	750	8,073	240	1,933,800	
	Overall New Recreation Program Area	750	8,073	240	1,933,800	
	Pro-Rated Building Mechanical/Electrical 5%	37.5	404	381	153,700	
	Pro-Rated Walls and Structure 2%	15	161	381	61,500	
	Component Internal Circulation 15%	112.5	1,211	409	495,300	
	Gross New Aquatic Program Area	915	9,849	268	2,644,300	
PHASE 3 Renovate Auditorium	Existing Performing Arts Upgrade					
	Auditorium	685	7,373	152	1,123,200	Upgrade acoustics, lighting, +300 ret. seats, remove stage, replace flooring; Add theatre drapes, add lighting grid
	Lobby	114	1,227	66	80,600	Upgrade finishes
	Public Washrooms	58	624	26	16,500	Upgrade finishes
	Control Room	15	161	65	10,500	Upgrade finishes
	Storage	70	753	31	23,100	Convert portion into dressing rooms
	Kitchen / Concession	56	603	66	39,800	Upgrade finishes
	Coat Room	35	377	32	12,100	
	Ticket	9	97	31	3,000	
	Sub-Total Performing Arts	1,042	11,216	117	1,308,800	
	Gross Renovated Performing Arts Area	1,042	11,216	117	1,308,800	
PHASE 4 NEW Recreation	New Fitness					
	Fitness Centre	320	3,444	440	1,515,600	
	Sub-Total Recreation	320	3,444	440	1,515,600	
	Pro-Rated Building Mechanical/Electrical 5%	16	172	381	65,600	
	Pro-Rated Walls and Structure 2%	6.4	69	381	26,200	
	Component Internal Circulation 15%	48	517	409	211,300	
	Gross MP and Fitness Program Area	390	4,202	433	1,818,700	

Total Hard Costs	Building Total + Site Total	68,503	309	21,182,600
Allowance for Site Works	8% of Hard Costs			1,694,600
Total Soft Costs	30% of Total Hard Costs			6,354,800
Total Project Cost (excluding GST, Land & Financing)		68,503	427	29,232,000

Notes:
Class D Estimate +/- 25%
Design pricing contingency of 10% is included in unit rates
Escalation of 2-years, 12% is included in unit rates (to projected mid-point of construction)
Construction change order contingency of 5% included in Soft Costs
Demolition and HazMat excluded
GST excluded
Financing excluded

Note regarding Budget Costs:
All priced in Q4 2020 Salmon Arm dollars [$] assuming a standard project delivery system with no sub-phasing, extraordinary market conditions, working hour restrictions or extraordinary site conditions. These costs are based on unit costs derived from recently completed projects of a similar nature in the BC interior and BC Lower Mainland. Unit rates include a design pricing contingency of 10%. Construction change order contingency of 5% (of hard costs) is included in the soft costs allowance. Class D Estimates +/- 25% accuracy. Costs are not based on specific site conditions and do not allow for any geotechnical measures or general site development. All off-site infrastructure upgrades and off-site utility company charges, hazmat abatement (if any) and non standard substructure works are excluded.

Note regarding Areas:
All areas are approximate gross areas only and should be confirmed before proceeding to schematic design

ROSS TEMPLETON + ASSOCIATES

Salmon Arm Recreation Centre
Salmon Arm, BC
Class D Estimate
January 18, 2019

OPTION 2

Phase	Program Area- Salmon Arm	sm	sf	$/sf	Escalated Construction Cost (Q4 2020 $)	Notes
PHASE 1 NEW Aquatic	Natatorium					
	25m 6 Lane Main Lap Pool	350	3,767	846	3,188,400	
	deck for main lap pool	300	3,229	607	1,958,600	
	Leisure Pool	245	2,637	875	2,306,200	
	deck for leisure pool	200	2,153	607	1,305,700	
	Hot Pool(s)	35	377	853	321,500	
	deck for hot pool(s)	65	700	607	424,400	
	Water slide(s)	100	1,076	1,048	1,127,900	
	On deck viewing	80	861	564	485,800	
	Sub-total Natatorium	1,375	14,800	751	11,118,500	
	Change Rooms					
	universal change	195	2,099	578	1,213,900	
	womens change	75	807	550	444,100	
	mens change	75	807	550	444,100	
	Sub-total Change Rooms	345	3,714	566	2,102,100	
	Natatorium Support					
	Storage Room(s)	50	538	381	205,000	
	Classroom	55	592	592	350,700	
	Sauna	15	161	515	83,100	
	Steam Room	15	161	543	87,700	
	Staff Change	40	431	423	182,200	
	Wet Offices	30	323	536	173,100	
	Pool Control / Lifeguard Room	20	215	536	115,400	
	First Aid Room	10	108	423	45,500	
	Sub-total Natatorium Support	235	2,530	491	1,242,700	
	Entry / Lobby Areas					
	Lobby (lower)	150	1,615	494	797,100	
	Lobby (upper)	150	1,615	494	797,100	
	Control Reception	30	323	458	148,000	
	Staff Room	20	215	374	80,500	
	Sub-Total Entry / Lobby Areas	350	3,767	484	1,822,700	
	Pool Mechanical					
	Boiler Room	40	431	395	170,000	
	Receiving	30	323	423	136,600	
	Chemical/Filter room	140	1,507	395	595,200	
	Electrical room	62	667	395	263,600	
	HVAC (interior AHUs)	374	4,026	395	1,589,900	
	Craw Space (access area surrounding pools)	120	1,292	352	455,100	
	Pool Basement (Pumps etc.)	270	2,906	352	1,024,000	
	Sub-Total Mechanical	1,036	11,151	380	4,234,400	
	Other					
	Fitness Room	320	3444	474	1,633,800	
	Spectactor Seating	90	969	513	496,500	
	Elevator (3 stops)				150,000	
	Sub-Total Mechanical	410	4,413	517	2,280,300	
	Gross New Aquatic Program Area	3,751	40,375	565	22,800,700	
	Pro-Rated Building Mechanical/Electrical 5%	187.55	2,019	381	768,800	
	Pro-Rated Walls and Structure 2%	75.02	808	381	307,500	
	Component Internal Circulation 15%	562.65	6,056	409	2,477,300	
	Gross New Aquatic Program Area	4,576	49,258	535	26,354,300	
PHASE 2 Renovate Recreation	Renovate/Convert Natatorium					
	Gymnasium (1 HS-size basketball courst; subdividable)	700	7,535	244	1,838,000	
	Gymnasium Storage	50	538	178	95,800	
	Multipurpose Rooms (3)	325	3,498	221	771,500	
	Social Spine	165	1,776	237	421,200	
	Renovate Changerooms					
	Changerooms	300	3,229	132	426,700	
	Minor/No Renovations					
	Racquet Courts Remain (2)	160	1,722	24	42,000	
	Circulation Remain	90	969	18	17,200	
	Fitness converted to staff area	65	700	178	124,600	
	Renovate Main Entry & Circulation					
	Social Spine	90	969	237	229,700	
	Sub-Total Recreation	1,945	20,936	189	3,966,700	
	Gross New Aquatic Program Area	1,945	20,936	189	3,966,700	
PHASE 3 Renovate Auditorium	Existing Performing Arts Upgrade					Upgrade accoustics, lighting, add 300+
	Auditorium	685	7,373	254	1,872,000	retractable seating, remove stage, replace flooring
						Add theatre drapes, add lighting grid
	Lobby	114	1,227	188	230,200	Upgrade finishes
	Public Washrooms	58	624	106	66,000	Upgrade finishes
	Control Room	15	161	185	29,900	Upgrade finishes
	Storage	70	753	123	92,500	Convert portion into dressing rooms
	Kitchen / Concession	56	603	189	113,700	Upgrade finishes
	Coat Room	35	377	129	48,500	
	Ticket	9	97	123	12,000	
	Sub-Total Performing Arts	1,042	11,216	220	2,464,800	
	Gross Renovated Performing Arts Area	1,042	11,216	220	2,464,800	

Total Hard Costs	Building Total + Site Total	81,410	403	32,785,800
Allowance for site works	8% of Hard Costs			2,622,900
Total Soft Costs	30% of Total Hard Costs			9,835,700
Total Project Cost (excluding GST, Land & Financing)		81,410	556	45,244,400

Notes:
- Class D Estimate +/- 25%
- Design pricing contingency of 10% is included in unit rates
- Escalation of 2-years, 12% is included in unit rates (to projected mid-point of construction)
- Construction change order contingency of 5% included in Soft Costs
- Demolition and HazMat excluded
- GST excluded
- Financing excluded

Note regarding Budget Costs:

All priced in Q4 2020 Salmon Arm dollars [$] assuming a standard project delivery system with no sub-phasing, extraordinary market conditions, working hour restrictions or extraordinary site conditions. These costs are based on unit costs derived from recently completed projects of a similar nature in the BC interior and BC Lower Mainland. Unit rates include a design pricing contingency of 10%. Construction change order contingency of 5% (of hard costs) is included in the soft costs allowance. Class D Estimates +/- 25% accuracy. Costs are not based on specific site conditions and do not allow for any geotechnical measures or general site development. All off-site infrastructure upgrades and off-site utility company charges, hazmat abatement (if any) and non standard substructure works are excluded.

Note regarding Areas:

All areas are approximate gross areas only and should be confirmed before proceeding to schematic design

8.4 Building Conditions Assessment Report

SASCU Recreation Centre

2600 10th Avenue NE, Salmon Arm, BC

Condition Assessment Report

Presented to:

Aiden Callison
Associate, Architect AIBC, LEED AP
HCMA Architecture + Design

MH Project No. 1803111.00 September 17, 2018

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

1.1 Condition Assessment Goals

The purpose of the Morrison Hershfield condition assessment of the SASCU Recreation Centre at 2600 10th Avenue NE, Salmon Arm, BC is to assess the existing building electrical, mechanical, and structural systems of the facility. This condition assessment report describes the findings of that assessment, along with engineering recommendations for upgrading or repairing the building systems, as necessary. Overall, the intent is to assist in decision-making regarding maintenance budgets and planning for the potential future use of the facility in upcoming years.

1.2 Condition Assessment Key Findings

The main points contained in Sections 2, 3 and 4 of this report are summarized below.

1.2.1 Electrical

Pending Final Review.

1.2.2 Mechanical

Pending Final Review.

1.2.3 Structural

Pending Final Review.

2. INTRODUCTION

Morrison Hershfield (MH) is pleased to present this condition assessment report for the SASCU Recreation Centre at 2600 10th Avenue NE, Salmon Arm, BC.

2.1 Scope of Report

Morrison Hershfield has been retained by HCMA Architecture + Design to conduct an engineering assessment of the SASCU Recreation Centre. The assessment includes the building electrical, mechanical, and structural systems.

We understand that the condition assessment has been requested by the Shuswap Recreation Society as part of their planning activities for the future use of the facility. The Society is considering various options for the facility, including maintaining it as it currently operates, or potentially repurposing the facility for other community amenities. The results of the condition assessment report, and associated budgetary estimates for repairs to the building, could affect the decisions regarding the future of the recreation centre.

2.2 Personnel

The following Morrison Hershfield employees were involved with the feasibility study:

Jose Luis Lopez, *P.Eng. LC*	Project Manager/ Electrical Engineer
Tom Miller, *P.Eng.*	Senior Mechanical Engineer
Hugo Tjong	Mechanical Designer
Jeremy Hapchina, *P.Eng.*	Senior Structural Engineer

2.3 Reference Documents

The following documents were available during our assessment of the building:

- Shuswap Recreation Society request for proposal documents titled "*Proposal to Provide Architectural and Recreational Planning Services for City of Salmon Arm Recreational Campus Development Plan*", dated April 27, 2018.
- *City of Salmon Arm Parks and Recreation Master Plan*, prepared by Lees and Associates Landscape Architects and Planners, dated 2012.
- Architectural drawings for the Salmon Arm Community Centre, prepared by Bernd Hermanski Architect, including drawings A1 through A20, dated July 1985.
- Electrical drawings for the Salmon Arm Community Centre, prepared by D.W. Thomson Consultants, including drawings E1 through E5, dated July 1985.
- Mechanical drawings for the Salmon Arm Community Centre, prepared by D.W. Thomson Consultants, including drawings M1 through M4, dated September 1985.
- Plumbing drawings for the Salmon Arm Community Centre, prepared by D.W. Thomson Consultants, including drawings P1 through P4, dated September 1985.
- Structural drawings for the Salmon Arm Community Centre, prepared by R&A Engineering Ltd., including drawings S1 through S9, dated July 1985.
- Historical photos of the facility and prior observed building deficiencies, provided by Dale Berger, Operations Manager via e-mail on July 16, 2018.

2.4 Acronyms, Terminology, Concepts

AH = Air Handling (unit)
CU = Condensing Unit
AC = Air Conditioner / Conditioning
SA = Supply Air
RA = Return Air
SA-T = Supply Air Temperature
SA-RH = Supply Air Relative Humidity
VAV= Variable Air Volume
DX= Direct Expansion

Cx = Commissioning
UPS = Unlimited Power Supply
ATS = Automatic Transfer Switch
kW = kilowatt
kVa = kilovolt ampere
SOW = Scope of Work
DP = Distribution Panel
PH = Phase (electrical 1 PH or 3 PH)

2.5 Limitations

This study provides an assessment of the current conditions at the reviewed facility based on our specific scope of services and to support the specific objectives identified previously.

This report was prepared for the exclusive use of BGIS, Shared Services Canada (and associated Government of Canada entities), and Oxford Properties, and may not be reproduced, in whole or in part, or used or relied upon by any other party. MH accepts no responsibility for any damages suffered by any third party because of decisions made, or actions taken, based on this report.

Professional judgment was exercised in gathering and analyzing the information obtained and in the formulation of the conclusions. Like all professional persons rendering advice, we do not act as insurers of the conclusions we reach, but we commit ourselves to care and competence in reaching those conclusions. No other warranties, either expressed or implied, are made.

The assessment is based, in part, on information provided by others. Unless specifically noted, we have assumed that this information is correct and have relied on it in developing our conclusions.

Unexpected conditions may be encountered at the facility that have not been explored within the scope of this report. Should such an event occur, MH should be notified in order that we may determine if modifications to our conclusions are necessary.

Conclusions are based on a visual review of a sampling of building electrical systems for the purpose of identifying electrical systems condition. Observations were made only of those areas that were readily accessible during our review. The general findings reported might not be extended to portions of the facility that were unavailable for direct observation at the time of the MH visits.

Detailed discussions of the existing elements and required repairs or replacements, and reporting on minor repairs or preventative maintenance requirements, were beyond the scope of this assessment. Results and recommendations described in this report may change as the engineering design progresses through the life of the project.

Cost estimates are provided only as an indication of the order of magnitude of remedial work. Our cost projections are based upon the following:

- our past experience and records of similar construction and remedial work;
- costs of past work at the building as reported by the maintenance staff;
- discussions with various contractors and/or material suppliers in the Lower Mainland area, where appropriate, or in the location of the facility;
- current cost data handbooks; and
- our professional judgment.

More precise cost estimates could require additional effort, possibly including more detailed investigation to better define the scope of work.

3. EXISTING BUILDING AND SYSTEMS

This section of the report describes the existing state of the facility, based on the documents available to Morrison Hershfield, and the information gathered during our visits to the building. The description in this section is intended as a reference baseline of the building for discussion in the *Condition Assessment* section of this report afterward.

3.1 Overall Building

The SASCU Recreation Centre was originally constructed in 1985, and at that time was named the Salmon Arm Community Centre. The original building had a footprint of approximately 2,675 m^2 (28,800 sf). The original building was comprised of two blocks, with Block A being the larger area, including the swimming pool facilities and change rooms. Block B included the main lobby area, the auditorium, stage, kitchen, washrooms, and storage areas. An addition to the complex to house squash and racquetball courts was constructed in approximately 2005 adjacent to Block A, adding approximately 300 m^2 to the building. The building is typically a single storey structure, with a roof height of approximately 11.8 m (39 ft) for the auditorium, and 7.8 m (25 ft) for the pool area. There are some areas with a lower basement level, and some second floor mezzanine areas within the building, typically for office space.

The subsequent sections review the systems within the building subdivided by discipline.

3.2 Electrical

3.2.1 Existing Electrical Distribution:

The building is supplied with power from a 25kV feeder through to a 500kVA BC Hydro transformer into a 600V feeder into the building. The main breaker is set to 600A. The feeder terminates into a 600Y/347V Main Switchboard A in the Mezzanine Block B.

Based on the BC Hydro logs, there is still quite a bit of capacity for expansion for the facility. The peak demand of the system is just at 33% of the system's max capacity. Below is a table showing the building's peak demand for each month from January 2017 to 2018.

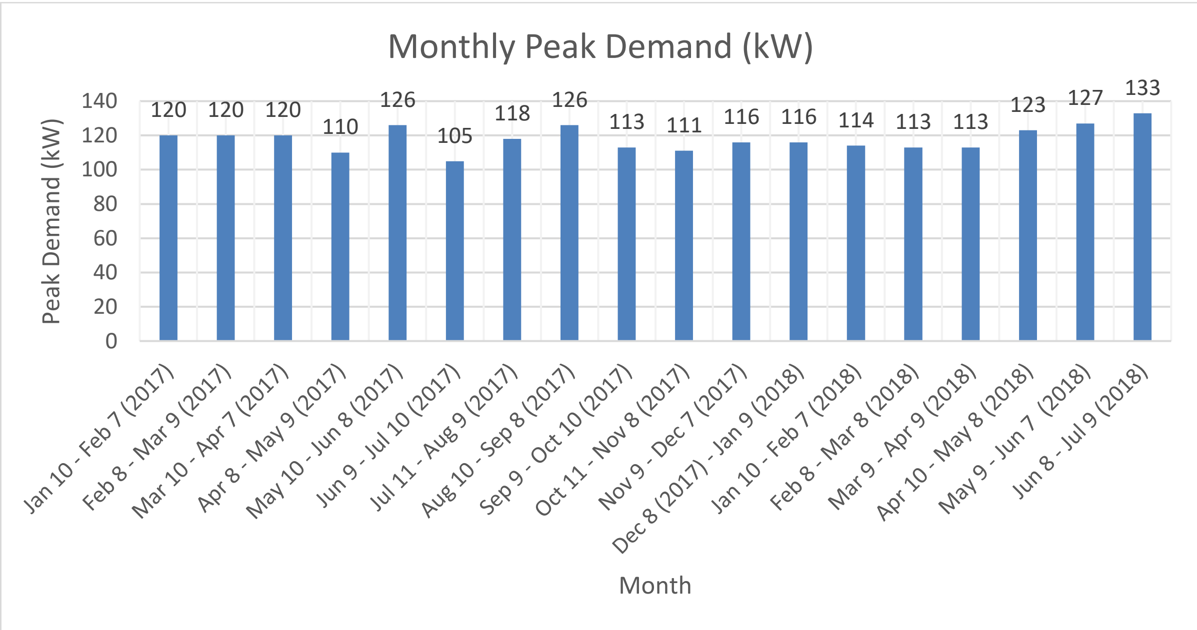


Figure 1: Peak Demand Loads for the facility

Within the facility itself, there also seems to be quite a bit of capacity for expansion. The table below is a summary of each of the sub panel's rating, location, and capacity used.

Panel Name	Location	Panel Rating (A)	Appx Breaker Capacity
Main Switchboard A	Mezzanine Block B	600	6/8 used
Panel DD (MCC D)	Mezzanine Block B	100	14/20 Used

Panel EE (MCC E)	Mech Room Block A	100	24/24 Used
Panel B	Mezzanine Block B	250	18/42 Used
Panel C	Life guard station	225	21/42 Used
Panel L	Mezzanine Block B	600	22/24 Used
Panel M	Mezzanine Block B	225	32/42 Used
Panel N	Mezzanine Block B	100 (Not confirmed on site)	(not found on site)
Panel P	Stage Exit	225	32/42 Used
Panel Q	Kitchen	225	32/42 Used
Panel R	Life guard station	225	41/42 Used
Panel S	Life guard station	225	34/42 Used
Panel FF	Mech Room Block A	100	12/24 Used

It was noted that Breakers for Pool lighting were not GFCI types:

Figure 2: Sample pool lights, not GFCI

There was no observed generator on site.

3.2.2 Existing Lighting and Controls:

The current lighting is a mixture of fluorescent and Metal Halide fixtures controlled by local line voltage switches.

Below is a table summarizing the lighting fixture type and location in the building. Note that where lighting types are not specified, fixture lamp type could not be identified from site visit.

Table 1: List of Light fixtures

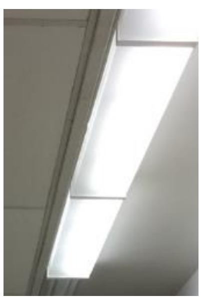
Type	Description
1. Exit Signs  *Figure 3: Cage Type*  *Figure 4:Wallmount Type*	*Multiple locations:* **Red non-pictogram EXIT signs**
2. Fluorescent Strips  *Figure 5: Wrap Type*  *Figure 6:Sconce Type*  *Figure 7: Reflector Type*  *Figure 8:Recessed linear type*	*Kitchen, Racquet Court Lobby Mezzanine Block A, Change Room, Showers*: **Wraps** *Hallways, Fitness Room, Staff Room:* **Sconces** *Storage Room, Mechanical/Electrical Rooms, Pool Storage Room*: **Reflector Type** *Hallways, Racquet Court Lobby:* **Recessed linear type** *Pool area:* ***Gasketted lensed type*** *Change Room, Change Room Washroom, Janitor Room*: **Open fluorescent holder**

 Figure 9: Gasketted lensed type  Figure 10: Open Fluorescent holder  Figure 11: Ceiling Troffer	*Racquet Court* : **Ceiling Troffer**

3. Decorative Screw-in Lampholders  *Figure 12: Wall mounted*  *Figure 13:Pole mounted Type*	*Pool area*: **Pole and wall mounted types**
4. Exterior Lights  *Figure 14 Wallpacks*  *Figure 15: Recessed Lensed Downlight*  *Figure 16: Exterior Bollard*	*Miscellaneous locations:* **Bollards, wallpacks and soffit downlights**

5. Specialty Lights

Figure 17Gymnasium highbay light

Figure 18: Surface mount wall light

Figure 19: Twin Head Remote Emergency light

Figure 20: Single Head Remote Emergency light

Figure 21: Emergency light with battery pack

Figure 22: Caged Emergency light with battery pack

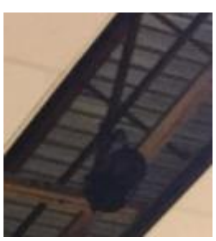


Figure 23 Gymnasium Stage Light

Gymnasium : **Highbay Fixture**

Sauna : **Surface mount wall lights**

Miscellaneous locations : **Metal Halide emergency lights**

From the original as-builts, the existing exterior lighting is controlled by a photocell mounted on the roof, with a time clock override.

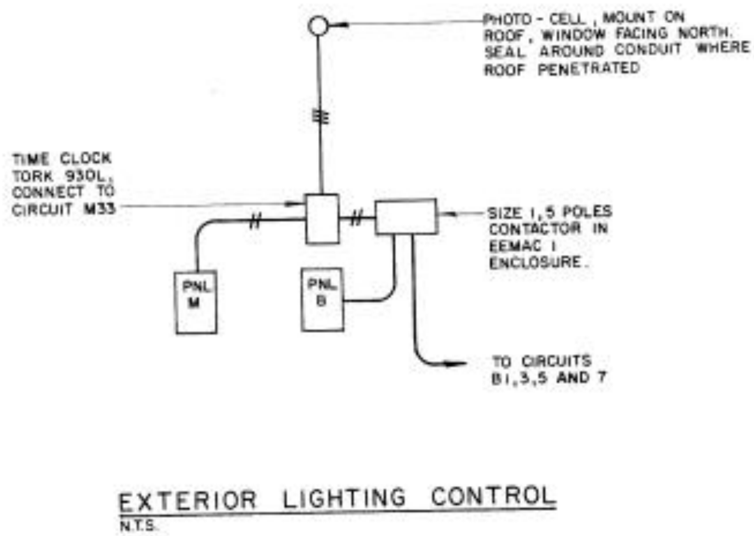


Figure 24: Timeclock schematic from as-builts

Figure 25: Existing exterior lighting controls and relays

There is also a defunct theater lighting control system beside the mezzanine. Interviews with staff revealed that these are no longer in use:

Figure 26:Existing Lighting control panel

Figure 27: LCP Nameplate

Figure 28: Defunct Stage Lighting Controls

For the pool facility, a manual control switch panel was present in the office:

Figure 29: Manual control switch bank

3.2.3 Communications

The communications equipment is mounted on a mm fire rated plywood backboard in the Mezzanine Block B.

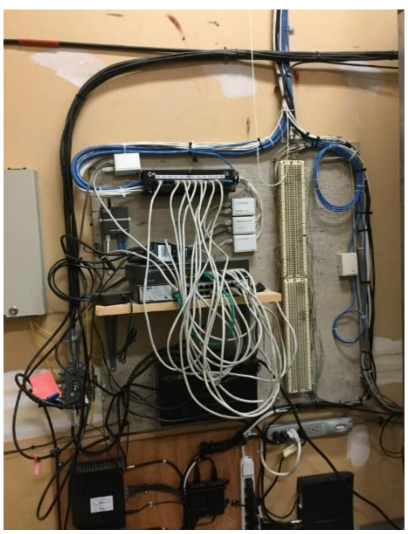


Figure 31: Communications backboard

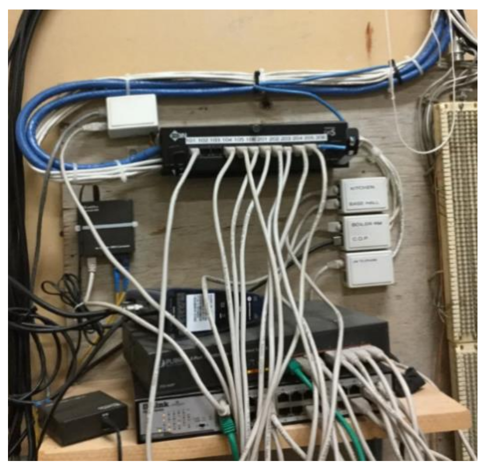


Figure 30: Main comms distribution

No further communications rooms/racks were observed on site or present on As-builts.

3.2.4 Fire Alarm

The existing Fire Alarm Control Panel is a MS-9600LS addressable system by Fire-Lite and is located in Mezzanine Block B.

Figure 32: Existing FACP

There are two Fire Alarm Annunciators located at the exits by the Pool Lobby and Auditorium Lobby.

Figure 33: Existing FAAP

Fault Isolators were found next to the Fire Alarm Control Panel suggesting it is a Class A fire alarm system.

There was no sprinkler system found in the building. Heat detectors and smoke detectors were found throughout the building.

It was indicated that a recent fire alarm upgrade had been conducted, but no Record drawings were obtained at the time of writing. The logbook mentions that the upgrade was performed in January 2014.

3.2.5 Security & Access Control

Currently, there is key fob access at the exits and to the squash court area.

A security control panel was also observed in the main office:

Figure 34: Existing security control panel

3.2.6 Other Systems

There is an existing audio system in both the auditorium and in the pool area:

Figure 35: Pool area audio system

3.3 Mechanical

3.3.1 Existing Plumbing System

The building domestic water system is supplied from the city water main by 100mm water main. Inside the building, the domestic water supply is split into 75mm DCW main and 100mm Pool Make Up line.

The Domestic water (DCW, DHW, and DHWR) pipe distribution system are composed of copper pipework that is still original to the building. The domestic hot water heaters have been replaced in 2013 with condensing hot water heaters. While the remainder of the domestic water system is till original from 1985.

The sanitary and storm drainage systems are made from cast iron pipe network, original from 1985. There has not been any upgrade to the drainage system since the construction of the building.

3.3.2 Existing Swimming Pool System

The building has 3 swimming pool systems:

1. 25m Pool system
2. Wading Pool system
3. Whirlpool system

Each of the systems work independently from each other. All the pool systems pipework was constructed using PVC pipes and are still original from 1985. Some components of the pool systems were replaced (heat exchangers, pump) in 2013. A UV sanitizing systems was also added to 25m Pool system in 2013.

3.3.3 Existing HVAC System

The building's HVAC system composed of two main systems:

1. Hydronic System

   The hydronic system composed of two condensing boilers (installed in 2013), hydronic heating pipe network, perimeter heaters, AHUs' heating coil, and other supporting equipment. Most of the hydronic equipment is still the original equipment from 1985.

2. Air/Ventilation System

   The air/ventilation system is mainly composed of 4 air handling units, two RTUs, exhaust fans, and ductworks. Beside the RTUs, all the air/ventilation systems are still the original equipment from 1985.

3.3.4 Existing Fire Sprinkler System

The building does not have a sprinkler system.

3.4 Structural

The building perimeter walls are constructed of 200 mm thick reinforced concrete masonry units (CMU). The exterior walls are covered with corrugated metal cladding. There are also CMU interior walls within the building. The foundations are reinforced cast-in-place concrete strip footings and cast-in-place concrete foundation walls.

The floor structure is typically 125 mm (5”) thick reinforced concrete slab-on-grade, with a 100 mm (4”) slab on grade at the lower level below the auditorium. The swimming pools are constructed of 150 mm (6”) thick reinforced concrete slab-on-grade. There are suspended concrete slab in the areas of the building with lower levels, such as the mechanical rooms beneath the pool deck and the basement areas beneath the auditorium. The pool area suspended slab is 190 mm (7.5”) thick, and the auditorium suspended slab is 170 mm (6.75”) thick.

The main roof structure is typically open-web steel joists (OWSJ), including 1200 mm deep trusses spaced at 1800 mm over the pool area, and 1350 mm deep trusses spaced at 2100 mm over the auditorium. The OWSJ are supported by CMU perimeter walls, and in the pool area there is structural framing including W530 steel beams and HSS 219 mm diameter steel columns supporting the OWSJ. The trusses support a 38 mm deep corrugated metal roof deck (aka Q-Deck). There are some areas in the building with wood trusses, dimension lumber roof joists, and wood decking, such as over the auditorium lobby area.

4. CONDITION ASSESSMENT

This section of the report describes the technical details considered as part of the Morrison Hershfield condition assessment. The engineering disciplines included in the assessment are the building electrical, mechanical, and structural systems. The *Observations* subsection for each discipline describes our noted condition of the existing building equipment and components. The *Recommendations* section describes our findings from the condition assessment, along with proposed actions and options for upcoming repairs and maintenance upgrades.

4.1 Electrical

4.1.1 Observations

4.1.1.1 Existing Electrical Distribution:

Despite many of the systems being panels, installed with the original basebuilding (1985), the existing system is in fair condition. With good periodic inspections (FLIR scanning) and periodic maintenance. Below are some specific observations on the power system.

A. Most of the existing panels are ITE panels that take 'BQ' type breakers. Note that the ITE brand has been phased out and is now represented by Siemens. Any breaker replacements should be coordinated for compatibility with Siemens.

Figure 36: Sample existing panel

B. No Arc Flash labels were observed on any of the equipment.

Per CSA Z462-2015 Workplace Electrical Safety Standard which acts as a standard of best practices as recommended by WorksafeBC, Arc Flash hazard labels should be placed on all electrical equipment to inform workers of proper safe distances and required PPE:

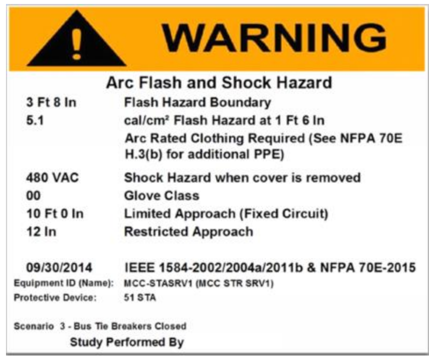


Figure 37: Sample Arc Flash Label

C. No GFCI breakers were observed feeding the pool areas and lights. It is recommended that, per current codes, the existing breakers be replaced with GFCI breakers.

D. Tamper Proof Receptacles were not observed in the areas being used as daycare areas currently. It is recommended that these be upgraded to be compliant with current codes.

4.1.1.2 Existing Lighting System:

The existing lighting system is in workable condition. Light levels for majority of the areas appeared to be appropriate. The existing controls, however do not meet the current building code's Energy efficiency measures—particularly the ASHRAE 90.1-2010 controls.

Upgrading the system to LEDs would provide the following benefits:

A. Reduced Energy consumption costs from lighting (estimated at 15% at minimum)

B. Drastically reduced maintenance (Lights can be specified with a lifetime of appx 15 years, maintenance free). This would be particularly useful for high-ceiling areas where changing light bulbs may be a challenge.

Further, it was observed that a few of the fixtures had been missing their lenses/covers:

Figure 38: Fluorescent fixture in kitchen without covers

Figure 39: Sample hallway light without covers

Replacing these fixtures with LED would decrease the number of times that the lenses/covers need to be removed for maintenance, leading to less lost/damaged covers.

If lighting is upgraded, ASHRAE 90.1-2010 controls are recommended to comply with current regulations.

It is also recommended to replace the existing Auditorium controls if lights are upgraded. Restoration of the original intent c/w dimming for fixtures can be installed if required.

To comply with current building codes, exit signs could be upgraded to Green Running-man style LED fixtures.

4.1.1.3 Existing Communications:

The existing communications systems are in good condition. Many of the cables, however, were observed to be incompliant with the BC Building Code's requirement for FT6 cable in plenum spaces.

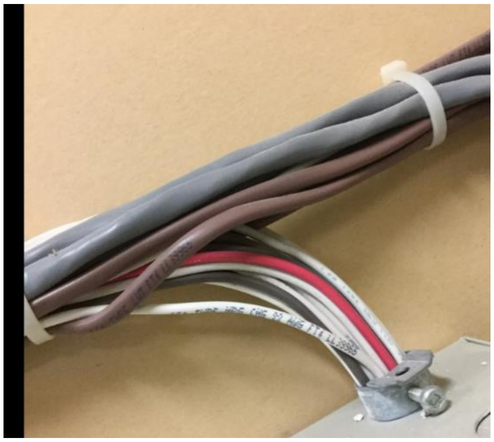


Figure 40: Sample Existing FT4 cable

4.1.1.4 Existing Fire Alarm System:

The fire alarm system appears to be in good condition, as expected considering it was recently replaced. Some End-of-line resistor boxes were observed on site; It is recommended that if redundant that these be demolished/removed to avoid confusion (Class A systems do not require end of line resistors).

Missing pullstations were observed at the exits by the women's storage room and by the kitchen.

4.1.1.5 Existing Security and Access Control:

The existing security and access controls appear to be in working condition.

4.1.1.6 Other Electrical Systems

The existing sound system appears in working order.

4.1.2 Recommendations

Below is a summary of Electrical recommendations and order-of-magnitude costs:

Priority Criteria:
Priority 0 – Fix immediate
Priority 1 – Fix within 1 year
Priority 2 – Fix within 1 to 3 years
Priority 3 – Fix within 5 years
Priority 4 – Client Discretion

No	Recommendation	Priority	Budgetary Cost
1.	Arc Flash Calculation and installation of stickers/labels.	4	$20,000
2.	GFCI Breakers for pools	4	$5,000
3.	Tamper Proof Receptacle Upgrade	4	$5,000
4.	Upgrade all lighting to LEDs	4	$250,000
5.	Upgrade all controls to be ASHRAE compliant	4	$100,000
6.	Upgrade all exit signs to Green Running man style	4	$100,000
7.	Install new Auditorium controls system	4	$35,000
8.	Replace all cables with FT6 type	4	$100,000

9.	Demolish End-of-line Resistor boxes	4	$20,000
10.	Install 2x additional pullstations c/w FA verification	4	$5,000

4.2 Mechanical

4.2.1 Observations

4.2.1.1 Domestic Water System

The domestic cold water (DCW) is supplied to the building by 100mm DCW main. The DCW main then split into 75mm DCW main and 100mm Pool Make Up. The DCW main is equipped with a supervised DCVA while the Pool Make Up is equipped with an RPBA. Each of the main lines is also equipped with a single PRV.

Figure 41 Water Entry Station

Based on their condition, the DCW's DCVA and Pool Make Up Line's DCVA are later additions to the system, most likely after 2013. The typical service life expectancy of major valves is 15 to 25 years thus no rebuild or replacement is forecasted for the next 10 years.

The domestic water distribution pipework is made from copper and original to the building (1985). Domestic water copper pipework has a typical service life expectancy of 20 to 35 years.

Figure 42 Domestic Water Pipework

The domestic hot water for the building is generated by three AO Smith BTH-500-A (146 kW; 492 L each) gas-fired water heaters. The water heaters are in good condition and were installed in 2013. Gas fired water heaters have a 6 – 10 year service life expectancy.

Figure 43 Domestic Hot Water Heaters

The system is also equipped with a Bell & Gosset B601T (0.19kW; 0.95 L/s; 45 kPa) domestic hot water recirculation pump which was installed in 2013. The typical service life of a small inline circulator pump is 10 years.

Figure 44 DHWR Pump

A DHW expansion tank (Amtrol ST-60V-C) is located next to the Hot Water Heater. The tank was installed as part of the DHW system upgrade in 2013. The typical service life expectancy of an expansion tank is 20 years.

Figure 45 DHW expansion tank

The commercial dishwasher machine at the Auditorium Kitchen is equipped with a 12kW electric domestic hot water heater (Super-Hot 312B)

Figure 46 Super Hot 312B

The typical service life of an electric domestic hot water heater is 10 to 15 years.

Most of the plumbing fixtures in the building are the original from 1985. They are operational but look dated and worn out.

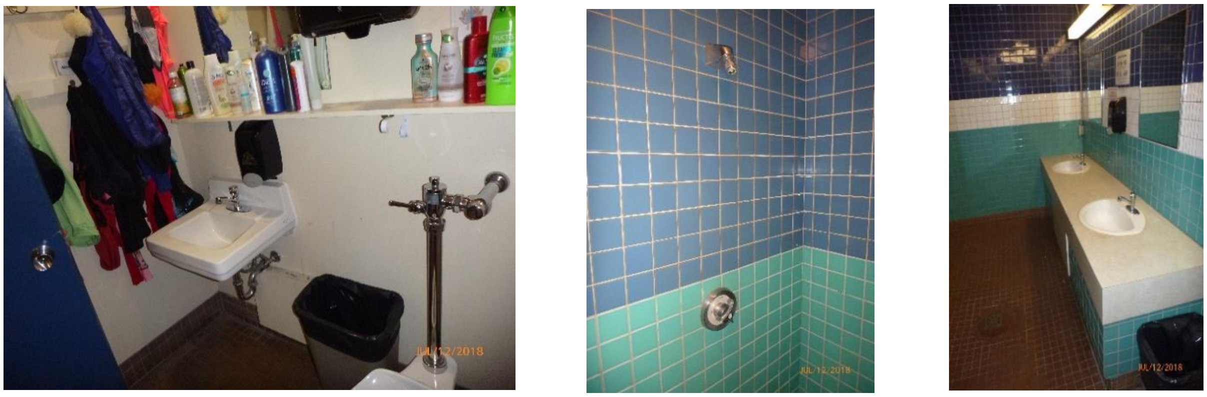


Figure 47 Sample of Existing Plumbing Fixtures

4.2.1.2 Sanitary Drainage System

The plumbing fixtures in the building are drained by a network of SAN pipework composed of cast iron pipework and copper pipework which mostly run below the floor slab.

The SAN line at the Block A part of the building is drained to the city sewer line through 200mm SAN main. A Backwater valve is located inside the sanitary sump inside the building before the 200mm SAN line leaving the Block A of the building.

The block B of the building is drained to the city sewer line through 150mm SAN main.

Cast iron sanitary drainage piping typically lasts 40+ years. MH expect replacement of individual compression fittings will be needed as part of regular maintenance, as they age.

4.2.1.3 Storm Drainage System

All the roof drains are collected by cast iron stormwater piping that runs from the roof down to below the grade. The storm water from the building is drained to the city main by gravity through a 250mm STW main. Cast iron STW piping typically lasts 40+ years. MH expect replacement of individual compression fittings will be needed as part of regular maintenance, as they age.

Figure 48 STW line

4.2.1.4 Additional observation on the existing plumbing system.

The auditorium’s kitchen is equipped with an ice machine. The water inlet of the ice machine is connected directly to the domestic cold water system. Based on CSA B64, an RPBA is required for ice machine installation.

Figure 49 Ice Machine

4.2.1.5 Existing Pool Mechanical System

4.2.1.5.1 25m Mechanical Pool System

Most of the components of the 25m mechanical pool system are original from 1985. Following is the list of 25m Pool's major component:

1. Diatomaceous Earth (DE) Filter System
   The diatomaceous earth filter system consists of DE feeder and DE tank. The main pool water filtration process happens in the DE tank. The tank is also equipped with filter rinse system.

Figure 50 DE Tank and DE Feeder

2. Soda Ash/Hypochlorite Feeder & Container
   Soda ash is being used to regulate the pH of the pool water. A feeder and container for soda ash services all three pool system.

Figure 51 Soda Ash Container

3. Chlorination system
   The chlorine gas is kept in a gas cylinder inside the chlorine room. The gas is piped to the 25 pool system at the chlorine injection points.

Figure 52 Chlorine Room

The system is also equipped with a chlorine booster pump (Grundfos JP series; ¾ HP). The pump was last replaced in 2017.

4. Main Circulator Pump
   The main circulator pump for the 25m pool is a 15 HP base mounted pump. The pump body is original (1985) but the pump motor has been replaced in 2013. Typical service life expectancy of a base mounted pump is 20 years.

Figure 53 25m Pool's main Circulator Pump

5. UV Pool Sanitizers
   A UV pool sanitizer (Aquafine UVLogic 06AL30) was added to the system in 2013. A UV filter system can remove up to 99.5% of pathogens found in the swimming pool water, reducing the required chlorine concentration.

Figure 54 UV filter

6. PVC pipework
   All the 25m pool pipework was constructed from PVC pipe and fittings. The pipework is original from 1985. The typical service life expectancy of PVC pipework ranges from 35 years to 50 years.

7. Heat Exchanger
   The 25m pool's original heat exchanger has been replaced with new Bell and Gosset 73.3 kW plate and frame heat exchanger in 2013. The typical service life expectancy of a plate and frame heat exchanger is 15 to 20 years before needing to be rebuilt or replaced.

Figure 55 25m Pool Heat Exchanger

4.2.1.5.2 Wading Pool System

Most of the components of the wading pool mechanical system are original from 1985. Following is the list of the major components:

1. Sand filter
   Two sand filters provide filtering for the wading pool. The sand filter container is original from 1985. The typical service life expectancy for the filter container is 25+years. The containers are typically replaced when they start to leak. The sand media is replaced once every 5 years as part of the maintenance program.

Figure 56 Wading Pool's Sand Filters

2. Main Circulator Pump
   The main circulator pump for wading pool is a 2 HP close coupled base mounted pump. The pump was replaced in 2013. Typical service life expectancy of a base mounted pump is 20 years.

Figure 57 Main Circulator Pump

3. Fountain Recirculation Pump
   Water fountain recirculation was found behind Boiler B-2. The pump body is the original from 1985. The pump motor has been replaced more recently. Typical service life of a base mounted pump is 20 years.

Figure 58 Fountain Re-circulation Pump

4. Heat Exchanger
   The wading pool’s heat exchanger is the original from 1985. The typical service life expectancy of a plate and frame heat exchanger is 15 to 20 years.

Figure 59 Wading Pool’s Heat Exchanger

5. PVC pipework
   All the wading pool pipework was constructed from PVC pipes and fittings. The pipework is original from 1985. The typical service life expectancy of PVC pipework ranges from 35 years to 50 years.

4.2.1.5.3 Whirl Pool System

Most of the components of the whirlpool mechanical system are original from 1985. Following is the list of the major component:

1. Sand filter
   Two sand filters provide filtering for the whirlpool. The sand filter containers are original from 1985. The typical service life expectancy for the filter container is 25+years. The containers are replaced when they start to leak. The sand media has to be replaced once every 5 years as a part of the maintenance.

Figure 60 Wading Pool's Sand Filters

2. Main Circulator Pump
   The main circulator pump for whirlpool is a 190 gpm Bell and Gosset base mounted pump. The pump motor has been replaced while the pump body remains to be original from 1985. Typical service life expectancy of a base mounted pump is 20 years.

Figure 61 Main Circulator Pump

3. Hydro Air Pump
   The hydro air pump is the original pump from 1985. Typical service life expectancy of a base mounted pump is 20 years.

Figure 62 Hydro Air Pump

4. Heat Exchanger
   The whirl pool's heat exchanger was replaced in 2013. The typical service life expectancy of a plate and frame heat exchanger is 15 to 20 years.

Figure 63 Wading Pool's Heat Exchanger

5. PVC pipework
   All the whirlpool pipework was constructed from PVC pipes and fittings. The pipework is still original from 1985. The typical service life expectancy of PVC pipework ranges from 35 years to 50 years.

4.2.1.6 Hydronic System

The building is mainly heated by the hydronic heating system, including the swimming pools. The following are the primary components of the existing hydronic system:

4.2.1.6.1 Hydronic Boilers

Two 879 kW Patterson Kelly hydronic condensing boilers produce the required heating hot water for the buildings. The current boilers were installed in 2013, replacing the original boilers. All the new boilers seem to be in good condition and well maintained. Each boiler has a cast aluminum heat exchanger which makes the boiler sensitive to water flow rate fluctuation compared to a high mass boiler.

Typical service life expectancy for a condensing boiler is between 15 to 25 years.

Figure 64 Existing Condensing Boilers

4.2.1.6.2 Boiler Pumps

Each of the boilers is equipped with a dedicated 250gpm; 2.24 kW Bell & Gosset 80 4x4x7 circulator pump to maintain a constant flow rate across the boiler. The pumps were installed in 2013.

Figure 65 Boiler Pump

Typical service life expectancy for base mounted in-line pump is 20 years.

4.2.1.6.3 Main Hydronic Circulator Pumps

The main hydronic heating loop is powered by two 1.5 hp base mounted pumps. Both of the pumps' bodies are original from 1985 while the motors were replaced in 2012. No VFD were found on these pumps. The main hydronic heating loop is currently designed to run at constant flow.

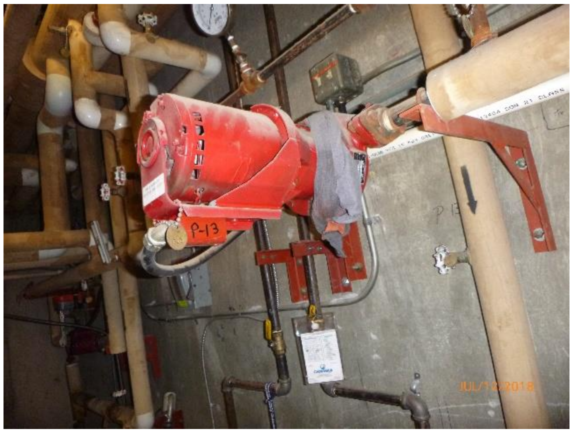
Typical service life expectancy for the base-mounted centrifugal pump is 20 years

Figure 66 Main Circulator Pumps

4.2.1.6.4 Radiant Panel Loop Pumps

The radiant panels in the building are supplied by a dedicated hydronic loop and a dedicated circulator pump. The pump is original from 1985. No VFD is found in the unit.

The typical service life expectancy of in-line pipe mounted circulator pump is 10 to 15 years.



4.2.1.6.5 AHUs' heating coil pumps

In total there are 4 AHUs in the building. Except for AHU-3, each comes with a hydronic heating coil and a coil pump (Grundfos UPS series; fractional HP). The AHU-3 comes with two heating coils and two coil pumps. Based on the nameplate, the pumps were installed around 2013. The typical service life expectancy of in-line pipe mounted circulator pump is 10 to 15 years.

4.2.1.6.6 Pool heat exchanger hydronic circulation pumps

Each of the pool systems is equipped with a Grundfos UPS (fractional HP) pump at the supply side of the heat exchangers. The pumps were replaced in separate years between 2007 and 2015. The typical service life expectancy of an in-line pipe mounted circulator pump is 10 to 15 years.

4.2.1.6.7 Hydronic Expansion Tank

The hydronic heating system is equipped with a plain steel expansion tank. The tank is the original tank from 1985. With this type of tank, air will gradually transfer from the tank to the highest point in the system, due to air dissolving in the water, and then coming out of solution elsewhere in the system. This, in turn, required regular draining of the expansion tank, as well as regular bleeding of the system, to maintain its effectiveness.

Figure 67 Ex. Expansion Tank

4.2.1.6.8 Perimeter Heating

Space heating/perimeter heating in the building is provided using a combination of radiant panels (e.g. swimming pool area) and hydronic baseboard heaters (e.g. multipurpose room on the lower floor). They are the original units from 1985.

Except for the control valve, a hydronic baseboard heater and hydronic radiant panels typically last 50+ years. They typically are being replaced due to their outdated look. A control valve's typical service life expectancy is between 10 to 15 years.

MH believe the radiant panels and the hydronic baseboard heaters are designed based on high-temperature HWS. These design will prevent the condensing boilers from condensing when the outdoor air temperature is close to winter design, thus reducing the efficiency of the system.

Figure 68 Radiant Panes and Hydronic Base Board Heaters

4.2.1.7 Air/Ventilation System

Most of the building ventilation is provided by four AHUs located in the block B mechanical room and block A mechanical room. Following are the list of the AHUs:

4.2.1.7.1 AHU-1 - Mechanical Room Block B

AHU-1 (Mark Hot) provides ventilation for the swimming pool area. The unit has a design flow rate of 14 000 L/s. The unit is equipped with an Alphair 2000 A.P. (7.5 hp) return air fan (RF-1), a heating coil, and a mixing box. The AHU-1 is not equipped with a dehumidifier as commonly found in modern pool AHUs. The unit is the original unit from 1985. Typical service life expectancy of an indoor AHU is 35 years. None of the fans on AHU-1 are equipped with VFD, indicating that the system is running at constant flow.

Figure 69 AHU-1 & RF-1

A typical pool AHU serves additional functions in addition to the standard ventilation purposed:

1. Pool air dehumidification
   With no mechanical intervention, an indoor swimming pool will create a high humidity environment produced by the large boundary surface between the air and pool surfaces. The amount of evaporation in a swimming pool area depends on the following factors:
   a. Swimming pool surface area
   b. Water temperature
   c. Water feature (water fountain will create large air/water boundary surface, allowing for additional evaporation)

   The existing AHU-1 does not have a dedicated dehumidifier system. We believe the current system was designed to rely on OA as a method to dehumidify the pool room. This configuration has several drawbacks:
   a. The dehumidification capacity will depend on the outdoor air temperature and humidity. When the outdoor air temperatures air and humidity is high, the system might not have enough dehumidification capacity.
   b. Due to the reliance on the outdoor air for dehumidification, during the winter time, a significant heat will be required to heat up outdoor air for the dehumidification process.

   The lack of humidity control and dehumidification capacity of AHU-1 could be one of the reasons for all of the corrosion found in the building structures as mentioned in the mechanical section.

2. Chloramines concentration control
   Chlorine is used in pools and other chlorinated aquatic venues to kill germs, but when it binds to the body waste swimmers bring into pools (for example, sweat and urine) it can form chemicals called chloramines. Chloramines in the water, irritate skin, eyes, and the respiratory tract (including the nose)

when they off-gas from the water and into the air above, particularly indoors. In addition, chloramines can also contribute to corrosion of metals around the aquatic venue and in air handling systems.

Air handling systems might remove moisture from the air, but they don't necessarily bring in enough fresh air or exhaust enough air polluted with chloramines, especially during a cold weather day when the heating cost is high. If chloramines are not exhausted to the outside, then the re-circulated air flowing over the water can become loaded with chloramines.

3. Heating
   The AHU-1 was designed to provide space heating in addition to the radiant panels that were found in the swimming pool area.

4. Cooling
   The AHU-1 is not equipped with the cooling system.

4.2.1.7.2 AHU-2 - Mechanical Room Block B

AHU-2 (Mark Hot) provides ventilation for the auditorium area. The unit has a design flow rate of 8,400 L/s. The unit is equipped with an Alphair 2000 A.P. (7.5 hp) return air fan (RF-2), a heating coil, and a mixing box. The unit is the original unit from 1985. Typical service life expectancy of an indoor AHU is 35 years.

None of the fans of AHU-2 is equipped with VFD, indicating that the system is running at constant flow.

A DX cooling coil and condenser (on the roof) was added to the unit around 1997 (based on condenser manufacturing date) to provide cooling for the auditorium area.

Figure 70 AHU-2 and RF-2

Figure 71 AHU - 2 Condenser

The typical service life expectancy of a DX condenser is 20 years which means it has reached its end of service life. One of the unit sub-module is currently no longer operational.

4.2.1.7.3 AHU-3 - Mechanical Room Block B

AHU-3 (Mark Hot) provides ventilation for auditorium lobby, upper floor office, women's change room, men's change room, and pool lobby. The unit has a design flow rate of 1850 L/sand come with a heating coil and a mixing box. No cooling system was found in the unit. No VFD was found in the unit, inferring that the unit run at constant flow. The unit is the original unit from 1985. Typical service life expectancy of an indoor AHU is 35 years.

Figure 72 AHU-3

4.2.1.7.4 AHU-5 - Mechanical Room Block A

AHU-5 (Mark Hot) provides ventilation for multi-purpose rooms (Block B lower level). The unit has a design flow rate of 1870 L/sand come with a heating coil and a mixing box. No cooling system was found in the unit. No VFD was found in the unit, inferring that the unit run at constant flow. The unit is the original unit from 1985. Typical service life expectancy of an indoor AHU is 35 years.

Figure 73 AHU-5

4.2.1.7.5 Pool Lobby RTU

A Lennox RTU (KGA072S4BH2J) has been added to provide cooling for the Pool Lobby area (AHU-3 does not have cooling). The unit has a heating capacity of 44 kW and Cooling capacity of 20.5 kW. The unit is 3 years old and in a good condition. An RTU has a typical service life expectancy between 15 to 20 years.

Figure 74 Pool Lobby RTU

4.2.1.7.6 Lv. 2 Office Air Conditioner

A 7kW York D1EM024A06A rooftop air conditioner has been added approximately 15 years ago to provide cooling for level 2 office area. The typical service life expectancy of a rooftop AC is between 20 to 25 years. The system seems to be in fair condition considering the age of the equipment.

Figure 75 Lv.2 Office A/C

4.2.1.7.7 Gym HVAC

The Gym HVAC system is composed of a wall mounted split A/C with hydronic radiator/baseboard heater at the perimeter wall. The hydronic baseboard heater is original to the building while the Split A/C unit was installed to replace an existing fan coil unit due to service access issue. Typical service life expectancy of an A/C split units is 15 years.

Currently, there is no outdoor air ventilation provided for the Gym.

Figure 76 Gym's Split A/C unit

4.2.1.7.8 Exhaust System

Based on the existing mechanical drawing, the exhaust for the washroom in the building is provided by 3 bathroom fans located on the roof. MH was only able to locate two of the exhaust fans. Following are the list of the exhaust system in the building:

1. EF-2
   EF-2 (Green heck GB-9-4XQD) provide exhaust for the men’s and woman’s change room areas. Based on the mechanical drawing, the fan is supposed to have a design flowrate of 1248 L/s. Based on the fan manufacture specification, the fan will only have a flow rate of 1250 cfm (at 0.125 in.H2O (31 Pa). This means that the exhaust flow rate at the change room area has been cut by half from the design flow rate.

Figure 77 EF-2

The fan is the original fan from 1985.

2. EF-4
   EF-4 (Green heck GB-14-4) provide exhaust for the men's and woman's washroom at the Block B of the building. Based on the mechanical drawing, the fan is supposed to have a design flowrate of 520 L/s. Based on manufacturer specification, the fan should be able to produce the design flow rate. The fan is the original fan from 1985. Typical service life expectancy for roof mounted exhaust fan is 20 years.

3. EF-3
   Based on the mechanical drawing, EF-3 provides exhaust for the men's and woman's washroom on the lower level. MH was not able to locate the fan during the site assessment. MH expect that the fan is the original fan from 1985 and has passed its service life expectancy.

4. Level 1 Guard & First Aid Area – Shower
   A shower was located in the Level 1 Guard & First Aid Area. The shower room is not equipped with an exhaust which leads into a wet ceiling condition as shown in the picture below.

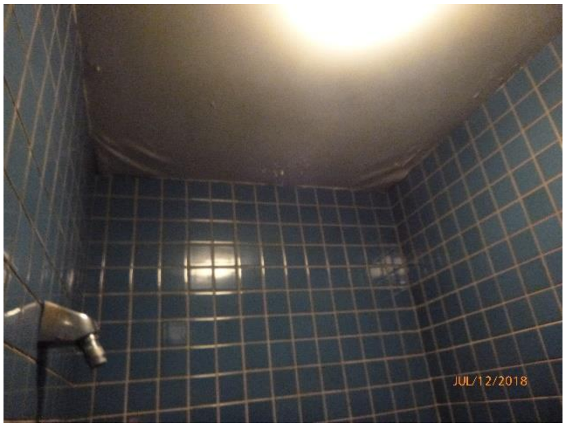


Figure 78 Level 1 Office Shower

4.2.1.7.9 DE Filter Room

Currently, the DE filter room is equipped with a small wall-mounted exhaust fan. MH believes the fan does not have the capacity to meet the minimum exhaust flowrate that is specified by ASHRAE 62.1 (210 L/s)

Figure 79 DE Filter Room Exhaust Fan

4.2.1.8 Mechanical Control System

The building mechanical system is controlled by a first generation Delta DDC system installed by Kimco Controls as shown in the picture below. The system is outdated but functional. It is missing a lot of features that are available in the current generation DDC system.


Figure 80 Existing DDC system

Some parts of the pool system is currently being controlled by a mechanical feedback loop. This type of control does not allow continuous monitoring and quick response from the operator.

4.2.1.9 Fire Sprinkler System

The building is not equipped with a fire sprinkler system.

4.2.2 Recommendations

Below is a summary of Mechanical recommendations and order-of-magnitude costs:

Priority Criteria:
Priority 0 – Remedy Immediately
Priority 1 – End of Expected Service Life, Monitor
Priority 2 – Fix within 1 to 3 years
Priority 3 – Fix within 5 years
Priority 4 – Client Discretion

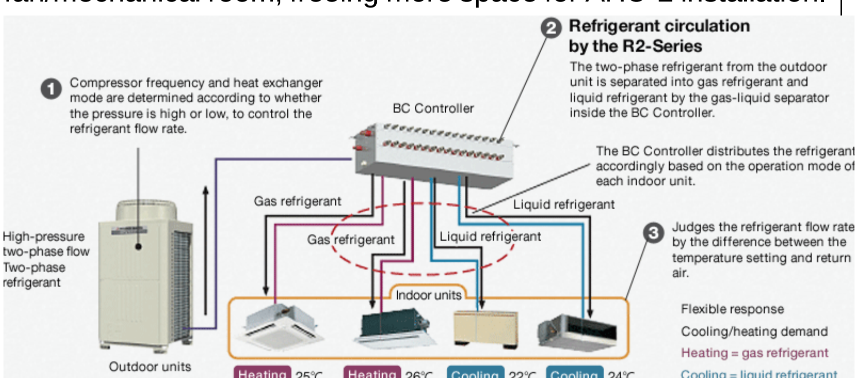
No	Recommendation	Priority	Budgetary Cost
1.	**Domestic Water System** Replace domestic water piping (DCW, DHW, DHWR) at the end of service life (2020). MH recommends stainless steel pipe for DCW, DHW and DHWR main replacement and PEX pipe for the branches. MH also recommends the use of Caleffi THERMOSETTER™ Thermal Balancing Valve to regulate the DHWR flowrate to achieve stable DHW temperatures. 	3	$ 300,000.00
2.	**Domestic Water System** Replace DHWR pump with a VFD pump such as the Grundfos Alpha 2 series. The pump will modulate the flow rate based on the pressure, set up by the Caleffi THERMOSETTER™ Thermal Balancing Valve. The setup will reduce energy use of the domestic hot water system 	3	$ 3,400
3.	**Domestic Water System – Plumbing Fixtures - Optional** Replace existing toilet and urinals with low flow toilet and urinal to reduce water usage. Replace existing flush valves with automatic (hand free) flush valves to increase hygiene and cleanliness	4	$ 40,000

			
4.	**Domestic Water System – Plumbing Fixtures - Optional** Replace existing lavatories faucet with automatic low flow (hand free) faucet. This upgrade will save water & energy usage and increase the hygiene. 	4	$ 17,000
5.	**Domestic Water System – Code Compliance** Provide RPBA for ice machine as per CSA B64	0	$ 1,000
6.	**Pool System** Replace 25m pool's main circulator pump with a new pump.	3	$ 25,000
7.	**Pool System** Replace wading pools fountain re-circulation pump with a new pump.	3	$ 5,000
8.	**Pool System** Replace wading pool heat exchanger with new. Heat exchanger size should take into account lower HWS temperature.	3	$ 10,000
9.	**Pool System** Replace whirlpool's main circulator pump with a new pump.	3	$ 7,500
10	**Pool System** Replace whirlpool's hydro air pump with a new pump.	3	$ 7,500

11.	**Hydronic System** The main hydronic heating loop pumps have passed their service life expectancy. Replace the two main hydronic circulator pumps with VFD pumps. This will allow the main heating loop flowrate to vary based on the heating demand, thus saving the pumping energy. 	2	$ 10,000
12	**Hydronic System** The radiant panel loop pump has passed their service life expectancy. Replace radiant panel heating loop with VFD pump. This will allow the radiant panel loop flowrate to vary with the heating demand, thus saving the pumping energy.	3	$ 4,500
13.	**Hydronic System** Replace pools heat exchanger pumps (source side) with VFD pump, to allow for variable flow through the heat exchangers. This upgrade will reduce the pumping energy use and allow for better temperature control.	2	$ 6,000
14.	**Hydronic System** Replace hydronic expansion tank with bladder type/diaphragm expansion tank. 	1	$ 7,000
15.	**Hydronic System - Optional** Replace the existing hydronic baseboard heater with low-temperature perimeter hydronic heaters such as Jaga Strada (radiator) or Jaga Briza (wall mounted fan coil). This upgrade will allow the existing condensing boiler to condense and increase the heating system efficiency.	4	60,000

16.	**Hydronic System - Optional** Replace the existing radiant panel with a low-temperature radiant panel such as Giacomini GK60 Metal Radiant Panel. This upgrade will allow the existing condensing boiler to condense and increase the heating system efficiency. 	4	$ 25,000
17.	**Air/Ventilation System – AHU-1** Replace AHU-1 with new indoor swimming pool AHU, complete with a de-humidification module (e.g. PoolPak MPK series). The dehumidification module of the new AHU-1 will be able to recover the heat from the dehumidification process to pre-heat the swimming pool water thus reducing the heating energy consumption. The new unit will be installed either on the roof above the swimming pool or on the ground outside the swimming pool wall. The de-humidification process will reduce the corrosion problems faced by the building. 	2	$ 550,000
18.	**Air/Ventilation System – AHU-2** Replace AHU-2 with new variable flow AHU with energy recovery core. The new AHU will come with a hydronic heating coil and a DX coil for cooling. A roof-mounted DX condenser will be replacing the existing DX condenser. The unit will be a modular unit that will be assembled on site to take account the limited service access route to the fan/mechanical room.	AHU:3; Condenser : 1	$ 300,000

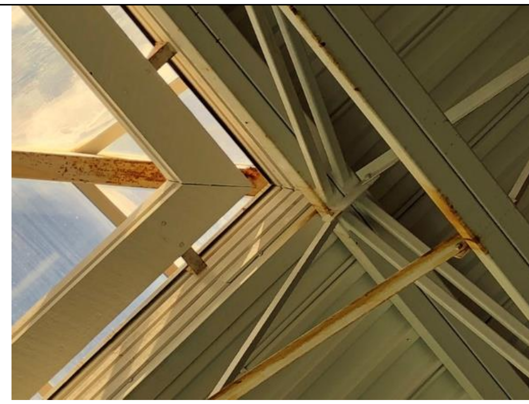
19.	**Air/Ventilation System – AHU-3 – Option 1** Replace AHU-3 with new variable flow AHU with energy recovery ventilator (ERV) core. The new AHU will come with a hydronic heating coil. The new unit can be specified with DX cooling coil and a roof-mounted DX condenser to provide cooling for the lobbies, change rooms, and the office area. With this configuration, EF-2 & EF-4 will no longer be needed and the heat from the washroom exhaust can be recovered to pre-heat the outdoor temperature during winter time. 12 new VAV box will be installed to provide temperature control for various HVAC zones. The New AHU-3 will also provide HVAC service for Gym area.	3	$ 130,000
20.	**Air/Ventilation System – AHU-3 – Option 2 (Recommended)** Replace AHU-3 with 3 medium size ERV units located inside the ceiling space (ventilation), combined with VRF DX Split Unit System (Heating and Cooling). Similar to the previous option 1, EF-2 & EF-4 will no longer be needed and the heat from the washroom exhaust can be recovered to pre-heat the outdoor temperature during winter time. During summer, the VRV split unit will provide cooling for the lobbies, change rooms, gym, and the office area. While during winter, the system can recover the heat from the internal zones to heat the perimeter zones. This configuration will not require any space inside the fan/mechanical room, freeing more space for AHU-2 installation.  	3	$ 120,000
21.	**Air/Ventilation System – AHU-5 – Option 1** Replace AHU-5 with new variable flow AHU with energy recovery ventilator (ERV) core. The new AHU will come with a hydronic heating coil.	3	$ 130,000

	The new unit can be specified with DX cooling coil and an outdoor DX condenser to provide cooling for the lower level/multipurpose room. With this configuration, EF-3 will no longer be needed and the heat from the washroom exhaust can be recovered to pre-heat the outdoor temperature during winter time. 6 new VAV box will be installed to provide temperature control for various HVAC zones.		
22.	**Air/Ventilation System – AHU-5 – Option 2 (Recommended)** Replace AHU-5 with an indoor ERV unit located in Block A mechanical Room (ventilation), combined with VRF DX Split Unit System (Heating and Cooling). EF-3 will no longer be needed and the heat from the washroom exhaust can be recovered to pre-heat the outdoor temperature during winter time. During the summer time, the VRV split unit will provide cooling. While during the winter, the system can recover the heat from the internal zones to heat the perimeter zones.	3	$ 120,000
23.	**Air/Ventilation System – First Aid Area – Shower Exhaust** Connect the shower room to the washroom exhaust duct network (EF-2).	0	Included in AHU-3
24.	**DE Room Exhaust** Provide and Install larger capacity exhaust fan for DE Room.	0	$ 750
25.	**Mechanical Control System** Replace the outdated DDC control with the latest generation DDC control, c/w internet gateway to allow remote access for operational staff. Expand DDC control to include the swimming pool control system.	3	$ 150,000
26.	**Fire Sprinkler System** Retrofit the building with a new fire sprinkler system. The new fire sprinkler system should meet NFPA 13 standard.	4	$ 150,000

4.3 Structural

The following observations describe the noted deficiencies in the structural components of the building. Typically the observations are limited to the building primary structural, however some deficiencies in the secondary structural elements and architectural components are included. We did not complete a building envelope review as part of the assessment, and so a review of the roof membrane and wall cladding was not part of the scope of work, yet general observations of these components have been included here for reference.

4.3.1 Observations

There is corrosion visible in the open-web steel joists (OWSJ) in the pool area roof structure. This is likely caused by condensation on the underside of the roof structure due to humidity from the pool.	
There is corrosion visible in the structural steel framing for the skylight above the pool area. This is likely caused by condensation on the underside of the roof structure due to humidity from the pool.	
There was corrosion at the base of the steel HSS columns in the pool area. The steel is at the same level as the pool deck and is exposed to splashing and ponding water from the nearby swimming pools.	

There is evidence of repairs to the suspended concrete slab in the pool deck area. The Operation Manager noted that repairs were completed in 2013 due prior corrosion and concrete deterioration, typically at the linear drains around the pools. Repair included removing 900 mm (3 ft) wide strips of the slab, and replacing it with new concrete. This was completed above the boiler room and the filter room.	
There was severe delamination of the concrete floor below the soda ash tank in the filter room. The concrete floor is not protected from spilling soda ash in this area.	
There were minor cracks observed in the concrete slab-on-grade at various locations. These were all found to be superficial and are not a structural concern.	

There were cracks observed in the concrete exterior wall above the door frame along the North wall.	
There were some cracks observed in the interior CMU walls. One location was in the stairwell adjacent to the pool area (Gridline F). There were also cracks noted in the CMU wall at the entrance to the men's locker room.	

There was paint bubbling in the inside surface of the exterior concrete walls in “Room 2”, at basement level along the North side of the building. This may indicated inadequate perimeter drainage and damp-proofing along the wall. Water may be accumulating outside the wall and seeping into cracks in the concrete.	
There was efflorescence, spalling, and deteriorated concrete observed at the base of columns in lower level at several locations. This may be caused by water accumulating below the slab-on-grade, and hydrostatic pressure forcing the water up to damage the concrete above.	
There was efflorescence and staining in the concrete wall in the diatomaceous earth (DE) room opposite the pool at basement level. The water from the pool appears to be seeping through cracks in the concrete wall in some areas.	
There was corrosion observed on the water side of pool surface, typically at the level of the pool perimeter drains. According to the SASCU Operations Manager this was first observed in 2015. The pool is emptied every 2 years, and the concrete has been repaired locally during these maintenance periods. This was last completed in 2017.	

The steel guardrail at the stairs in the filter room is severely corroded at the connection to the wall.	
The steel channel supporting the expansion tank is visibly deflecting. The channel may not be adequately sized to support the weight of the full tank.	
There was corrosion noted at the steel base plate for the pool diving board.	

The wearing surface coating on the concrete slab in the pool storage room was delaminated and there was ponding water in this area.	
There was efflorescence in the CMU wall at the swimming pool storage area. This may be caused by humidity and condensation within the room.	
There are sagging ceiling tiles in the pool lobby area. The Operations Manager noted this was caused by an air-conditioning unit that had been leaking. The AC unit has been decommissioned but is still in place within the ceiling space.	

The ceiling in the administration office shower is sagging. This is likely caused by humidity in the showers and potentially inadequate ventilation. It is not a structural concern.	
There is corrosion at the base of the metal door frames in the administration offices. This is likely caused by humidity and water being brought into this office area from the pools.	
The Operations Manager noted that the roof membrane is original to the building and is more than 30 years old.	
There was extensive corrosion on the metal flashing below the boiler exhaust vent on the roof.	

There was corrosion observed on one of the large metal roof vents.	
There is vehicle damage to the metal wall cladding in some areas, particularly along the North wall of the auditorium. The damage may create cracks and hole where water could enter behind the cladding.	
The subgrade insulation around the perimeter foundation walls is exposed in several areas. The surface coat over the insulation is cracked and spalling.	

4.3.2 Recommendations

Below is a summary of Structural recommendations and order-of-magnitude costs:

Priority Criteria:
Priority 0 – Fix immediate
Priority 1 – Fix within 1 year
Priority 2 – Fix within 1 to 3 years
Priority 3 – Fix within 5 years
Priority 4 – Client Discretion

No	Recommendation	Priority	Budgetary Cost
1.	Repair steel at skylights and open-web steel joists in pool roof structure. It is expected these repairs can be performed locally and will not require full replacement of the structural elements. However, the extent of the corrosion would need to be confirmed once the repairs have begun.	0	$65,000
2.	Repair base of steel columns in pool area.	0	$15,000
3.	Repair concrete floor at soda ash tank and provide protective covering.	0	$8,000
4.	Monitor cracks in slab, concrete walls, and CMU walls to confirm that there is no further deterioration. No repair action is needed at this time.	0	$0
5.	Conduct a drainage study for the facility, considering observed issues with water ingress at perimeter walls and basement columns. An allowance for future improvement to the building perimeter drainage and site drainage has been provided for this item.	1	$250,000
6.	Perform thorough repairs to the swimming pool concrete surfaces, particularly at perimeter drains and at walls to lower level mechanical rooms.	1	$35,000
7.	Repair the steel guardrails in the lower level mechanical rooms.	0	$20,000
8.	Replace the steel channel supporting the expansion tank and provide properly engineered supports.	0	$3,000
9.	Repair the steel base support for the diving board, or replace the entire assembly.	0	$2,000
10.	Repair the floor surfaces in the swimming pool and adjacent rooms.	0	$8,000
11.	Replace the ceiling tiles in the lobby area	1	$2,000
12.	Replace the ceiling in the pool office shower, after ventilation issues have been addressed.	1	$1,000

13.	Replace the metal door frames in the pool office area, after floor drainage has been improved in the area.	1	$4,000
14.	Replace the roof membrane for the building. Repair soffits and replace skylights.	2	$900,000
15.	Repair flashing at boiler roof vent. Provide metal with sufficient coating to protect from future damage.	1	$2,000
16.	Replace the damaged and corroded vents on the roof.	1	$4,000
17.	Locally repair damaged metal wall cladding.	1	$30,000
18.	Repair subgrade insulation and provide protective covering.	1	$10,000

5. OPTION ANALYSIS AND SUMMARY

The table below summarizes the potential upgrades identified in respect to the architectural options:

Option 0: Continue operating as is
Option 1: Expand aquatic areas
Option 2: Relocate aquatic areas
Option 3: New facility

Upgrade Legend:

R = Recommendation Required in option
MR = Modification of recommendation Required in option
NR = Recommendation Not Required / obsolete in option
O = Recommendation Optional

Priority Criteria:

Priority 0 – Remedy Immediately
Priority 1 – Fix within 1 year (Structural); End of Service Life, Monitor (Mechanical & Electrical)
Priority 2 – Fix within 1 to 3 years
Priority 3 – Fix within 5 years
Priority 4 – Client Discretion

Discipline	**Item No.**	**Priority**	**Option 0**	**Option 1**	**Option 2**	**Option 3**	**Notes**
ELEC 4.1.2	1. Arc Flash Calculation and installation of stickers/labels.	4	O	O	O	O	
	2. GFCI Breakers for pools	4	O	MR	MR	R	
	3. Tamper Proof Receptacle Upgrade	4	O	MR*	MR*	R	*Only required for areas of new work
	4. Upgrade all lighting to LEDs	4	O	O	O	O	
	5. Upgrade all controls to be ASHRAE compliant	4	O	MR*	MR*	R	*Only required for areas of new work

Discipline	Item No.	Priority	Option 0	Option 1	Option 2	Option 3	Notes
	6. Upgrade all exit signs to Green Running man style	4	O	MR*	MR*	R	*Only required for areas of new work
	7. Install new Auditorium controls system	4	O	O	O	O	
	8. Replace all cables with FT6 type	4	O	MR*	MR*	R	*Only required for areas of new work
	9. Demolish End-of-line Resistor boxes	4	O	O	O	O	
	10. Install 2x additional pullstations c/w FA verification	4	O	MR*	MR*	O	*Only required for areas of new work
MECH 4.2.2	1. Replace domestic water piping (DCW, DHW, DHWR) at the end of service life (2020)	3	R	R	R	NR*	* Complete new system will be required for new building
	2. Replace DHWR pump with a VFD pump such as the Grundfos Alpha 2 series.	3	R	R	R	NR*	* Complete new system will be required for new building
	3. Replace existing toilet and urinals with low flow toilet and urinal to reduce water usage	4	O	O	O	NR*	* Complete new system will be required for new building
	4. Replace existing lavatories faucet with automatic low flow (hand free) faucet	4	O	MR	MR	NR*	* Complete new system will be required for new building
	5. Provide RPBA for ice machine as per CSA B64	0	R	R	R	NR*	* Complete new system will be required for new building
	6. Replace 25m pool's main circulator pump with a new pump	3	R	MR	NR*	NR*	* Complete new system will be required for new building
	7. Replace wading pools fountain re-circulation pump with a new pump.	3	R	MR	NR*	NR*	* Complete new system will be required for new building

Discipline	Item No.	Priority	Option 0	Option 1	Option 2	Option 3	Notes
	8. Replace wading pool heat exchanger with new. Heat exchanger size should take into account lower HWS temperature.	3	R	MR	NR*	NR*	* Complete new system will be required for new building
	9. Replace whirlpool's main circulator pump with a new pump	3	R	MR	NR*	NR*	* Complete new system will be required for new building
	10. Replace whirlpool's hydro air pump with a new pump	3	R	MR	NR*	NR*	* Complete new system will be required for new building
	11. Replace the two main hydronic circulator pumps with VFD pumps	2	R	MR	MR	NR*	* Complete new system will be required for new building
	12. Replace radiant panel heating loop with VFD pump	3	R	MR	MR	NR*	* Complete new system will be required for new building
	13. Replace pools heat exchanger pumps (source side) with VFD pump	2	R	MR	MR	NR*	* Complete new system will be required for new building
	14. Replace hydronic expansion tank with bladder type/diaphragm expansion tank	1	R	R	R	NR*	* Complete new system will be required for new building
	15. Replace the existing hydronic baseboard heater with low-temperature perimeter hydronic heaters	4	O	O	O	NR*	* Complete new system will be required for new building
	16. Replace the existing radiant panel with a low-temperature radiant panel	4	O	O	O	NR*	* Complete new system will be required for new building
	17. Replace AHU-1 with new indoor	2	R	MR	MR	NR*	* Complete new system will be

Discipline	Item No.	Priority	Option 0	Option 1	Option 2	Option 3	Notes
	swimming pool AHU, complete with a de-humidification module						required for new building
	18. Replace AHU-2 with new variable flow AHU with energy recovery core	3/1	R	R	R	NR*	* Complete new system will be required for new building
	19. Replace AHU-3 with new variable flow AHU with energy recovery ventilator (ERV) core	3	R	R	R	NR*	* Complete new system will be required for new building
	20. Replace AHU-3 with 3 medium size ERV units located inside the ceiling space (ventilation), combined with VRF DX Split Unit System (Heating and Cooling)	3	R	R	R	NR*	* Complete new system will be required for new building
	21. Replace AHU-5 with new variable flow AHU with energy recovery ventilator (ERV) core	3	R	R	R	NR*	* Complete new system will be required for new building
	22. Replace AHU-5 with an indoor ERV unit located in Block A mechanical Room (ventilation), combined with VRF DX Split Unit System (Heating and Cooling)	3	R	R	R	NR*	* Complete new system will be required for new building
	23. Connect the shower room to the washroom exhaust duct network	0	R	R	NR	NR	
	24. Provide and Install larger capacity exhaust fan for DE Room	0	R	R	NR*	NR*	* Complete new system will be required for new building
	25. Replace the outdated DDC control with the latest	3	R	R	R	NR*	* Complete new system will be required for new building

Discipline	Item No.	Priority	Option 0	Option 1	Option 2	Option 3	Notes
	generation DDC control						
	26. Retrofit the building with a new fire sprinkler system	4	O	R	R	NR*	* Complete new system will be required for new building
STRUC 4.3.2	1. Repair steel at skylights and open-web steel joists in pool roof structure	0	R				
	2. Repair base of steel columns in pool area	0	R				
	3. Repair concrete floor at soda ash tank and provide protective covering.	0	R				
	4. Monitor cracks in slab, concrete walls, and CMU walls to confirm that there is no further deterioration.	0	R				
	5. Conduct a drainage study for the facility, considering observed issues with water ingress at perimeter walls and basement columns	1	R				
	6. Perform thorough repairs to the swimming pool concrete surfaces, particularly at perimeter drains and at walls to lower level mechanical rooms.	1	R				
	7. Repair the steel guardrails in the	0	R				

Discipline	Item No.	Priority	Option 0	Option 1	Option 2	Option 3	Notes
	lower level mechanical rooms.						
	8. Replace the steel channel supporting the expansion tank and provide properly engineered supports.	0	R				
	9. Repair the steel base support for the diving board, or replace the entire assembly.	0	R				
	10. Repair the floor surfaces in the swimming pool and adjacent rooms.	0	R				
	11. Replace the ceiling tiles in the lobby area	1	R				
	12. Replace the ceiling in the pool office shower, after ventilation issues have been addressed.	1	R				
	13. Replace the metal door frames in the pool office area, after floor drainage has been improved in the area.	1	R				
	14. Replace the roof membrane for the building. Repair soffits and replace skylights.	2	R				
	15. Repair flashing at boiler roof vent. Provide metal with sufficient coating to protect from future damage.	1	R				

Discipline	Item No.	Priority	Option 0	Option 1	Option 2	Option 3	Notes
	16. Replace the damaged and corroded vents on the roof.	1	R				
	17. Locally repair damaged metal wall cladding.	1	R				
	18. Repair subgrade insulation and provide protective covering.	1	R				

Additional Considerations:

1. Electrical

    a. With option 2, the new building would have to be examined to determine whether electrical/communications/fire alarm systems would need to be connected

2. Mechanical

    a. With option Option 2 and Option 3, the new building will require new HVAC, Plumbing and Fire Protection.

    b. With Option 1, a hydronic heating system upgrade will likely be require to provide additional heating capacity

    c. With Option 2, the existing hydronic heating system will likely be overcapacity. The new building will require new heating system. Other option, small district energy system.

    d. With Option 3, a complete new heating system will be required. The new boilers and hot water tank can be re-used.

6. CLOSING

Morrison Hershfield has completed the building condition assessment for SASCU Recreation Centre in Salmon Arm. We find that the facility should be suitable for future use, provided the noted building deficiencies are addressed in accordance with the descriptions and recommendations provided in this report.

Thank you for entrusting Morrison Hershfield with providing this assessment and report. We endeavor to support our clients with services and solutions that effectively meet their needs. We trust that this report has provided the details that are needed to make informed decisions regarding the future of this facility. Please contact us if Morrison Hershfield can be of assistance in the next stages of the project.

Sincerely,

Morrison Hershfield Limited

Matthew Yim, P.Eng. Mechanical Engineer	Jose Luis Lopez, P.Eng. Electrical Engineer	Jeremy Hapchina, P.Eng. Structural Engineer

8.5 Massing Energy Model Report

REPORT

Salmon Arm Recreation Campus Redevelopment

Energy Model Report Rev.1

Salmon Arm. BC

Report No. 1804440.Rev1 April 25, 2019

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1. BACKGROUND

The City of Salmon Arm has engaged HCMA to provide planning for redeveloping the existing Salmon Arm Recreation Centre in Salmon Arm, BC. Two massing options are considered for redevelopment, which include renovating the existing facility, developing additions to the existing buildings, and developing new buildings. Morrison Hershfield has created two energy models – one model for each massing option – to analyze and compare the long-term energy implications of potential design alternatives between each of the two massing options. The intent of this report is to outline the results of the energy analysis.

For massing option A, the project is approximately 6,175 m^2, consisting primarily of a renovated aquatic centre along with an aquatic addition, a regulation-size gymnasium to replace existing racquetball courts, a renovated performing arts auditorium, and a new fitness facility. For massing option B, the facility is approximately 7,830 m^2, consisting primarily of a new aquatic centre addition with fitness on the upper level, an existing aquatic centre renovated into a non-regulation-size gymnasium and multi-purpose spaces, and a renovated performing arts auditorium. Models are shown below in Figure 1.

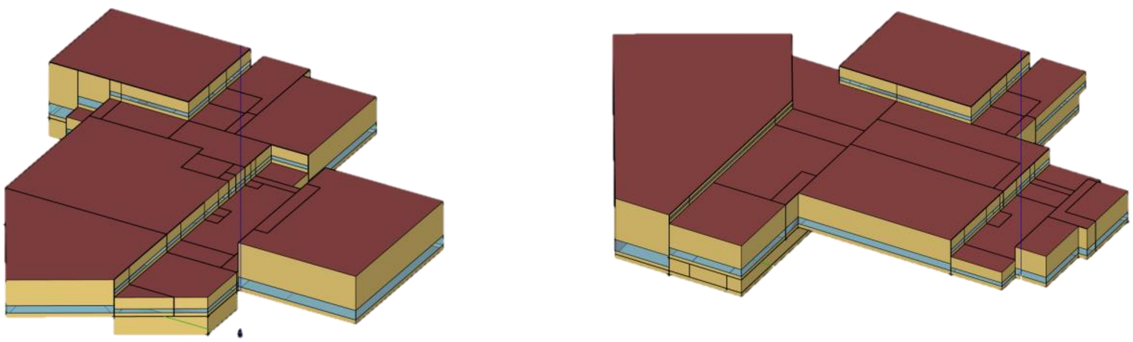

Figure 1: Screenshot of Models for Massing Option A (left) and Massing Option B (right)

The potential design options considered in the analysis include variations on the following 8 parameters:

- Lighting Power Density
- Wall effective R-value
- Roof effective R-values
- Window U-value
- Window SHGC
- Window-to-wall ratio
- Outdoor air economizer
- Heat recovery

The design information available at the time of conducting the analysis included preliminary architectural drawings for each of the two massing options and discussions with the design team. Inputs and assumptions used in the energy model are described in more detail in Appendix A.

2. RESULTS

A set of design options was chosen as “base case” and a summary of the results for each massing option is shown below in Table 1. The chosen design options are as follows:

- LED lighting, estimated at 20% savings over NECB 2015 Lighting Power Density
- Wall effective R-value of R-5 (RSI-0.88), estimated based on curtain wall assemblies with backpan insulation and spray foam, and some interior insulated concrete
- Roof effective R-value of R-31 (RSI-5.50), estimated based on approximately 6” of rigid insulation entirely above deck
- Window U-value of U-0.38 (USI-2.16), estimated based on a thermally broken, double glazed with aluminum frame system
- Window SHGC of 0.35
- Window-to-wall ratio of 20%
- Use of outdoor air economizer
- Use of heat recovery at 70% sensible heat recovery effectiveness and 65% latent heat recovery effectiveness

Ideal air loads systems are modeled; this is essentially a 100% efficient mechanical system serving heating and cooling loads with no efficiency accounted for. This is a useful mechanism to compare early designs prior to mechanical systems, heating/cooling plant efficiencies, fan power, pump power, and so on being selected. The anticipated energy use in future design will depend on these choices as the design develops. Heating, pool heating, and domestic hot water are assumed to be natural gas, and other end uses are assumed to be electric. Heating and cooling plants efficiencies are accounted for and are assumed to be a natural gas boiler at 90% efficiency and an electric chiller with a COP of 3.5, respectively.

Table 1: Summary of Energy Modelling Results for each Massing Option

Massing Option	Electricity (GJ)	Natural Gas (GJ)	Annual Energy (GJ)	Annual Energy Cost ($)*	Floor Area (m^2)	EUI (kWh/m^2)
Option A**	2,443	8,165	10,608	$150,830	6,175	477.3
Option B**	2,760	8,639	11,399	$165,438	7,830	404.3

*assumes $0.12/kWh of electricity and $8.5/GJ of natural gas

**uses ideal air loads model for comparison only, actual anticipated energy use will vary as this does not account for fans, pumps, or other HVAC end uses, but instead compares loads for the two massing options. Heating and cooling plants efficiencies are accounted for and are assumed to be a natural gas boiler at 90% efficiency and an electric chiller with a COP of 3.5, respectively.

While massing option B shows an overall higher annual energy use compared to massing option A, the EUI is significantly lower due in part to a larger building floor area. Also, option A has an additional hot tub compared with option B (an energy intensive use), whereas option B contains additional gymnasium space, multi-purpose areas, squash courts, and aquatic centre space. These spaces have lower energy intensity than the pool areas, allowing option B to spread pool energy use over a larger area, leading to reduced EUI despite higher energy use. Currently for approximately 27% additional floor area, loads have increased only 7.5%, due to the high concentration of process loads for the pool.

Note that out of the total natural gas energy use reported in Table 1, water systems energy use represents about 761 GJ of natural gas annually for massing option A, and about 835 GJ of natural gas annually for massing option B.

3. ANALYSIS

Various potential design scenarios were investigated based on the design alternatives considered. The evaluated design options are listed below:

- Lighting Power Density:
    - NECB 2015 Lighting Power Density
    - LED lighting, estimated at 20% savings over NECB 2015 Lighting Power Density
- Wall effective R-values:
    - R-5 (RSI-0.88), estimated based on curtain wall assemblies with backpan insulation and spray foam, and some interior insulated concrete
    - R-10 (RSI-1.76), estimated based on sandwich panel assemblies, some exterior-insulated steel stud with girts and metal panels, and some interior insulated concrete
    - R-15 (RSI-2.64), estimated based on exterior-insulated assemblies with thermally efficient clip system
- Roof effective R-values:
    - R-25 (RSI-4.40), estimated based on approximately 5” of rigid insulation entirely above deck
    - R-31 (RSI-5.50), estimated based on approximately 6” of rigid insulation entirely above deck
    - R-40 (RSI-7.04), estimated based on approximately 8” of rigid insulation entirely above deck
- Window U-value:
    - U-0.38 (USI-2.16), estimated based on a thermally broken, double glazed with aluminum frame system
    - U-0.33 (USI-1.87), estimated based on a thermally broken, double glazed with non-metal frame system
    - U-0.25 (USI-1.42), estimated based on a thermally broken, triple glazed with non-metal frame system
- Window SHGC:
    - SHGC of 0.25
    - SHGC of 0.35
- Window-to-wall ratio:
    - 20% glazing
    - 40% glazing
    - 60% glazing
- Outdoor air economizer:
    - No economizer
    - Use of economizer
- Heat recovery:
    - No heat recovery
    - Use of heat recovery at 70% sensible heat recovery effectiveness and 65% latent heat recovery effectiveness

Morrison Hershfield analyzed the potential design alternatives using our interactive data visualization tool, the Building Energy Performance Map, which allows us to visually and quickly assess the impact of any combination of design options on specified metrics. In this case, to inform the design team on the long-term energy implications of design decisions for each of the two massing options, the examined metrics were peak space heating, peak space cooling, total electricity use, total natural gas use, total energy use, total energy cost, and EUI. All metrics are reported annually. A screenshot of the tool is shown in Figure 2, where each line represents one scenario, and each axis represents an input parameter or an output. The location where the lines cross the axes corresponds to the value of that parameter or output for the given simulation.

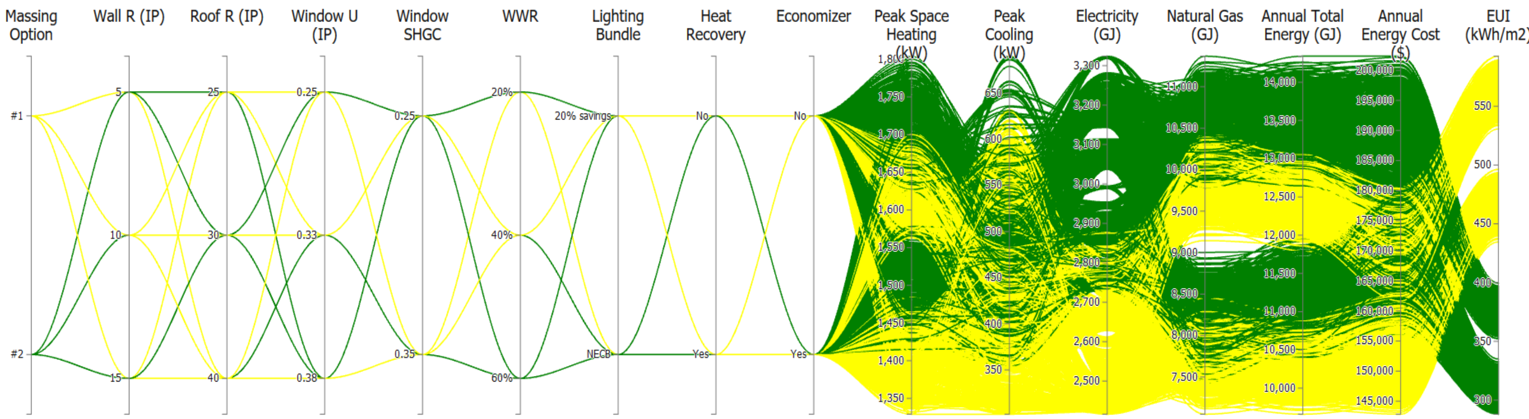

Figure 2: Simulation Results Summarized in Performance Mapping Tool

For the following subsections, which summarize the findings from the parametric analysis, one of the design parameters is varied while all others are kept at the values chosen for the “base case” scenario presented in the previous section, so that the relative impact of the various design options on each massing option can be assessed.

3.1 Envelope

Increasing the walls effective resistance to heat transfer to and from the outside has a positive impact on all reported metrics, with significant savings on natural gas from reduced heating loads of up to 7.7% and 8.9% for massing option A and B, respectively, using effective R-15 walls. Diminishing returns on improving the walls effective thermal resistance should be noted, as the savings are relatively higher going from effective R-5 to R-10 walls compared to going from R-10 to R-15 walls; at effective R-10 walls, the annual energy cost is reduced by 2.9% and 3.2% for massing option A and B, respectively, while the savings are correspondingly 4% and 4.4% at an effective R-15.

Although increasing the roofs effective resistance to heat transfer also has a positive impact on all reported metrics, the benefits are small compared to the impact of increasing the effective R-value of walls, at only 0.6% annual energy cost savings for both massing options A and B.

Increasing glazing area has a negative impact on all metrics as glazing generally has a lower heat transfer resistance compared to opaque areas. Also, increasing the window-to-wall ratio results in a significantly higher annual peak cooling load, at 12.1% and 12.7% higher for massing option A and B, respectively, at 40% glazing area. Using glazing with a lower solar heat gain coefficient would diminish this negative effect, however.

Using better performing double glazed windows shows an overall marginal improvement on annual energy cost, and the benefits of using triple glazed windows are also relatively small, at 0.9% annual energy cost savings for both massing option A and B. However, these results assume a glazing area of 20%. At 40% window-to-wall ratio, the annual total energy cost savings of using better performing windows amount to about double what is reported for 20% glazing area.

3.2 HVAC Operation

The economizer increases the outdoor air flow rate above the minimum outdoor air flow rate when there is a cooling load and the outdoor air temperature is below the zone air temperature, resulting in significantly lower annual peak cooling loads by 64.5% for massing option A and 29.4% for massing option B, as well as lower electricity use through a reduction in cooling load. However, using an economizer increases the heating load. Overall, as the price of electricity is about four times that of natural gas, using an economizer results in annual energy cost savings of 1% and 1.7% for options A and B, respectively.

Latent and sensible heat recovery can occur whenever the zone exhaust air conditions (enthalpy) is more favourable than the outdoor air conditions. The analysis shows heat recovery to be the most important design feature assessed that very significantly reduces annual energy use and annual energy cost for both massing options. With heat recovery, annual energy cost savings amount to 12.3% for massing option A and 12.2% for massing option B.

3.3 Lighting

Assuming a 20% lower lighting power density compared to NECB 2015 lighting levels through the use of LED lights results in significant annual energy cost savings of 4% and 5.4% for massing options A and B, respectively. The higher savings for massing option B are due to a larger building surface area. Decreasing lighting power density further, either through occupancy sensor or highly efficient LED, could allow additional energy cost savings through a decreased electricity use from a lesser cooling load.

3.4 Roof Mounted PV

Based on assumptions and calculations shown in Appendix B, it was estimated that a standard fixed roof mount photovoltaic (PV) system size of 274 kW and 333 kW could be installed for massing option A and B, respectively. These systems translate into an estimated annual energy production of about 1050 GJ and 1300 GJ for massing option A and B, respectively. The potential energy production represents potential savings of about 32% and 35% of annual electricity use (with an additional allowance for later detailed HVAC design to occur during DD) for massing option A and B, respectively.

3.5 Renovation of Existing Facility Envelope

The parametric analysis was repeated assuming, for each massing option, that the portions of envelope kept from the existing facility would ***not*** be renovated. The existing envelope has little glazing area, assumed to be U-0.38, and walls are assumed to be R-5 effective. For massing option A, the existing walls would amount to about 1100 m^2 or about a third of the total wall area, and about 2150 m^2 or about half of the total wall area for massing option B.

Overall, the results show very similar trends to what was emphasized in subsections 3.1 to 3.3, except for two notable differences. Firstly, increasing the wall effective R-value on only the new portions of the facility results in an overall lower wall effective R-value compared to what was presented in subsection 3.1, such that the positive impacts of this design option are lessened. Savings on natural gas from reduced heating loads are 5.7% and 5.4% for massing option A and B, respectively, using effective R-15 for new walls. Diminishing returns on improving the walls effective thermal resistance can still be noted, as the savings are relatively higher going from effective R-5 to R-10 for new walls compared to going from R-10 to R-15 for new walls; At effective R-10 for new walls, the annual energy cost is reduced by 2.2% and 1.9% for massing option A and B, respectively, while the savings are correspondingly 3% and 2.7% at an effective R-15 for new walls. Secondly, while increasing glazing area still has a negative impact on all metrics and still results in a significantly higher annual peak cooling load, the increase is lessened at 9.7% and 9.1% for massing option A and B, respectively, at 40% glazing area, due to an overall lower window-to-wall ratio as the existing facility as little glazing area.

3.6 ASHP/GSHP

The base case scenario was revisited replacing the gas boiler plant with an Air Source Heat Pump or a Ground Source Heat Pump. A summary of the energy modelling results are shown below in Table 2 and Table 3, where 10% of natural gas use compared to the base case scenario was assumed to account for the occasional need of using a gas boiler during peak demand times or pool refill. An ASHP with a COP of 2.5 and a GSHP with a COP of 4 were assumed.

Table 2: Summary of Energy Modelling Results with Air Source Heat Pump

Massing Option	Electricity (GJ)	Natural Gas (GJ)*	Annual Energy (GJ)	Annual Energy Cost ($)**	EUI (kWh/m²)	GHG Emissions ($kgCO_2e$)***
Option A	5,709	907	6,616	$198,011	297.7	64065
Option B	6,216	960	7,175	$215,346	254.5	68320

*assumes 10% of natural gas use compared to base case to account for peak demand times and pool refill.

**assumes $0.12/kWh of electricity and $8.5/GJ of natural gas.

***assumes emissions factor of 0.185 $kgCO_2eq$/kWh for natural gas and 0.011 $kgCO_2eq$/kWh for electricity.

Table 3: Summary of Energy Modelling Results with Ground Source Heat Pump

Massing Option	Electricity (GJ)	Natural Gas (GJ)*	Annual Energy (GJ)	Annual Energy Cost ($)**	EUI (kWh/m²)	GHG Emissions ($kgCO_2e$)***
Option A	4,484	907	5,391	$157,186	242.6	60323
Option B	4,920	960	5,880	$172,151	208.6	64360

*assumes 10% of natural gas use compared to base case to account for peak times demand and pool refill.
**assumes $0.12/kWh of electricity and $8.5/GJ of natural gas.
***assumes emissions factor of 0.185 $kgCO_2eq/kWh$ for natural gas and 0.011 $kgCO_2eq/kWh$ for electricity.

Overall, switching from a natural gas plant to an electric plant significantly reduces the total annual energy use. Another advantage of switching to an electric plant is a substantial decrease in greenhouse gases emissions due to a much lower emissions factor for electricity compared to natural gas; natural gas has a GHG emissions factor over 10 times that of electricity using the provincial Energy Step Code factors.

3.7 Benchmarking

Using the existing facility utility bills from 2018, a comparison was made with the energy modelling results for the base case scenario for each massing option. A summary of the results are shown below in Table 4. Note that the unit energy costs were calculated as yearly averages from the existing facility electricity and gas bills for 2018, respectively.

Table 4: Summary of Existing Facility Utility Bills for 2018 and Comparison with Energy Modelling Results for each Massing Option

Massing Option	Electricity (GJ)	Natural Gas (GJ)	Annual Energy (GJ)	Annual Energy Cost ($)	Floor Area (m^2)	EUI (kWh/m^2)
Existing	2,142	8,126	10,268	$114,439	3,888	733.5
Option A**	2,443	8,165	10,608	$122,696*	6,175	477.3
Option B**	2,760	8,639	11,399	$134,466*	7,830	404.3

*assumes $0.10/kWh of electricity and $7.10/GJ of natural gas. Unit energy costs were calculated as yearly averages from the existing facility electricity and gas bills for 2018, respectively.

The preliminary energy model uses an ideal air loads model developed for early comparisons of the different massing options and early exploration of major envelope decisions. The actual anticipated energy use will be larger than the results shown above, as the current preliminary model does not account for fans, pumps, or other miscellaneous loads, but instead compares loads for the two massing options. Fans and pumps might be expected to lead to approximately a 20-30% increase in energy use compared with the current modeled result. Heating and cooling plants efficiencies are accounted for and are assumed to be a natural gas boiler at 90% efficiency and an electric chiller with a COP of 3.5, respectively.

The current options show a significantly larger floor area and very similar total energy use compared with the existing building. The EUI of the proposed designs is expected to be reduced compared with the existing building, allowing a significant increase in space and programming with a much smaller increase in energy use than the increased area would suggest.

4. CLOSING

We trust the above information provides an evaluation of the long-term energy implications for each of the two massing options, as well as an assessment of the relative impact of various design options.

Please feel free to contact the undersigned with any questions or comments.

Sincerely,

Julien Schwartz, M.Eng.
Building Energy Consultant

Alex Blue, P.Eng., LEED AP BD+C
Principal, Building Energy Practice Lead

Appendix A: Model Inputs

Characteristic	Massing Option A	Massing Option B
Climate	Salmon Arm, BC, CWEC 2016 (ASHRAE Climate Zone 5)	
Building Area	6,174 m^2	9,972 m^2
Operating Hours	NECB Schedules: Schedule B for Pool area, Gymnasium, Fitness facility and related common spaces Schedule C for Auditorium, Meeting rooms and related common spaces	
Occupancy	NECB 2015 Occupant Density Auditorium, Meeting/Multi-purpose room: 5 m^2/person Pool area, Gymnasium, Fitness: 5 m^2/person Corridors, Storage: 100 m^2/person Locker room, Lobby: 10 m^2/person Electrical/Mechanical, Stairs: 200 m^2/person Offices, Kitchen: 20 m^2/person Washroom: 30 m^2/person	
	904 people total peak occupancy	1,029 people total peak occupancy
Plug loads	NECB 2015 Equipment Loads Auditorium: 2.5 W/m^2 Pool area, Fitness, Meeting/Multi-purpose room: 1 W/m^2 Gymnasium: 1.5 W/m^2 Corridors, Stairs: 0 W/m^2 Locker room: 2.5 W/m^2 Electrical/Mechanical, Lobby, Storage, Washroom: 1 W/m^2 Offices: 7.5 W/m^2 Kitchen: 10 W/m^2	
Outdoor Air	Auditorium, Locker room, Meeting/Multi-purpose room, Office, Storage: 5 cfm/person + 0.06 cfm/ft^2 Corridor, Stairs, Electrical/Mechanical: 0.06 cfm/ft^2 Fitness: 20 cfm/person + 0.06 cfm/ft^2 Gymnasium: 0.3 cfm/ft^2 Kitchen: 7.5 cfm/person + 0.12 cfm/ft^2 Pool area: 0.48 cfm/ft^2	

<table>
<tr>
<td rowspan="4">Interior Lighting</td>
<td colspan="2"><u>Design Option #1:</u> NECB 2015 Lighting Power Density
Auditorium, Storage: 6.8 W/m^2
Corridor: 7.1 W/m^2
Fitness: 7.8 W/m^2
Gymnasium: 13.0 W/m^2
Kitchen: 13.1 W/m^2
Lobby: 9.7 W/m^2
Locker room: 8.1 W/m^2
Electrical/Mechanical: 4.6 W/m^2
Meeting/Multi-purpose room: 13.3 W/m^2
Office: 12.0 W/m^2
Pool area: 9.8 W/m^2
Stairs: 7.4 W/m^2
Washroom: 10.5 W/m^2</td>
</tr>
<tr>
<td>Building overall 9.2 W/m^2</td>
<td>Building overall 8.1 W/m^2</td>
</tr>
<tr>
<td colspan="2"><u>Design Option #2:</u> LED lighting, estimated at 20% savings over NECB 2015 Lighting Power Density
Auditorium, Storage: 5.4 W/m^2
Corridor: 5.7 W/m^2
Fitness: 6.2 W/m^2
Gymnasium: 10.4 W/m^2
Kitchen: 10.5 W/m^2
Lobby: 7.8 W/m^2
Locker room: 6.5 W/m^2
Electrical/Mechanical: 3.7 W/m^2
Meeting/Multi-purpose room: 10.6 W/m^2
Office: 9.6 W/m^2
Pool area: 7.8 W/m^2
Stairs: 5.9 W/m^2
Washroom: 8.4 W/m^2</td>
</tr>
<tr>
<td>Building overall 7.4 W/m^2</td>
<td>Building overall 6.5 W/m^2</td>
</tr>
<tr>
<td>Infiltration</td>
<td colspan="2">0.25 L/s/m^2 of exterior area</td>
</tr>
<tr>
<td>Floor R-Value</td>
<td colspan="2">Slab-on-grade floors:
R-15 (RSI-2.64) for 24” vertical</td>
</tr>
</table>

Wall R-Value	***Design Option #1:*** R-5 effective (RSI-0.88) This is estimated based on curtain wall assemblies with backpan insulation and spray foam, and some interior insulated concrete ***Design Option #2:*** R-10 effective (RSI-1.76) This is estimated based on sandwich panel assemblies, some exterior-insulated steel stud with girts and metal panels, and some interior insulated concrete ***Design Option #3:*** R-15 effective (RSI-2.64) This is estimated based on exterior-insulated assemblies with thermally efficient clip system The effective R-value calculation accounts for thermal bridges such as from clips, girts, and parapets.
Roof R-Value	***Design Option #1:*** R-25 effective (RSI-4.40) This is based on approx. 5" rigid insulation entirely above deck ***Design Option #2:*** R-31 effective (RSI-5.50) This is based on approx. 6" rigid insulation entirely above deck ***Design Option #3:*** R-40 effective (RSI-7.04) This is based on approx. 8" rigid insulation entirely above deck
Window U-Value	***Design Option #1:*** U-0.38 (USI-2.16) This is based on a thermally broken, double glazed with aluminum frame system ***Design Option #2:*** U-0.33 (USI-1.87) This is based on a thermally broken, double glazed with non-metal frame system ***Design Option #3:*** U-0.25 (USI-1.42) This is based on a thermally broken, triple glazed with non-metal frame system

Window SHGC	***Design Option #1:*** SHGC 0.25 ***Design Option #2:*** SHGC 0.35
Window Area %	***Design Option #1:*** 20% ***Design Option #2:*** 40% ***Design Option #3:*** 60%
HVAC Systems	HVAC systems modelled as ideal units that mix air at the zone exhaust conditions with the specified amount of outdoor air and then adds or removes heat and moisture at 100% efficiency in order to produce a supply air stream at the specified conditions. Crawl spaces modelled as unconditioned ***Design Option #1:*** No economizer ***Design Option #2:*** With economizer (differential enthalpy control)
Heat Recovery	***Design Option #1:*** No heat recovery ***Design Option #2:*** With heat recovery (enthalpy control) at 70% sensible heat recovery effectiveness and 65% latent heat recovery effectiveness
Pumps	60 ft head for hot-water loop pump, and 60 ft heat for chilled-water loop. Variable speed pumping.
Chiller	Electric, COP 3.5
Boiler	Natural gas, 90% efficiency

Appendix B: Roof PV Assumptions and Calculations

Assumptions

Calculation according to	https://pvwatts.nrel.gov/
Module type	Standard
Array type	Fixed roof mount
Array tilt	50°
Array Azimuth	180°
System losses	14%
Inverter Efficiency	96%
DC to AC size ratio	1.1
module efficiency	15.6%

Option A

roof available area [m^2]	3352
DC System Size [kW]	274
Average Annual Solar Radiation [$kWh/m^2/day$]	3.90
Annual AC Energy [kWh]	294469
Annual AC Energy [GJ]	1060

Option B

roof available area [m^2]	4076
DC System Size [kW]	333
Average Annual Solar Radiation [$kWh/m^2/day$]	3.90
Annual AC Energy [kWh]	357877
Annual AC Energy [GJ]	1288

HCMA Architecture + Design
www.hcma.ca

Vancouver
400 - 675 West Hastings Street
Vancouver BC V6B 1N2 Canada

604.732.6620
vancouver@hcma.ca

Victoria
Suite 300, 569 Johnson Street
Victoria BC V8W 1M2 Canada

250.382.6650
victoria@hcma.ca