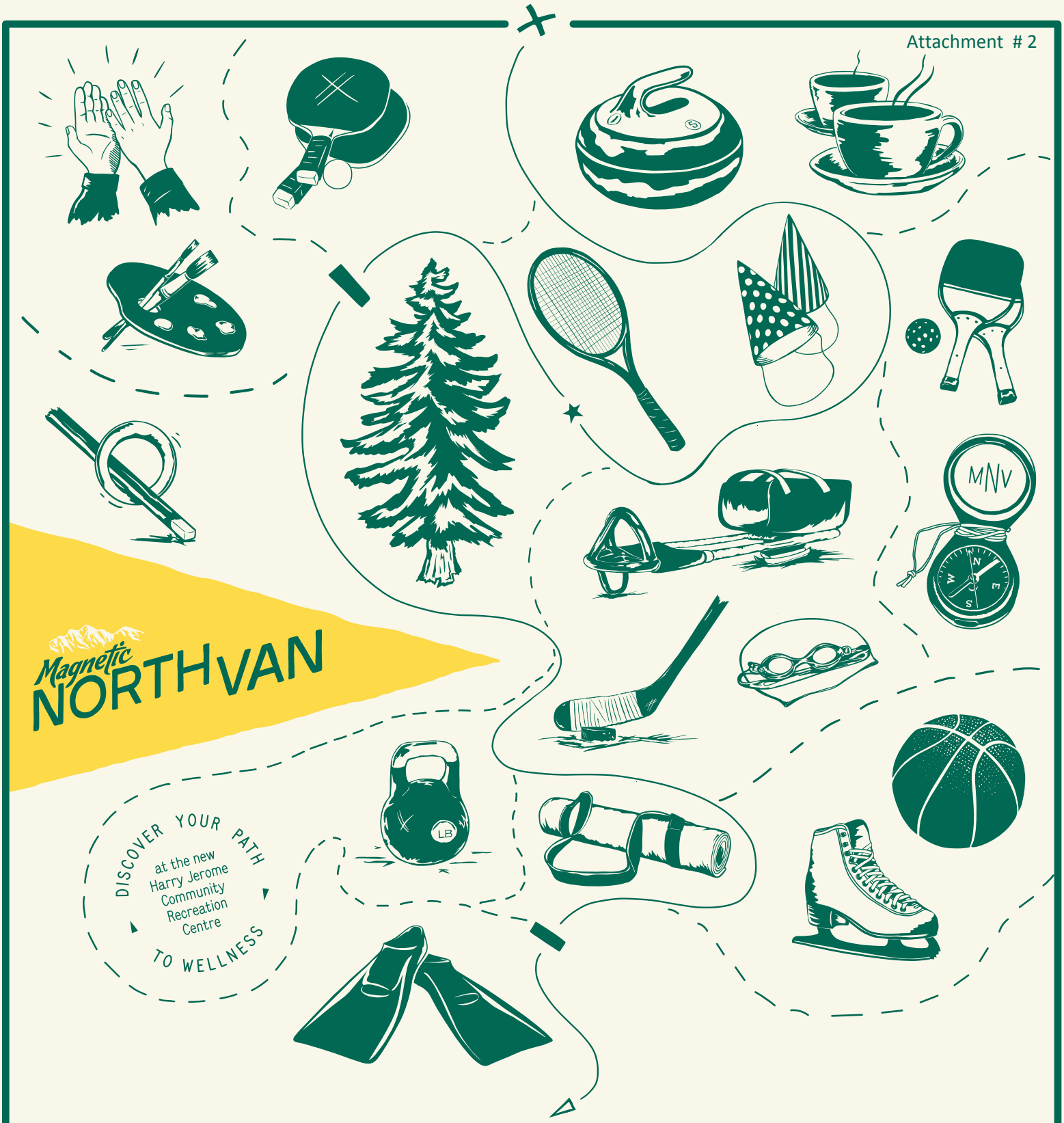

HARRY JEROME COMMUNITY RECREATION CENTRE
SCHEMATIC DESIGN REPORT

Issued | July 2018

Revision 1

city of north vancouver
North Vancouver Recreation & Culture
NEWLINE SKATEPARKS
HCMA Architecture + Design

"This project will dramatically impact our community for the good. I fully support this project and can't wait for it to open!"

Community Member
Community & Stakeholder Engagement

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PROJECT CONSULTANTS

ARCHITECTURAL

HCMA Architecture + Design

LANDSCAPE

PFS STUDIO
PLANNING • URBAN DESIGN • LANDSCAPE ARCHITECTURE

STRUCTURAL

Fast + Epp

MECHANICAL

AME Group
consulting mechanical engineers

ELECTRICAL

AES

CIVIL

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

SUSTAINABILITY

INTEGRAL GROUP

QUANTITY SURVEYOR

ROSS TEMPLETON + ASSOCIATES

SKATE PLAZA

NEWLINE SKATEPARKS
www.newlineskateparks.com

CODE

LMDG
Building Code Consultants Ltd

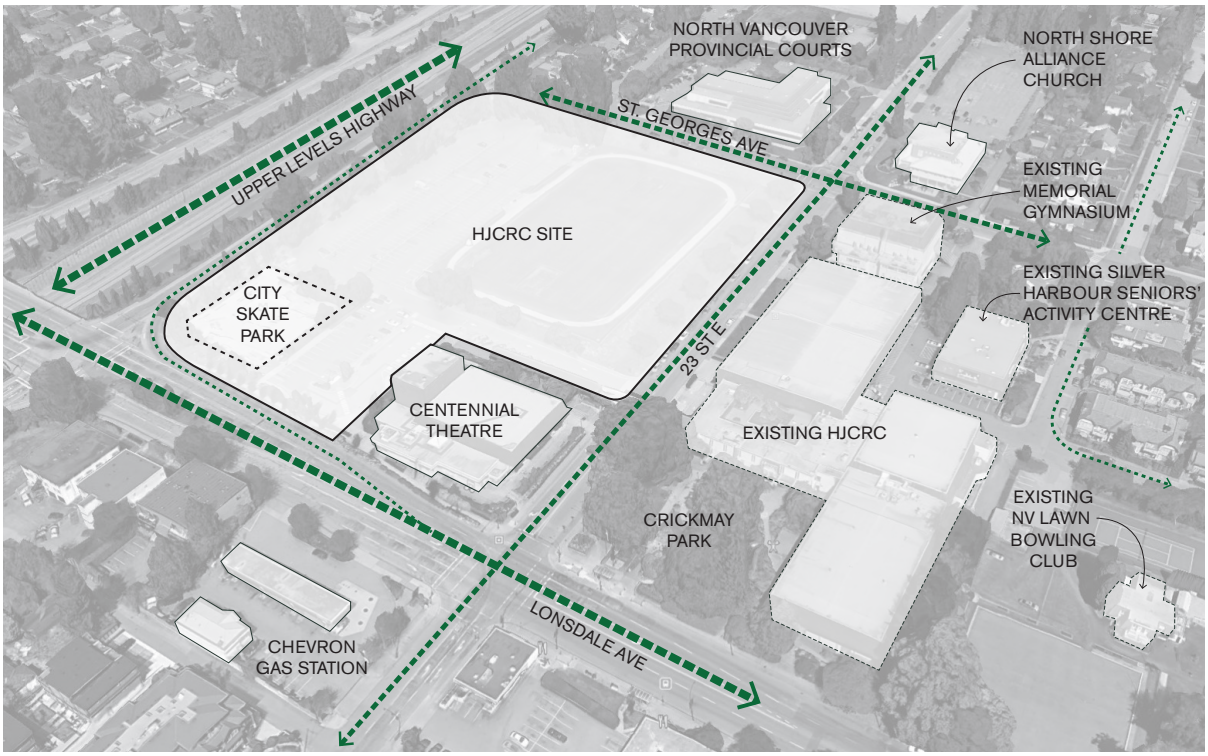
1.0 Executive Summary

1.0 Executive Summary

The City of North Vancouver engaged HCMA Architecture + Design to perform a schematic design study for a new Harry Jerome Community Recreation Centre (HJCRC) which is intended to replace the City's existing recreation facility. The new HJCRC will be constructed on the site located north of East 23rd Street between Lonsdale Avenue and St. Georges Avenue. The Centre is intended to be a focal point for the community; where residents and visitors of all ages and backgrounds come together to connect, experience, play, learn, socialize and celebrate.

This report documents 3 different concept options for a new community recreation facility that were developed as part of this project. Through extensive engagement with city staff, consultants, community and stakeholders, one of these concepts was selected and developed to schematic design level. The preferred design is described in more detail in section 3.0 of the report.

The work was completed between December 2017 to July 2018 with biweekly project development team meetings that included the design consultant group and staff representatives from various departments within the City of North Vancouver and the North Vancouver Recreation and Culture Commission (NVRCC). Beyond this working group, extensive engagement was employed to enhance the quality of the design solution. This engagement included Visioning workshops, Functional Programming sessions, Ideas Fair, Community Survey, Information Sessions, Skate Plaza engagement, and advisory bodies. This engagement provided feedback that helped establish the size, form and character of the building as well as its relationship to adjacent open space and surrounding neighbourhood.



The schematic design work occurred in parallel with a programming consultant to define the building program which included some of these main spaces. Aquatics, Gymnasium, Ice Arena, Curling, Fitness, Silver Harbour Seniors' Activity Centre, Multi-Purpose rooms, Children's area, Youth Centre, Active zone and more. As part of the design process, the below vision statement was developed, along with a series of principles, goals and strategies that define the project brief and can be used to guide future decision making as the project progresses.

THE VISION

"The Harry Jerome Community Recreation Centre will be a welcoming, vibrant, social heart of the community.
It will foster individual and collective wellness by providing opportunities to participate in a variety of organized and casual activities.
A beacon of pride in the community, the centre will reflect the unique identity and character of North Vancouver."

The selected site for the new HJCRC faced numerous constraints including a 10m grade change across the site, a large building program that fills most of the site, and limited options for vehicular site access. Following an extensive test-fit exercise, a building massing solution was agreed upon that had the greatest potential to achieve our project vision. This massing option was selected due to the following advantages:

- Integrated green space throughout building
- Create programmed outdoor spaces in courtyards
- Large animated day lit circulation space and opportunities for casual recreation
- Views to green courtyards from programmed space
- Partially covered skate plaza integrated into facility through both activity and unique landscape
- Aquatics prominence on Lonsdale

A number of key design strategies were used to help the facility be a good neighbor and responsive to its context while creating a welcoming and vibrant heart for the community. The key strategy was in breaking apart the massive building footprint and allowing ravine like nature, light and casual activity to pass through it. This strategy also helped to:

- Break down massing to establish neighbourhood scale on 23rd St.
- Establish key social spaces as anchors
- Maximize indoor – outdoor connections

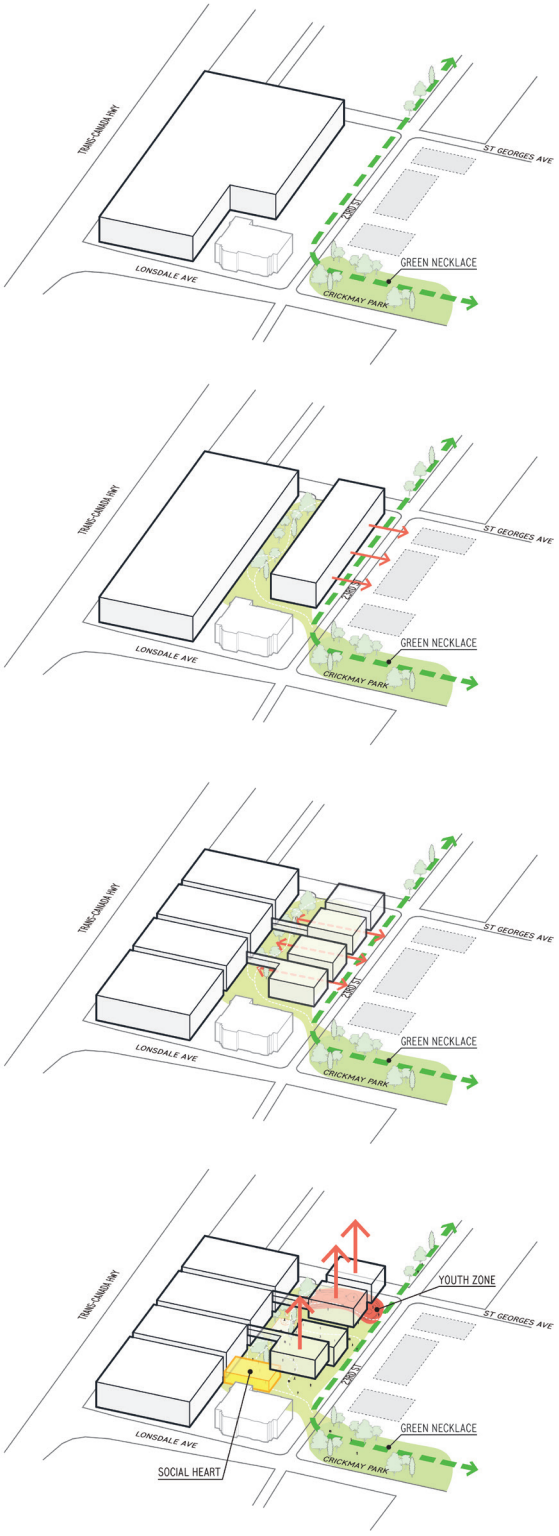
The building will also have a significant impact in the City's climate action plan as the existing Harry Jerome Community Recreation Centre is the largest contributor to the City's greenhouse gas emissions footprint. Despite a significant increase in size and services, the new HJCRC design will reduce GHG emissions by 60-70%. Other sustainable efforts include maximizing heat recovery on-site, extensive natural daylight, passive solar strategies, electric vehicle charging and maximizing water and rainwater re-use on site.

CAPITAL COSTING ANALYSIS

It is anticipated that the total project capital costs will be approximately $200.6 million based on a Class C cost estimate conducted in June 2018. The cost estimates have allowed for $15.7 million in contingencies and $16.6 million in escalation.

NEXT STEPS

The next stage in this process would see the project through detailed design and into construction. We would recommend considering hiring a construction manager at this point if it is the preferred construction delivery method.



2.0 Project Background

2.1 Functional Program

Developing the Functional Program for the proposed HJCRC was a separate process undertaken by Resource Planning Group Inc (RPG) with the City of North Vancouver and NVRCC. The following outline is a summary of their report.

48 programming sessions comprised of over **670** participant hours were held.

Programming sessions included the following external stakeholders:

- North Shore Aquatics Society: representing swim and diving clubs
- North Shore Sport and Recreation Council: representing arena clubs such as Minor Hockey, Wolf Pack, Ringette, Figure Skating, Lacrosse, Floor Hockey and the North Shore Curling Association
- North Vancouver Tennis Centre
- North Shore Pickleball Association
- Silver Harbour Seniors' Activity Centre

9 versions of the Functional Program document were created and circulated to the external and internal stakeholders involved to confirm the information compiled was accurate and reflective of the processes undertaken.

The area schedule on the opposite page describes a summary of the Functional Program.

WHAT IS BEING PLANNED IN THE NEW CENTRE?

Social spaces for gathering and casual activities

Aquatic Centre with pools, steam room and sauna

Fitness Centre

Gymnasiums

Silver Harbour Seniors' Activity Centre

Youth Centre

Spaces for children and their families

Multi-purpose rooms

Arts and cultural spaces

Arena with 500 spectator seats

Curling Facility

Food services

Outdoor sports courts

New skate plaza

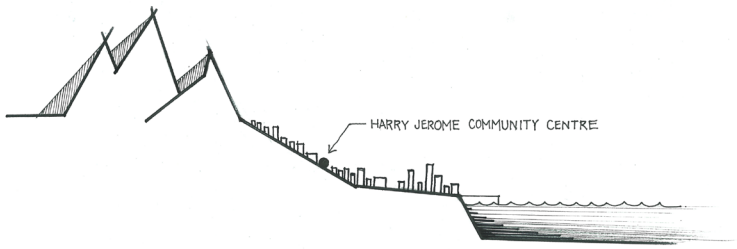
Underground parking

FUNCTIONAL PROGRAM AREAS		
Entrance and Internal Street	**sq.ft**	**sq.m**
Lobby, incidental spaces, food services	16,200	1,505
Staff Area		
Offices, staff amenity space	2,370	220
Community Recreation		
2 Gymnasiums	18,140	1,685
Fitness Centre	15,715	1,460
Multi-Purpose Spaces	9,472	880
Arts and Cultural Studios	3,175	295
Youth Centre	1,290	120
Children's Areas	3,280	305
Aquatic Centre		
50m pool, leisure pool, hot pools, steam room, sauna change rooms, staff, support spaces	56,400	5,240
Senior's Centre		
Silver Harbour Seniors' Activity Centre	19,000	1,765
Arena		
Single NHL sheet with 500 spectator seats, dressing rooms, support spaces	36,760	3,415
Curling Facility		
6 sheets with multi-purpose room, support spaces	24,755	2,300
Operations and Maintenance		
Loading, maintenance, storage	4,520	420
Building Gross Factor (1.10)	21,100	1,960
TOTAL GROSS FLOOR AREA	**232,180**	**21,570**

2.2 Site Analysis

2.2.1 Regional Scale

The selected site for the project is located in North Vancouver near the Upper Levels Highway, north of 23rd Street E between Lonsdale Avenue and St. Georges Avenue. It is situated on a prominent corner of upper Lonsdale that acts as a gateway to the City. The site is uniquely located almost directly in the middle between North Vancouver's mountains and ocean. This defining location and context is well positioned to provide a meaningful and connected facility that bolsters a sense of place. The site also offers a key landmark to the city's proposed urban greenway that encircles the urban centre of the City (Green Necklace).


HARRY JEROME COMMUNITY CENTRE

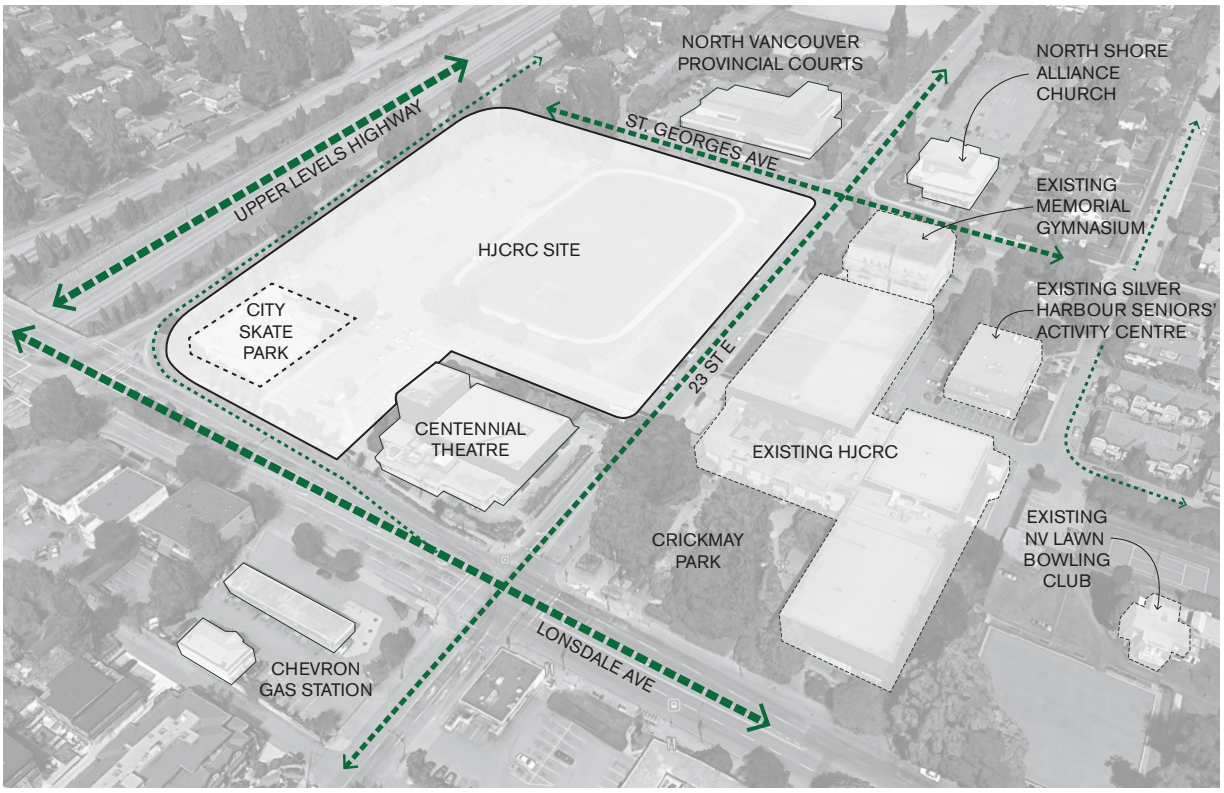

HJCRC

2.2.3 Site Scale

South of the site is the existing HJCRC, which is intended to be demolished and commercial and residential development to take its place. This future development is called the Harry Jerome Neighborhood Lands (HJNL) and includes an expansive new public park of approximately 1.0 ha that builds on the existing Crickmay park. The proposed development provides a mix of housing types and tenure, commercial space, and additional amenities.

Public transit to the site is frequent along Lonsdale Avenue with the nearest bus stop locations south of 23rd Street E on either side of Lonsdale Avenue. Because of its proximity to the Upper Levels Highway, higher volumes of vehicular traffic surround our site making access into our site a challenge. The Upper Levels Highway is to the north, a major arterial road to the west and two minor arterial roads on the south and east.

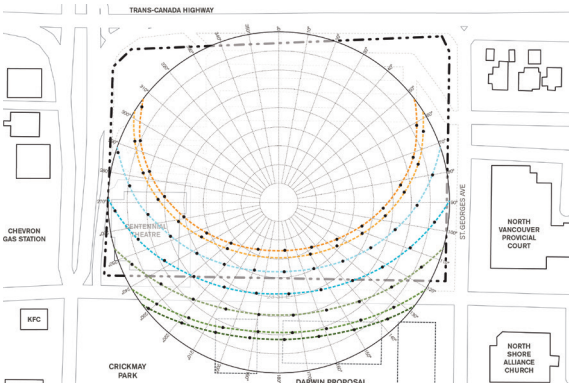
The project location shares a site with the Centennial Theatre and City Skate Park and therefore needs to function jointly with them. The skate park has the potential to be reconfigured and incorporated into the new community recreation centre design. The theatre will remain and should be welcomed and celebrated in the layout of the new HJCRC facility.



▲ Site context diagram

SUN ANALYSIS

This shows the orientation of the sun between sun rise and sun set throughout the year. In the winter the sun is as low as 35 degrees and in the summer as high as 72 degrees.

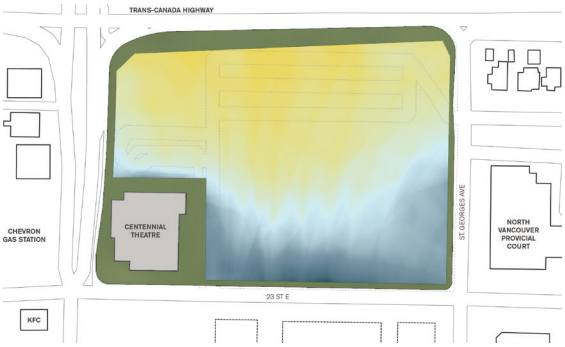


TOPOGRAPHY ANALYSIS

Site topography shows a 10m grade change from north-east to southwest. This site topography will impact the wind patterns as well as rainwater management.

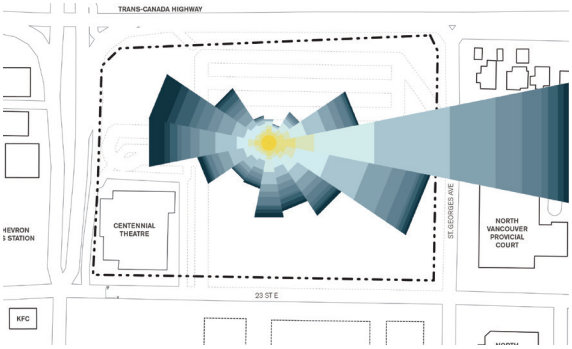
SHADOW ANALYSIS

Annual shading analysis shows how surrounding proposed buildings will impact the sun reaching our site at ground level. The northern part of the site remains in direct sun light continually while the southern part is shaded.



WIND ANALYSIS

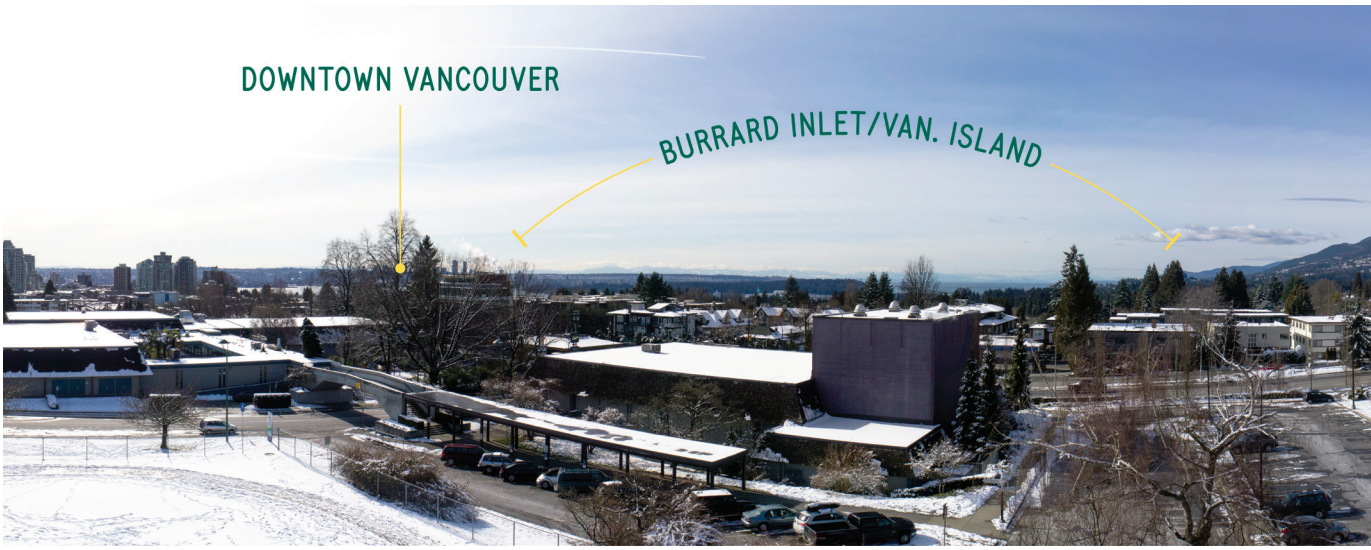
Annual wind analysis shows the prevailing winds coming from the east while occasionally a strong wind from the west will occur.

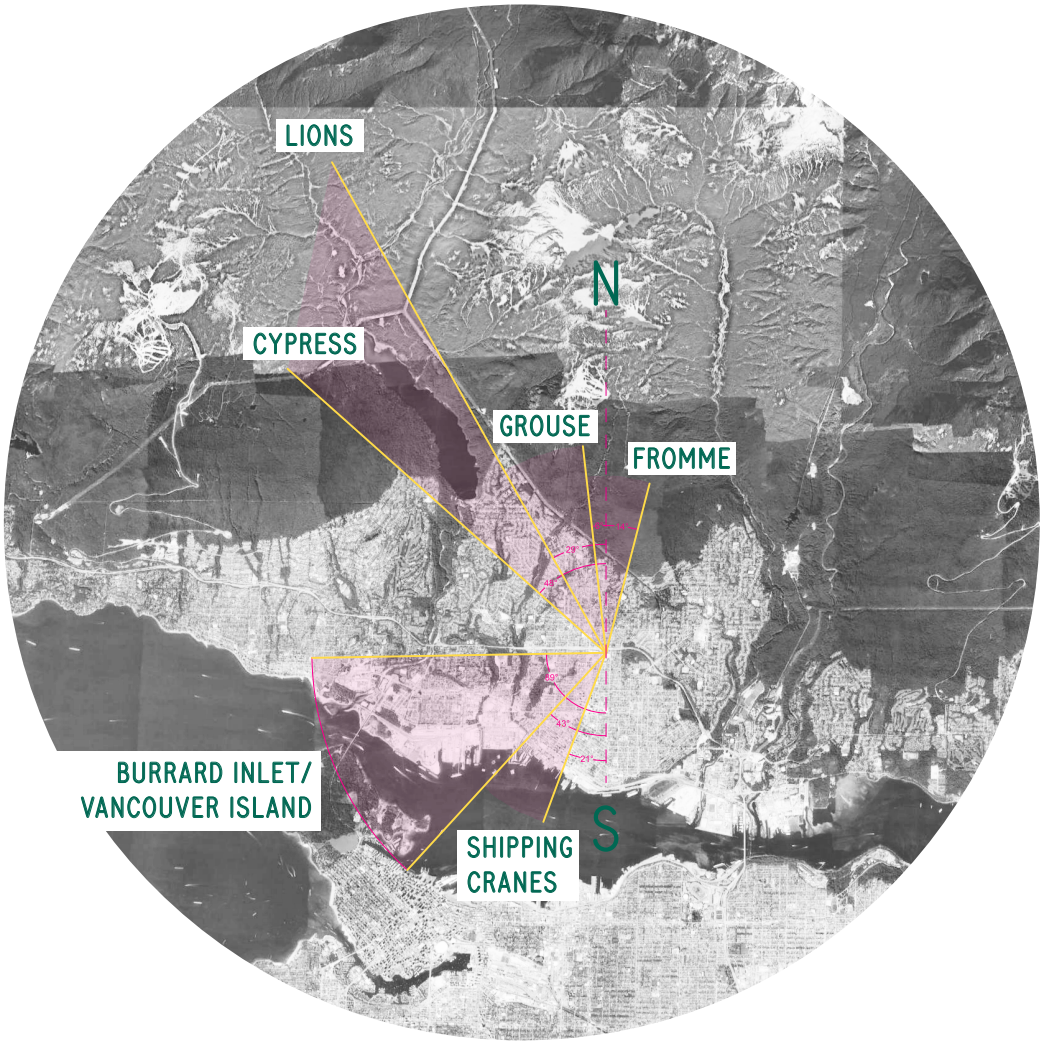


2.2.4 Views

Given the terrain of the North Shore, the project site offers spectacular views both towards the mountains and the ocean. Capitalizing on these views from our site will reinforce a sense of place and enhance wellness for visitors to the community recreation centre..

Using drone imagery, we were able to establish actual views from each floor level of the proposed community recreation centre. These drone images informed key spatial planning decisions to capitalize on views from various points throughout the building and site..

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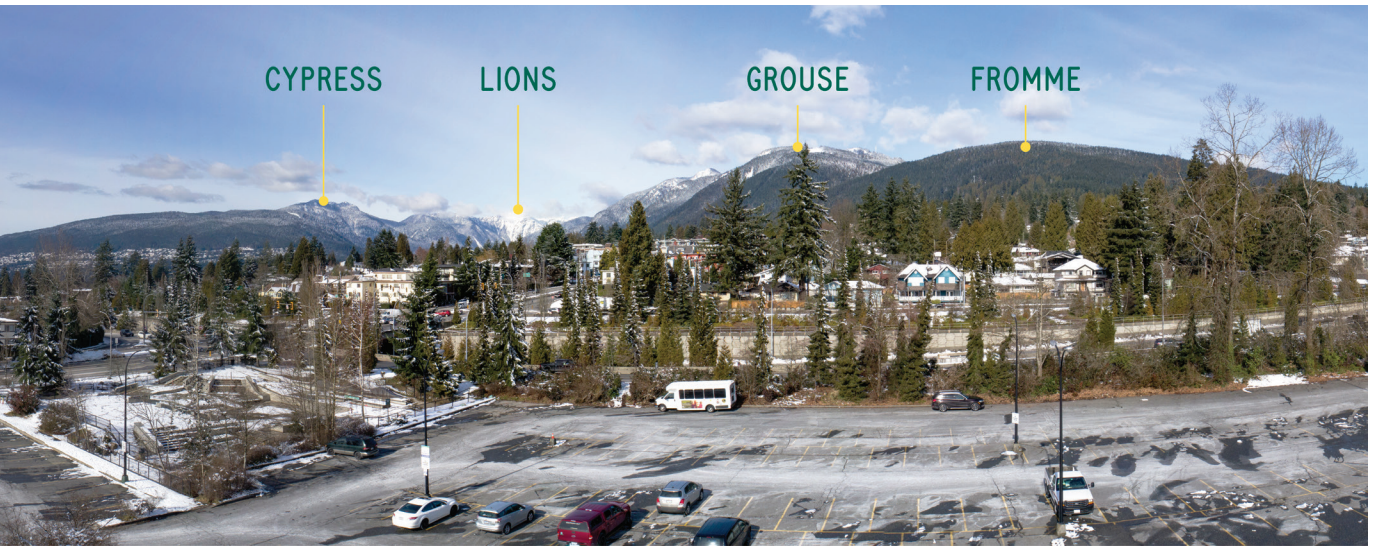

CYPRESS
LIONS
GROUSE
FROMME

2.2.5 Site Constraints

2.2.5.1 PROGRAM AREA AND VOLUME

With a building program area of 21,570 sq.m (232,180 sq.ft), and with many programs having high ceiling heights (e.g.: aquatic centre, arena, gymnasiums, and curling facility), the site is nearly fully covered by building. Strategic location and stacking of large program components require exploration to create opportunities for outdoor activities and landscaping.

2.2.5.2 ENTRANCES + ACCESS

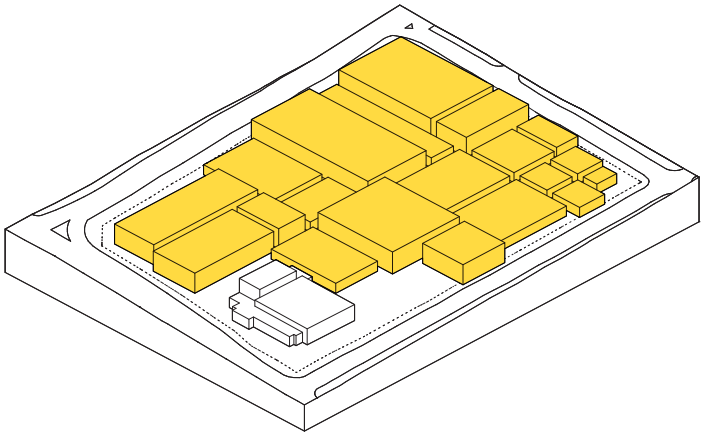
While the proximity to major transportation thoroughfares provides opportunities for multiple modes of transit, the adjacency to the Upper Levels Highway and Lonsdale Avenue restrict the direct access to the site from these busy roadways. Available areas for vehicle driveways, lay-bys, pedestrian crossings, and primary visitor access to access the site remain only at the eastern portion of the south property line (along 23rd Street E) and the southern portion of the east property line (along St. Georges Avenue).

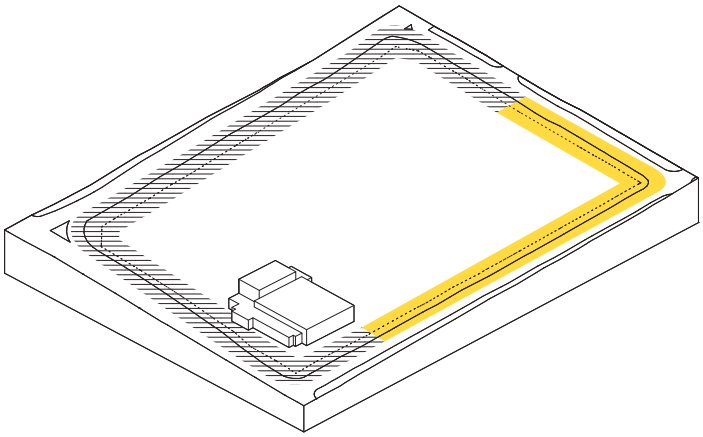
2.2.5.3 SITE TOPOGRAPHY

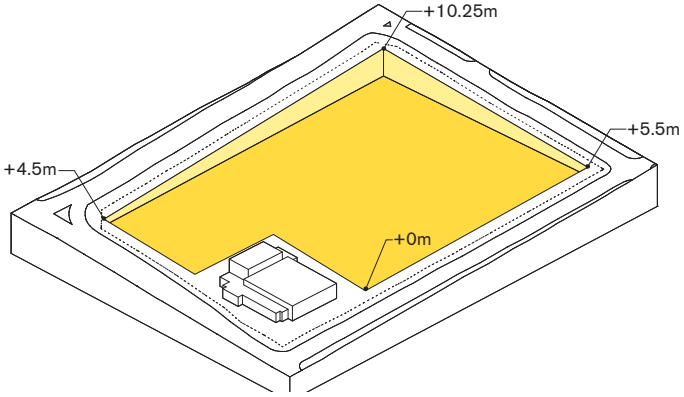
Located on a slope midway between ocean and mountain, the site presents a greater than 10m grade change from south-west to north-east. With site access available from the south and east edges of the site, building entrance and floor levels must respond in relation to the adjacent grades. Program components with high ceiling requirements will require strategic location within the site to maintain an appropriate relationship with the scale of the surrounding neighbourhood.

2.2.5.4 SKATE PLAZA LOCATION

The City Skate Park is currently located on the north-west corner of the site, at the Upper Levels Highway and Lonsdale Avenue. To maintain the current amenity, there are four possible locations for the City Skate Park while providing the central area of the site for the building mass: north-west corner (maintain existing skate plaza), east of Centennial Theatre (new skate plaza), south-east corner (new skate plaza), north-east corner (new skate plaza).



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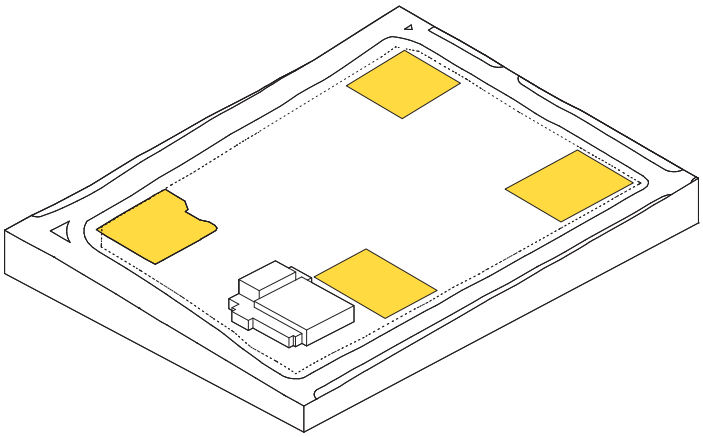


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2.3 Concept Options

Three design concept options were explored in depth through the course of Schematic Design, all of which contained a strong organizing principle for social connection through shared space in the building.

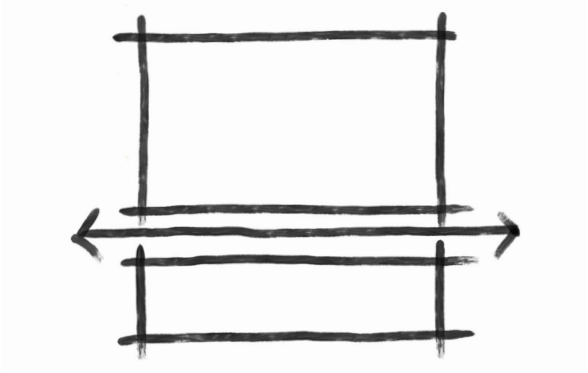
Option 1 explored separating organized programming with an indoor pedestrian 'street' acting as both primary circulation and a large central social space. The existing City Skate Park is accommodated by stacking program in a taller building. The reduced building footprint results in a requirement for three levels of underground parking.

Option 2 also explores separating the organized programing, but includes a large central green space through the building. The large programs are situated at the rear of the site, and the finer-grain programs have been located along 23rd Street E to respond to the neighbourhood scale and create permeability from the neighbourhood to HJCRC. The location of the aquatic centre at the corner of the Upper Levels Highway and Lonsdale creates prominence and visual connection. A large entry plaza and new skate plaza is partially covered for versatility of outdoor activity and casual programming, which connects through to the central green space.

Option 3 tests a large central courtyard as a radial connection hub. The organized programming surrounds the central courtyard and smaller circulation routes spine from the courtyard through to the various programs and building edges.

A range of opportunities and challenges were identified in each option, outlined in the following option lists. The significant advantages of Option 2 resulted in this preferred option being developed through to schematic design, described in more detail in section 3.0 Design Response.

Option 1: Street



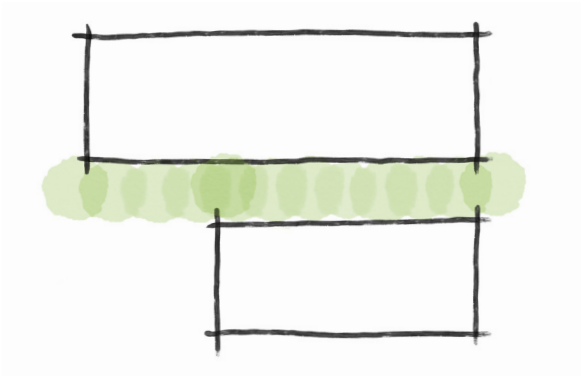
Opportunities

- Retain existing City Skate Park
- Tall atrium has visual presence on Lonsdale
- Large public entry plaza space

Challenges

- Inefficient parking layout - 3 levels
- Sports courts on rooftop
- Skate plaza roof structure diminishes HJCRC prominence on Lonsdale

Option 2: Ravine



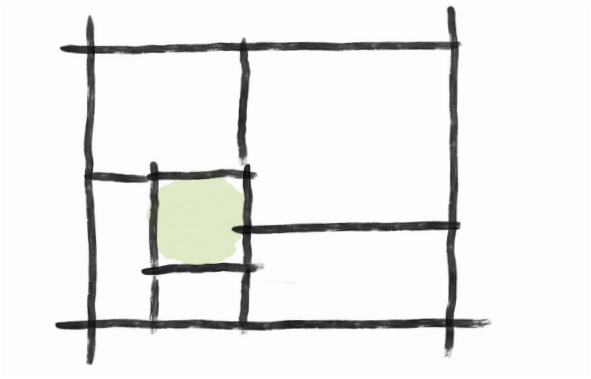
Opportunities

- Integrated green space throughout building
- Create programmed outdoor spaces in courtyards
- Large animated day-lit circulation space, opportunities for casual recreation
- Views to green courtyards from programmed space
- Partially covered skate plaza integrated into facility: activity and unique landscape
- Aquatics prominence on Lonsdale
- Efficient parking layout

Challenges

- High site coverage
- Sports courts on rooftop

Option 3: Hub



Opportunities

- Central courtyard strong organizing element in the building
- Large public entry plaza space
- Flexibility in skate plaza location
- Aquatics prominence on Lonsdale

Challenges

- Inefficient parking layout - 3 levels
- Sports courts on rooftop
- Less prominence on Lonsdale than Option 2
- Access to daylight away from building edges and central courtyard

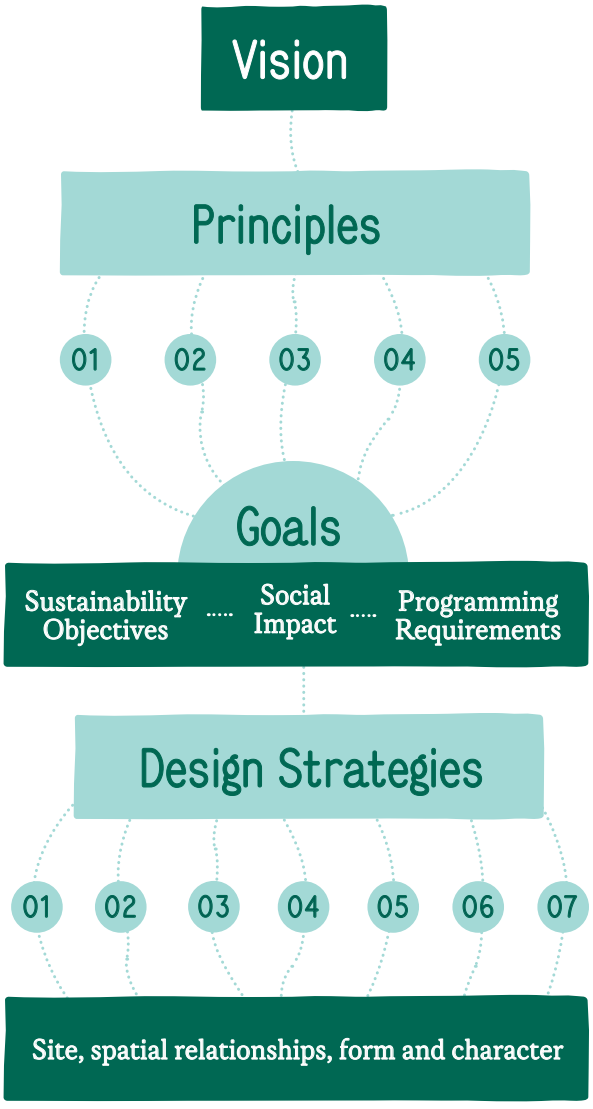
3.0 Design Response

3.1 The Vision

"The Harry Jerome Community Recreation Centre will be a welcoming, vibrant, social heart of the community.

It will foster individual and collective wellness by providing opportunities to participate in a variety of organized and casual activities.

A beacon of pride in the community, the centre will reflect the unique identity and character of North Vancouver."



VISION STRUCTURE

The project vision was formulated through the exploration of three components: Social Impact, Environmental Sustainability, and Programming, including consideration of the project's financial parameters.

The purpose of the vision statement and development of principles and goals is to set the over arching project direction and intent, which can then be used to guide future decision making. Listed below are explanations of the terms we use in this section of the report:

- **Vision**: the role of the vision statement is to declare the HJCRC's purpose and aspirations. It informs the supporting principles, goals and strategies.
- **Principle:** a high level aspiration or value which can guide and inspire goals, strategies and actions across spectrum of policies, designs or actions.
- **Goal**: a general or specific desired outcome associated with principles
- **Design Strategy**: a container for a set of actions intended to fulfill stated goals

Principles

THE HARRY JEROME COMMUNITY RECREATION CENTRE WILL BE...

Equity

01 Accessible to all, with freedom and opportunity to participate in a variety of casual and structured activities.

Social Inclusion

02 An inclusive place that draws people together and fosters strong social connections between the diverse communities of North Vancouver.

Secure

03 A welcoming and safe environment that clearly communicates it's okay to be who you are, and promotes ease of use.

Adaptable

04 Responsive to evolving community needs which creatively shape a broad range of recreation and cultural activities.

Wellness

05 Supportive of individual and community wellness through physical, social, and creative pursuits. A connection to the natural environment is deeply valued in achieving this.

Environmental Sustainability

06 A global example of social and environmental sustainability and resilience.

Goals

How can we realize this vision? By working towards 4 key goals. These goals can be assigned with associated metrics that can later be used to measure success.

GOAL 1
Be a beacon for community identity and pride

The design of the new HJCRC will foster a vibrant sense of place and community that will continue to strengthen over time. Its design will attract and welcome people, and support positive individual and shared experiences.

Themes for assessment metrics:
Sense of place and belonging
Social and cultural life
Connectivity and imageability

GOAL 2
Redefine perception of recreation to promote wellness in the community

The new HJCRC will embody the full spectrum of recreation by creating a variety of dynamic spaces that actively support expanding notions of physical, mental, and social wellness. It will promote progressive synergies between recreational, cultural, and intergenerational uses to support lifelong discovery and development. The sum will be greater than its parts.

Themes for assessment metrics:
Social and cultural life
Personal development and enjoyment
Access, health, and safety

GOAL 3
Provide for diverse users now and in the future

The new HJCRC will promote access and belonging for all. It will creatively respond to community needs as they evolve through adaptable and innovative design and governance.

Themes for assessment metrics:
Community resilience
Sense of place and belonging
Access, health, and safety

GOAL 4
Support the city's climate action plan targets

The City's 2011 Corporate Climate Action Plan set a target of a 25% reduction below 2007 levels by 2020. As the existing HJCRC accounts for 27% of the City's overall corporate greenhouse gas emissions, there is an opportunity to demonstrate leadership and significantly reduce corporate GHG emissions. The redevelopment of HJCRC has long been a key component of the City's corporate Climate Action Plan.

Themes for assessment metrics:
Refer to the Sustainability Report in appendix 6.6.

Design Strategies

These goals will be achieved through a variety of strategies which will directly be used to guide the design.

01 Create a welcoming and animated arrival space.

02 Design in features for delight and celebration of community identity and unique setting.

03 Ensure access for all through safe arrival, variety of seating, legibility of space and circulation, and ease of use.

04 Strong visual and physical connections both within the facility and to the wider community.

05 Create spaces of a variety of scales and openness for user comfort.

06 Create flexible and adaptable spaces that promote a range of both specific and broad programming as well as informal, temporary, and formal uses.

07 Connect to and integrate outdoors (build on the unique North Vancouver identity and express through physical form).

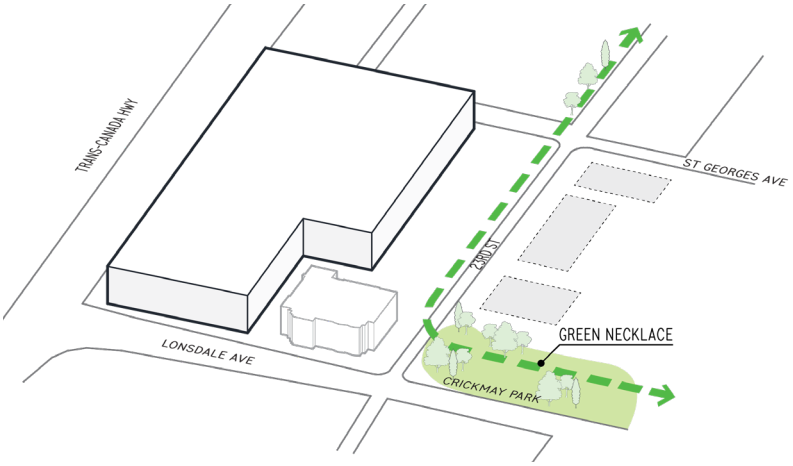
08 Enhance and connect to urban fabric.

09 Use materials and technology that contribute to a positive experience for all.

3.2 Form & Character

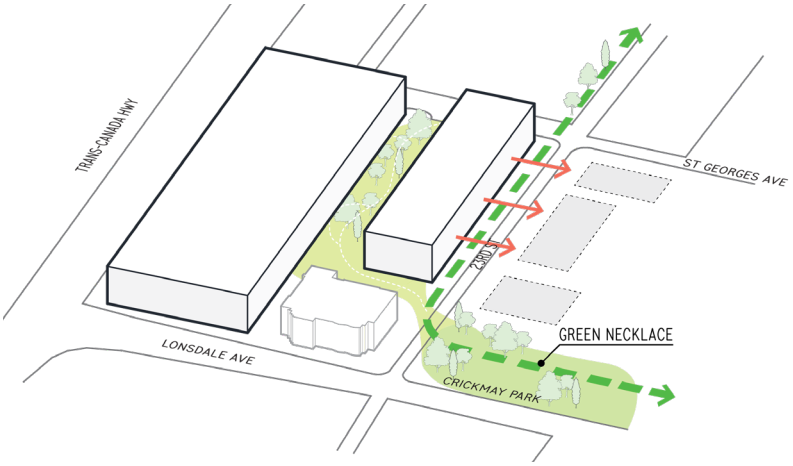
3.2.1 Building Massing

Following an extensive test-fit exercise, a building massing solution was agreed upon that had the greatest potential to achieve our project vision. A number of key design strategies were used to help the facility be a good neighbor and responsive to its context while creating a welcoming and vibrant heart for the community. The key strategy was in the breaking apart the massive building footprint and allowing ravine like nature, light and casual activity to pass through it.



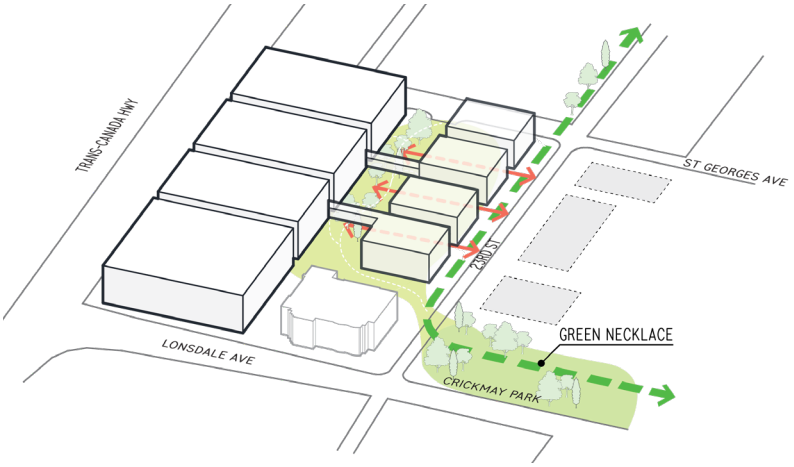
STEP 1

- Large volume demonstrates the amount of program the site has to accommodate.



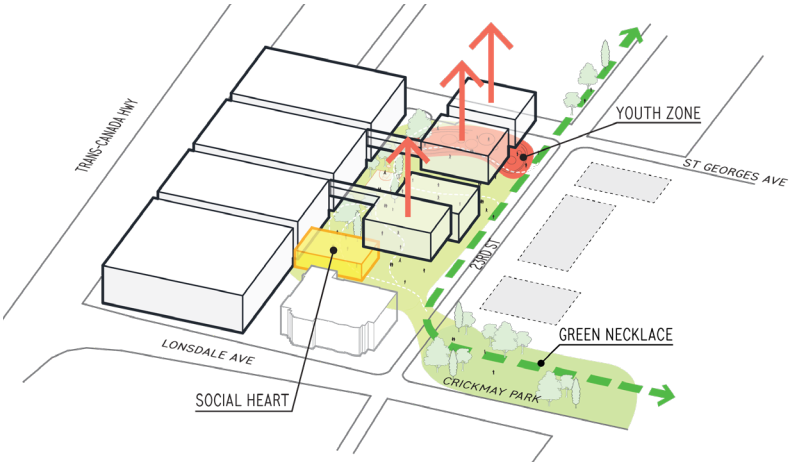
STEP 2

- Break open massing to allow: views, daylight, and natural ventilation
- Locate large program area next to highway
- Locate larger blank walls next to steep slopes
- Maximize parking efficiency



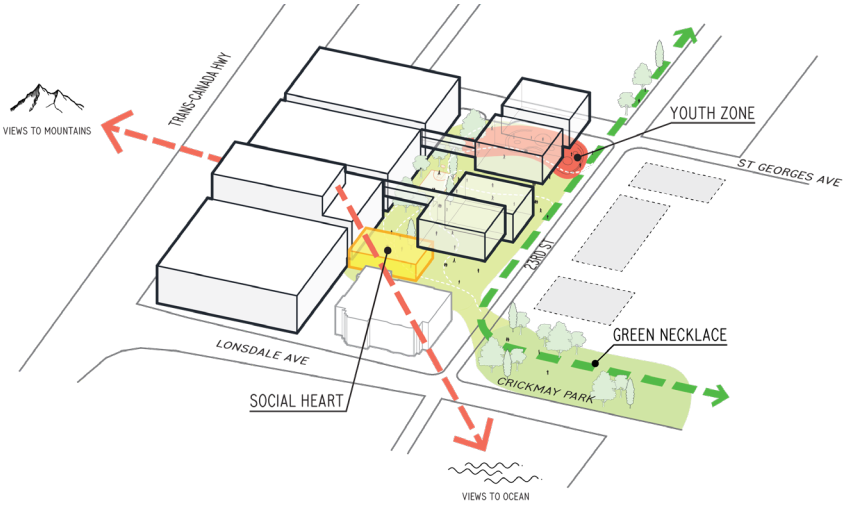
STEP 3

- Break down massing to establish neighbourhood scale on 23rd St. E
- Connect Green Necklace and ravine



STEP 4

- Maximize transparency at the ground plane
- Provide covered area for youth zone
- Establish key social spaces as anchors to ravine



STEP 5

- Establish visual connections to mountains + ocean

3.2 Form & Character

3.2.2 Physical Models

Physical modeling played an important role in studying building massing and exploring the relationship between volumes, to the ravine and grade, and to the neighbouring buildings.

The opposite page shows a selection of study models created.

3.3 Spatial Layout

3.3.1 Design Response

The intention is to create a new community hub that builds on the success of the existing community recreation centre by relocating, expanding, and upgrading the current amenities.

The community recreation centre's main entrance, landscaped plaza, and primary pedestrian site access is off 23rd Street E. The plaza also connects with the existing Centennial Theatre to create a new, shared public space. As part of this design approach, the landscape has been continued beyond the plaza and through the site, creating the ravine.

As a result, the larger program components have been sited along the northern edge of the site next to the Highway and the smaller, more modular program components have been located to the south where a finer grain is required to respond to surrounding residential neighbourhood. The two masses are connected at high level by volumes that span over the ravine.

Two levels of vehicle parking are located below grade at Level 1 and Level -1. The Level 1 parking area is accessed off St. Georges Avenue and the Level -1 car park is accessed off 23rd Street E. Internal vehicle circulation is provided between the two levels of parking for continuous access throughout the parkade.

The diagrams in the following pages describe the specific site planning and design responses that were influenced by the existing site constraints and urban design objectives.

3.3.2 Plan Layout

3.3.2.1 ORGANIZED AND CASUAL PROGRAMMING, OUTDOOR SPACE

The building plan has been organized into three zones which include: organized programming, casual programming and outdoor space.

Organized programming consists of the components of the building area program, which includes community recreation spaces, an aquatic centre, a seniors' centre, an arena, a curling facility, and community recreation spaces, illustrated in the diagram on the opposite page.

The casual programming zones have been designed as an intermediate space between outdoor and indoor activity and the concept of the space is deeply embedded in the project Vision and Principles (see subsection 3.1 The Vision). These zones provide circulation, informal social and recreation space, areas for spectator viewing and facilitate active surveillance throughout the Recreation Centre. Examples of the types of activities and casual programming in this zone are illustrated in the lower diagram on the opposite page.

At the centre of the site is the outdoor space which forms part of the ravine. The outdoor space connects and adds to the casual programming zones, defines the building mass, accommodates the change in level (see Level Differential in the following pages) and brings natural daylight, nature, and views into the centre of the building.

PRINCIPLES

01 Accessible to all with casual and structured activities.

02 An inclusive place that fosters social connections.

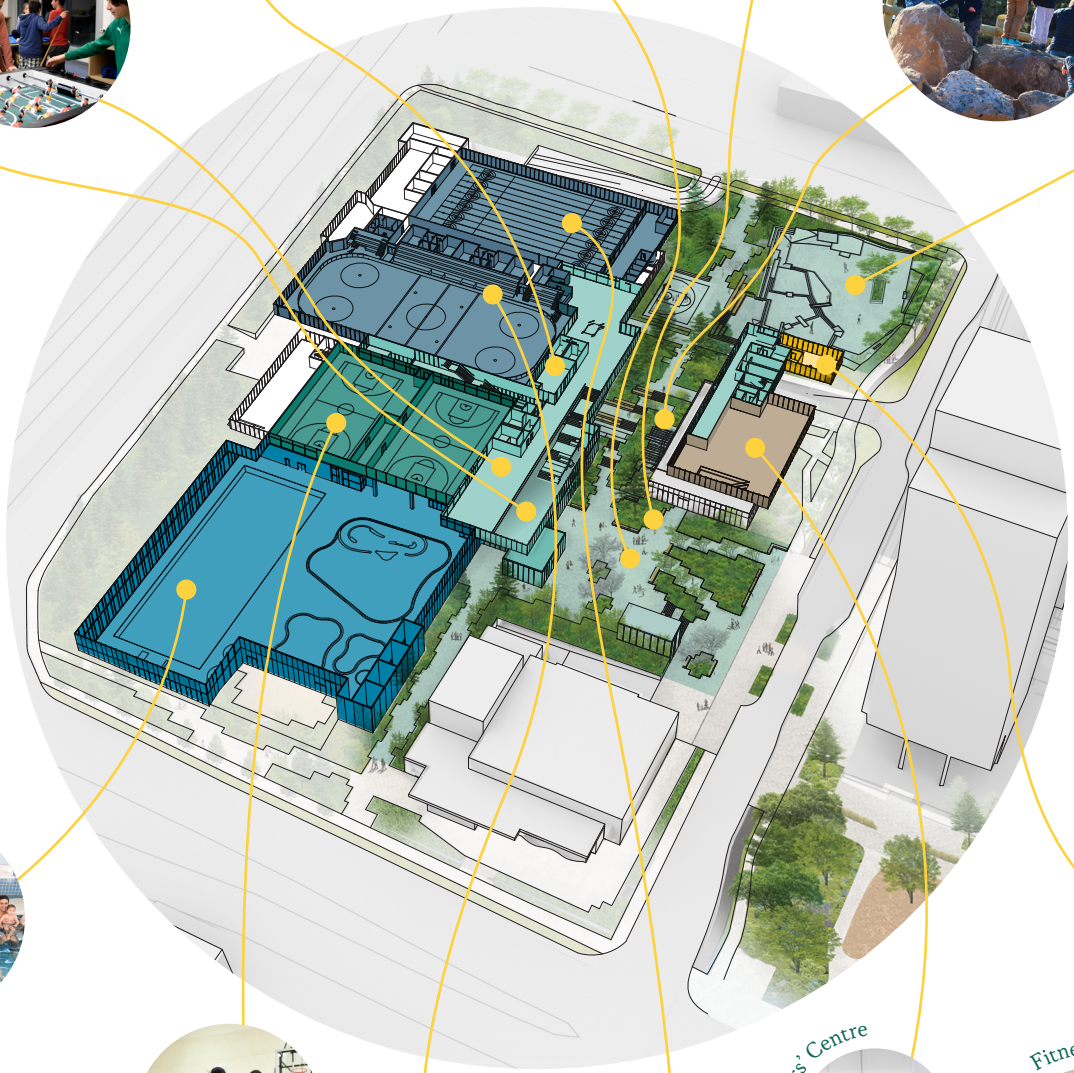
03 A welcoming and safe environment.

04 Responsive to evolving needs.

05 Supportive of individual and community wellness.

06 A global example of sustainability.

CASUAL PROGRAMMING



ORGANIZED PROGRAMMING

Aquatic Centre

Youth Centre

Multi-Purpose & Arts (levels above)

Gymnasiums

Arena

Curling

Seniors' Centre

Fitness Centre (levels above)

3.3.2.2 BUILDING ORGANIZATION

The building is organized over 5 levels which include:

- Level-1: Below ground
- Level 1: Partially below ground
- Levels 2-4: Above ground.

The building program is organized across the levels as follows:

- Level -1: Parkade
- Level 1: Parkade, Lobby, Aquatics Centre, Operations and Maintenance and Seniors' Centre.
- Level 2: Gymnasiums, Arena, Curling Facility, Youth Centre, and Seniors' Centre
- Level 3: Multi-Purpose Areas, Arena Spectator Seating, and Seniors' Centre
- Level 4: Fitness Centre, Children's Areas, and Arts and Cultural Studios

3.3.2.3 LOBBY

A generous lobby has been located within the casual programming zone at Level 1 off the landscaped plaza. The lobby provides important social space that animates the plaza, defines the building entrance and creates a welcoming entrance for people using the facility. Internally, the space spans two levels and connects to the second floor through a large social stair and atrium.

3.3.2.4 CONTROL POINTS

The main reception desk is located centrally in the lobby so that it can directly observe the main entrance, lobby and concession area. The reception desk also has sight lines to the associated elevator, atrium and internal street that connects to the skate shop at the east of the building plan. The skate shop also acts as a secondary control point to both the internal street and the Arena and Curling Facilities.

3.3.2.5 BUILDING ACCESS & USER CIRCULATION

The adjacent colour-coded plan illustrates the building layout and spatial relationships between the different program components. Open circulation has been consolidated into the casual programming zones which run east-west along the site. Located within each of these zones are the stair and elevator cores that connect the building levels.

As mentioned in Level Differential below, the site grading allows for access into the building on multiple levels.

At Level 1, circulation is accessed from the landscaped plaza via the entrance lobby. The lobby connects to both the internal street and the level 1 parkade where there is a dedicated drop off zone adjacent to the lobby. To the north of the lobby is a secondary circulation route that leads to Aquatics and Fitness program areas. Access to these areas is restricted via a control point. The landscape plaza also offers access to the main entry of the seniors' centre.

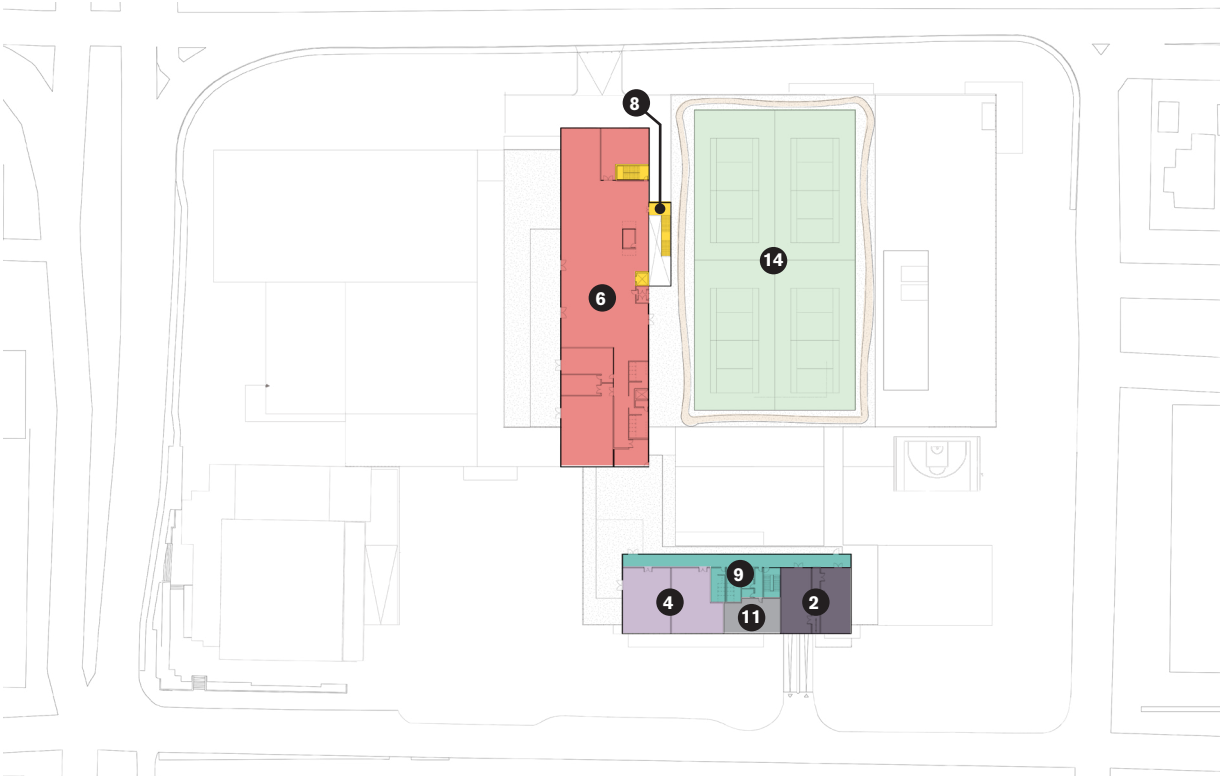
At level 2 there are two secondary entrances into the internal street: one connecting into the north building adjacent to the arena and curling facility, and one connecting into the south building adjacent to the youth centre and skate plaza. Level 2 also provides direct access to the curling facility from the ravine.

At Level 3, the circulation within the north and south masses connect, with the program spanning the ravine to form an internal walking loop. At Level 4, the circulation leads to three outdoor areas, one for the outdoor sports courts and rooftop walking loop, one for the children's area and viewing, and one for outdoor fitness. The Fitness Centre is accessed via controlled circulation from level 1, and the Children's area is accessed via open circulation.

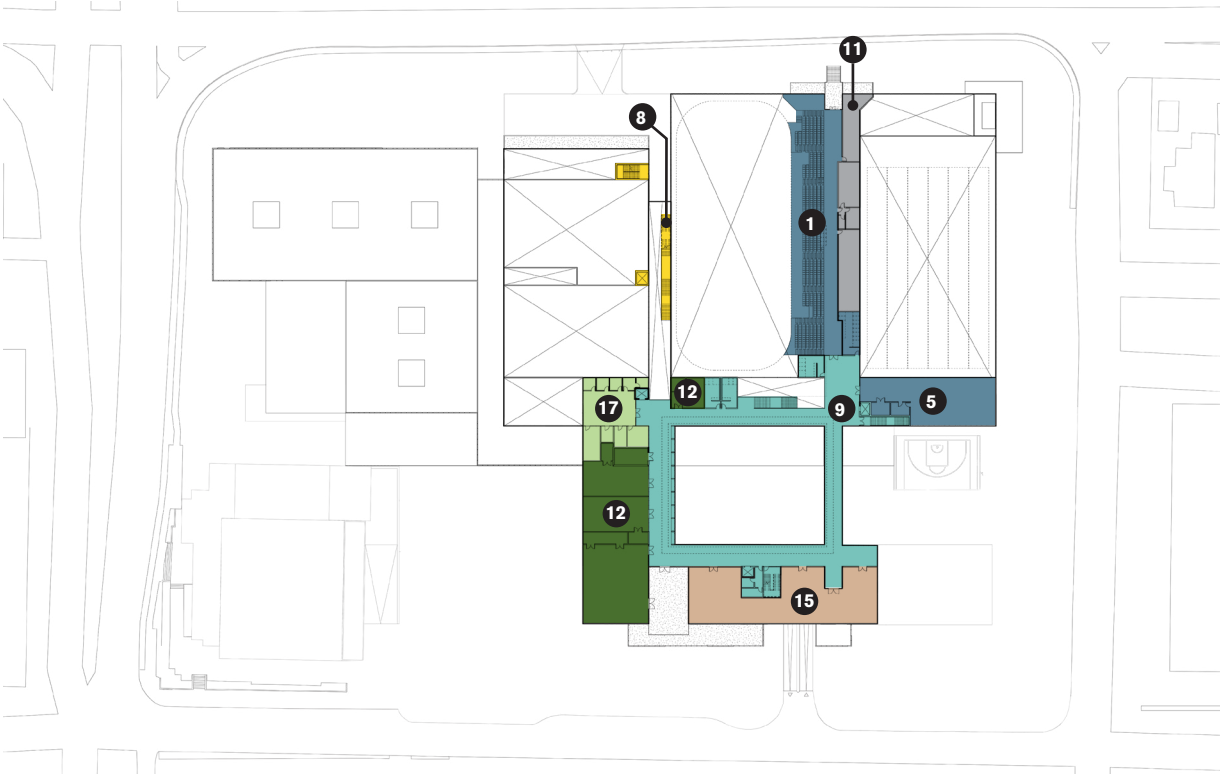
PLAN LEGEND

1. Arena
2. Arts & Cultural Studios
3. Aquatic Centre
4. Children's Areas
5. Curling Facility
6. Fitness Centre
7. Gymnasiums
8. Controlled Circulation
9. Open Circulation
10. Lobby
11. Mechanical / Electrical
12. Multi-Purpose Spaces
13. Op's & Maintenance
14. Sports Courts + Rooftop Walking Track
15. Seniors' Centre
16. Skate Plaza
17. Staff Area
18. Underground Parking
19. Youth Centre

▼ Building Entrance



▲ Level 4 Plan



▲ Level 3 Plan

3.3.2.6 LEVEL DIFFERENTIAL

Due to existing site levels, the grade increases from the plaza to the property line at the north-east corner of the site along St. Georges Avenue and the Highway (refer to subsection 2.2.4 Site Constraints). This level differential allows level access into the building at multiple levels across the site (refer to Building Access below).

The level change between the plaza and St. Georges Avenue is accommodated in the ravine where the grade is softened with planting, stepped paving, and outdoor play and recreation spaces. This change in level creates two entrance zones: one off the plaza at 23rd Street E and one off the east end of the ravine near St. Georges Avenue. Both zones provide universal access to the building and outdoor casual recreation spaces.
In addition it allows the parkade and service core at Level 1 to be concealed underground.

The grade continues to rise to the north of the site along the Upper Levels Highway where the large program areas are located. Embedding the large, high ceiling program components into the grade helps to reduce the physical and visual impact of the grade change by locating servicing and solid frontage against the steep banking.

3.3.2.7 SITE ACCESS

The proximity of the site to the major transportation thoroughfares of the Upper Levels Highway and Lonsdale Avenue restrict direct access into the site (refer to subsection 2.2.4 Site Constraints).

Primary pedestrian access is via the entrance plaza located off 23rd Street E between Centennial Theatre and the new community recreation centre. Secondary pedestrian access is provided off St. Georges Street, and additionally off Lonsdale Avenue between Centennial Theatre and the aquatic centre. Vehicle access is provided off 23rd Street E and St. Georges Avenue. Access is provided to both levels of the underground parking, and drop off / pick up areas are located near the parkade entrances adjacent to the primary and secondary building entrances, as well as the senior's centre.

3.3.2.8 VIEWS

The building has been designed to maximize views outwards, inwards and in between program spaces. Externally, the arrangement and orientation of the stacked boxes allows views to be captured towards the harbour to the south, the mountains to the north and into the site and the proposed ravine.

Internally, the casual programming zone and internal street are highly glazed and open plan to maximise visual connections. At each level, the zone provides spectator or casual viewing into the main program areas, allowing users to connect with the activity and function of the building.

3.3.2.9 OPERATIONS

The Operations and Management (O&M) facility is located along the northern edge of the site and is accessed from Level 1 parkade via a vehicular route and ramp off St. Georges Avenue.

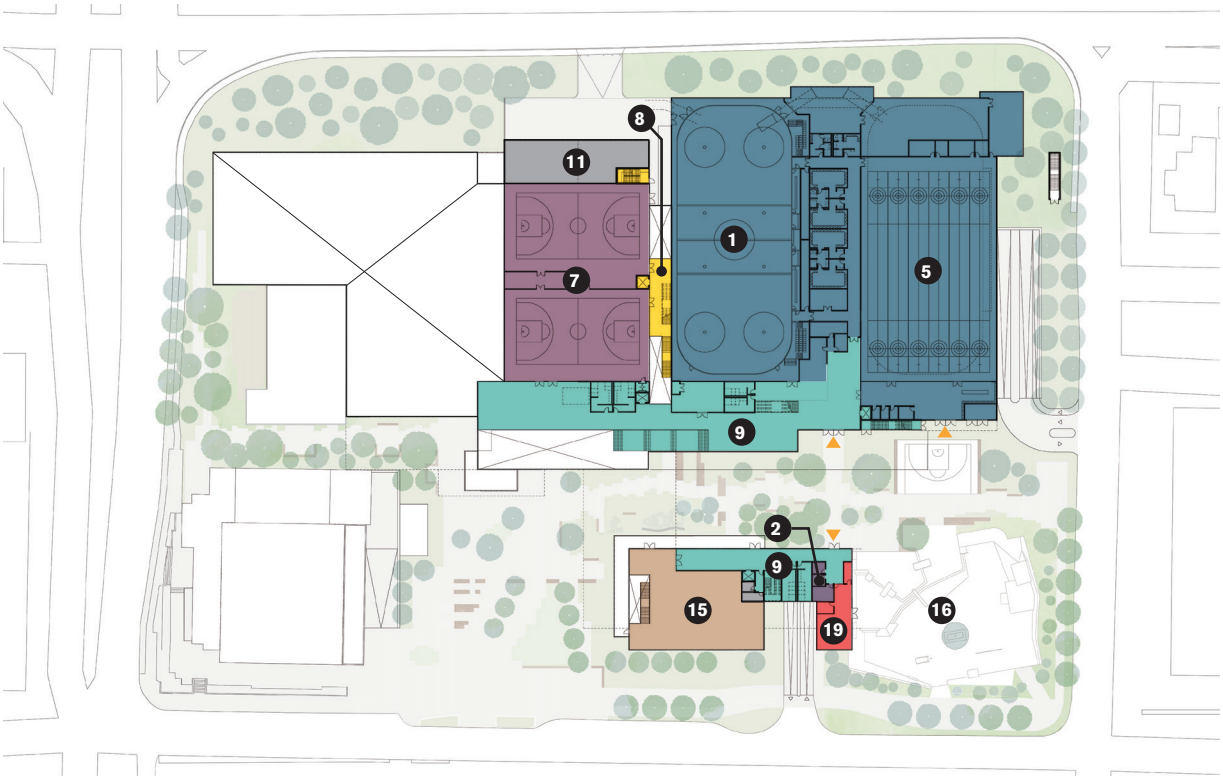
The O&M facility houses the loading dock, maintenance storage, garbage storage, workshop and staff offices.

Adjacent to the O&M facility is the primary mechanical and electrical core which runs between Levels 1-3. This core links up to secondary service cores that are distributed throughout the building. In addition to this, there is a dedicated refrigeration, mechanical and electrical core shared between the Ice Arena and Curling Facility.

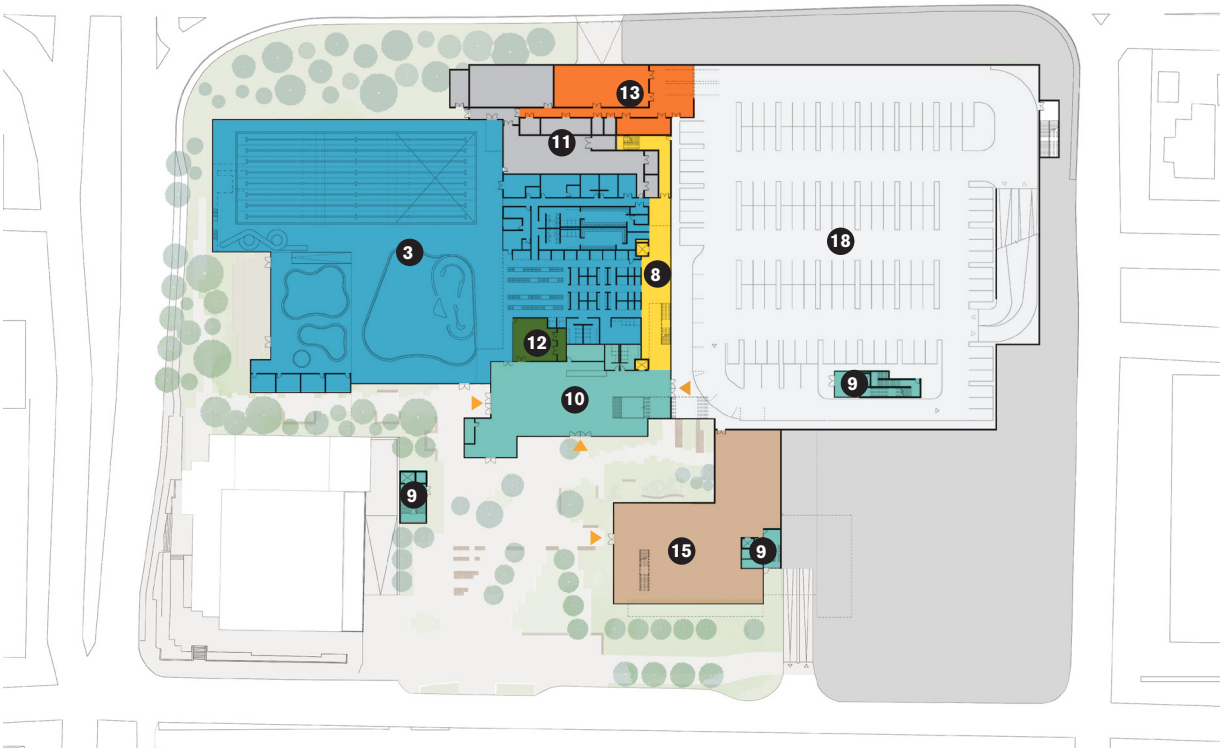
PLAN LEGEND

1. Arena
2. Arts & Cultural Studios
3. Aquatic Centre
4. Children's Areas
5. Curling Facility
6. Fitness Centre
7. Gymnasiums
8. Controlled Circulation
9. Open Circulation
10. Lobby
11. Mechanical / Electrical
12. Multi-Purpose Spaces
13. Op's & Maintenance
14. Sports Courts + Rooftop Walking Track
15. Seniors' Centre
16. Skate Plaza
17. Staff Area
18. Underground Parking
19. Youth Centre

▼ Building Entrance



▲ Level 2 Plan



▲ Level 1 Plan

For significant repairs and replacement, access to the main service core can be gained via the level 1 parkade or from a restricted loading area, off the Upper Levels Highway on-ramp. This restricted loading area also serves as an exit route for the ice resurfacer.

3.3.2.10 CENTENNIAL THEATRE

Integration with the existing Centennial Theatre has been an integral part of the design process as it both neighbours the development site and shares car parking facilities with the Recreation Centre. At level 1, the theatre connects directly to the proposed plaza, providing shared outdoor space with the community facility. Directly off the plaza is a dedicated stair and elevator core that links to Level -1 of the shared parkade.

PLAN LEGEND

1. Arena
2. Arts & Cultural Studios
3. Aquatic Centre
4. Children's Areas
5. Curling Facility
6. Fitness Centre
7. Gymnasiums
8. Controlled Circulation
9. Open Circulation
10. Lobby
11. Mechanical / Electrical
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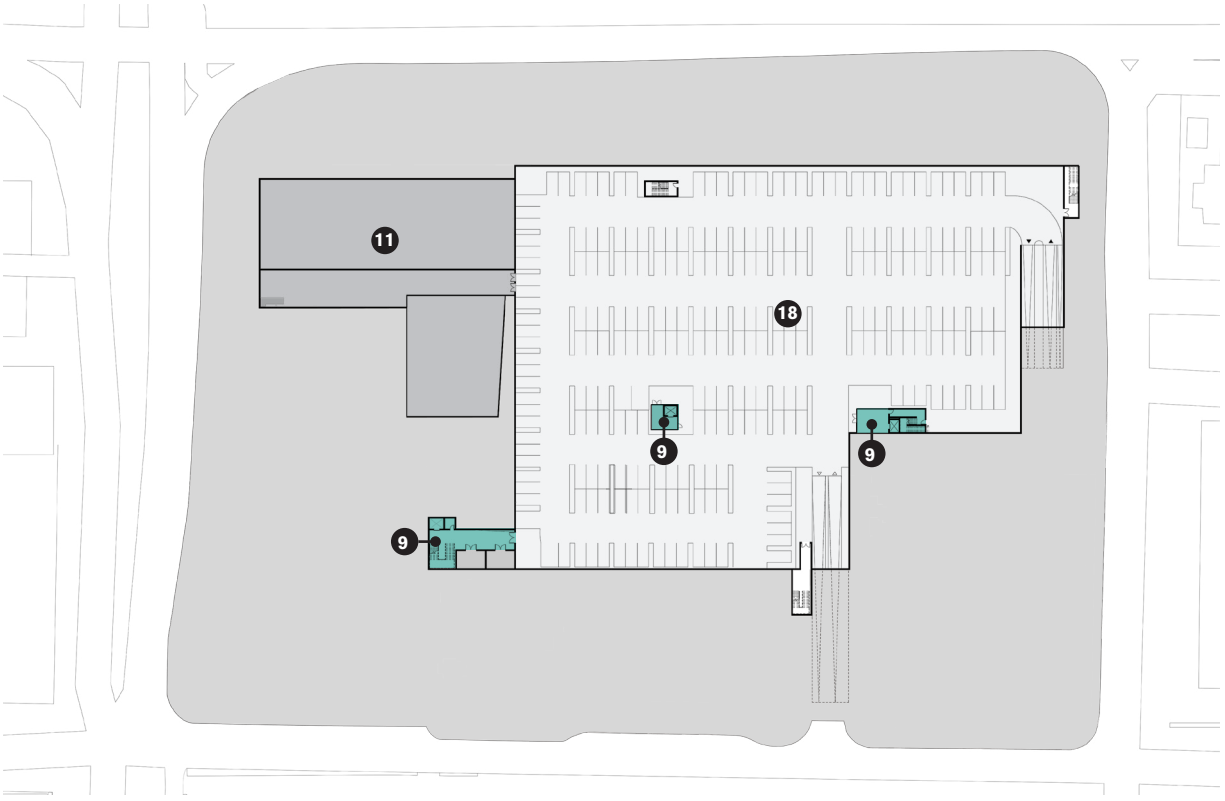
16. Skate Plaza
17. Staff Area
18. Underground Parking
19. Youth Centre

▼ Building Entrance



▲ Level -1 Plan

3.4 Materials

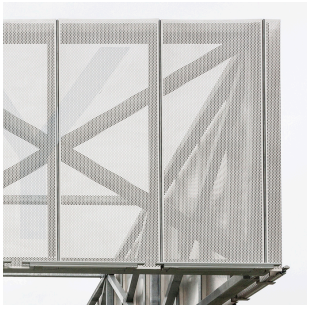
Materiality has been chosen in relation to the following parameters:

- Visual appearance
- Durability & maintenance
- Cost efficiency

The building envelope consists of: corrugated metal cladding, corrugated insulated metal panel, perforated metal screen, clear glazing, fritted glazing, full height louvers, and wooden soffits. For cost efficiency purposes, the corrugated insulated metal panels will be used at less public areas of the facade and at higher levels.

A linear language has been established through the vertical orientation of the cladding and panels, and in the curtain wall mullions to maintain a crisp figuration in the individual shifting forms. The transition of materials subdivide the facades to create variety and further emphasize the shifts. Strategic placement of glazed curtain wall in the vertical rhythm allow for key incorporation of daylight and views to correspond to the programs' needs. The lobby and casual programing zones are clad with glazed curtain wall. This maximizes visibility into and within these social spaces and creates visual connections between program areas.

The underside of the cantilevered and spanning forms are clad with a fractured wood soffit. This warmer material complements the landscape design and links to the community that is characterized by its natural environment.



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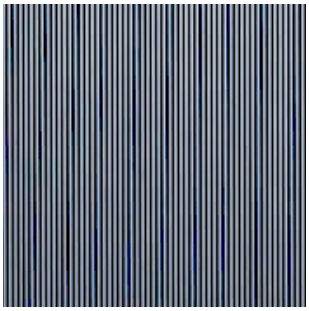

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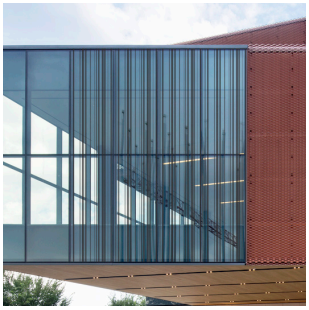

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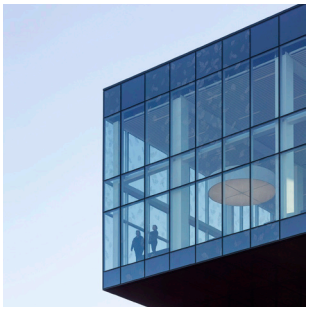


6

LEGEND

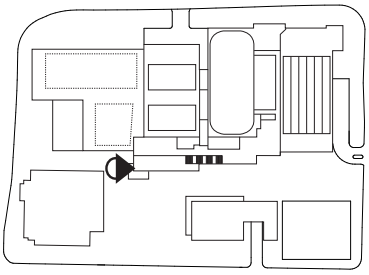
1. Perforated Metal Screen
2. Corrugated Insulated Metal Panel
3. Corrugated Metal Cladding
4. Wooden Soffit
5. Frit
6. Structural Silicone Glazed curtain Wall

3.5 Concept Renders

The following concept renders show key views of the proposed HJCRC.

▲ Concept Render - Exterior view from entrance plaza

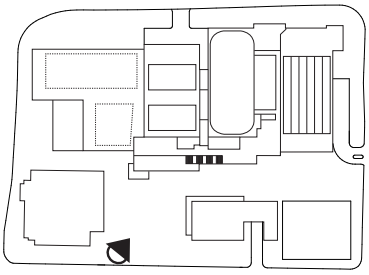
The entrance plaza can be compared to a clearing in the trees — an open area that offers flexibility for a wide range of outdoor activities. Surrounded by nature, you can see an outdoor yoga class in the plaza, the ravine, Silver Harbour Seniors' Activity Centre on the right, and multi-purpose rooms cantilevered on the third floor.



VIEW KEY

▲ Concept Render - Exterior view from plaza

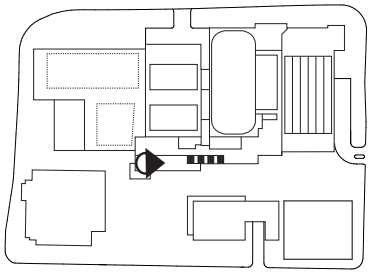
Crossing 23rd Street E from Crickmay Park, you begin to see the shifting form of the building and activity inside. The landscaped entrance plaza is welcoming and vibrant.



VIEW KEY

▲ Concept Render - Interior view from within Lobby

The social heart of the building invites interaction and play. A welcoming and flexible space that blurs the boundary of indoor and outdoor. To the left of the image you see into the Level 1 parkade, which has direct access into the entrance lobby and views through to the entrance plaza.



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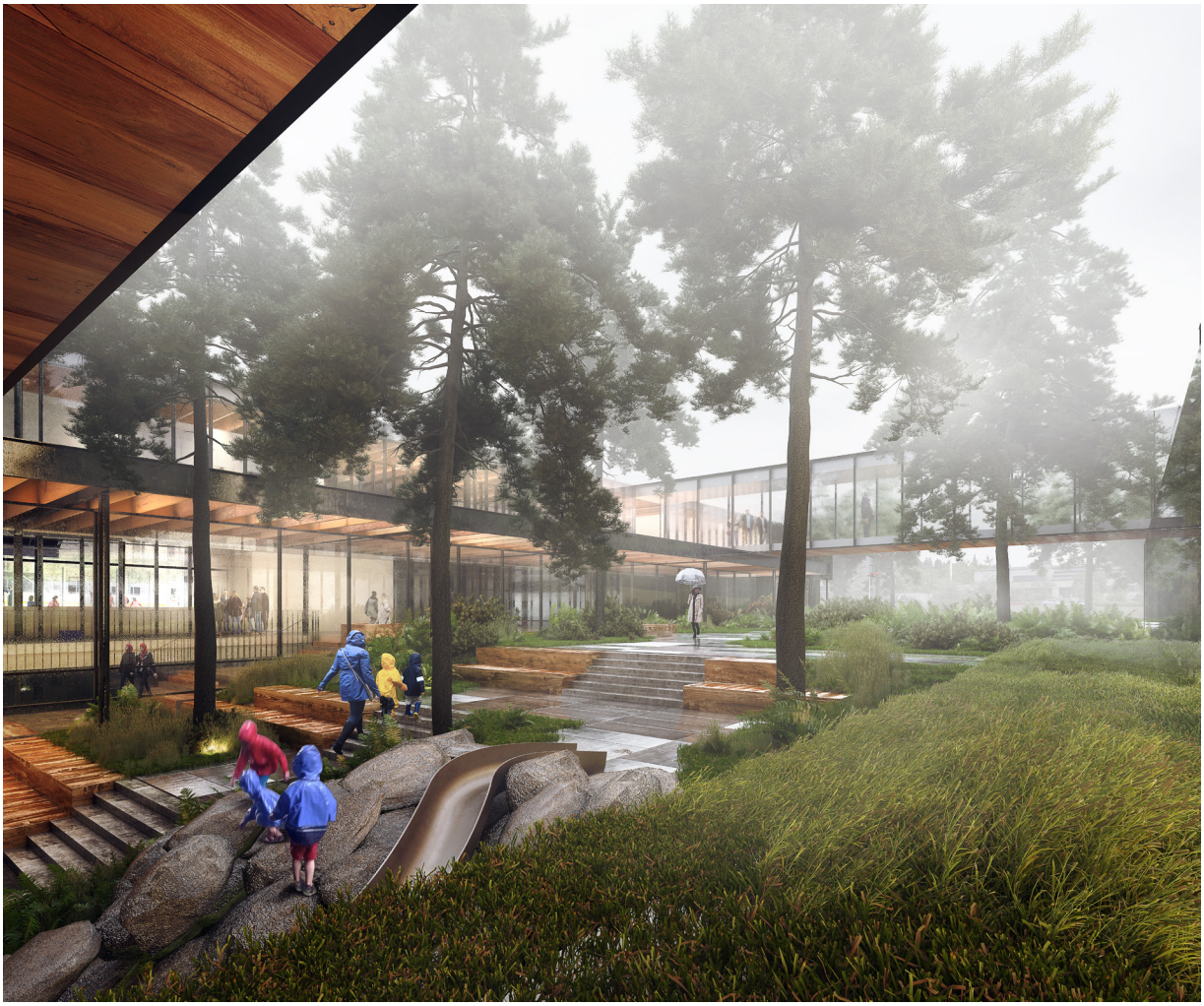
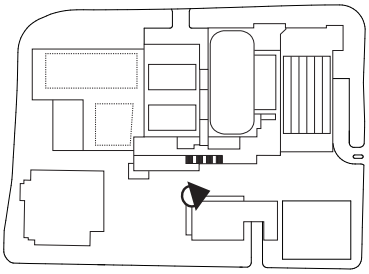


▲ Concept Render - Exterior view from within ravine

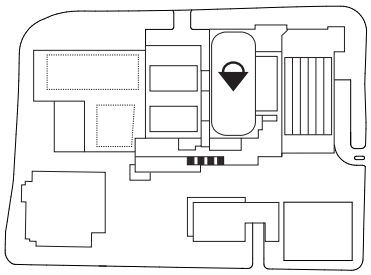
The building across the ravine glows with activity as you glance into the ice arena on a rainy day. Trying to stay dry, but active, you see people walking laps on the third floor internal walking loop above.



VIEW KEY

▲ Concept Render - Interior view from within Ice Arena

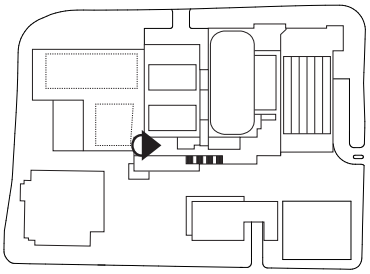
Soft daylight filters into the arena as you enjoy an afternoon on the ice. Parents watch from the spectator seating and from the large warm viewing areas in the internal street and walking loop. Through this space, you can see the tall trees of the ravine.



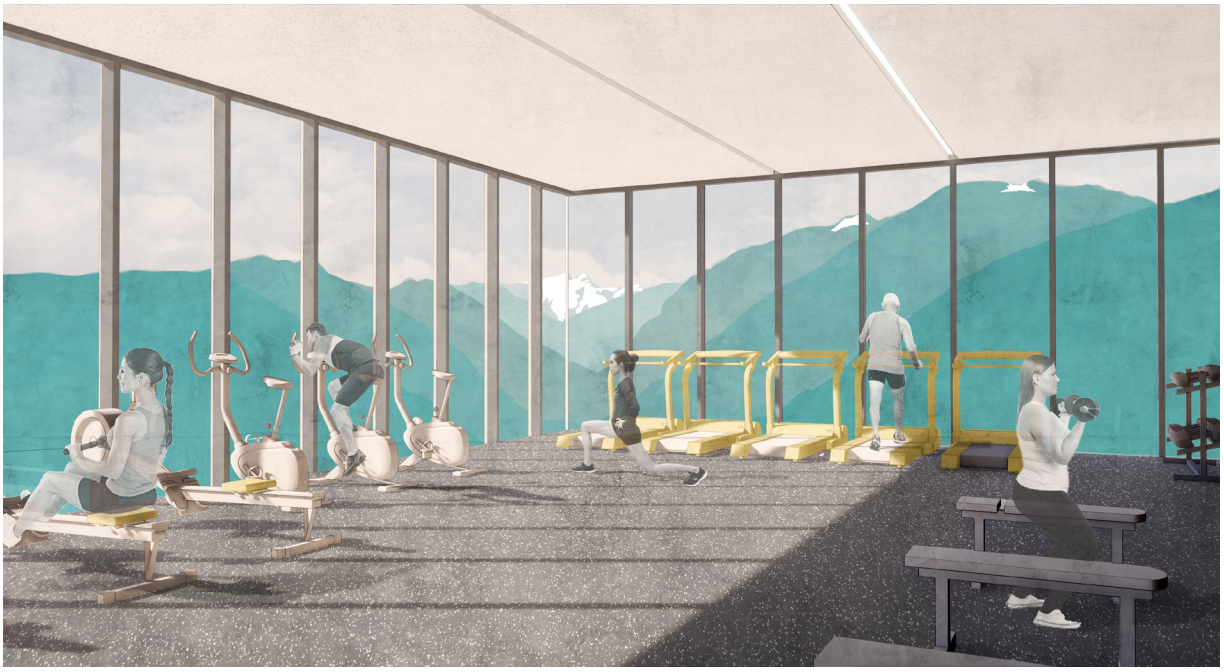
VIEW KEY

▲ Concept Render - Interior view from within Casual Activity Zone

A welcoming place to casually explore recreation. You can see through multiple levels and layers of activity. From the ravine, lobby, and swimming pool over to the arena and gymnasium.

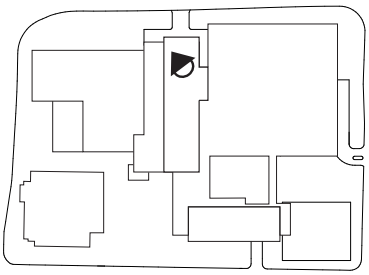


VIEW KEY



▲ Concept Render - Interior view from within Fitness Centre

Surrounded by elevated views to mountain tops and ocean harbour, multiple exercising options are offered on the fourth floor from fitness classes to individual strength training.

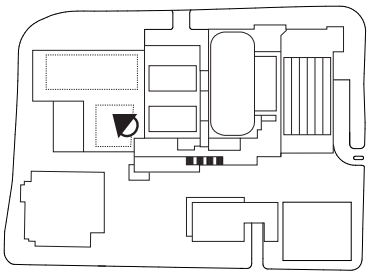


VIEW KEY

▲ Concept Render - Interior view from within the Aquatic Centre

The zero-entry leisure pool provides play space and leisure swimming for all ages. Beyond, someone dives into the 50m pool while others are swimming laps. The wellness area, on the left, stretches outside to a west-facing and naturally landscaped patio beyond the two hot pools.

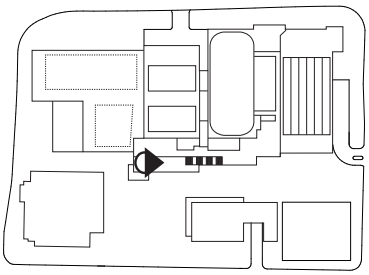
Framed views of the North Shore mountains are prominent from within the Aquatic Centre.



VIEW KEY

▲ Concept Render - Interior view from within Lobby

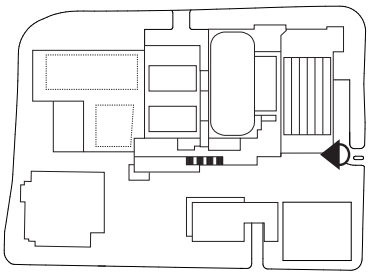
The community gathers in the welcoming and vibrant social heart of the building. The entrance lobby provides views into the Aquatic Centre and ravine, and offers a cafe to enjoy a treat indoors, or in the entrance plaza and ravine.



VIEW KEY

▲ Concept Render - Exterior view from Active Zone

Vibrant and active gathering zones span across the upper ravine providing casual activities for all ages and abilities. The partial covering over the new skate plaza on the left offers riders shade from the sun and protection from the rain.



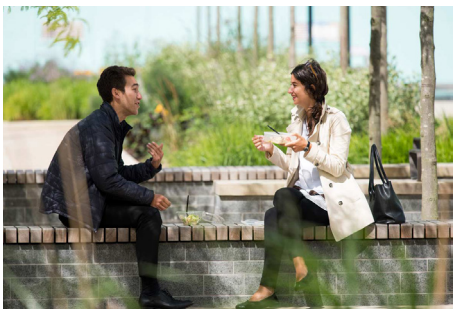
VIEW KEY

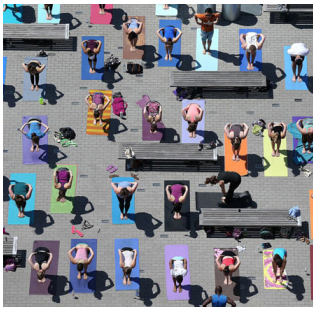
3.6 Landscape Design

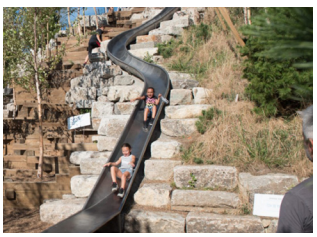
The open space design for HJCRC evokes the character of North Vancouver through native and adaptive planting, use of materials including wood and stone, as well as through the expression of landform. This design language unites spaces that have diverse program and of varying scales, from small tranquil seating areas nestled within planting, to areas of high activity including a skate park and youth zone.

These interconnected spaces between the building allow activity on the buildings interior to spill out into the landscape, and for the landscape to create a strong backdrop for the life that occurs inside. This relationship helps to support a vibrant and diverse community and fosters social interaction through gathering spaces adjacent to programmed areas; spaces where parents can meet while their children play, where youth can talk between a basketball game or between rides through the skate plaza, where visitors to Silver Harbour Seniors' Activity Centre can go outside for a chat in the shade, or where Centennial Theatre goers can gather before a play. The largest of these social areas is the entry plaza, a highly flexible and adaptable space able to host: community events, outdoor classes, seniors' crafts or children's art programs, while also offering a comfortable environment for informal daily use by providing ample seating and gathering spaces along its edges.

The design and programming of the community recreation centre's open space reveals the energy and activity that takes place inside while further contributing to the HJCRC's ability to foster strong social connections between members of North Vancouver's diverse community.





▲ Landscape Plan

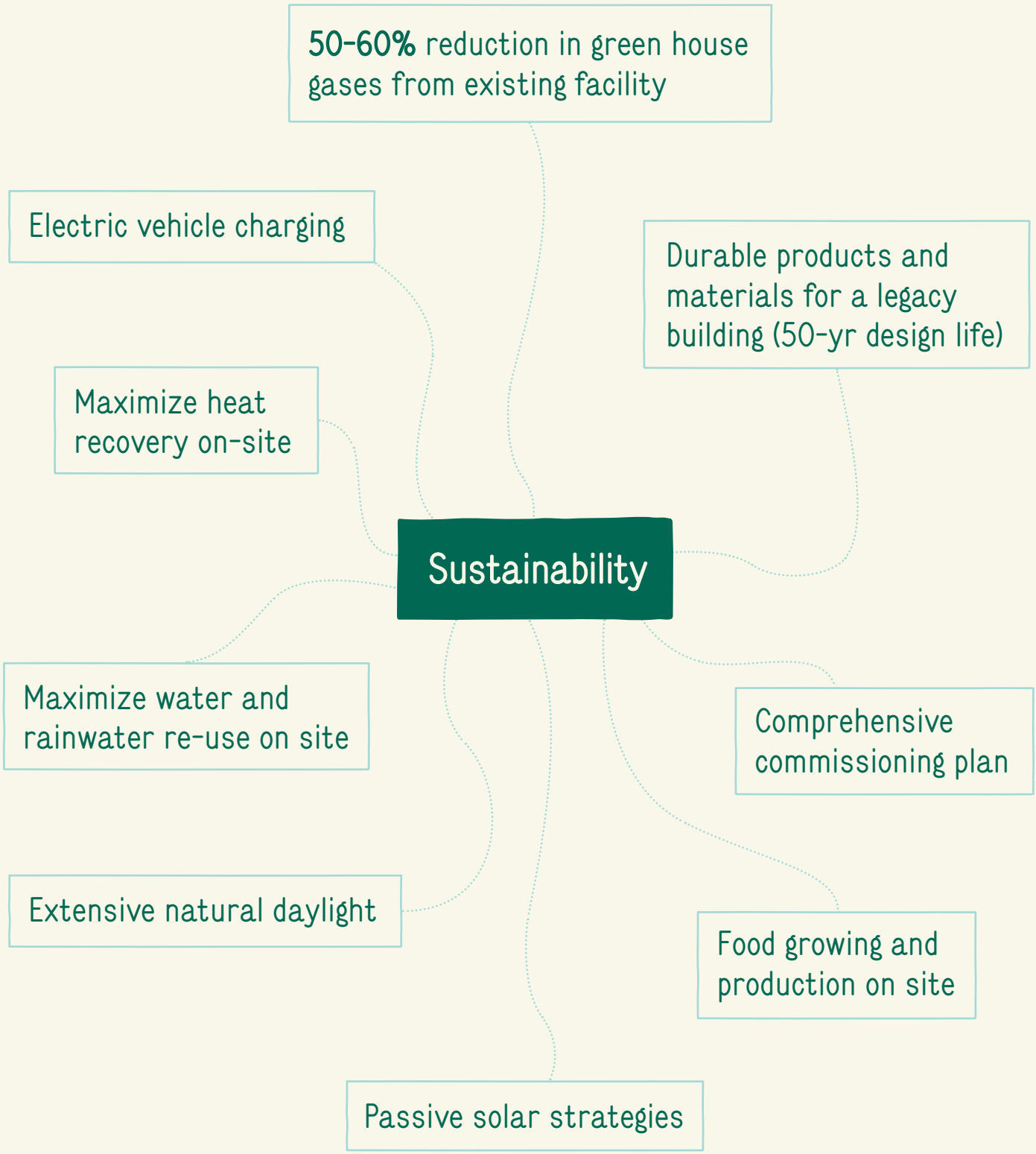
3.7 Sustainability

The City has adopted aggressive climate action targets to reduce greenhouse gas emissions and the existing Harry Jerome Recreation Centre is the largest contributor to the city's overall emissions footprint. As a result, sustainability is a priority within the project vision and principles.

City staff and consultant team met over a 4-month period to develop a sustainability strategy for the project. The strategy is based on a mixture of quantitative targets related to energy and carbon, and tactical design targets such as maximizing rain water re-use on site.

The Harry Jerome Community Recreation Centre has a highly complex building program, with a mixture of energy intensive uses such as pools and ice rinks. Despite these challenges, staff and design team came to consensus on a design approach that reduced the carbon Intensity of the project by 50-60%.

Throughout the course of the integrated design process there were a number of other design goals that emerged through the dialogue. Some of these include maximizing heat recover on-site, extensive natural daylight, passive solar strategies, electric vehicle charging and maximizing water and rainwater re-use on site.


50-60% reduction in green house gases from existing facility
Electric vehicle charging
Durable products and materials for a legacy building (50-yr design life)
Maximize heat recovery on-site
Sustainability
Maximize water and rainwater re-use on site
Comprehensive commissioning plan
Extensive natural daylight
Food growing and production on site
Passive solar strategies

3.8 Cost Analysis

A class C cost estimate was prepared based on the review of schematic design information provided for the new construction of the Harry Jerome Community Recreation Centre in North Vancouver, BC. The estimate was priced in Q3 2018 and assumed a construction start date of September 2020. Class C Order of Magnitude conceptual estimates are typically +/- 15% in accuracy with many variables influencing the final construction price including final design scope parameters and steel market conditions.

HJCRC Cost Summary

CLASS C ESTIMATE

$166, 963, 600	Construction + Soft Costs
$32, 337, 300	Contingencies + Escalation
$1, 391, 000	Project Oversight
$200, 691, 900	Total Project Cost

4.0 Community & Stakeholder Engagement

The HJCRC renewal project has been many years in the making with numerous public engagements. This engagement process built upon the previous findings, but with a renewed focus on the over arching project vision, programming opportunities/priorities, and concept design. The engagement approach was comprised of three key phases:

PHASE 1: IDEAS FAIR AND IDEAS SURVEY

An Ideas Fair took place at North Vancouver City Hall on February 15, 2018. The Ideas Fair consisted of 10 visually engaging and interactive boards with area for community feedback. Almost 400 comments were collected on sticky notes on the interactive exhibit about what is important to community members in the new community recreation centre. A total of 900 respondents completed the survey during the survey period that ran for over two weeks. The survey was available online and in paper format; community ambassadors attended both the Ideas Fair and visited various locations around the City during the survey period with iPads available for the public to fill in the online survey. The purpose of this survey was to find out what the community's activity and program priorities are for the new community recreation centre, including areas for indoor and outdoor programs, events, and casual recreation as well as social and cultural activities. The findings of this survey were used to inform the overall vision and design of the centre.

PHASE 2: INFORMATION SESSION

An Information Session occurred on May 23, 2018 at HJCRC to share with the community the emerging concept design and to hear the community's thoughts about what role this exciting new facility could play in our community. The Information Session provided informative graphic boards showing the community what the planning team heard in phase 1 of community and stakeholder engagement and how it was incorporated in the emerging concept design. Comment cards were available at the Information Session; over 40 comment cards were completed.

PHASE 3: SKATE PLAZA

Three events took place in the Spring of 2018 to engage the community on the new skate plaza: Design Workshop 1 on April 14 at Centennial Theatre, CityFEST on May 5 adjacent to the existing City Skate Park, and Design Workshop 2 on May 22 at Centennial Theatre. The purpose of the skate plaza engagement was to hear the City Skate Park community's ideas about how they'll use the temporary and proposed new skate plaza. A participant feedback form was provided at each of the design workshops to record the community's feedback in relation to the materials presented at the workshops.

Refer to appendices 6.7 and 6.8 for the full community and stakeholder engagement results summaries.

Simultaneous to the public events, the City of North Vancouver and NVRCC led 48 sessions with multiple advisory and stakeholder groups during the Functional Program development. Refer to subsection 2.1 for additional information on the Functional Program as well as the advisory and stakeholder groups engaged.

Harry Jerome Community Recreation Centre

Community & Stakeholder Engagement

Information Session

MAY 23, 2018

50 attendees signed in

43 completed comment cards

Ideas Fair

FEB 15, 2018

68 attendees signed in at opening event

Over **400** post-it feedback notes were gathered

Exhibits in place at HJCRC for two weeks

Ideas Survey

FEB 15 TO MAR 2

900 respondents

Student ambassadors assisted with iPads at various locations:

City Hall, **HJCRC** and **Lonsdale Quay**

Skate Plaza Engagement

Workshop 1: April 14

22 participants

CityFEST: May 5

30 attendees signed in

Workshop 2: May 22

35 participants

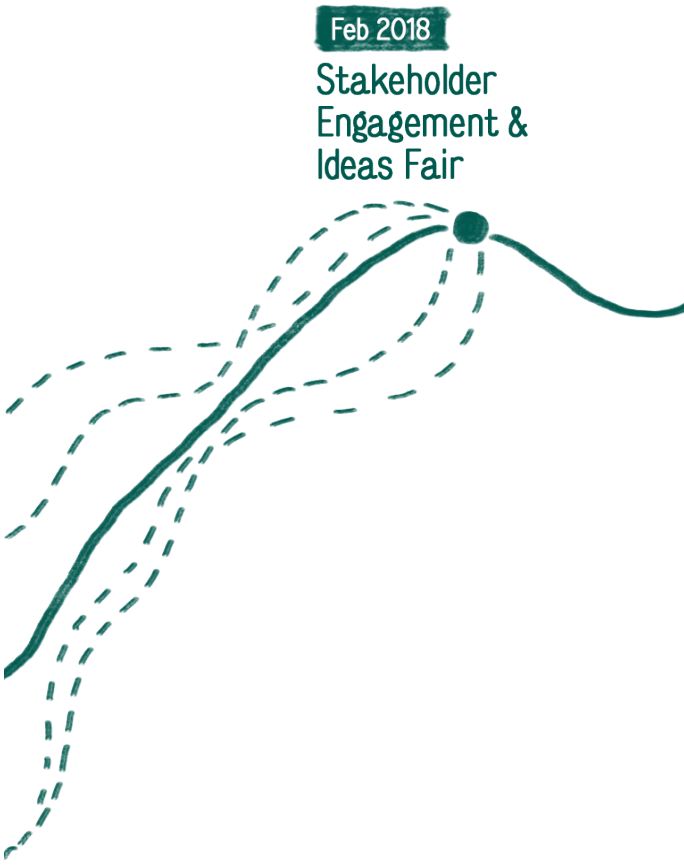
5.0 Next Steps

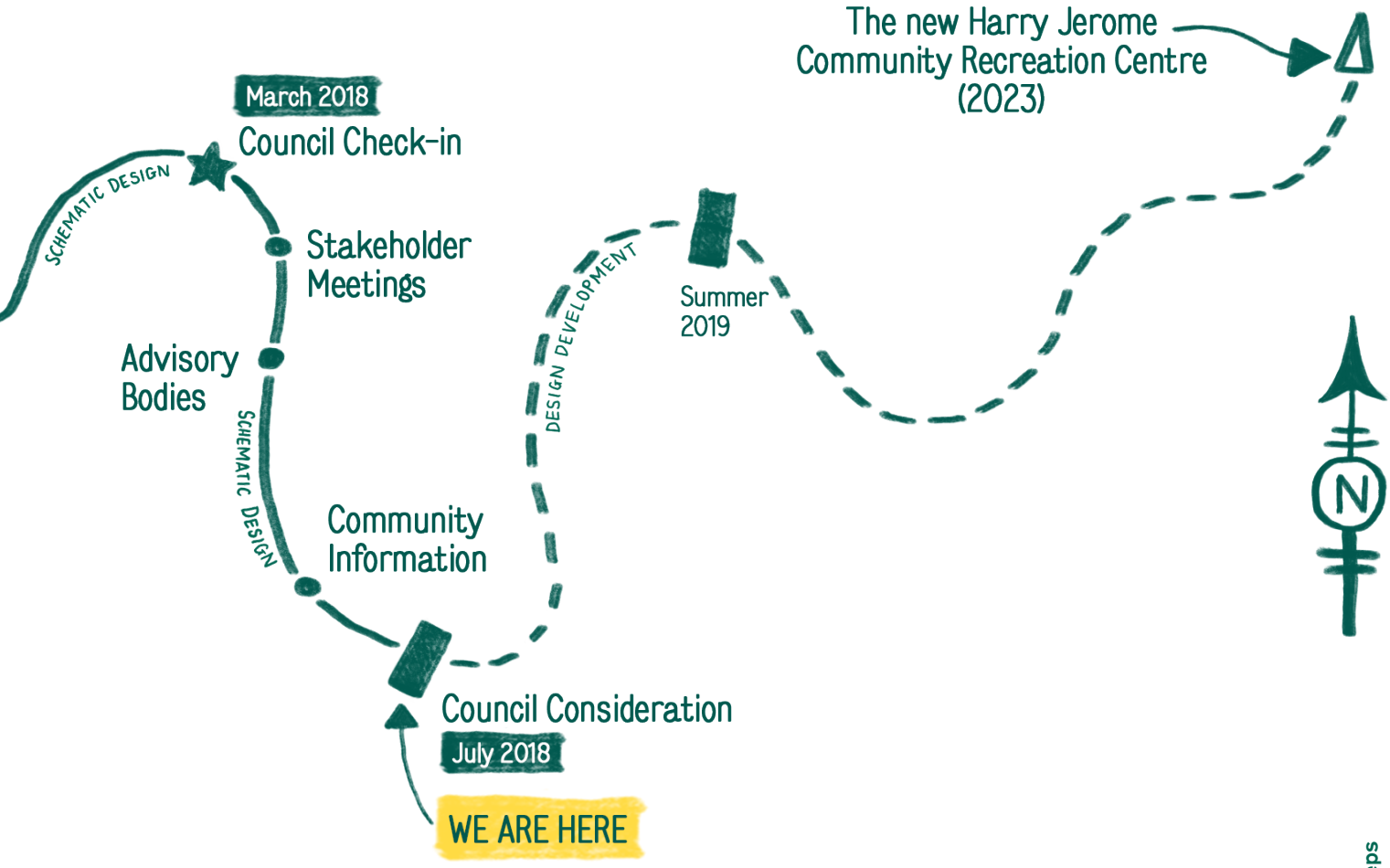
6.0 Next Steps

The next stage of this project is to proceed to design development. We would advise the release of this Schematic Design report and continue into the next stage.

As part of the next stage, we would recommend the City of North Vancouver consider hiring a construction manager if it is the preferred construction delivery method.

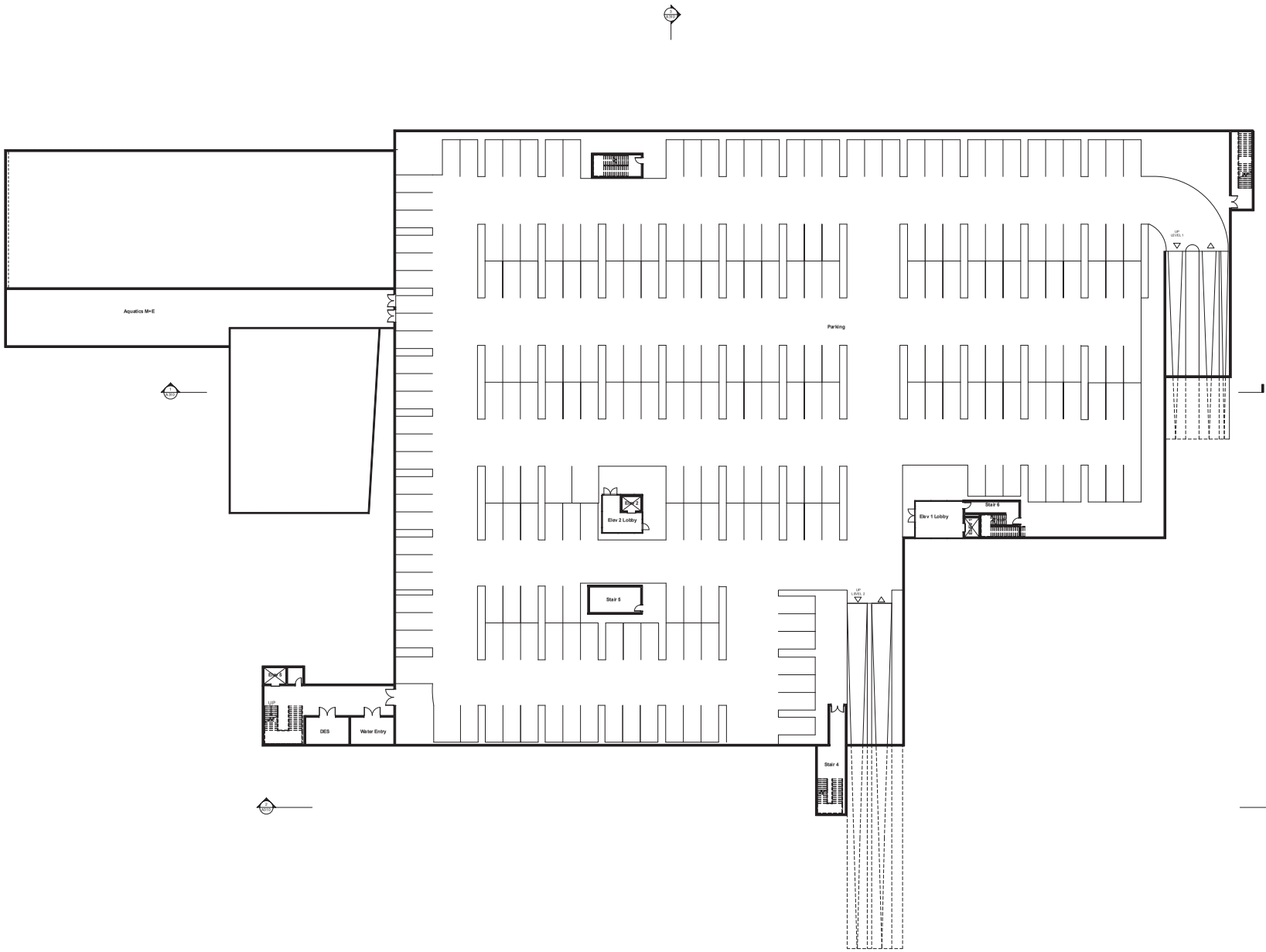
The team should also consider further investigations into sustainability opportunities and continue to find collaborative ways to further reduce GHG emissions.




The new Harry Jerome Community Recreation Centre (2023)
March 2018
Council Check-in
SCHEMATIC DESIGN
Stakeholder Meetings
Advisory Bodies
SCHEMATIC DESIGN
Community Information
DESIGN DEVELOPMENT
Summer 2019
Council Consideration
July 2018
WE ARE HERE
N

6.0 Appendix

6.1 Architectural Drawings



HCMA

CONSULTANT LOGO

DATE

REVISION DESCRIPTION

Harry Jerome CRC
North Vancouver, BC

LEVEL -1 PLAN

A200

SCALE: 1 : 200

HCMA Architecture + Design
400 - 675 West Hastings Street
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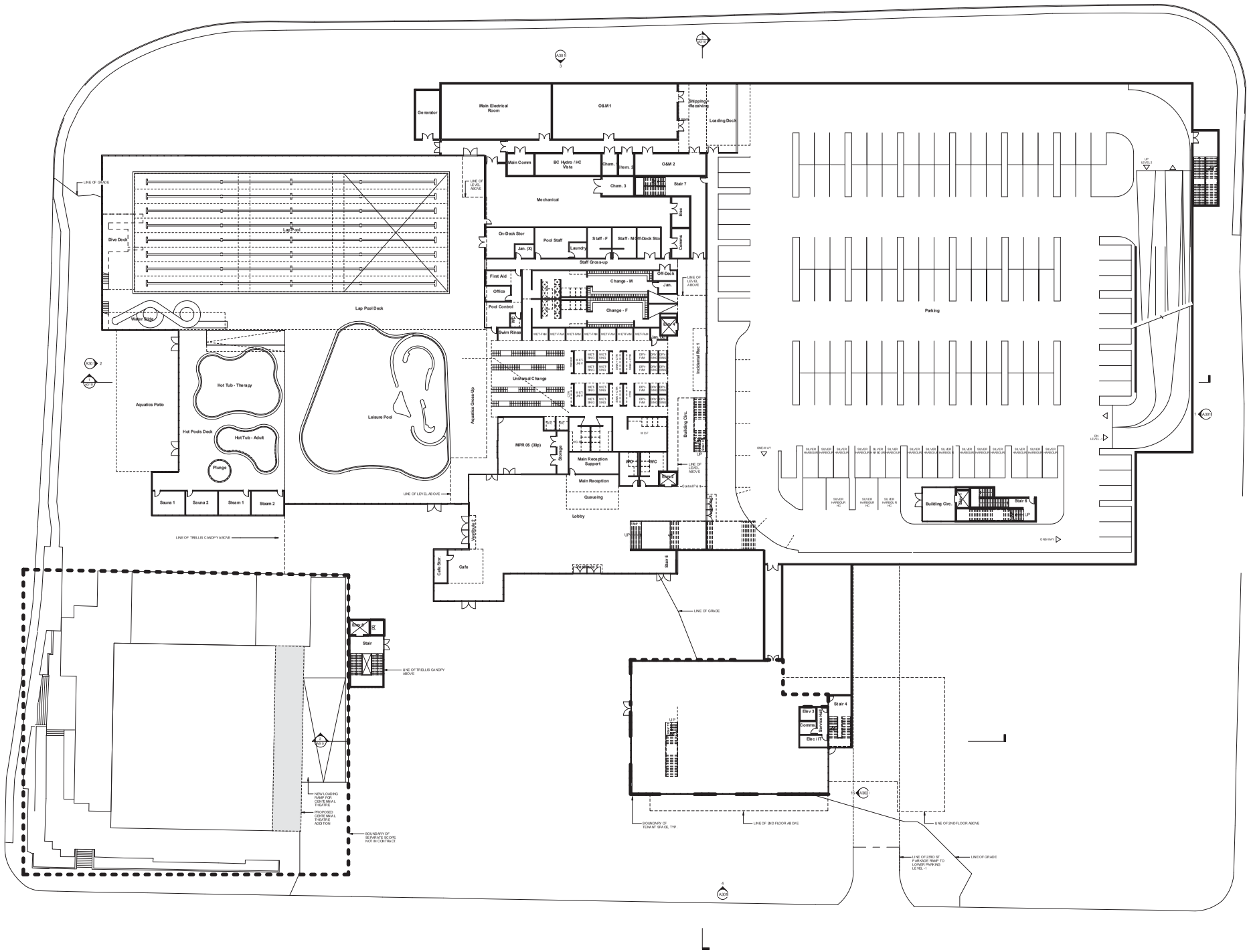
PROJECT#:1766 • **DRAWN:**Author



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CONSULTANT LOGO

Harry Jerome CRC
North Vancouver, BC

REVISION	DESCRIPTION	DATE
1	ISSUED FOR...	DD/MMM/YYYY

LEVEL 1 PLAN

A201

SCALE: 1 : 200

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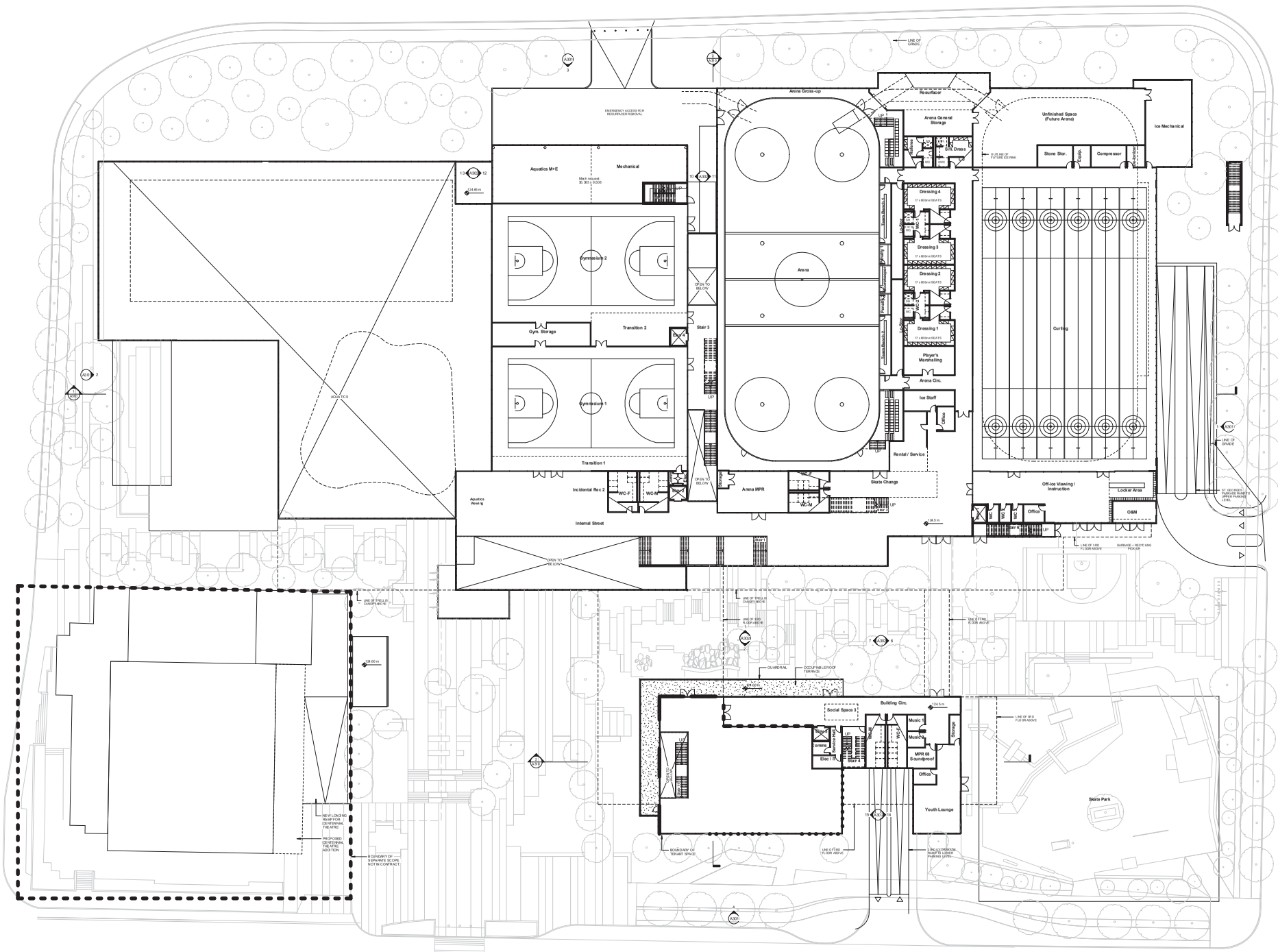

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North Vancouver, BC

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LEVEL 2 PLAN

A202

SCALE: 1 : 200

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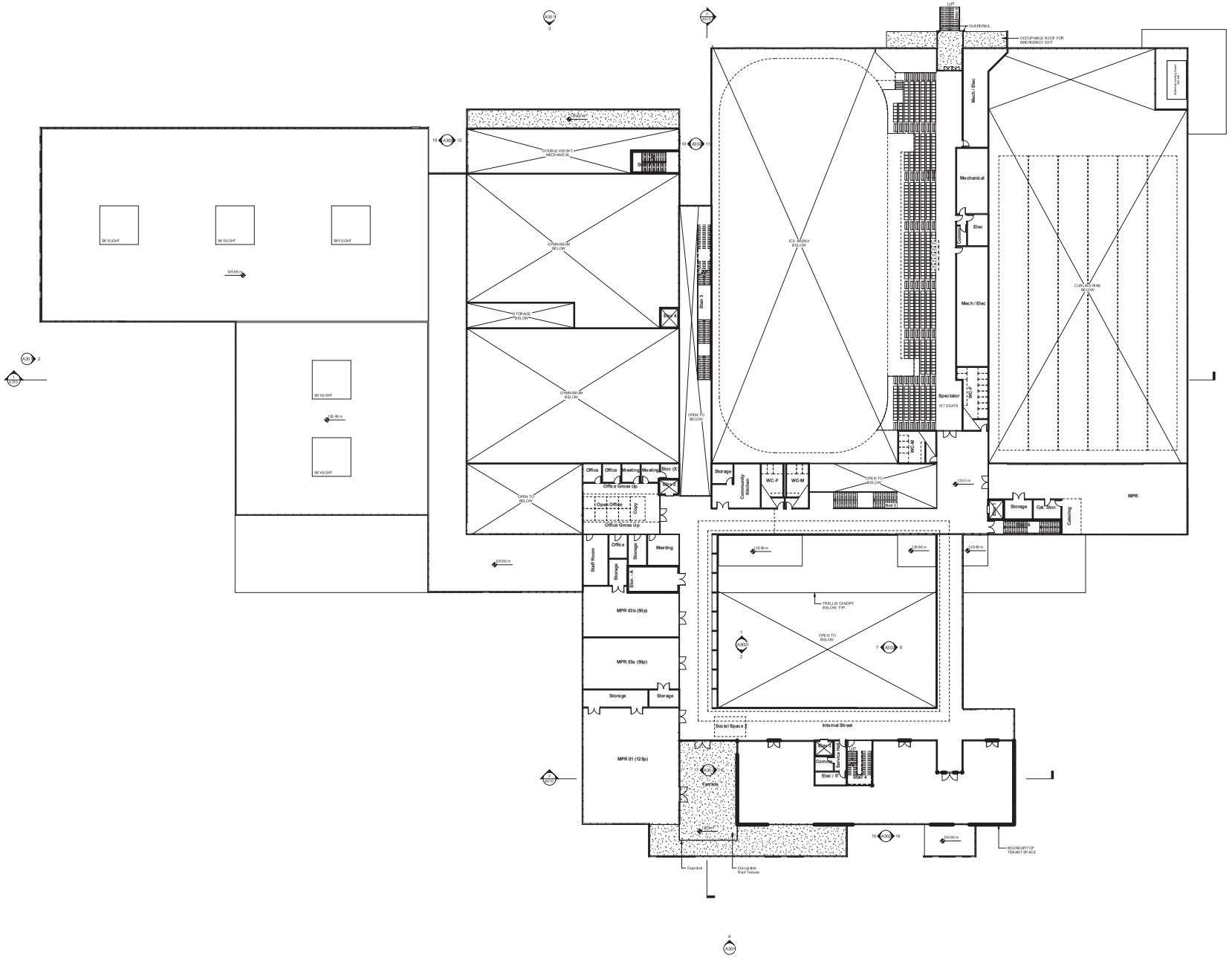

HCMA

CONSULTANT LOGO

Harry Jerome CRC
North Vancouver, BC

REVISION DESCRIPTION DATE

LEVEL 3 PLAN

A203

SCALE: 1 : 200

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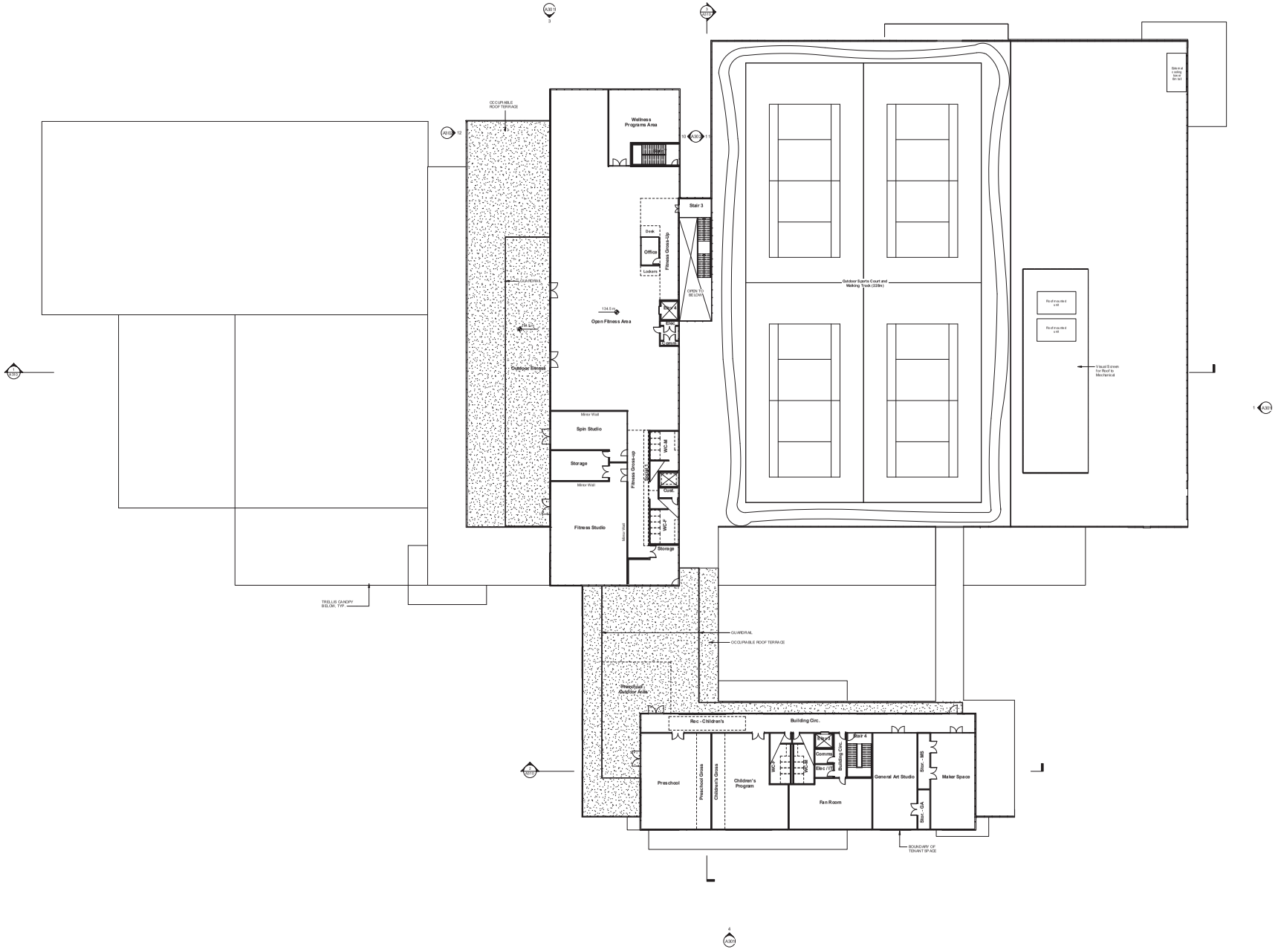
PROJECT#:1766 • DRAWN:Author



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CONSULTANT LOGO

Harry Jerome CRC
North Vancouver, BC

REVISION DESCRIPTION DATE

LEVEL 4 PLAN

A204

SCALE: 1 : 200

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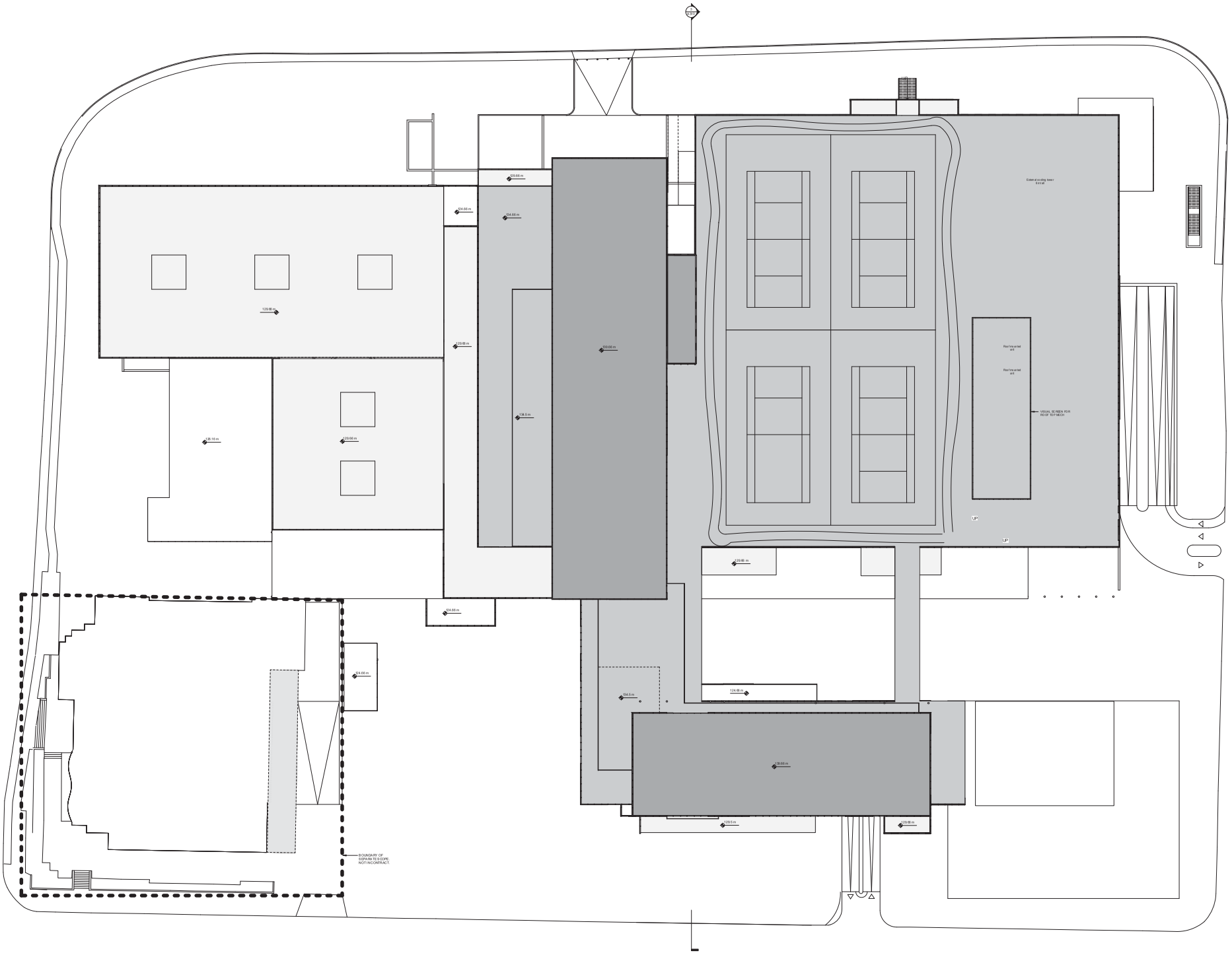
W hcma.ca

PROJECT#:1766 • **DRAWN:**Author



HCMA

CONSULTANT LOGO

Harry Jerome CRC
North Vancouver, BC

REVISION DESCRIPTION DATE

ROOF PLAN

A205

SCALE: 1 : 200

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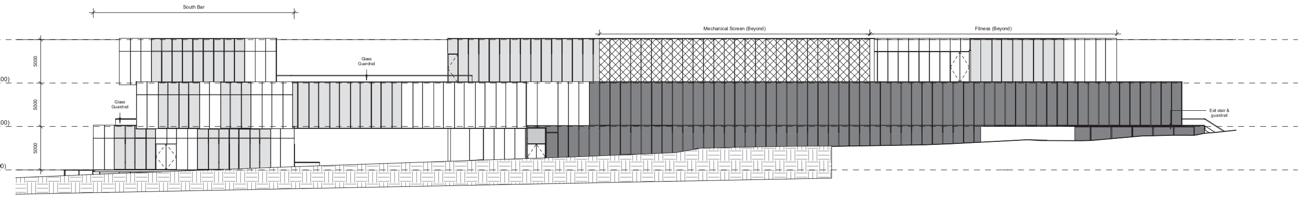
PROJECT#:1766 • **DRAWN:**Author



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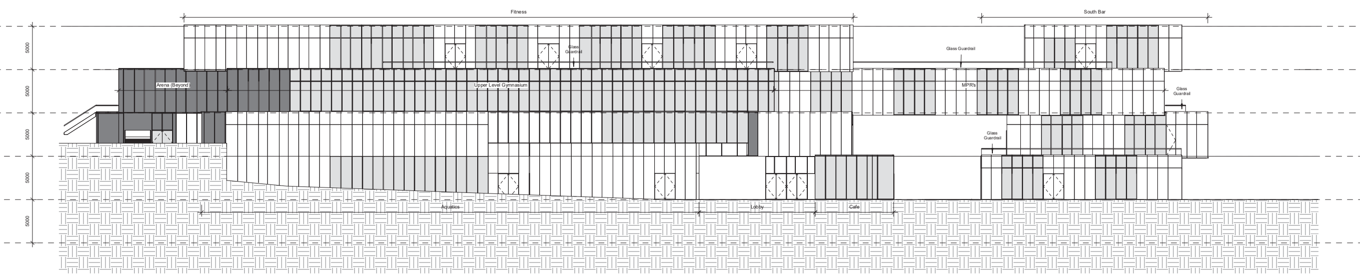

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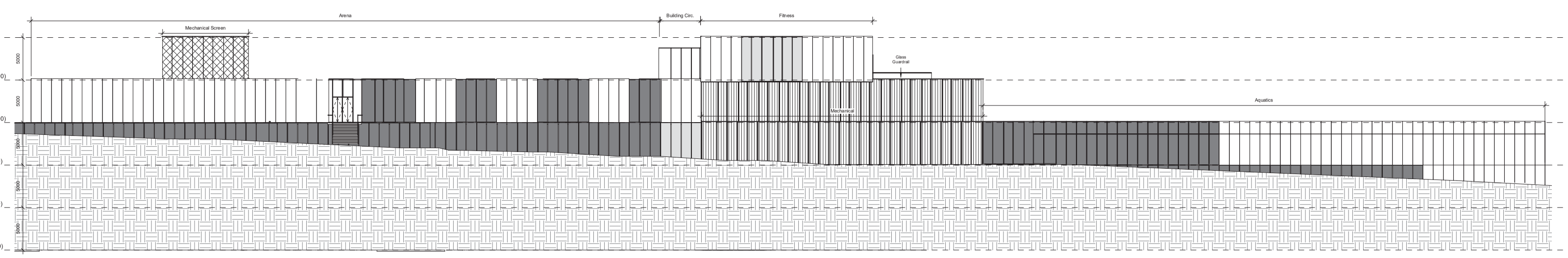

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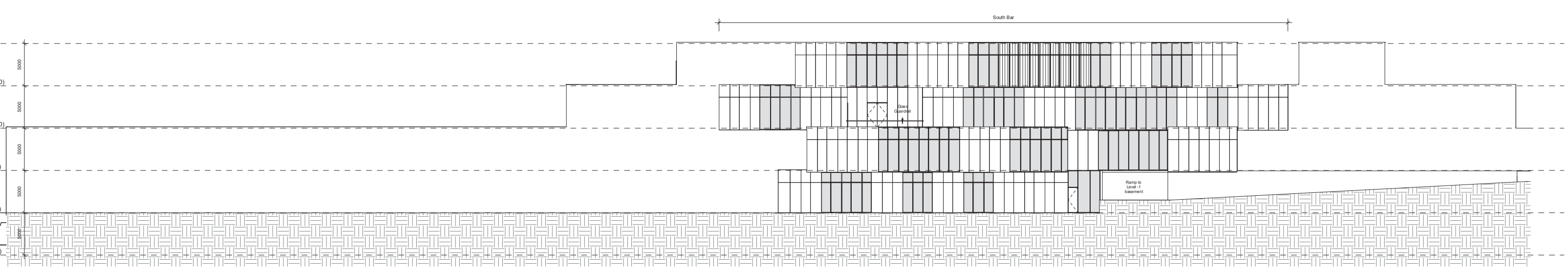

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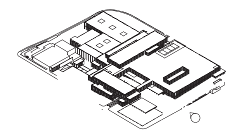

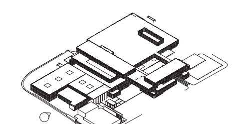

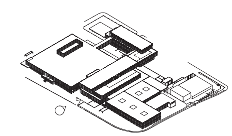

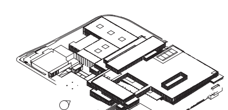

HCMA

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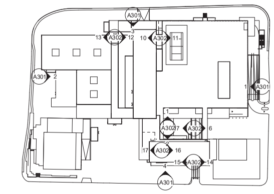

Facade Panel Types

- **Facade Panel Type 1** Kawneer 1600UT system 2 - 4 sided SSG. (20% of glass panels to include fritted pattern)
- **Facade Panel Type 2** Insulated metal panel to custom colour
- **Facade Panel Type 3** Corrugated steel rainscreen on steel stud to custom colour
- **Facade Panel Type 4** Architectural louvre panel to custom colour
- **Facade Panel Type 5** Perforated corrugated steel screen

REVISION DESCRIPTION DATE

Harry Jerome CRC
North Vancouver, BC

BUILDING ELEVATIONS

A301

SCALE: As indicated

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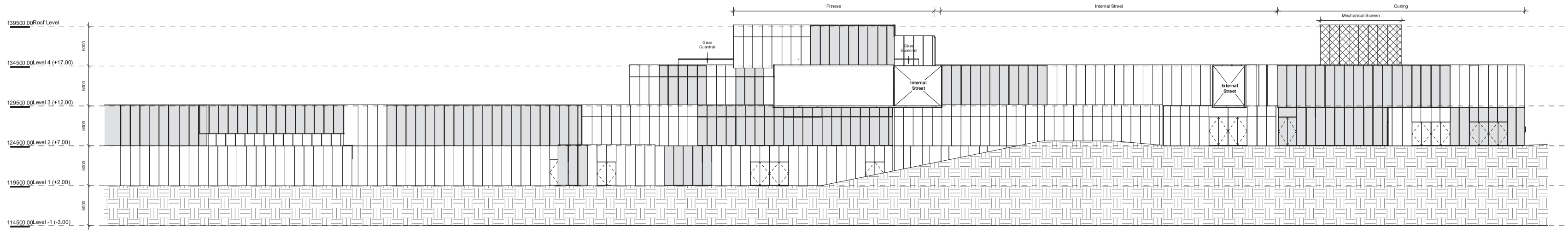

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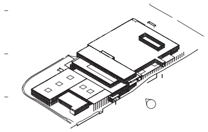

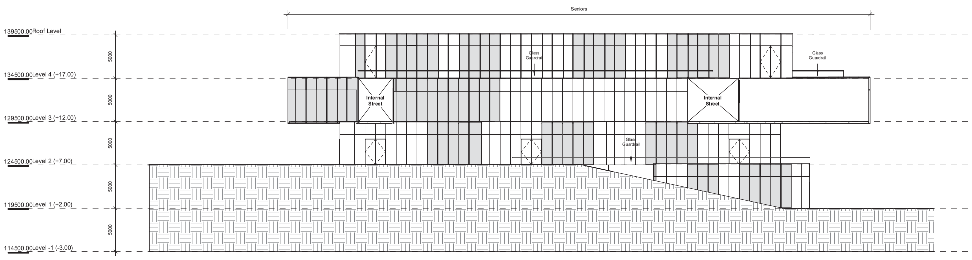

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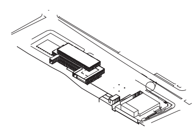
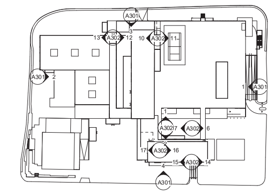




Facade Panel Types

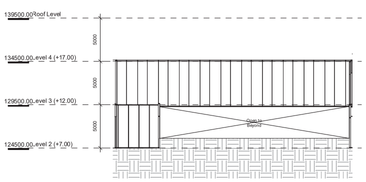
Facade Panel Type 1
Kawneer 1600UT system 2 - 4 sided SSG. (20% of glass panels to include fritted pattern)

Facade Panel Type 2
Insulated metal panel to custom colour

Facade Panel Type 3
Corrugated steel rainscreen on steel stud to custom colour

Facade Panel Type 4
Architectural louvre panel to custom colour

Facade Panel Type 5
Perforated corrugated steel screen



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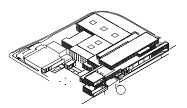

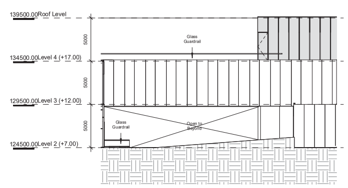

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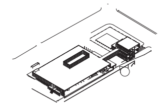

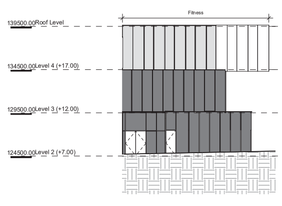

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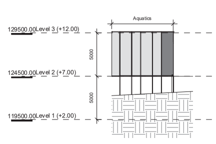

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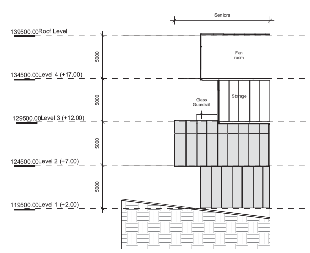

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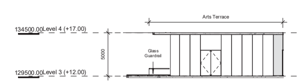

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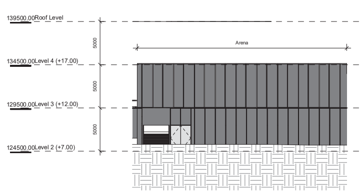

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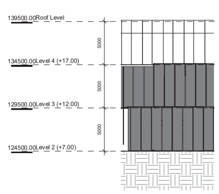

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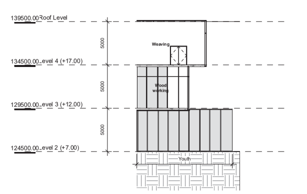

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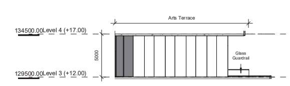

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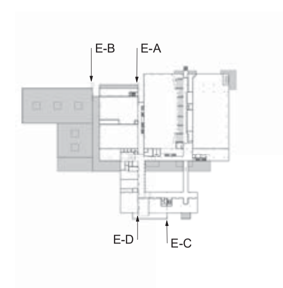

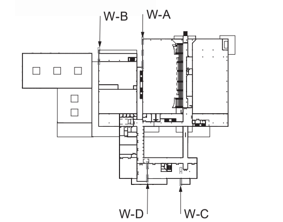

CONSULTANT LOGO:

HCMA

Harry Jerome CRC
North Vancouver, BC

REVISION DESCRIPTION DATE

BUILDING ELEVATIONS

A302

SCALE: As indicated

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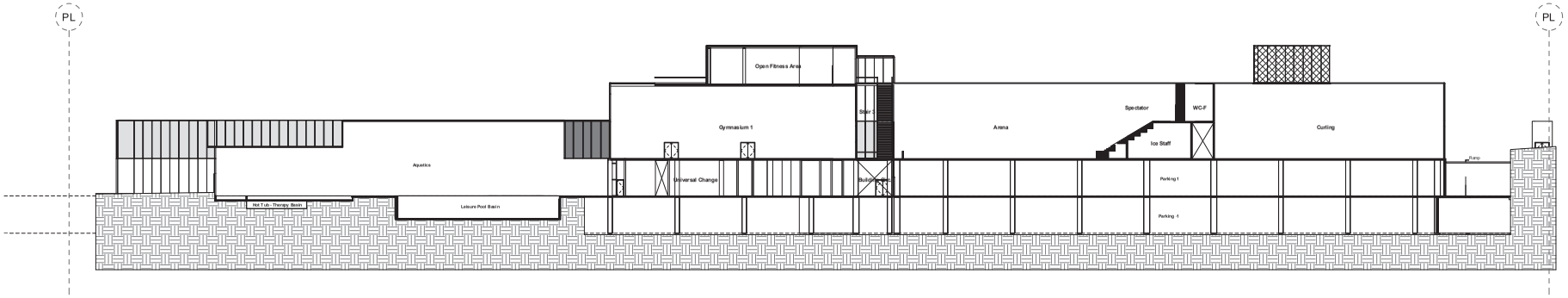

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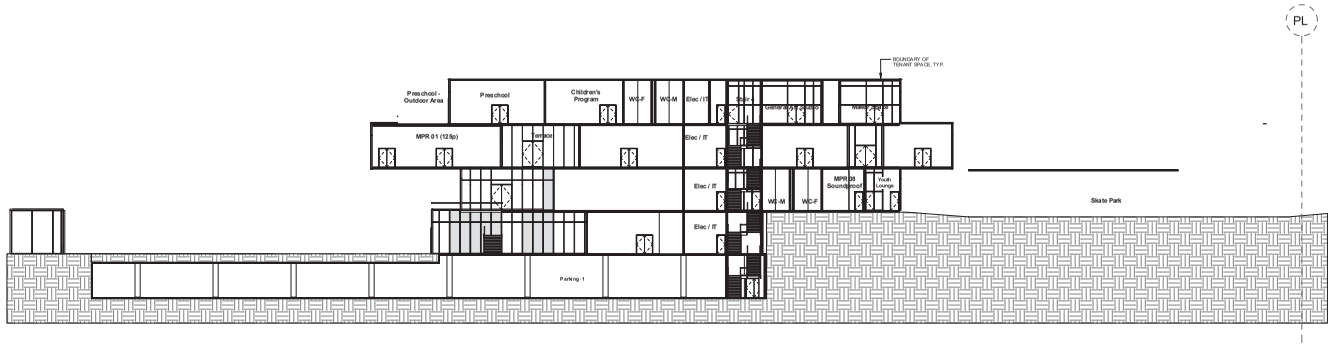

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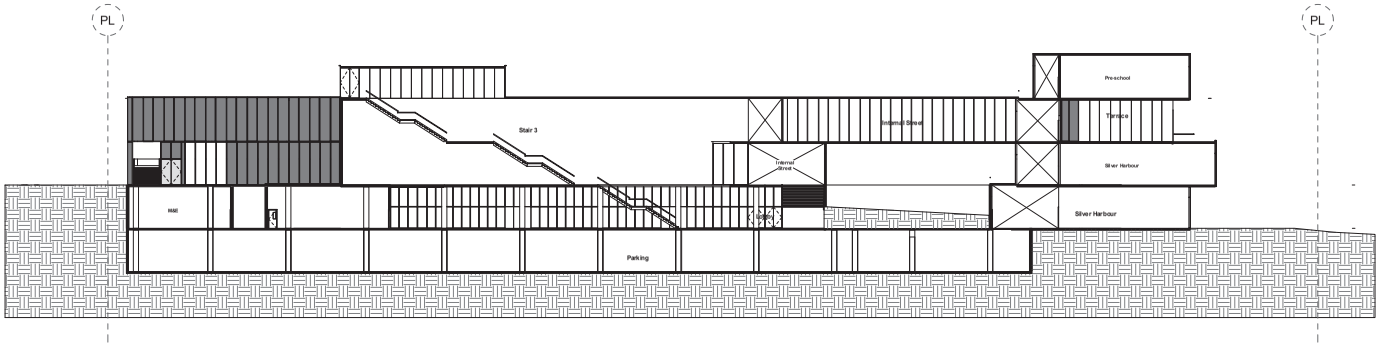

3 Section C
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PROJECT#:1766 • DRAWN:Author

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CONSULTANT LOGO

DATE

REVISION DESCRIPTION

Harry Jerome CRC
North Vancouver, BC

BUILDING SECTIONS

A310

SCALE: 1 : 200

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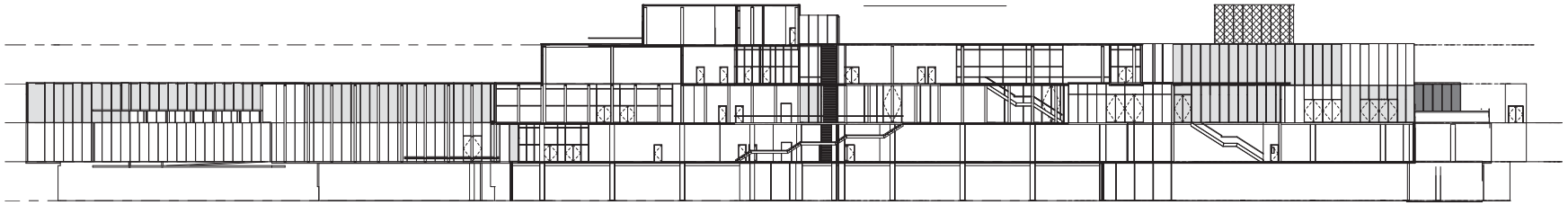

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North Vancouver, BC

REVISION DESCRIPTION DATE

BUILDING SECTIONS

A311

SCALE: 1 : 200

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PROJECT#:1766 • **DRAWN:**Author

6.2 Structural Drawings & Report

Fast + Epp

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July 11th, 2018

Paul Fast, Principal
HCMA Architecture + Design
400–675 West Hastings Street
Vancouver, BC, V6B 1N2

Structural schematic design report for Harry Jerome Community Recreation Centre (HJCRC)

1. Introduction

The proposed Community Recreation Centre at 100th block of East 23rd street, North Vancouver, BC is a complex of three buildings, up to four storeys high, with up to two storeys of below grade parking.

The Centre is set to be a significant new community facility providing amenities including a 50m long swimming pool, a gymnasium, an ice arena, a curling arena and multi-purpose social spaces. In the context of this structural schematic report the buildings within the complex are defined on the basis of being structurally independent from each other and are therefore defined as:

- Ice arena complex to the north-east
- Aquatics and gymnasium complex to the north-west
- Multi-purpose building to the south

The structural design aims to achieve the architectural vision of open, bright spaces for the large recreational spaces, providing flexible floor plans and facilitating the architectural massing geometry.

The structural material strategy is to use materials where best suited while looking to maximise sustainability goals. Concrete is proposed for lower level building structures as an economical method of construction for the large area floor plates and below grade structures. Steel is proposed for the upper level structures and is to be used with timber for the long span roof structures. The community building to the south is a feature massing element composed of storey high, overlapping cantilever box structures. The nature of this special massing lends itself to a concealed steel truss system. Careful attention to detail with exposed elements will ensure a pleasing aesthetic throughout the building and achieving sustainability goals will be assisted by utilizing a high recycled content in steel sections and high volume of fly ash substitution for cement in all concrete elements.

2. Design assumptions

2.1 Codes

As the British Columbia Building Code (BCBC) may be superseded before this project is issued for building permit, we have used the more recent National Building Code of Canada (NBCC) to ensure the most current code strategies are employed. The schematic design presented is based on the NBCC 2015.

The following material design codes are to be followed in the design:

- CSA A23.3-14 Design of concrete structures
- CSA S16-14 Design of steel structures
- CSA O86-14 Engineering design in wood
- CSA S304-14 Design of masonry structures

2.2 Importance category

The building is a community centre with the potential to act as an emergency shelter and is also assumed not to be a facility for manufacturing or storing toxic, chemical or other hazardous substances in sufficient quantities to be hazardous to the public if released. The building is therefore categorized as High importance with the following importance factors for the purposes of the code:

- Snow Importance factor: $I_S = 1.15$;
- Wind Importance factor: $I_W = 1.15$
- Earthquake Importance factor: $I_E = 1.3$

2.3 Loads

Live load

The following live loads are to be used:

- Garage for vehicles not exceeding 4000kg gross weight 2.4kPa
- Loading bay (vehicles to 9000kg max gross weight) 6.0kPa
- Offices (except basement and ground floor) and classrooms 2.4kPa
- Mechanical rooms 3.6kPa
- All other areas including sport facilities 4.8kPa (inc. partitions)
- Inaccessible roof space 1kPa

For the design of the floor (excluding roof) in this schematic design, a live load of 4.8kPa is allowed for in all areas, to allow programming flexibility as the design progresses.

Snow load

S_s	3.0kPa
S_r	0.3kPa

Wind load

$q_{1/50}$	0.45kPa
$q_{1/10}$	0.35kPa

Seismic load

$S_a(0.2)$	0.794	$S_a(5.0)$	0.077
$S_a(0.5)$	0.699	$S_a(10.0)$	0.027
$S_a(1.0)$	0.399	PGA	0.345
$S_a(2.0)$	0.243	PGV	0.518

The geotechnical assessment by Geopacific, dated May 14 2018, determines that the Site Class is Class C in accordance with BCBC 2012. Classification in accordance with NBCC 2015 should be confirmed by the geotechnical consultant if the design is determined to be based on this code.

2.4 Fire protection

The floor structures will be designed to provide adequate fire protection to the structural members. Where structural members do not have code recognized fire resistance one of two options will be used. The first option is to use a protective barrier, such as gypsum drywall or cementitious spray. The second is to use an approved method of surface protection, such as intumescent paint for steel members or charring protection in the case of wood members.

3. Substructure and Parkade

The foundation design has been based on the site investigation and recommendations outlined in the geotechnical report provided by Geopacific Consultants, dated May 14, 2018.

Strip footings are to be used to spread the wall loads and pad footings are to be used to spread the concentrated column loads onto the supporting stratum. Shallow foundations were chosen for three reasons. First, the high bearing capacity of the native soils at the building grades do not require deeper foundations. Second the use of cast-in-place concrete footings is very common and should be the most cost-effective option. Lastly, the required contingency for changes during the design phase can be reduced because of the low unit cost rate for pad footings relative to deep foundations.

All three buildings will share a common basement that will make up the majority of the site footprint at the lowest parkade level. The soil conditions will allow for a typical reinforced slab on grade construction for the lowest parking level.

At Level 1 above the parking structure, a 300mm thick concrete flat plate construction will be used. The slab will be supported on concrete columns on a typical 9m x 9m grid, developed to best meet spatial requirements across floors. For areas of slab with intense vegetation a thicker slab will be required. Some columns above may require transfer elements within the slab to ensure efficiency in the parking layout.

The below grade retaining wall structure will typically comprise of a continuous 300mm thick concrete wall with drainage mat and waterproofing to prevent water ingress.

4. Superstructure

The three buildings as described in section 1 will be structurally separated from each other by continuous seismic joints. Each building will be structurally independent both vertically and laterally. Each building system is described in this section in turn.

4.1 Ice Arena Complex

Floors and roofs

For the Ice Arena Complex the Level 1 and Level 2 floor slabs will be suspended concrete flat slabs varying between 300mm and 350mm thick. The selection of a cast-in-place concrete slab system takes into account the following considerations:

- The structural depth of the floors is to be minimized to allow maximum flexibility and co-ordination with mechanical services such as ductwork to pass underneath.
- Concrete floors are suitable for purposes sensitive to vibrations, as the large floor mass minimizes footfall vibration response.
- Lead times for procurement and fabrication associated with steel construction are reduced with a concrete structure, allowing the earliest work to proceed immediately after the excavation.

The ice slabs will be independent from the structural slab and separated by an insulation layer to provide efficiency for the cooling system and structural isolation for repair/replacement of the ice slabs if necessary.

The upper level spectator and circulation structures are proposed as steel construction as the long spans and up-close user experience are better suited to steel construction.

The ice arena and curling rink spaces are both covered by a non-accessible roof. Steel trusses spanning E-W between 35-40m are proposed to form the primary structure. The trusses will be located at 9m o/c on the typical grid, supporting a secondary glulam beam system and a conventional steel roof deck above.

Vertical structure

Below the underside of Level 2, the columns are typically 600mm by 600mm concrete columns. Larger columns will be required that support the base of the roof truss structures. Above Level 2 steel circular HSS columns are proposed which will extend up to, and support, the roof structures. Circular steel elements are proposed to ensure the vertical elements can be as slender as possible while maximising space and openness.

Lateral force-resisting system

The lateral force-resisting system will be defined as conventional construction in accordance with NBCC 2015. The primary means of lateral support will consist of evenly distributed and co-ordinated shear walls. Below the underside of Level 2 these will typically be concrete shear walls co-ordinated with the column grid. Above Level 2 the shear walls will become steel braced frames to maintain compatibility with the upper steelwork structure.

4.2 Aquatics and Gymnasium Complex

Floors and roofs

The Aquatics and Gymnasium Complex does not include a basement below the pool areas. The pool bases will be of slab on grade construction, allowing mechanical services to proceed independent of the structural construction schedule. Similar to the ice arena complex, pool deck surfaces and change room floors will be suspended concrete flat slabs varying between 300mm and 350mm thick.

The gymnasium roof structure spanning E-W approximately 33m has added complexity in that the system will support the interior fitness area and exterior terrace space above, as well as the fitness centre roof. Similar to the ice complex, a steel truss system will be used for the gymnasium primary spans, with glulam secondary structure and steel roof deck over. The consistency in roof assemblies should provide efficiency for the construction team and reduce costs.

The swimming pool roof structure covering an area of approximately 60m x 60m is to comprise a timber beam system with a mid–span support line between the north and south pool spaces maximising the economy of structure. This results in a N-S spanning, continuous glulam beam system with a maximum span of 33m. This roof will be an extension of the Colonnade structure at the main entry with the same spacing and construction type.

Vertical structure

Outside the pool area, below the underside of Level 2, the columns are typically 600mm by 600mm square concrete columns. Within the pool areas and above Level 2 steel circular HSS columns are proposed which will support the roof structures similar to the adjacent Colonnade structure.

Lateral force-resisting system

Similar to the Ice Arena Complex, the lateral force-resisting system will be defined as conventional construction in accordance with NBCC 2015. The primary means of lateral support will consist of evenly distributed and co-ordinated shear walls. Outside the pool area below the underside of Level 2 these will typically be concrete shear walls co-ordinated with the column grid. Above Level 2 and in the pool area the shear walls will be steel braced frames.

4.3 Multi-purpose building

Floors and roofs

The 4 storey multi-purpose community building to the south is a feature architectural massing piece comprising intersecting storey high box elements that cantilever up to 9m beyond the floors below.

At Level 1 the floor slab will be either a 350mm thick suspended concrete flat slabs above the parkade similar to the other building base structures, or a 150 thick Slab on Grade south of the parkade structure. Above the Level 1 slab the typical structure will be steel construction with steel beams, open web steel joists, and steel deck and topping. In order to facilitate the cantilevered floor assemblies, two discrete storey high steel trusses are proposed to be concealed within the walls of

the third storey. If areas of the steel work are to be exposed, careful attention to detailing will be employed to ensure a pleasing aesthetic both from inside and outside of the building.

The multi-purpose building is connected to the rest of the complex to the north with two link bridges. We propose these bridge structures will clear span the exterior space below and be framed with steel floor trusses that also support the roof.

Vertical structure

Below Level 1, the columns are typically concrete construction aligned with the large steel columns above. Smaller building loads may be supported by a transfer structure in the concrete slab to allow for a more efficient parking layout. Above Level 1 steel columns are proposed which will co-ordinate with the upper level steel work and truss structures.

Lateral force-resisting system

Similar to the other buildings the lateral force-resisting system will be defined as conventional construction in accordance with NBCC 2015. The primary means of lateral support will consist of carefully coordinated shear walls with the steel truss system above. Similar to other structures these will be concrete walls below Level 1 and steel braced frames above Level 1 to coordinate with the steel gravity system.

5. Miscellaneous structures

5.1 Colonnade

A key architectural feature for the project is the Colonnade that will provide architectural consistency as well as structural support for both roof and floor assemblies in locations across the site. It is expected this will be timber glulam system supported by steel columns along the length. The various conditions will be dealt with by varying the properties of the structural members while keeping the visible expression consistent.

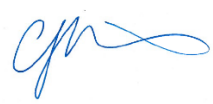
5.2 Skate park

The centre is also to include a new skate park on the south east corner of the site south of the parkade structure. The skate park will be built on grade and independent of the rest of the Centre. This will allow renovations to the skate park to be independent of the rest of the building and also allows this construction to be completed outside of the building schedule if desired.

6. Conclusion

The new four-storey complex of the HJCRC includes a range of space types and functions. Fast+Epp have looked to develop a structural scheme which is economical and efficient across the buildings but also responds to the range of space types and desired architectural massing to ensure the right material and system is used in the right place. Because of this the overall construction will be a true hybrid structure with concrete, steel and wood used to their maximum effect.

Should you have any questions at all, please don't hesitate to contact us.



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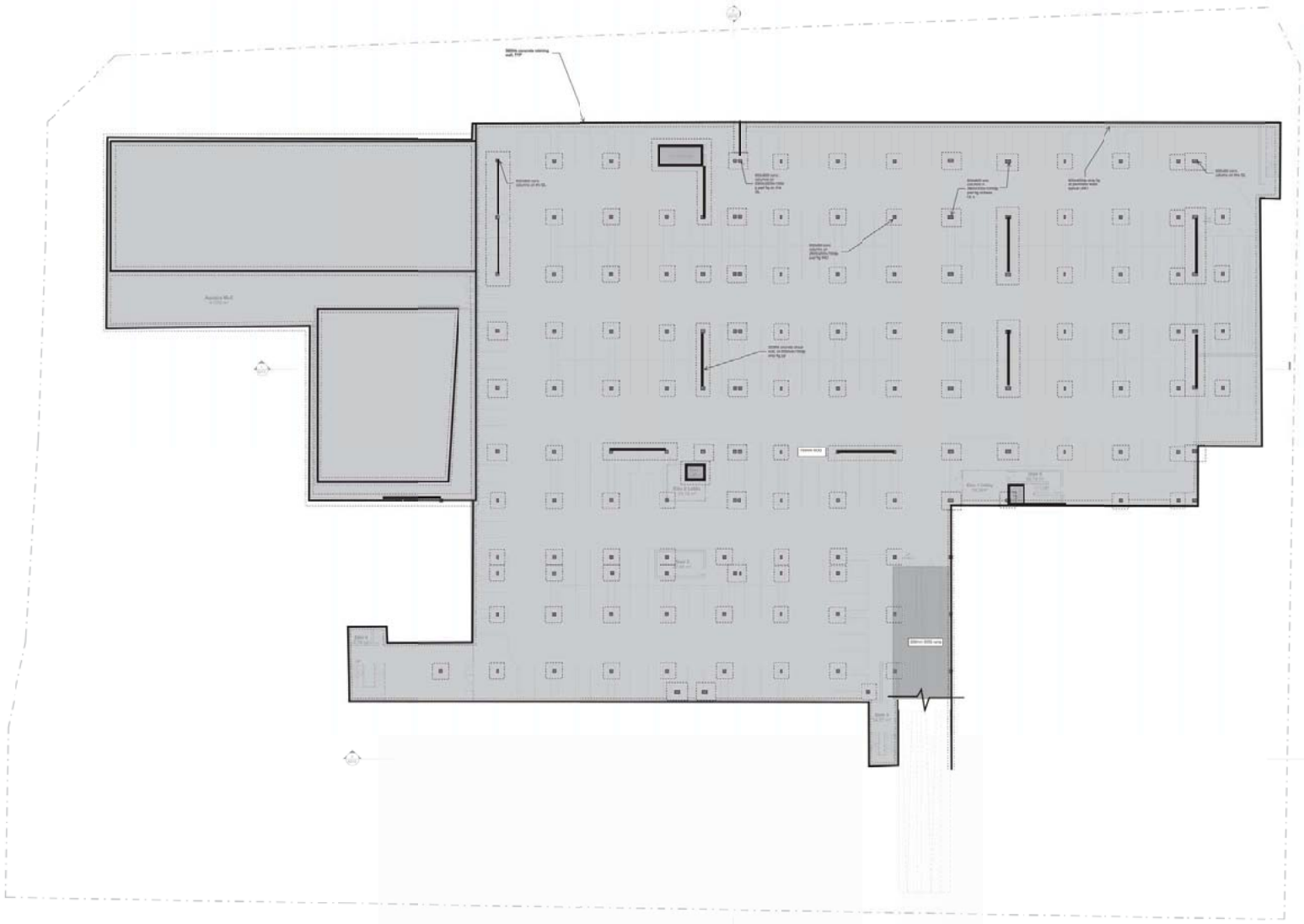

HCMA

CONSULTANT LOGO

Harry Jerome CRC
North Vancouver, BC

REVISION	DESCRIPTION	DATE
1	Issued schematic design	Jan 30 2019

LEVEL 1 PLAN

S100

SCALE: 1 : 200

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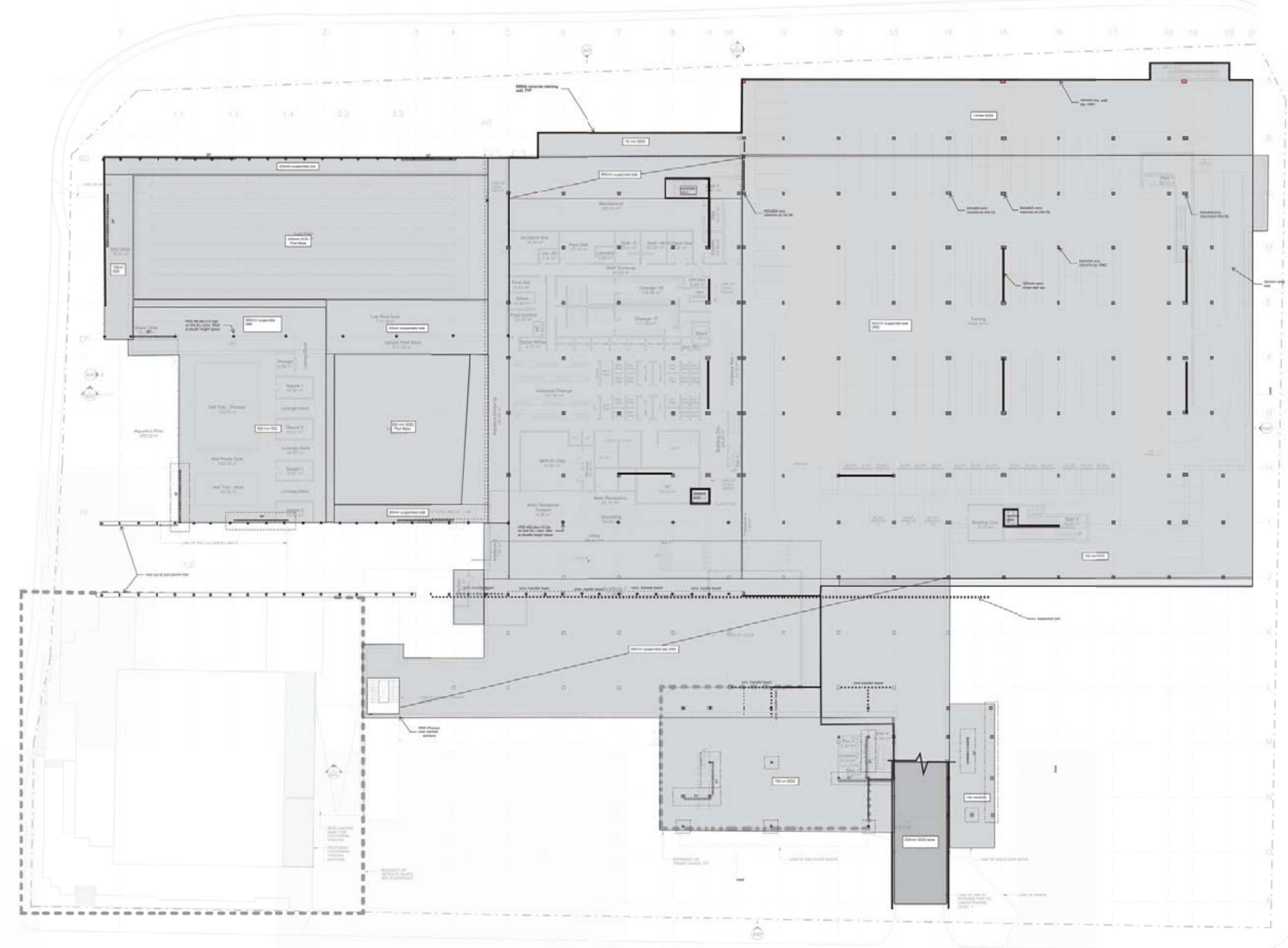
PROJECT#:1706 • DRAWN: Author



HCMA

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LEVEL 1 PLAN

S101

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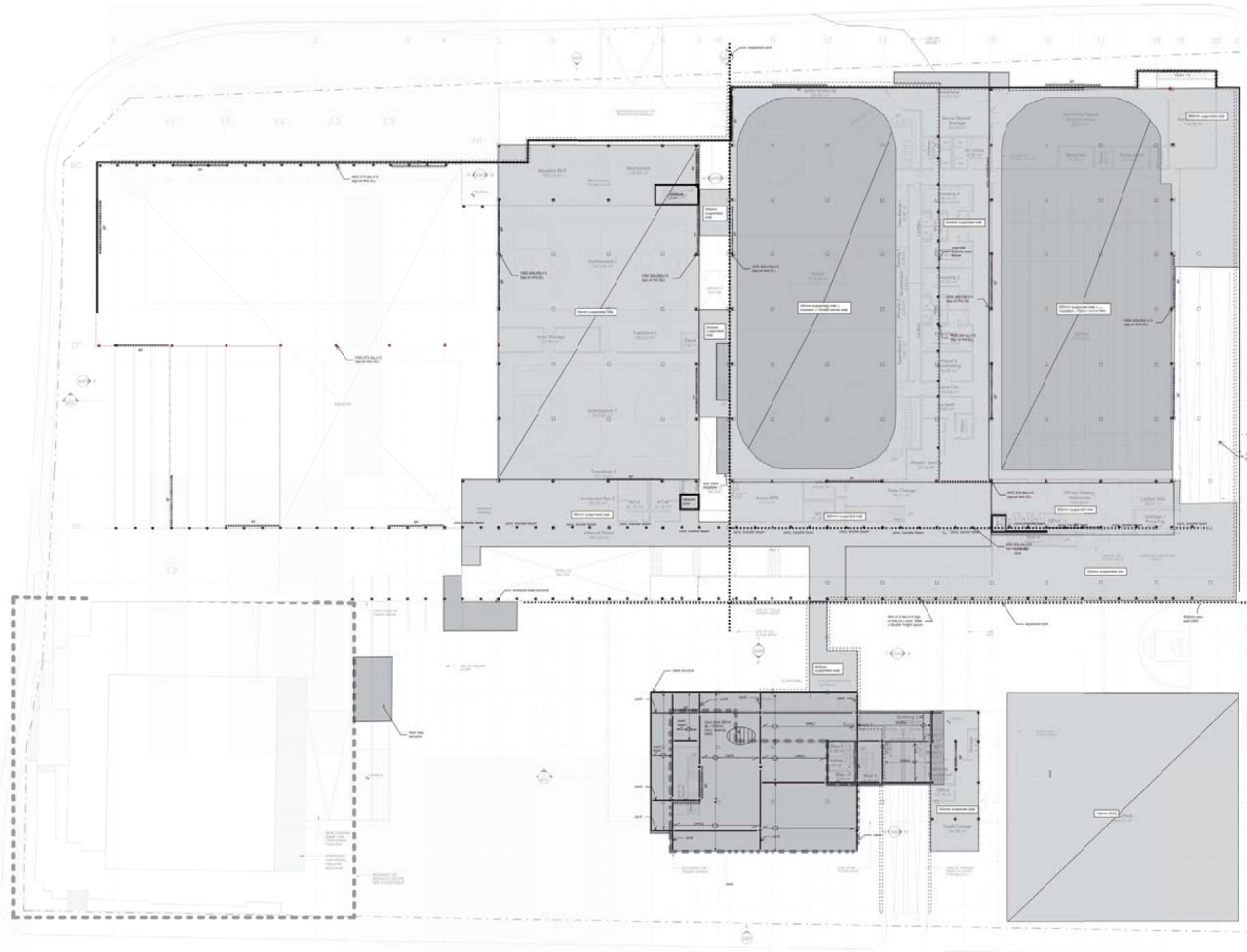

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LEVEL 2 PLAN

S102

SCALE: 1 : 200

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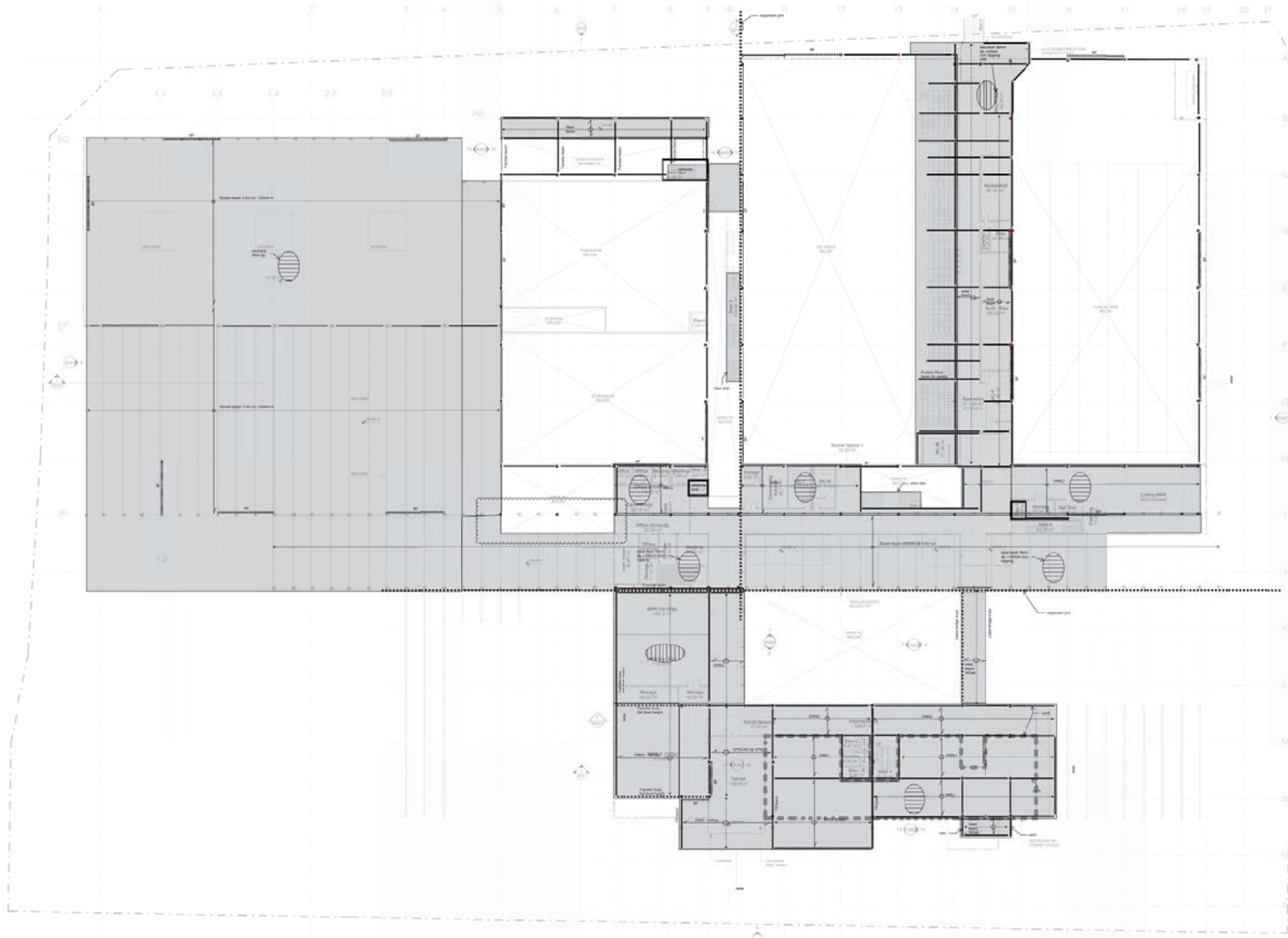
PROJECT# 1700 • DRAWN Author



Harry Jerome CRC
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LEVEL 3 PLAN

S103

SCALE: 1 : 200

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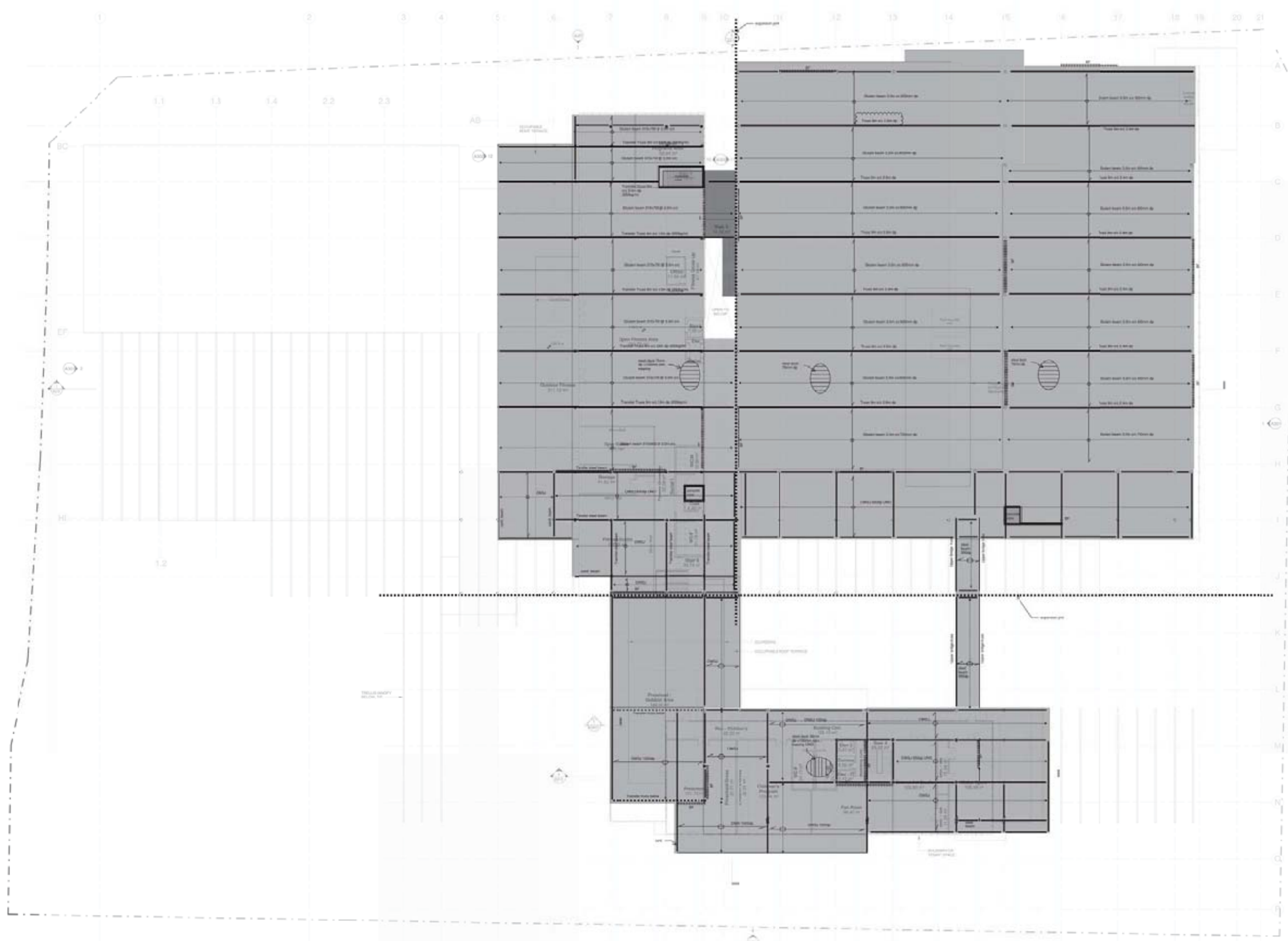

HCMA

Harry Jerome CRC
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REVISION DESCRIPTION DATE

LEVEL 4 PLAN

S104

SCALE: 1 : 200

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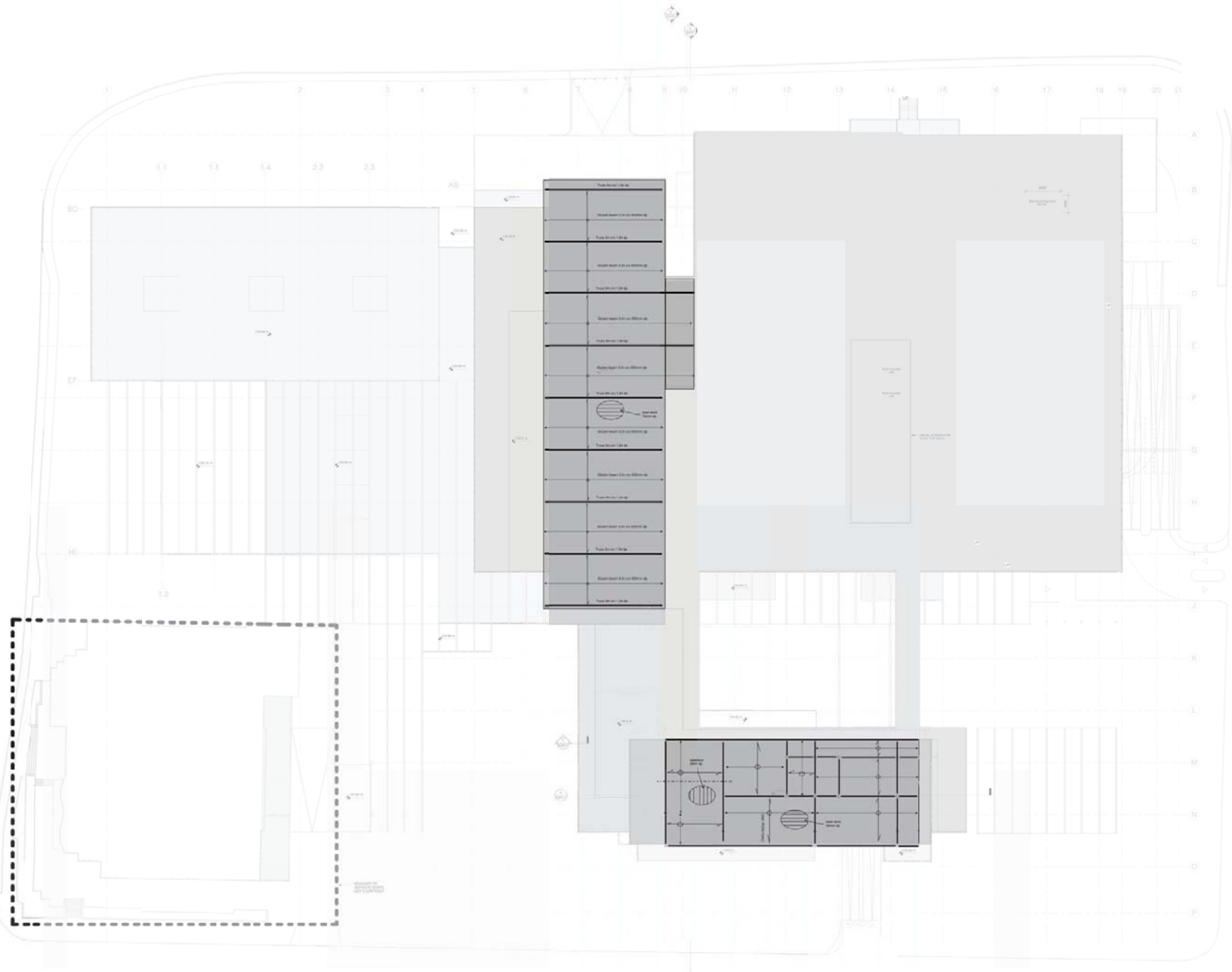

HCMA

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ROOF PLAN

S105

SCALE: 1 : 200

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PROJECT#:1766 • DRAWN: Author

6.3 Mechanical Drawings & Report

HARRY JEROME COMMUNITY RECREATION CENTRE (HJCRC)

PROJECT NO.: 009B-073-17

NORTH VANCOUVER, BC

MECHANICAL SCHEMATIC DESIGN REPORT

JULY 9, 2018

PREPARED FOR:
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AME Group
consulting mechanical engineers

TABLE OF CONTENTS

1. INTRODUCTION:

AME consulting Group was commissioned by HCMA, the Prime Consultant, on behalf of the City of North Vancouver to provide mechanical consulting services for the new Harry Jerome Community Recreation Centre. The purpose of the report is to outline the basis of design for the mechanical systems and to identify options for the Project Development Team to consider. All information provided will meet current codes and standards and where applicable will identify future codes and standards being considered. Based on the time frame presented there will likely be a new BC building Code in place at submission for Building permit.

The basis of design includes information from industry Best Practices. Where we have a recommendation for a different strategy or improvement we have identified the options and have noted the differences for the user group consideration. Options will be explored further through the Design Development stage with the Project Development Team (City of North Vancouver and North Vancouver Recreation Commission) as well as Lonsdale Energy Corporation with consideration of overall mechanical design efficiency, ease of operations, energy optimization and greenhouse gas reduction.

At this time no green building rating system will be considered, however strategies will be described that will attempt to reduce the overall GHG emissions of the facility significantly.

The facility will consist of a Community Recreation centre, Aquatics Centre, two Ice Arenas, one for ice sports and one for curling, the Silver Harbour Seniors Activity Centre and welcoming space. The facility also includes two levels of U/G Parking. The mechanical systems will generally be housed indoors and will serve the entire facility. A portion of the mechanical room may be below grade where some pool equipment will be housed.

2. DESIGN CRITERA

The contents of this section are based on industry standard requirement and best practices. In all cases the design requirements will meet the applicable codes and standards as a minimum. The standards used are recognized industry standards.

2.1 Applicable Codes and Standards

The following is a list of the significant codes and standards for this project. Generally the BC Building Code identifies all codes applicable:

.1 British Columbia Plumbing Code 2012 Edition (likely a new Version)

.2 British Columbia Building Code 2012 Edition (likely a new Version)

.3 British Columbia Fire Code 2012 Edition (likely a new Version)

.4 National Energy Code for Buildings (likely 2015)

.5 Provincial Fire Marshall Regulations

.6 Applicable NFPA Regulations

.7 BC Gas Code – CSA B149.1-10

.8 BC Boiler and Pressure Vessel Act – CSA B51-14

.9 American Society of Heating, Refrigeration and Air Condition Engineers (ASHRAE)

.10 American Society of Plumbing Engineers (ASPE)

.11 Sheet Metal Contractors Association of North America (SMACNA)

.12 BC Public Health Act for Swimming Pool, Spray Pool, and Wading Pool Regulation (New Addition)

.13 BC Guidelines for Pool Design 2014

.14 Model Aquatic Health Code (U.S. code used as a standard not a code)

.15 Lonsdale Energy Corporation (LEC) By-Law

2.2 Plumbing Guidelines

The plumbing system will be designed to the BC Plumbing Code 2012 (or newer version if required) requirements. At this time there are no anticipated specialty plumbing requirements.

2.3 Fire Suppression Requirements

The fire suppression system will be designed to meet all requirements in National Fire Protection Association (NFPA). Any alternate solutions defined by the Code Consultant will be incorporate into this design.

2.4 HVAC Design Guidelines

The HVAC system will be designed to meet all requirements in the BC Building Code 2012 (or newer if required) and all required ASHRAE Standards: ASHRAE 90.1-2010 Energy Standard for Buildings except Low-Rise Residential Buildings and ASHRAE 62.1-2001 Ventilation for Acceptable Indoor Air Quality. The ASHRAE Standards will be up-dated if required to newer version as indicated an any new building codes.

The building heating and cooling loads will be calculated based on the following outdoor conditions specified in the BC Building Code 2012, Appendix C, for North Vancouver B.C:

Design Temperatures			Degree Days
January	July 2.5%		
1 % Design	Dry Bulb °C	Wet Bulb °C	
-9	26	19	2910

Our design for the entire facility will include 10% safety for all primary heating systems and 0% safety for cooling systems unless specifically noted otherwise within this report.

The HVAC system will be designed such that the noise level in the spaces will be maintained to meet ASHRAE suggested guideline:

.1 Between 25-35dB in enclosed offices, multi-purpose spaces and yoga studios.

.2 Between 30-40dB in open public areas.

.3 Between 40-50dB in the natatorium and arenas.

Indoor space temperatures will follow ASHRAE 55 standards. Where possible higher airflow velocities may be used to allow for a higher room temperature setpoint (eg Fitness Studio).

2.5 Pool Design Guidelines

.1 Turnover Rates

A pool's turnover rate is defined as the time it takes for its full water volume to be passed through the filtration plant. It is expressed in hours or minutes, but can also be expressed as a volume flow rate when the pool's volume is taken into account. Lower turnover rates provide for better water quality, clarity, and a faster response to varying water chemistry.

Maximum pool turnover rates are determined by the BC Guidelines for Pool Design. In AME's experience, however, turnover rates less than maximum values are recommended. Best practice turnover rates are determined by applying a recommended rate by depth approach for each pool

type. Shallow pools, regardless of designation, tend to see concentrated bathers and less water volume per bather, requiring lower turnover than deeper pools.

Hot pools require the lowest turnover rates of all pools. This is due to their high temperature, which encourages biological growth; as well as their propensity for hi bather load.

The following table summarizes the minimum and recommended turnover rates for the facility described in this report.

Parameter	Code Minimum (h)	Recommended (h)
Lap Pool	6	4 – 6
0-600mm		n/a
600-1200mm		2
1200-1800mm		4
≥ 1800mm		6
Leisure Pool	2	1 – 2
0-600mm		0.5
600-1200mm		1
1200-1800mm		2
≥ 1800mm		3
Hot Pools	0.5	0.15 – 0.25
Plunge Pool	0.5	0.15

For this facility, the lap pool will be designed to approximately 4 hours, leisure 1.5 hours, and hot pools 0.15 hours

.2 Pool Operating Temperatures and Heat Up Times

AME recommends designing pool heating systems to generate pool temperatures in accordance the American Society of Heating Ventilation and Air Conditioning (A.S.H.R.A.E). The pool heating system will be designed to maintain those temperatures under normal operating conditions. Facility staff are free to operate their pools at lower rates than those allowed for, however, exceeding those temperatures are not recommended, nor will they likely be achievable.

The following table lists the recommended pool temperatures for this project. AME will design its heating plant such that it is capable of maintaining these temperatures with a pool hall air temperature of 27 °C. Should it be desired to operate at higher pool temperatures and/or lower air temperatures, this must be confirmed prior to the completion of design development.

Parameter	Recommended Operating Temperature (°C)	Design Heatup Time (h)
Lap Pool	29	72
Leisure Pool	32	48
Hot Pools	40	6
Plunge Pool	5	6

3. POOL MECHANICAL SYSTEMS

Pool mechanical systems consist of pool fittings, water features, piping, pumps, filters, chemical treatment, and controls. This section describes recommended mechanical systems and presents options for those subsystems whose selection will have an impact on pool operation and water quality.

3.1 Pool Tank and Fittings

The filtered and treated pool water will return back to the pool through floor inlet fittings. The inlet fittings will be spaced such that they achieve the required turnover rates, supply clean water to all areas of the pool and scour the pool bottom to promote suspended solids so they can be picked up from the main drain or gutter system. Inlets will be placed primarily on the pool floor to promote upward movement of suspended solids towards skimmers and gutters.

To assure uniform flow has been achieved a dye test will be conducted before the pool is occupied. Dye is introduced into the system which allows the pool commissioning agent to visually check that all areas of the pool are being covered and treated water is being supplied equally throughout the pool. Should the test fail the commissioning agent can adjust the fittings to either increase or decrease flow to improve system design.

The pool water is returned back to the filtration plant via main drains and either a gutter system or skimmers. Main drains collect the water at the bottom of the pool and are sized for 100% of the filtration rate. The drain configuration and piping will be designed to ANSI / APSP-7: 2006 American National Standard for suction entrapment avoidance in swimming pools. And specified drains will be ANSI 16 certified to prevent entrapment and entanglement.

In the absence of a continuous gutter, skimmers will be installed around the pool. The skimmers will be designed to provide continuous skimming of the pool surface while the free board will handle instantaneous bather loads.

3.2 Pool Piping

Below grade piping shall be concrete encased Schedule 40 PVC, while above grade piping shall be Schedule 80 PVC, with the following exceptions:

.1 Pool heat exchanger branch lines will be Schedule 80 CPVC.

.2 UV branch lines will be Schedule 80 CPVC or 316 Stainless Steel.

.3 Pool fill lines will be Schedule 80 PVC and feature water hammer arrestors.

.4 Air bubble piping from an air blower will be galvanized steel.

.5 Chemical feed piping will be high-density polypropylene (HDPP). Double-walled HDPP tanks with be used in all areas without structural containment.

3.3 Pool Pumps

Three-phase, base-mounted centrifugal pumps with epoxy coated wetted components will be used for the filter pumps and larger water feature pumps. Filter pumps will be sized to meet the minimum turnover rate when the pool filters are dirty. The pumps will be supplied with VFD's so that when filters are clean, the pumps will run at a lower speed to save energy. Parallel pumps each sized for 50% of the flow will provide redundancy for filtration system should one pump fail. With only one pump operating, the system will be able to achieve approximately 75% of design flow, which will meet minimum code turnover requirements. The result is that the pool can stay operational with one pump under service.

Smaller water feature pumps will be either stainless steel in-line circulators, or plastic end suction with integral strainer.

Chemical injection pumps will be plastic, fully modulating digital metering pumps. These will be capable of very precise variable dosing.

Electronic flow meters will be provided on all pool circulation systems and will work in concert with pump's variable frequency drives to provide the circulation flowrate required to provide the selected pool turnover rate. This ensures that the pumps are only using the minimum amount of energy required to meet the design flowrate, and will continuously adjust the pump speed as the filter loads.

As a safety feature, all secondary pumps will be provided with controls that will shut them down when circulation in a specific section of the pool piping stops, regardless of whether the main circulation pumps are running.

A 'strainer cleaning' pit will also be provided in the pump area to ease cleaning and limit the spread of debris generated by strainer cleaning.

3.4 Water Features

Each water feature will have a dedicated pump or pumps. Smaller volume pumps will be constructed of corrosion resistant, reinforced thermoplastic with an integral strainer. Larger pumps will be either base-mounted, end-suction type, similar to the filter pumps, or 316SS in line circulators.

A master control panel will be provided at the lifeguard station, allowing deck-level control of the water features by lifeguards. In addition, supplementary emergency stop buttons will be located strategically throughout the pool area to shut off all water features in case of a bather emergency, potential or real.

The lazy river pump will be provided with a variable speed drive that can be controlled and adjusted manually at the life guard station to allow staff to vary the speed of the river.

3.5 Pool Water Heating Systems

The pool heat will be provided by the central facility heating plant. It is currently expected that as part of the heating plant design, a portion of the heat provided to the pools will have been recovered from either the natatorium dehumidification process or the exhaust air stream.

Plate and frame type heat exchangers using titanium plates will be provided for each individual pool. This material has proven to be an excellent balance between longevity/resistance to corrosion and first costs.

Each individual pool heat exchanger will be sized to meet the peak heating load, which is typically during the pool fill. By sizing the heat exchangers on peak load, they are guaranteed to be large enough to meet the remaining heating demands – make-up water for backwashes, spillover, carryout, and evaporation.

Pool heat will be controlled through the BMS. Return water temperature will be monitored by a digital temperature sensor located downstream of the filtration plant. Heating water flow into the pool heat exchanger will be modulated to maintain pool temperature setpoints. A secondary temperature sensor will be located at the heat exchanger discharge, to act as a hi limit. Should the heat exchanger temperature increase to an unsafe temperature, the heating system will be prevented from delivering more heat to the pool.

3.6 Plunge Pool Cooling System

The plunge pool will be cooled by a small air-cooled chiller. An air cooled section will be mounted in the parkade with water connections to the pool system.

3.7 Filtration

The filtration system is responsible for providing water clarity and assisting in the chemical balance in the pool tanks. The filtration system requires the most labour and attention of all the pool maintenance tasks; and is typically both the largest piece of mechanical equipment and the largest consumer of water in the facility.

The type of filtration plant selected for the facility will influence the overall design of the pool mechanical system, affect the mechanical space requirements, and affect the size and complexity of the wastewater system. In light of this, it is recommended that a decision be made on the filtration plant very early in the project design schedule.

AME recommends regenerative pressure DE filters for this facility. They produce the best water quality, consume the least amount of water, and require the least amount of mechanical space, allowing more space for other program functions. They have the highest mechanical capital cost. However, it is believed that this will be offset by a reduction in building construction costs and water conservation.

Pressure DE filters are similar to vacuum DE in that they incorporate Diatomaceous Earth media. However, instead of drawing pool water through the filter by generating a vacuum, pool water is pushed through the filter media. This filter provides the best ultimate micron rating and rate of turbidity reduction for a commercially available filter. Pressure DE filters make several substantial improvements over the traditional vacuum/open tank configuration.

The filter elements are contained in a pressurized tank, and water is not pulled through (vacuum) the media surface, but is pushed via pump pressure upward through the filter and back to the pool. Hence the filters are often referred to as 'pressure-D.E. filters.'

Filter element area is similar to that of vacuum D.E. filters and as a result, can be fit into a much smaller space than a conventional open tank vacuum D-E system. Rather than discs, long fabric-coated fingers or 'septa' provide filter surface area. This allows more filter area to fit into a smaller compartment. It also requires dramatically less space than an equivalent hi-rate sand filter system

DE filters have a 'regenerative' function. Conventional D.E. filters require a constant feed of new filter media (and accompanying feed equipment) to replace media that is partly clogged with dirt that falls from the filter elements. However, the media still retains effective filter area as only a small part of its shape is contaminated. Regenerative filters take advantage of this retained useful area by shaking loose or – initiating a 'bump cycle' - and reorienting the media on the filter elements on a daily basis. This process takes 1 minute and is performed by the filter mechanism automatically, but can be manually initiated by the operator.

There is substantially less operator exposure to the filter media in comparison with vacuum-DE systems, and manual cleaning of the filter elements is not typically required. The re-introduction of media is also done via a dustless, tank-mounted system that minimizes operator involvement.

The 'regeneration' process involves a pre-coat cycle as is used in a vacuum-D.E. system, however it can be automated with a series of actuated valves to increase ease of operation. It also requires only two such valves per system, unlike a hi-rate sand system.

Backwashing of the filters is required very infrequently in comparison with hi-rate sand filters (1 to 2 month intervals), resulting in dramatic water savings. Media is drained from the bottom of the filter to the sanitary sewer. Operators are not required to manually clean the filter elements during backwashing.

The design options for these filters depend on the filtration rate selected (measured in # of USGPM/sq ft of filter area). The lower the USG/sq ft, the better the filtration performance. The following are design flow rate options for DE filters:

.1 Code Maximum: the filters are NSF-50 approved for 2 USGPM/ sq ft filtration rate. At this rate 'piling' or 'bridging' of the filter media occurs and leads to more frequent 'bump' intervals and poor performance. The minimum is not recommended.

.2 Industry Standard: the filtration rate will be 1.0-1.2 USGPM/ sq ft. This optimizes filter tank sizing, media 'bump' intervals, and minimizes 'bridging' of the media. AME recommends this filtration rate.

3.8 Chemical Disinfectant

.1 Sodium Hypochlorite (Liquid Chlorine)

Liquid chlorine systems consist of a storage tank, injection pumps, and a transfer system to move chlorine from the delivery vessel to the storage tank. 12% by volume CL2 is stored in an isolated room that is ventilated in accordance with the BC Safety Authority's guidelines.

Liquid chlorine is an effective and safe method of pool water disinfectant. It is the most capital cost effective of the options presented in this report and the simplest to maintain. Concentrated chlorine is corrosive, however, and care must be taken to prevent fumes from reaching the public and operators.

Liquid chlorine increases ph, alkalinity, and total dissolved solids (TDH) in pool water. As such, an acid is also required to reduce ph and alkalinity. And as TDH increases, measures must be taken to remove them.

CL2 is typically delivered by truck with a gravity feed or pumped system. In order to accommodate this delivery method, there will be an external CL2 fill port, a portable hose and reel to connect to the truck, and an interior transfer pump (if required) capable of transferring CL2 from the truck to the storage tank inside the building.

.2 pH Control

Another method of reducing acid use is the use of CO2 as a pH reducer. CO2 is a relatively safe and environmentally friendly pH reducer, which can, in some cases, act as the sole pH balance agent. It does not, however, reduce alkalinity. And if used, will require operators to periodically add acid to the pool to bring the alkalinity down.

.3 Secondary Disinfectant - UV

Medium-pressure UV water treatment for each pool will provide chloramine control and secondary bacterial oxidation for the water. UV treatment has been used in drinking water, industrial, and effluent applications for many years. However, it is new for swimming pools in the North American market. The primary action of UV is to kill bacteria and viruses, reducing the risk of stomach, skin, and respiratory tract infection transmission to the pool users. UV has a secondary action that initiates photo-chemical and photo-oxidation reactions, which destroy chloramines.

3.9 Supplementary Chemical Bulk Feed

In addition to chlorine and pH control, two other chemicals will be added in substantial quantities to the pools, depending on the source water and pool chemical balance requirements:

.1 Calcium chloride, to increase water hardness

.2 Sodium bicarbonate, to increase total alkalinity.

Experience has shown that the best means of adding large quantities of the chemical is to dilute it and add it manually to the pool. As such, a bulk feed supply system will be provided to allow facility staff to mix and supply chemicals in large quantities into the system. This system can also be used for superchlorination of the pool. AME recommends a chemical storage space adjacent to the deck for this purpose. A rolling tub can be provided to move the chemicals.

3.10 Chemical Controllers

Each pool will have its own standalone chemical controller that will signal the disinfectant and pH treatment systems. For chlorine control, there are two methods of measuring levels: ORP or ppm. An ORP-type controller is recommended for this facility. ORP Controllers measure the ability of chlorine to react in the water rather than the amount of chlorine within the water. In other words you could have a large percentage of chlorine within the water however it may not be available chlorine. An ORP controller will detect this and react accordingly.

The controller will also be provided with a 'signal generator' to allow precise recalibration of the chemical controller as required.

The chemical controller will be provided with an interface to the Building Management System. This will allow the BMS to monitor and log pool chemical levels, chemical dose rates, and overall chemical usage over time. Trend logs can be reviewed for historical levels, should it be required.

3.11 Pool Control Systems

All pool systems will be integrated with the Building Management System. The following lists the proposed level of BMS integration:

.1 All pumps will be monitored and controlled.

.2 All pool levels will be monitored and maintained. Hi and low level alarms will be provided complete with email or phone notification.

.3 Water features will be controlled through a Water Feature Control Panel, accessible to operations staff. The panel switches will operate respective feature pumps through the BMS.

.4 Chemical controllers will be integrated, allowing monitoring and logging of levels, dose rates, and consumption. Chemical controllers will NOT be adjustable through the BMS.

.5 Pool temperature and pool heat will be monitored and controlled.

.6 Pool filtration flow rate will be monitored and the filtration pump(s) will be modulated to maintain design turnover rates.

.7 The primary pool filtration flow switch will be monitored and should loss of flow be detected, all chemical injection, UV operation, and pool heat will be disabled.

3.12 Pool Treatment System Decisions

During a design held on March 1, 2018 the systems described above were discussed, and it was concluded that AME will move forward with the detailed design of those systems. In summary, the treatment system for this project will be:

.1	Filtration Plant:	Regenerative Filters, Pressure DE
.2	Primary Disinfectant:	**Liquid Chlorine (Sodium Hypochlorite)**
.3	Secondary Disinfectant:	**UV**
.4	pH Balance:	CO2

4. ARENA REFRIGERATION SYSTEMS

The refrigeration plant for the Harry Jerome Arena will be a packaged refrigeration system for the arena and curling rink. The primary refrigerant system will be a carbon dioxide system using two - three compressor systems, a cooling tower, condenser, surge drum - receiver, and a direct cooling system using pumped liquid refrigerant to each floor. The system will reject heat to the building heating loop and will utilize the building cooling tower to maximize energy recovery when available.

The arena and curling rink floors will use pumped liquid carbon dioxide to cool each floor. The refrigeration plant will be controlled from a central computer system allowing for fully automatic operation and with the ability to manually override the controls.

The arena and curling rink floor construction will use the latest techniques for building a super flat slab for the best ice quality.

Carbon dioxide refrigeration is an innovative solution that combines the refrigeration advantages of carbon dioxide with the ability to produce large quantities of high quality heat for waste heat recovery. The following characteristics of carbon dioxide refrigeration will apply

.1 Higher first cost

.2 Less efficient primary energy use compared to other refrigerants.

.3 Better heat recovery efficiency due to higher temperatures

.4 Proprietary system technology

The following is an outline of the carbon dioxide refrigeration equipment.

.1 Two separate refrigeration plants with three compressors for each cooling floor

.2 Cooling tower – to utilize building cooling tower

.3 Plate and frame chiller for each system operating at different temperatures

.4 Surge drum-receiver

.5 Liquid refrigerant pump for each system

.6 Underfloor heating system using heat recovery

.7 Snowmelt heating system using heat recovery

.8 Provision for a 100 percent heat reclaim system

.9 Independent computer control

Independent temperature control of each ice will be included to allow the curling community control of their own ice temperature. Control of each ice surface temperature can be accomplished using several methods:

.1 Concrete slab sensor

.2 Liquid temperature return sensor

.3 Ice sensor

.4 Suction Pressure

All available methods of energy conservation will be included in the design. These include:

.1 Computer control

.2 Variable speed drive on the cooling tower fan

.3 Variable speed drive on the liquid pumps

.4 Floating head pressure.

.5 Oversized heat exchangers

The refrigeration plant will be equipped with heat reclaim exchangers for underfloor heating and building heating. The heat recovery exchangers are designed for 100 percent of the waste heat and will be integrated with the mechanical design.

The refrigeration plant room will be constructed to the refrigeration code requirements for carbon dioxide. (Class T room construction is not required for carbon dioxide refrigeration systems.).

The refrigeration plant will have a capacity 180 tons of refrigeration at 18 ^{o}F, saturated suction temperature and 170 ^{o}F saturated discharge temperature, 68 ^{o}F wet bulb temperature. The plant will be divided into two separate systems as described above, one 90 ton plant approximately per ice surface.

5. PLUMBING SYSTEMS

5.1 Service Requirements

The building will be fully serviced with connections coordinated with the City of North Vancouver. The preliminary analysis indicates that the following site services are required. Piping connections for the mechanical contractor will extend to 1.0 metre from the building.

.1 200 Ø service sanitary sewer: The sanitary will be drained by gravity where possible and some portion of the building sanitary may be pumped.

.2 2 - 300mm Ø service storm sewers: The sanitary will be drained by gravity where possible and some portion of the building sanitary may be pumped.

.3 150mm Ø combined fire and domestic water supply.

.4 Natural gas will be supplied with a new line (preliminary size of 50mm Ø at 69 kPa) will be routed to the appliances and a new gas meter will be installed to service the building. The gas meter will reduce the pressure to 14 kPa if required (TBD). This is expected for kitchen appliances, bbq's etc, General building heat is expected to be provided by the DES.

5.2 Plumbing Distribution

.1 The domestic cold water system will consist of:

.1 Central pressure reducing valve.

.2 Distribution system to the building's DHW tanks.

.3 Distribution system to service individual fixtures.

.4 Irrigation cap-off at the water entry room.

.2 The domestic hot water system will consist of:

.1 Domestic hot water pre-heat tanks fed from unused heat rejection, located in the main mechanical room on the main floor.

.2 Domestic hot water recirculation system with a pump

.3 Distribution system to service individual fixtures

.4 Temperature mixing valve and stations for local tempering to supply 40°C (105°F)

.5 A separate domestic hot water system will be located in the level 3 mechanical room between the two arenas. This system will also consist of a pre-heat tank and final heating tank system. This separate system will limit the amount of recirculation piping throughout the building and heat loss through these lines as well.

.6 Finally, a third system will be located in the mechanical room at the child minding area to feed that building's systems. There will be one to feed the senior's centre and a separate one for the child minding to separate the loads from each different zone. There is expected to be one pre-heat system to feed both.

.3 The natural gas system (if required) will consist of distribution piping from a utility supplied meter to (this will be reviewed in more detail when the GHG targets are understood):

.1 Commercial style kitchens.

.2 Gas fired Barbeques.

5.3 Storm Drainage System

.1 The storm drainage system will collect all roof drains and overflow drains. The number and arrangement of roof drains will be designed to suit the building configuration and will be in accordance with the B.C. Plumbing Code with a minimum of 2 drains for every major roof surface. Internal rainwater leaders will be collected within the building and run below grade to the building storm connection at the north side of the building. All drains outside of the building footprint will be picked up as part of the civil scope of work.

5.4 Footing Drainage System

.1 Footing drainage will be provided for this project. The main floor elevation is to be a minimum of 300mm above the surrounding grade. A portion of the mechanical room and the pool tank will be below grade. The capacity will be determined by the Geotechnical engineer.

5.5 Sanitary Waste and Vent Systems

.1 All plumbing fixtures will have drains connected to the sanitary waste and vent system. Plumbing vents will be collected and terminate above the roof level (one vent per building segment/washroom group). The sanitary waste system will discharge to the building sewer below grade at the south side of the building.

5.6 Fuelling System

.1 No fuelling system will be provided.

5.7 Plumbing Fixtures

.1 All fixtures will be commercial grade, CSA approved, made of vitreous china.

.2 All public water closets will be low flow flush valve type.

.3 Urinals will be flush valve type for automatic flushes.

.4 Lavatories will be equipped with single temperature sensor metering type faucets. This will reduce water consumption.

.5 Barrier-free fixtures, including drinking fountains, will be provided where required.

.6 Sensor activated showers with narrow spray pattern will be provided.

.7 Drinking fountains with bottle fillers will be provided in the fitness rooms and natatorium as a minimum and as directed by the programme. The drinking fountain will be refrigerated.

.8 Non-freeze hose bibbs will be installed in areas subject to freezing (exterior landscaped areas, underground parkade and as required).

.9 Floor drains will be provided in mechanical rooms, washrooms and in any other rooms as required.

.10 Emergency eyewash and shower will be provided in the chemical storage room, and an emergency eyewash will be located at the Pottery and Arts Studio. We will review the requirements near the refrigeration machine room and other locations where chemical spills may be a concern.

5.8 Plumbing Accessories

The plumbing system will consist of the following accessories as required by codes and standards:

.1 Backflow preventers will be provided as required by CSA B64.10-07 (ex: Hose bibbs in equipment rooms, connection to equipment, coffee stations, etc.).

.2 Heat tracing will be provided for sanitary waste traps and supply water piping subject to freezing in the underground parking areas.

6. FIRE PROTECTION SYSTEMS

The new facility will be fully sprinklered with a wet and dry system and will be complete with supervisory and tamper switches on all main isolation valves, backflow prevention, flow switches, and sprinkler flow control valve assemblies at each floor. Dry sprinklers will be used in the U/G parking, overhangs, and other areas subject to freezing.

All areas will be sprinklered unless otherwise directed by the authorities having jurisdiction.

6.1 Zoning

The building will be zoned as follows:

.1 Each floor will have multiple zones of wet sprinklers designed to NFPA-13: Light Hazard and ordinary hazard.

.2 Dry heads will be installed off of the wet system to protect areas where sprinkler heads are subject to freezing. Building overhangs exceeding 4.5m (where sprinklering is required) will be protected by a dry system. At this time it is not anticipated to have a dry system.

.3 The parking levels will have zones by floor.

.4 The two arenas will be provided with dry sprinkler systems.

.5 The natatorium will be provided with corrosion resistant sprinkler heads with exposed piping protected either through coating or pipe selection.

.6 Maximum zone sizes will be in accordance with NFPA-13.

6.2 Fire Protection Accessories

The fire protection system will consist of the following accessories as required by NFPA and local building code:

.1 An exterior siamese connection for the fire department and a test connection will be provided adjacent to the main entrance.

.2 Fire extinguisher cabinets complete with a 4.5-Kg fire extinguisher will be provided in accordance with NFPA 10 and reviewed and approved by the authority having jurisdiction.

.3 Test flow connections for the sprinkler system will be incorporated at the water entry room for each zone, and for testing each alarm device.

7. HEATING, VENTILATION AND COOLING SYSTEMS

7.1 General

The basis preferred option for HVAC system selection is presented first with the understanding that this will be designed to meet a high level of GHG emissions reduction, with options included that will help the building achieve even further GHG reductions and energy savings, and was selected based upon the following criteria:

.1 Energy Efficiency

.2 Owner experience and maintenance

.3 Long term operating costs

.4 Occupant comfort

7.2 Heating and Cooling Plant (Source)

.1 Heating Systems:

The primary heating source will be from the Lonsdale Energy Corporation (LEC) district heating system. The facility will have hot water supply and return into a D.E. room in the parking level and will split into two or more heat exchangers. One for building heat and one for domestic water heating. The typical system may also include a third heat exchanger for lowering return water temperatures. All of the components up to and including the heat exchangers will be provided by the LEC. All downstream components will be under this building budget. The system will be installed per the LEC by-laws.

The heating system will include for heat from the full heat recovery systems of chillers from the ice plant and heat recovery chillers that provide chilled water for cooling and dehumidifying. The heat generated in this process will be fully utilized as the first stage of heating for the building.

The hot water recovered will be injected into the primary heating loop for the building. The heating system is designed based on a low temperature heating system with an operating temperature less than 46°C (115°F). Sources requiring higher temperatures like domestic hot water will have a separate loop which will be fed from the District Energy System directly.

Note that if pool covers are not installed for the pools that 60% of the energy for heating the pools must come from energy recovered on site, per ASHRAE 90.1 which will require the use of heat recovery chillers or heat pumps above and beyond what will be received from the Ice Plant refrigeration systems.

Optional Heating System Strategies:

1. A solar system is also proposed as an additional heating source to help reduce the carbon footprint of the building. This system is meant to utilize evacuated tube solar panels and will utilize the cooling tower system to reject excess heat when it's not able to be utilized.

2. Sewage heat reclaim is being considered as a source of heat for the building as well to further drive the building towards the City's carbon reduction goals. This will collect general sanitary drainage from showers, plumbing fixtures, pool filter backwash etc, and will extract the heat through a heat pump to be utilized in the central heating loop.

   The building has a significant waste volume with much of it at higher than standard temperatures including shower and backwash waste. This is a great opportunity for heat recovery and energy efficiency.

.2 Cooling System:

Cooling for the facility will be provided through central heat recovery chillers. The chillers will provide chilled water for cooling and de-humidification, along with heat recovery on exhaust air where possible and electrical and process cooling loads. The building requires dehumidification in the winter, space cooling and ventilation cooling in the summer and is provided by heat recovery chillers to utilize the waste heat where possible.

Preliminary estimates on plant sizing are on the order of three chillers at 120 cooling tons each. This will be reviewed in detail over the design development stage of work.

The chillers supply chilled water to the following:

.1 Pool Air handling units dehumidification/cooling coils and heat recovery coils in exhaust air.

.2 Fitness, gyms and change area air handling unit cooling coils.

.3 4 pipe fan coils for multi purpose, seniors center, child minding, small admin spaces and ancillary spaces

.4 Electrical Rooms, Data room cooling.

.5 Mechanical room cooling.

The chillers shall be selected to meet a cooling load at the following temperatures:

.1 Leaving chilled water temperature 7°C (45°F)

.2 Entering return water temperature 15°C (60°F)

The chillers shall be capable of supplying heating at the following design temperatures:

.1 Leaving heating water temperature 46°C (115°F)

.2 Entering return water temperature 35°C (95°F)

The building is heating dominated, however a cooling tower will be required for summer cooling loads and will be sized to meet the overall heat rejection loads including the ice plant heat rejections. At this time we are estimating a total cooling tower sizing of approximately 450 cooling tons.

A closed-circuit cooling tower will be installed outside for heat rejection in times when the heating demand is less than the cooling load and heat recovery is satisfied.

.3 Variable speed pumping:

.1 Variable volume pumping and controls

The building is provided with a low temperature hot water loop and chilled water loop. Hot and cold-water heating and cooling is distributed throughout the building to serve the pool systems, perimeter heating devices and ventilation equipment.

.2 Heating circulation loop:

The hot water circulates by means of a parallel pump system complete with variable speed drives. The distribution delivers heating water at 46ºC (115ºF) through the building. All equipment requiring or rejecting heat is piped into the loop system for individual heating requirements. The pool is integrated in the sizing of the main loop.

The benefit of running at such a low water temperature is that it allows the heat recovery chillers to drive the entire heating load if the loads allow without the need for district heating, except during times when peak heating is needed. This will be a key driver to achieving the efficiencies that we anticipate for this project.

.3 Cooling circulation loop:

The chilled water is circulated by means of a parallel pump system complete with variable speed drives. The distribution delivers chilled water at 7.2°C (45°F) - 15°C (60°F) through the building. All equipment requiring or rejecting heat is piped into the loop system for individual cooling requirements.

7.3 Heating Ventilation and Air Conditioning Systems in Various Spaces

.1 Natatorium:

This zone is provided with air handling units complete with supply and return fans, heating coil, cooling/dehumidification coil, heat recovery coil, filter, and mixing section. We will energy model the efficiency of a sensible heat recovery core prior to the dehumidification coil.

The units are sized to provide outside and re-circulated air at a rate of min 6 AC/hr (air changes per hour) maintaining +/- 27°C and maximum 50 – 60% RH under winter conditions. Supply-air (S/A) ductwork will run around the perimeter at high and low level of the aquatic space. Low and high return air louvers are recommended, one at high level and one at deck level. The low-level return-air louver captures the heavy chloramines whereas the high level louver captures the excess heat. This system re-circulates the air back to the air handling system.

The air handling system at this time is intended to be a minimum of two units located in the adjacent fan room. These units sized at 6 AC/hr will be on the order of 62,500 cfm (cubic feet per minute) or 30,000 L/s (liters per second) each.

All internal parts of the unit will be aluminum construction. Metal frames etc. will be epoxy coated. The coils will have a protective coating like herisite to prevent from rusting. The filters are selected as disposable MERV 13 type filters with an upgrade option to electronic filtration to limit possible issues with the nearby highway vehicle traffic.

Trichloramine exhaust will be utilized within the gutter system of the large pools to further reduce the build up of trichloramines on top of the pool surface.

Sustainable considerations specifically for the natatorium to be considered:

At this time we are considering the option to upgrade the building envelope in the natatorium and utilize temperature sensors to calculate the dewpoint of the building envelope at various locations. Upgraded building envelope will consider the use of a minimum of triple glazed windows with insulated thermal breaks and a well insulated structure. We anticipate that if we can achieve a high degree of envelope insulation, the natatorium air handling systems can reduce in size to approximately 4 AC/hr.

This will reduce the overall size of the AHUs in the fan room, overall energy consumption as a whole and will allow the natatorium to be controlled to a higher RH percentage during normal operating periods without worry of condensation on the glazing and building structure. The AHUs if reduced in size could be on the order of 42,000 cfm or 20,000 L/s.

.2 Curling and Ice Sports Arenas:

Each arena will have a dedicated desiccant dehumidifier to maintain relative humidity for proper ice conditions. The dehumidifying units will be mounted on the roof between the two arenas. They shall be connected to the chilled water and heating water building systems and shall be equal to the Munters Drycool FreeDry 1220-CW model. The unit shall use building cooling for pre-cool of the arena air to put a load on the building cooling systems to add to the heat recovery available and shall use the building heating for pre-heat of the reactivation air.

The refrigerant system will be set up to utilize the heat in the reactivation air loop.

Finally, there will be a post heat connection to the unit for temperature control.

The units shall be provided with the ability for 100% outdoor air operation which shall modulate based on demand control through space sensors.

The intention at this time is to utilize electric powered ice re-surfacers. This will remove the requirement to have general exhaust and make-up air tied into a gas detection system. There will be a battery recharging station that will require a separate exhaust air component to limit the off-gassing of the batteries to below the lower explosion limits. It is likely this will be located in or near the ice re-surfacer storage garage.

The arenas will be provided with gas detection systems with audible and visual alarms even with the current intention to provide an extra safety precaution should a gas fired vehicle ever be driven on or near the ice.

.3 Administrative, Seniors Centre, corridors, multipurpose spaces etc.: Fan coils and HRV's

Each zone will have a dedicated fan coil capable of providing heating and cooling to the zone. The zones will be grouped based on occupancy type and load.

Fresh air will be provided by heat recovery ventilators, and in high occupancy areas demand controlled ventilation will be utilized to turn down airflow when it is not required.

.4 Fitness Area: Fan coils and HRV

The main fitness zone along with the adjacent wellness programs and fitness studios will be fed with an HRV for outdoor and exhaust air from the spaces. There will be zoning and demand controlled ventilation completed with VAV box control for each zone as they are all highly variable loads and occupancies.

The zone heating and cooling will be accomplished through small fan coils located throughout each space. These will provide some additional smaller thermal zones compared with a single air handling system, and we believe there is sufficient height in these spaces to accommodate ductwork runs and unit spacing.

We recommend utilizing overhead fans to help the project reduce the space temperature setpoint requirements (initially set at 18C) to a higher setpoint in the range of 21C. Having a high air velocity across the human body, comfort criteria during heavy exercise allows for a higher air temperature to produce the same occupant comfort. Again there is a high floor to floor which is conducive to this option.

.5 Aquatics Changing Rooms:

We recommend a single air handling unit with air heat recovery for the Changing Room areas. The unit will consist of supply and return fans with variable speed drives, 100% fresh air mixing box with two position occupied / unoccupied dampers, bag filters and heating coil. 100% of the exhaust air heat will be recovered before discharging outdoors.

Each change room including staff room will have its own reheat coil to provide individual temperature control. The fresh air will be supplied to the change lockers and opening separating the change rooms from the pool. Exhaust air grilles will be located in the shower and toilet areas. Each zone will be pressure neutral to the pool and negative pressure to the lobby.

In-floor radiant heating will be reviewed for these spaces to increase occupant comfort.

.6 Arena Changing Rooms:

These change rooms will be supplied with heating through central HRVs located in the mechanical room above them. Heat will be supplied to maintain these room temperatures through the supply air from the HRVs. We anticipate a minimum of two HRVs for the change rooms in these areas.

.7 Pool Mechanical Room:

Due to the high corrosive environment in the pool mechanical room, it shall be provided with a dedicated make up air unit with 100% outdoor air, cooling and exhaust air heat recovery through a chilled water heat recovery coil.

.8 Electrical Rooms, Data Room Cooling:

Electrical, Data rooms are provided with dedicated air conditioning units connected to the chilled water system. Rejected heat is recovered by the chiller and used to meet the heating demand of the rest of the building.

.9 Miscellaneous Spaces

The Life guard control room, staff offices and corridors will be air conditioned. 4-pipe fan coil units will service these spaces to provide individual control. Fresh air will be supplied through an HRV.

.10 Lobbies and Reception Areas: In-slab Radiant Heating and Cooling and HRV for Ventilation

In-slab radiant heating will provide the space heating and cooling depending on the calculated loads and thermal comfort analysis in the large open lobbies and reception areas. Where there are direct solar gains, in-floor cooling is able to achieve significant performance as it is directly removing the solar gains on the flooring systems.

In-floor systems will have temperature sensing to maintain the slab temperatures below 28C in heating mode (or as dictated by the flooring materials), and above the space dewpoint temperature for cooling.

Ventilation will be provided through an HRV with demand control. This unit shall be offset to ensure that there is a positive pressure from the lobby to both the arenas and the pool changerooms. This will impact the efficiency of the units, but is necessary to limit movement of moisture throughout the building.

7.4 Demand Controlled Ventilation

.1 Demand controlled ventilation will be part of the base design intent with the highly variable occupancy expected within the various programs in the building. This type of system is typically done through the use of wall mounted CO_2 sensors. These sensors often drift and can see poor control effectiveness over the course of many years.

Possible Upgrade Option:

An option that will be considered is the use of a central sensing suite utilizing small air tubes to draw air from each space back to a single group of sensors. These sensors are then regularly replaced ensuring accuracy of sensing and control. It requires a regular maintenance fee each year, but has proven through other projects to save energy over time due to the lack of sensor drifting or failures.

7.5 Exhaust Systems

.1 Exhaust of washrooms will be provided by a central washroom exhaust system. An exhaust fan will be located in the mechanical room and be ducted to each washroom. The exhaust fans will be equipped with a heat recovery coil when HRV's are not utilized. Our initial design intent is to utilize HRVs, with an option to upgrade to include for a heat recovery coil on the exhaust side of the units as well.

.2 A trichloramine exhaust system will be provided in the natatorium to remove gases from the swimming zone at the pool level.

.3 Common storage areas will be exhausted as required through separate ductwork back to the HRV feeding that zone.

7.6 Specialty Systems

.1 Pool Chemical Storage Room:

Dedicated exhaust systems will be provided for each storage room. The exhaust fan, ductwork and grille shall be of non-corrosive material. The make-up air and room conditioning will be done with a dedicated fan coil.

.2 Commercial kitchen range hoods will be exhausted through a fully welded duct system and dedicated ULC listed exhaust fan. This system will be designed to meet NFPA 96 requirements.

These zones will require dedicated make-up air units connected to each exhaust system. They are anticipated to be located up in the mechanical room on top of this section of the building. We believe that each fan system will be on the order of approximately 5,000 cfm or 2,500 L/s in capacity each as a high limit.

.3 Dust Collection systems will be installed within the wood working shop. This system will be required to be a full scale dust collection system with all required safeties to meet the latest requirements of the BC Safety standards.

This unit will need to be interlocked with a separate make-up air unit as well interlocked to run whenever the dust collector is on. The entire dust collection system will be required to be intrinsically safe.

.4 Kiln Exhaust will be required for the large kiln system that is anticipated in the arts program. The size and extent of this is as of yet unknown to the project, but will again be required to have a make-up air component when it is running. The project could look at using a heat recovery coil in this exhaust as it is generally just exhausting high grade heat from the building. Further information will be needed to understand the extent of these systems.

.5 U/G Parking:

The underground parking areas will be exhausted at a rate per the BC Building Code with the make-up air source being the opening to the parkade entrances.

.6 Refrigeration Plant Room:

The refrigeration plant will include monitoring and exhaust systems in accordance with CSA B52 standards. With the consideration for a CO_2 refrigeration system for the ice plant, it is not expected that a Class T machine room will be required.

.7 Elevator Machine Rooms:

A dedicated fan coil unit will be provided for this room and sized based on elevator manufacturer requirements.

7.7 Ductwork Material and Design

.1 All supply and return air duct sizing will be based on 18 Pa (0.07"w.c.) pressure drop and a maximum air velocity of 6.0 m/s (1200ft/min.) for branch lines.

.2 Fully ducted supply air systems will be used. Ceiling spaces will be used for return air plenums where applicable.

.3 Duct systems will be designed in accordance with ASHRAE recommendations and SMACNA, HVAC Duct Construction Standards latest edition.

.4 Duct acoustic lining material in the natatorium will be of non-fibreglass type.

.5 Natatorium exhaust and return ductwork will be aluminum or plastic

.6 Natatorium supply air ductwork will be galvanized and painted, aluminum or fabric.

.7 Each air handling system shall be complete with fresh air, return air and exhaust dampers with dampers sized for 100% fresh air and exhaust air.

.8 Concealed supply air ductwork will be insulated with minimum 25mm thick external insulation. All pool hall exposed ductwork will be painted.

.9 Internal surfaces of all plenum sections including mixing box, access sections, filter section, discharge plenums and fan casing will be covered with 50mm neoprene coated rigid duct line of 72.0 kg/m3 density.

.10 Fire and smoke protection will be incorporated in the design of all air handling systems in accordance with local codes and standards.

.11 All floor-mounted equipment will be placed on 100mm thick concrete housekeeping pads.

.12 On end of line diffusers, the line of branch will be extended by two neck diameters before dead ending.

.13 For main duct and shaft take-off, conical fitting will be used for circular ducts, and prism shaped shoe fittings will be used for rectangular duct.

.14 Manual balancing dampers will be installed at each branch take-off from a main duct on both supply and return air systems.

.15 Access doors of adequate size will be provided within working distance of all volume dampers, fire dampers, VAV boxes, etc.

.16 Vibration isolation will be provided for all air handling equipment, unless otherwise indicated.

8. CONTROL SYSTEMS

8.1 Mechanical Building System

All major mechanical systems will be equipped with Direct Digital Control (DDC) systems. This will include all equipment located in mechanical Rooms as well as the roof mounted systems. It has been confirmed by the City of North Vancouver that the two preferred controls systems will be ESC and Control Solutions.

The entire building will be controlled by BACnet compatible components. BACnet is an ASHRAE protocol that allows standardised data communication for complete automation and control of building systems, such as heating, ventilating, air- conditioning control, lighting control, access control and fire detection systems. Devices like chillers will use the BACnet protocol removing all redundant control points not applicable to the unit.

All devices installed into the facility will be completely BACnet compatible, i.e. thermostats, sensors, etc.

Some type of DDC interface control is recommended for the lighting system. This will allow the energy consumption to be monitored and then controlled depending on the demand, i.e. if a light is not required in a particular space then the main control system will turn it off. This load shedding system could significantly reduce the annual energy consumption of the building.

Energy meters will be installed on the main central plant components. We are also coordinating with electrical to determine if separate meters will be provided for electrical lighting, plug and equipment loads. These individual meters will allow the owner to trouble shoot should the energy consumption increase or change.

The majority of the wall mounted thermostats will be installed for zone temperature control, occupancy sensor and CO_2 sensor. Protective covers will be installed on the sensors within the public spaces. The administrative areas will allow a small amount of manual temperature control by the occupants. The rest of the sensors will be controlled centrally through the DDC interface.

Shower rooms and other applicable spaces will be equipped with humidity sensors in accordance with ASHRAE 55 standard.

8.2 Automatic System Control Strategy

It is understood that the major pool mechanical systems will operate with a significant degree of automation under normal operation. This will be accomplished through the BMS or the equipment's internal programming. However, there will still be the need for interaction and adjustments by facility operators. Typically, disabling and restarting of this equipment is done only through manual operator involvement.

Chemical Controllers

Each pool will have its own standalone chemical controller that will signal the chlorine and pH treatment systems. For chlorine control, there are two methods of measuring chlorine: ORP or ppm. We recommend using an ORP-type controller for this facility. ORP Controllers measure the ability of chlorine to react in the water rather than the amount of chlorine within the water. In other words you could have a large percentage of chlorine within the water that isn't 'free' chlorine and therefore isn't able to disinfect properly. An ORP-type controller will detect this and react accordingly.

The controller will also be provided with a 'signal generator' to allow precise recalibration of the chemical controller as required.

The chemical controller will either have a modem connection that will allow access to the ORP & pH readings remotely or a cable will be provided between the chemical controller and the BMS PC. The PC would then be able to access the information via windows compatible software.

8.3 Natatorium Controls

The natatorium air handling units will be controlled by temperature and humidity sensors located within the natatorium. A pressure differential sensor will monitor the difference in pressure between the natatorium and neighbouring spaces to ensure that this space is always negatively pressurized in comparison to the rest of the building. We anticipate installing sensors on natatorium glazing as well to determine dewpoint temperatures for the structural components to help turn down the required airflow when possible.

Trichloramine sensors will be installed within the Natatorium which will control the trichloramine exhaust system.

9. SUSTAINABLE ENGINEERING STRATEGIES

The following are a summarized list of sustainable energy strategies that have been described above, but should be strongly considered to achieve high levels of GHG reductions to meet the City's mandate:

.1 High performance envelope construction is encouraged with shading devices and low-e window coatings. Triple glazing is recommended – areas that we believe will benefit the most out of triple glazed, high performing windows are the Natatorium and Senior's Centre and Child Minding areas.

The intention for a high performing envelope within the Natatorium, as described within the body of the report, is intended to help the design team reduce the size of the natatorium air handling systems and overall reduce the significant energy use in this zone.

.2 Sewage Heat Reclaim would suit this project with the large quantity of water use from pools, changerooms and plumbing fixtures. This technology is locally made and has been proven in many other installations throughout the lower mainland and offers a significant reduction in energy use and GHG emissions.

At this time it is estimated that this facility could benefit from the use of a system that utilizes a storage tank on the order of 1,000-2,000 gallons, located either in the parkade or below grade. The heat pump would be located in the central plant room on the main floor.

.3 Overhead fans in the Fitness Centre with increased space temperatures. This will provide high airflow directed to the occupants with the benefit of raising room temperature setpoints and reducing overall cooling plant sizing and loads.

This has the benefit of reducing the capital costs of the central chilled water systems, while maintaining the same thermal comforts for the occupants.

.4 Ventilation Air/Relief Heat Recovery System:

An upgraded system intent will review during the next stage of design the possible benefits of combining a sensible only heat recovery core on HRVs or central air handling equipment, with an exhaust air heat recovery chilled water coil.

.5 Water conserving plumbing fixtures and plumbing trim to be used where applicable to conserve water and reduce the waste load on the municipal sewer systems. This is included in the base design intent. These fixtures will be:

.1 High efficiency flush valve toilets with sensor activated flush.

.2 Low flow sink faucets with metered sensors.

.3 Low flow showers will be reviewed for this project as an option above and beyond typical water savings strategies.

.6 Solar panels may be installed as a source of heating for the building, pool and domestic hot water.

.7 Variable speed pumping for heating, cooling, brine systems and pool system pumps

.8 Dew-point calculations for humidity control in the natatorium

.9 Regenerative media filter is proposed as efficient pool filters. These have lower water consumption. This also results in requiring less energy input to heat the pool water.

.10 Envelope performance recommendations:

.1 A maximum glazing to gross wall ratio of 40% is recommended. The heating dominated nature of this building will require exceptional insulation performance if aggressive energy efficiency targets are to be met.

END OF REPORT

APPENDIX A

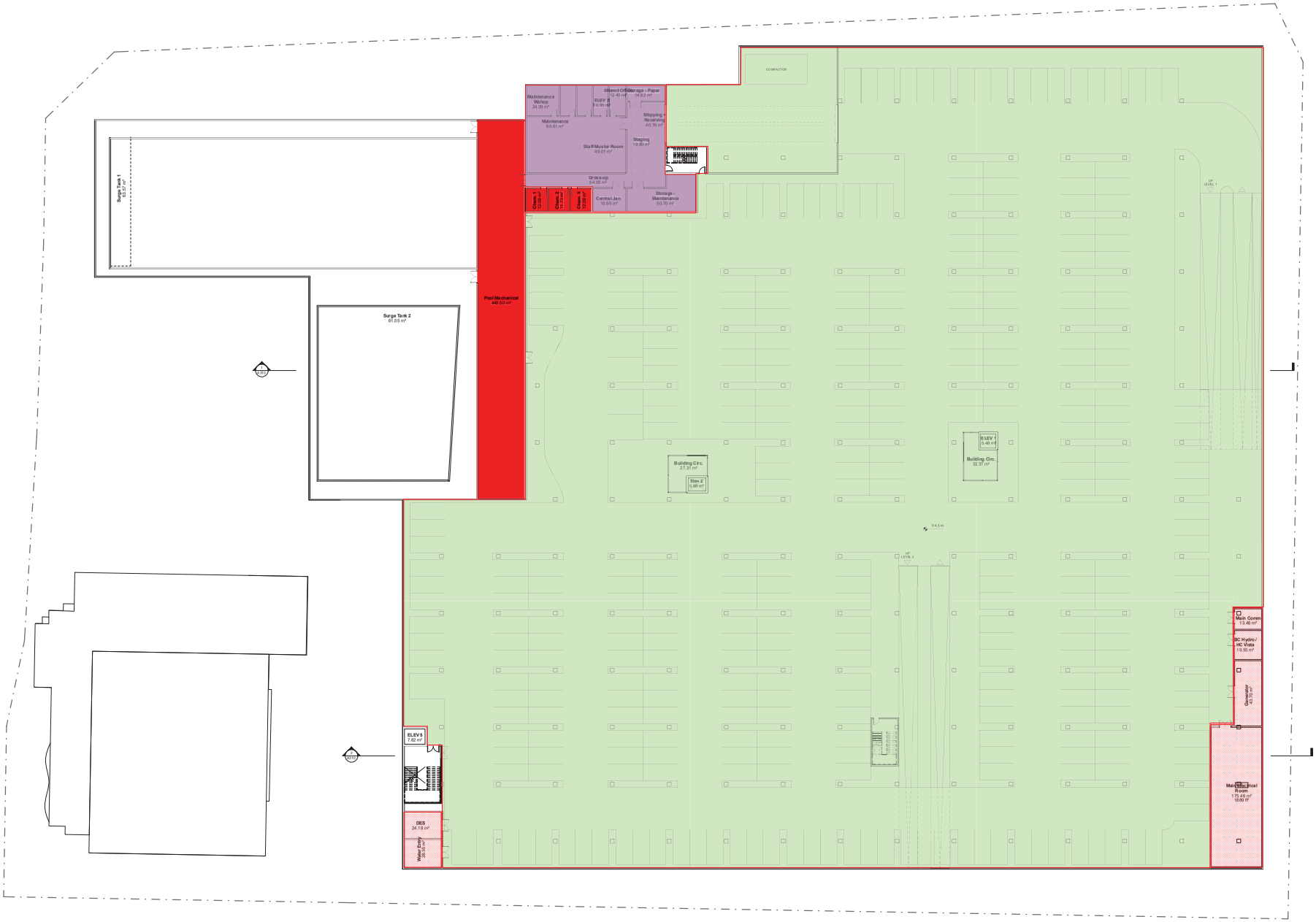
PIPING MATERIALS

SERVICE:	MATERIAL:	INSULATION:
Sanitary Drainage and Vent	Cast iron (buried and above grade), Type "DWV" copper option for exposed OPTION: PVC Piping (IPEX System 15/XFR)	Not required
Storm Drainage	Cast iron (buried and above grade), Type K copper option for exposed OPTION: PVC Piping (IPEX -System 15/XFR)	25mm thick insulation with continuous vapour barrier
Domestic Water	PP piping (ex: Aquatherm) OPTION: Type K soft copper, PVC ringtite, cement lined ductile iron (buried) Type L hard copper (above grade), Type K copper for hot water (above grade)	25mm thick insulation with continuous vapour barrier
Natural Gas	Schedule 40 steel piping for all above ground piping	Not required
Solar Water	Type K soft copper	50mm thick insulation
Fire Protection		
Pool Heating & Cooling Gas		
Fire Water	cement lined ductile iron (buried) Schedule 40 standard weight steel, thin-wall threadable steel, thin-wall steel with Victaulic type grooved / gasketed fittings, Type L copper (within building)	
Sprinkler main and branches	Schedule 40 standard weight steel, thin-wall threadable steel, thin-wall steel with Victaulic type grooved / gasketed fittings, Type L copper (within building)	
Sprinkler heads – pendant type in finished areas	Chrome plated	
Sprinkler heads – upright type in unfinished areas	Bronze plated	

SERVICE:	MATERIAL:	INSULATION:
Sprinkler Heads – all types in natatorium and chemical storage room	Corrosion resistant head	
Solar Water	Type K soft copper	50mm thick
Radiant Floor Hot Water Heating	Schedule 40 steel piping	< 32ø = 25mm thick ≥ 32ø = 40mm thick
Chilled Water	Schedule 40 steel piping	25mm thick with continuous vapour barrier
Heating Water	Schedule 40 steel piping	25mm thick

APPENDIX B

DRAWINGS



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NO.	DESCRIPTION	DATE
1	ISSUED FOR SD REPORT	MAY 29, 2018

Sketch

M-SK-1

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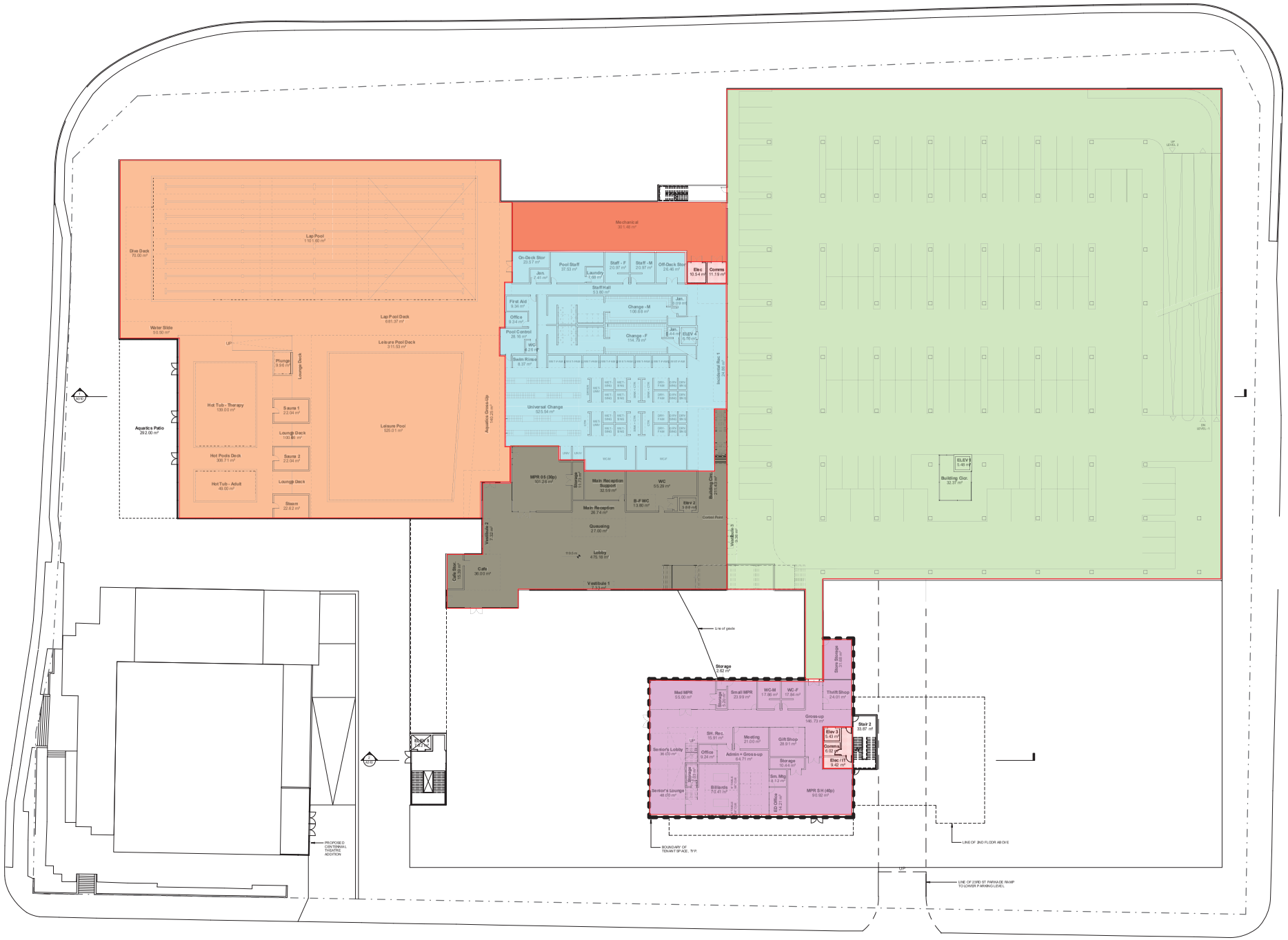

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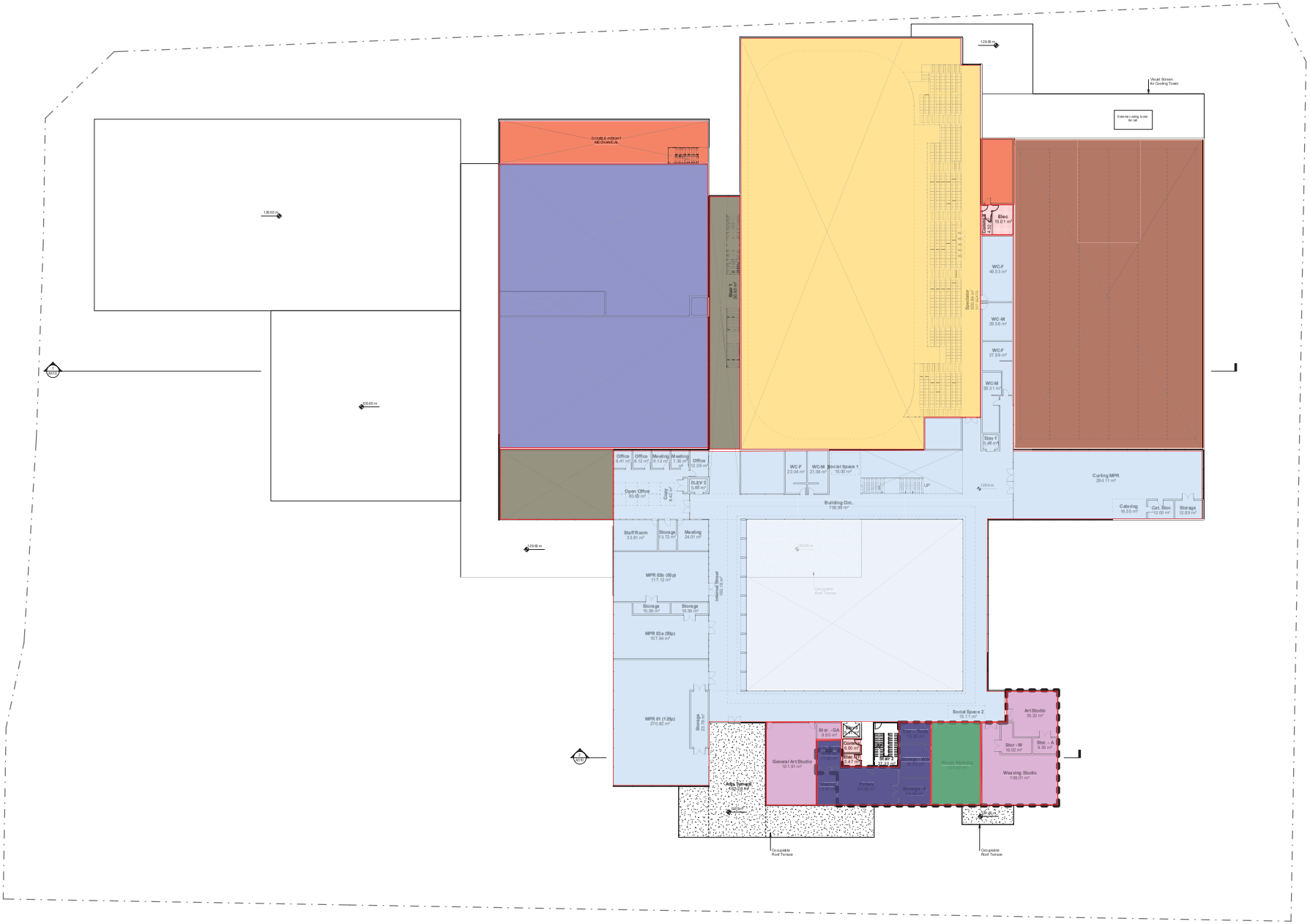

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1	ISSUED FOR SD REPORT	MAY 30, 2018

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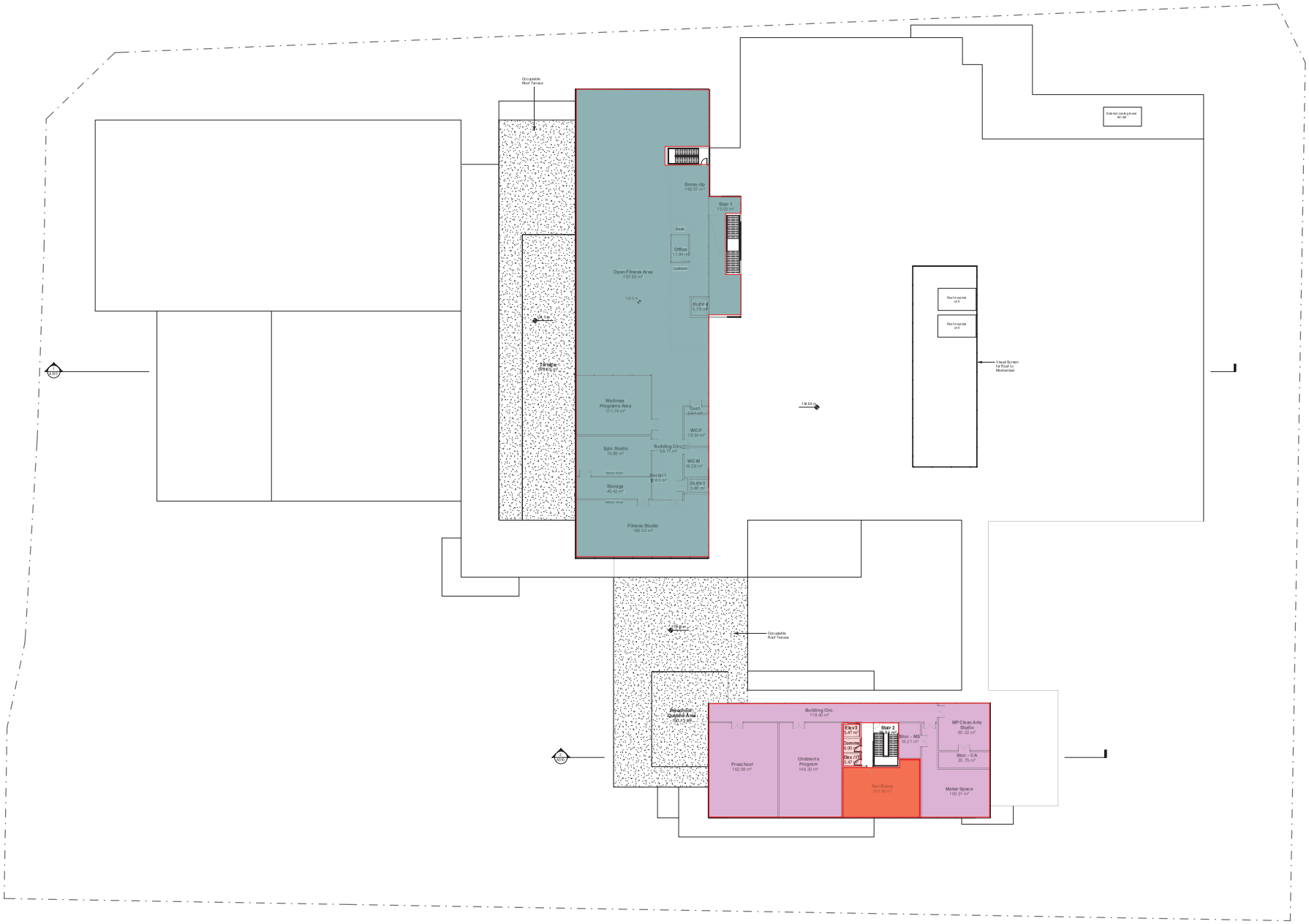

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1	ISSUED FOR SD REPORT	MAY 30, 2018

Sketch

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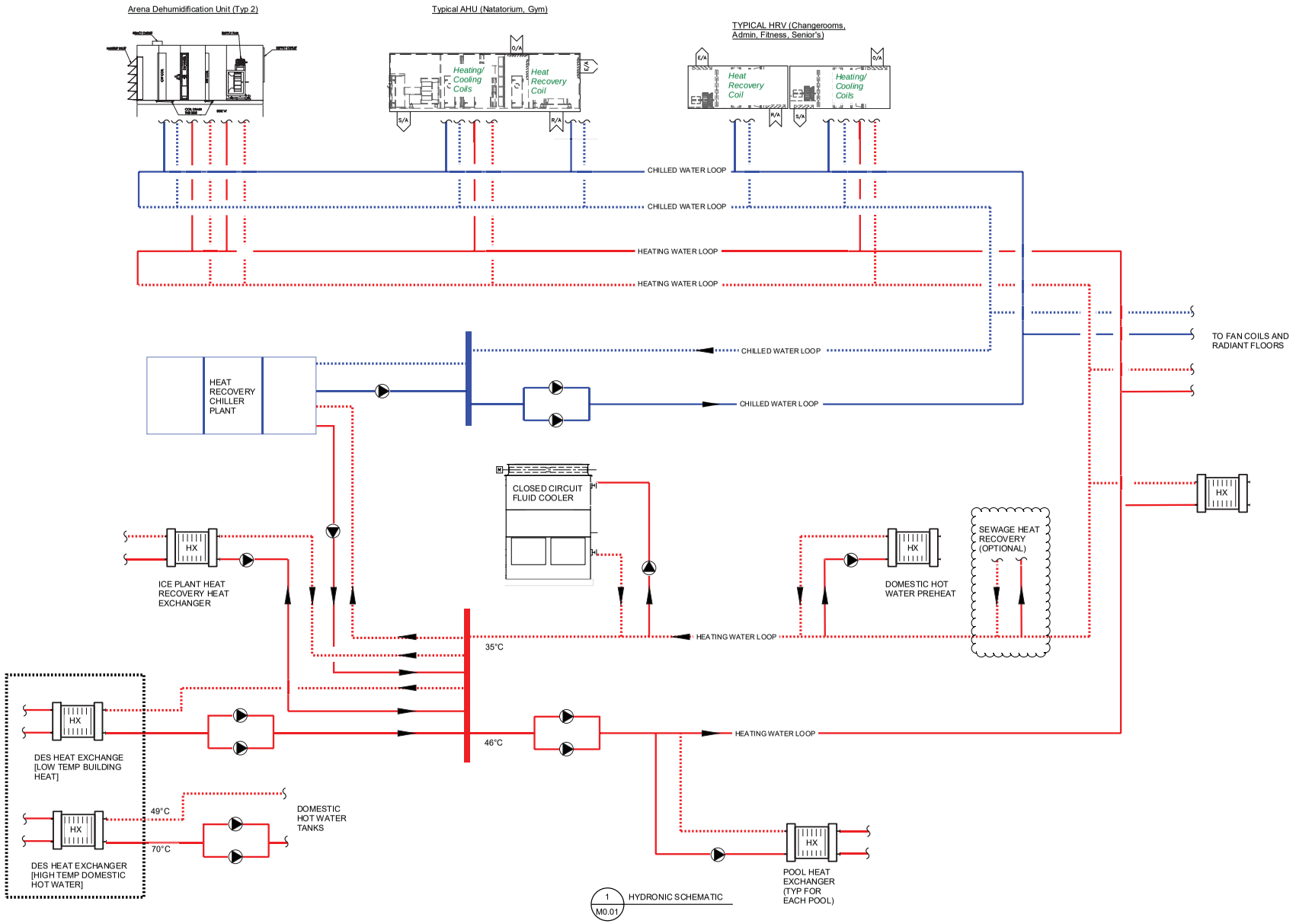

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PROJECT#2009-073-17 • DRAWN:MZT

6.4 Electrical Drawings & Report

Designing A Better Tomorrow

Schematic Design For

Harry Jerome Community Recreation Centre

PREPARED FOR:
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PROJECT NO. 2-18-046
July 11, 2018

TABLE OF CONTENTS

1.0 INTRODUCTION

This report is the schematic design summary of the electrical systems planned for Harry Jerome Community Recreation Centre in North Vancouver, BC. The report is primarily intended to indicate the basis of electrical design. These documents are preliminary in nature, and are only intended to be used as a guide, and to rely on past experience on similar projects to ensure a fully functional electrical installation. Documents of this division and drawings are diagrammatic and not to scale unless detailed otherwise. They establish scope, material, and installation quality and are not detailed installation instructions.

The work shall include but not limited to the following:

- Complete building power distribution system, normal and life safety.
- Complete life safety system (fire alarm, emergency lighting, and exit lighting).
- Complete infrastructures for communications, security and audio-visual systems (power, cable trays, empty conduits and junction boxes).
- Main incoming services for power and telephone.
- Complete CATV cabling system.
- Complete indoor lighting, including lighting control system.
- Complete parkade lighting, including lighting control system.
- Complete power supply, starters, and disconnected switches for all mechanical equipment and equipment supplied by owner.
- Commissioning, start up and training.

2.0 GENERAL ELECTRICAL PROVISIONS FOR DESIGN

2.1 CONFORMANCE

The electrical system shall be designed in accordance with the intent of all applicable codes, ordinances, bylaws, standards and regulations.

The following list of applicable codes and regulations apply to this design:

- 2018 BC Building Code
- ASHRAE 90.1 – 2016

- Illumination Engineering Society of North America (IESNA)
- Applicable NFPA Regulations
- 2015 Canadian Electrical Code (CEC)
- Underwriters' Laboratories of Canada
- Code Consultant Report
- Utility Requirements
- LEED Gold Standards as listed under CaGBC or Passive House – To be determined

2.2 LOAD ESTIMATE

Load Calculation as per Section 8 of the CEC			
Load Calculation	W/m^2	m^2	Total (W)
Community Recreation Gross Area		6,023	
Power Loads	40	6,023	240,920
Lighting Loads	8	6,023	48,184
Mechanical Loads	30	6,023	180,690
Sub-Total Connected Loads			469,794
Aquatic Gross Area		5,549	
Power Loads	25	5,549	138,725
Lighting Loads	9	5,549	49,941
Mechanical Loads	185	5,549	1,026,565
Sub-Total Connected Loads			1,215,231
Senior Centre		966	
Power Loads	40	966	38,640
Lighting Loads	9	966	8,694
Mechanical Loads	30	966	28,980
Sub-Total Connected Loads			76,314
Ice Arena		4,180	
Power Loads	25	4,180	104,500
Lighting Loads	18	4,180	75,240
Mechanical Loads (Refrigeration)	120	4,180	501,600

Mechanical Loads (General)	70	4,180	292,600
Sub-Total Connected Loads			973,940
Curling Facility		3,345	
Power Loads	25	3,345	83,625
Lighting Loads	18	3,345	60,210
Mechanical Loads (Refrigeration)	150	3,345	501,750
Mechanical Loads (General)	90	3,345	301,050
Sub-Total Connected Loads			946,635
Admin & Social		604	
Power Loads	50	604	30,200
Lighting Loads	10	604	6,040
Mechanical Loads	30	604	18,120
Sub-Total Connected Loads			54,360
Parkade		18,729	
Power Loads	5	18,729	93,645
Lighting Loads	1.5	18,729	28,094
Mechanical Loads	15	18,729	280,935
Sub-Total Connected Loads			402,674
Exterior Spaces		12,681	
Power Loads	2	12,681	25,362
Lighting Loads	1.5	12,681	19,022
Mechanical Loads	0	0	0
Sub-Total Connected Loads			44,384
EV Charging Stations (Total 400 Stalls)	Total EV Stalls	W/Stall	Total (W)
50 Dual heads with shared circuit Installed	100	3,600	360,000
1 DC with dual heads and shared circuit installed	2	31,250	62,500
30 Dual head with dedicated circuit installed	60	7,200	432,000
119 Dual heads with shared circuit between four stalls (future)	238	1,800	428,400
		Total with 70% Demand Factor	898,030

Elevators	# Elevators	W/Elevator	Total (W)
Elevators @ 50HP each	5	54,000	270,000
Existing Theatre			288,000
Total connected loads			5,639,361
Total kVA using 0.9pf			6,265,957
@600Y/347V, 3-Phase, 4-Wire System			6,029A
Total Load with 25% Spare			7,537A

3.0 SUSTAINABLE DESIGN

The design and operation of an energy efficient facility is an important design goal.

Energy conservation, Environmental design issues and participation in Energy Efficiency Certification programs include the following:

- LEED rating system of the Canada Green Building Council for New Construction – To be determined,
- BC Hydro High Performance Building program,
- Sustainable design will focus, but not limited, on the following:
    - Minimize up-lighting and maximize efficiency of exterior lighting systems.
    - Metering systems will be installed throughout the facility.

Daylighting will be implemented throughout all spaces of the building. High efficiency luminaires will be specified. The lighting system shall be automated using the following:

- Daylighting controls,
- Zone switched luminaires,
- Occupancy/vacancy sensors,
- Dimming drivers tied into daylight sensors,
- Photoelectric cells.

4.0 ELECTRICAL SERVICES

4.1 BC HYDRO SERVICE

The point of service connection from BC Hydro to the building will be in the South-East corner of the development. The electrical service to the site shall be provided at 12/25kV. BC Hydro will provide a Vista switch outside of the building and the building main 12/25kV service will come from that switch. All work will be carried out to meet BC Hydro standards.

4.2 TELEPHONE SERVICE

The point of service connection from Telus to the building will be on the South-East corner of the development. Three (3) – 4" RPVC ducts c/w inner duct will run from the Telus manhole to the Main Communication Room (MCR). Pull boxes will be provided anytime more than 2 offsets are installed. In addition, six (6) – 4" RPVC ducts will be provided to a manhole outside the building for other service providers. All work will be carried out to meet Telus standards.

4.3 CABLE TV SERVICE

Cable TV service will be provided to MCR. One of the Telus ducts will be utilized for this.

5.0 POWER DISTRIBUTION

The main electrical service shall enter the main electrical room via a pull pit and terminate at 12/25kV incoming cubicle sections. The electrical room is located beside the BC Hydro switchgear vault. All High Voltage (HV) equipment will be rated at 12/25kV for future conversion to 25kV by the utility. Refer to attached drawing E250 for the single line diagram.

The HV line-up will contain:

- An incoming section c/w Load Break Switch and Disconnect Switch,
- One transition section,
- One 12/25kV circuit breaker to feed transformer A,
- One 12/25kV circuit breaker to feed transformer B.

Line-up two shall contain:

- Transformer A – 3,000kVA/4000kVA ANN/ANF, 25kV – 600Y/347V dry type with fan cooling, and 80°C temperature rise,

- Transformer B – 3,000kVA/4000kVA ANN/ANF, 25kV – 600Y/347V dry type with fan cooling, and 80°C temperature rise,
- One 4,000A – 600Y/347V secondary main circuit breaker section for transformer A,
- One 4,000A – 600Y/347V secondary main circuit breaker section for transformer B,
- One 4,000A – 600Y/347V tie circuit breaker section,
- Distribution sections for transformer A,
- Distribution sections for transformer B.

In addition, the main electrical room will contain the following:

- 600Y/347V distribution and panel boards,
- 600V – 208Y/120V transformers,
- 208Y/120V distribution and panel boards.

600Y/347V and 208Y/120V panel boards, and 600V – 208Y/120V transformers will also be placed in the sub-electrical rooms/closets throughout the facility.

All panel boards shall be 42, 66 and 84 circuits complete with breakers as required. All panel board breakers shall be complete with bolt-on molded case circuit breaker with thermal magnetic trip, with trip free action and trip position separate from the “On” or “Off” position.

All step-down transformers shall be minimum K-13 rated.

All power distribution equipment shall be sprinkler proof. All outlets, panel boards, transformers distribution centers, etc. are to be labeled with lamacoid labeling. All feeder conduits shall have 25% spare capacity.

The existing Centennial Theatre to be re-fed from the new distribution of the facility.

A certified electronic metering system will be included completed with all necessary hardware, and software to facilitate the on-going measurement and monitoring of the power consumption in the facility including the metering of mechanical, lighting, receptacle and process loads.

Power outlets will be strategically located and installed in various parts of the facility to accommodate power requirements for computers, electrical equipment, special equipment (eg. Pottery kilns, events, auxiliary fans, etc.), appliances, and maintenance services, and in accordance with City of North Vancouver and user requirements. GFCI outlets will be provided in all washrooms, change rooms, pool area, activity room sinks, and similar places. Activity room circuits will be split to ensure several outlets maybe used at once.

Power connections will be provided for mechanical systems equipment including electric heating, fans, pumps, refrigeration plants, etc., as required to facilitate mechanical systems installation. Weatherproof receptacles shall be provided next to rooftop mechanical equipment.

50kVAR active filter capacitor banks will be provided at each mechanical plant, currently allow for one at ice plant and another one at aquatic plant.

15A standard type receptacles and special power outlets will be installed for telecommunications equipment complete with dedicated circuits as required in all communications rooms/closets. Power connections will be provided for elevator distribution equipment, and other similar loads. All equipment and cabling will be properly labeled.

The power distribution system will be designed such that 50% of the receptacles in offices will be automatically turned off via local occupancy sensor.

6.0 GROUNDING

The water main and any metallic waste water pipe shall be bonded electrically to the main grounding system. The grounding conductor shall be the same size as required by the local electrical inspection authority. The UFER ground to be connected to at least 6 columns on perimeter of the building located in different sections of the building connected via #3/0 bare copper ground wire to the main building ground bus.

Separate ground wire shall be installed in each conduit for feeders. The ground wire will be sized based on the largest wires installed in the conduit. The conduit shall not be used as ground conductor.

All grounding and bonding shall be in accordance with applicable rules of Canadian Electrical Code.

7.0 EMERGENCY POWER SYSTEM

7.1 LIFE SAFETY SYSTEM

The following loads shall be fed from the life safety distribution systems:

- Elevators (if required),
- Mechanical loads (smoke control systems, sprinkler heat tracing),
- Fire alarm system,
- Emergency lighting,
- Exit lighting,

- Fire pump(s) (if required),
- Other life safety loads.

The life safety power distribution system in the building consists of one (1) 500kW/600kVA diesel generator which provides 600Y/347V emergency power to the facility for the life safety systems. An automatic transfer switch complete with a manual bypass switch will be provided to automatically transfer the utility power to the life safety power system if the utility power fails.

The storage on site shall provide two hours of operations at full load via sub-base tank. The generator shall be complete with residential quality muffler, vibration isolators, day tank, and dual pump for redundancy.

The contacts that monitor the status of the transfer switch and alarms from the generator shall be connection to the Building Management System (BMS).

7.2 STANDBY SYSTEM

A standby distribution system shall be fed from the same generator but separated from the life safety distribution. The standby distribution will provide power to other equipment such as security system, sump pump, heat tracing, etc.

An automatic transfer switch complete with a manual bypass will be provided to automatically transfer the utility power to the standby system if the utility power fails.

8.0 WIRING SYSTEMS

8.1 GENERAL

Wiring shall be in accordance with the Canadian Electrical Code and British Columbia Building Code. The raceways for the project shall be as follows, unless required otherwise by authorities having jurisdiction:

- Rigid Steel Conduit: In all areas where the wiring can be subject to damage.
- Rigid PVC Conduit: in concrete or underground installation.
- EMT: Use for general use, where allowed, unless otherwise stated in these specifications, or on the drawings.
- Flexible Liquid Tight Conduit: Provide a short length liquid-tight flexible conduit prior to connection to each motor.
- ENT will not be allowed on the project.

Wiring will be copper and shall be minimum #12 AWG with 1000V XLPE insulation. TECK cable or armored cable shall not be used. Armored cable is only allowed for drops to luminaires, partition walls and connection to equipment.

Conduits and raceways shall be concealed except in services spaces, ceiling spaces, mechanical and electrical rooms. All conduit and cabling shall run parallel or perpendicular to building lines.

8.2 MECHANICAL WIRING

Electrical service shall be provided to all mechanical equipment, including but not limited to air handling units, pumps, fans, heat tracing, chillers, air conditioners, cooling towers, heaters, boilers and all associated equipment. This service will consist of the following:

- All protective devices for feeders/circuits feeding mechanical equipment,
- All conduit and wires,
- All starters, whether they are installed in MCC's or loose in their own enclosures.

MCC's will be installed in mechanical rooms, and where mechanical equipment is installed. Loose mounted HOA starters will be used only for isolated mechanical equipment.

Wiring will be provided for interconnection of MCC's and fire alarm system.

Where specified, controls equipment will be supplied and installed along with all necessary conduit and wiring.

8.3 ELECTRICAL DEVICES

The devices with specification grade shall be used. All devices shall match, including and not limited to receptacles and switches.

9.0 LIGHTING SYSTEM

A complete lighting system will be provided for all areas of the development in compliance with codes, IESNA, ASHRAE and client requirements. The supply, installation and connection of all interior and exterior lighting and related systems shall be included. The luminaires shall be suitable for the environment they are installed in, and suitable for the function of the space.

The lighting system will provide the IESNA levels of horizontal and vertical foot-candle levels, without exceeding uniformity requirements (Maximum to Minimum).

Daylighting zones will be considered in the design of the artificial lighting system. Luminaires will be chosen on the basis of accessibility, efficacy, and CRI (Colour Rendering Index).

All luminaires within the facility will be rated at 120V including the parkade. The exterior luminaires will be rated at 347V.

Refer to attached drawing E151 for the costing allowances for different areas of the building.

9.1 STRUCTURE AND LANDSCAPE LIGHTING

The goal of the lighting is to enhance the exterior appearance of the building, adding ambiance to the night scene. Illumination of the building shall be accomplished by LED luminaires with proper aiming angle, and the design will be coordinated with the landscape architect

9.2 GENERAL LIGHTING

All lighting will be LED type luminaires complete with dimming drivers.

Exterior luminaires shall be installed to provide security lighting and to illuminate areas as directed by the City of North Vancouver. These shall be controlled by photoelectric cells and timers and be integrated with the building lighting control system.

9.3 LIGHTING CONTROLS

Lighting system shall comply with the requirements of ASHRAE 90.1 – 2016.

A complete Low Voltage (LV) lighting control system shall be provided. This shall include all panel tubs, relays and scanners for a fully operational lighting control system. The LV system shall be fully compatible so that it can be tied into the BMS for full control via the BMS system. No gateway will be accepted.

All LV lighting control will be connected to the BMS which will be combined with the mechanical system. The BMS can be programmed to turn on and turn off the designated luminaires at specific time via programming.

9.4 EXIT LIGHTING SYSTEM

A complete exit lighting system will be provided to clearly indicate all egress routes from the facility, in accordance with the requirements of the building code and Local Fire Marshall.

The exit lights will be LED type and comply with the requirements of CAN/CSA-C860 standards and shall be green pictogram (running green man). Where necessary, double sided exit signs will be installed.

All exit lights will be fed from the life safety generator.

9.5 EMERGENCY LIGHTING SYSTEM

Emergency lighting will be designed to the illumination levels and requirements of applicable standards and will be provided in all public and egress routes throughout the facility.

This system will consist of dedicated luminaires connected to the life safety generator, which will remain energized during power outage conditions.

Battery power emergency lighting heads shall be provided in the main electrical room and generator room.

10.0 FIRE ALARM SYSTEM

The fire alarm system shall be installed and verified in accordance with applicable standards and requirements of CAN/ULC and the local authority having jurisdiction. The system shall be supplied and installed by an approved fire alarm equipment system installer in accordance with manufacturer's requirements.

Fire alarm speakers and combination audio/visual devices shall provide audible/visual signals in accordance with the ULC requirements and local authority having jurisdiction.

All fire alarm wiring shall be run in metal conduit. The system shall be monitored by base central monitoring agency as per CAN/ULC requirements.

The fire alarm system shall be addressable with an active graphic annunciator located at the main entrance of the building. Additional annunciator panels may be provided in the facility as required by the fire department.

Manual pull station shall be installed at all exit doors.

Fire alarm notification devices will be installed throughout the building to ensure that the system when in alarm is audible in all areas of the building.

All sprinkler system flow switches and tamper switches shall be monitored via the fire alarm system.

11.0 TELECOMMUNICATION SYSTEM

Provide infrastructure only for communications system, in the form of empty conduits, junction boxes, and power supply. The cabling system will be specified and provided by others.

12.0 CABLE TV SYSTEM

Provide infrastructure only for cable TV system, in the form of empty conduits, junction boxes, and power supply. The cabling system will be specified and provided by others.

13.0 SECURITY SYSTEM

13.1 CCTV SYSTEM

Provide infrastructure only for CCTV system, in the form of empty conduits, junction boxes, and power supply. The cabling system will be specified and provided by others.

13.2 INTRUSION/ACCESS CONTROL SYSTEMS

Provide infrastructure only for intrusion/access control systems, in the form of empty conduits, junction boxes, and power supply. The cabling system will be specified and provided by others.

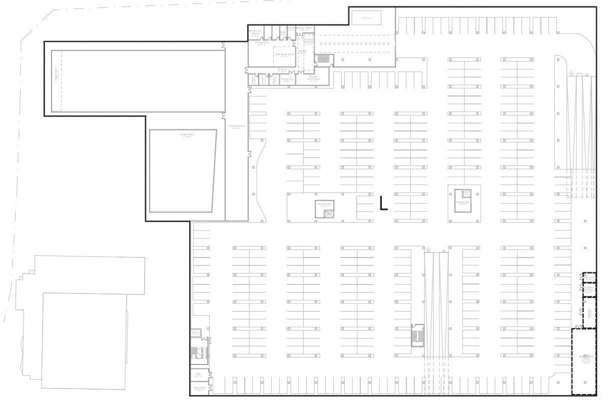
14.0 MISCELLANEOUS SYSTEMS

Electric service for the flowing will be provided:

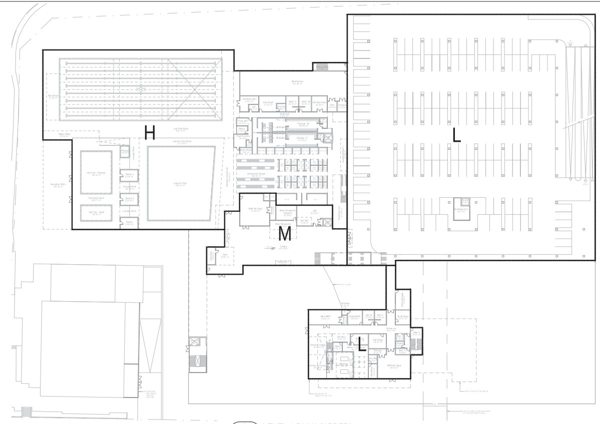
- Power to garbage compactors,
- Power to the elevators and elevator pits,
- Power to all owner supplied equipment,
- Power to window washing equipment,
- Power to all automatic door openers and blinds,
- Power to garbage compactor.
- Electrical connections for all signage additional information,
- Power to electric vehicle charging stations.
    - Level 2 EV charging station for 10 fleet vehicle stalls, each with a dedicated circuit.
    - Level 3 DC charging station for two stalls.
    - Level 2 EV charging station for 50 stalls, each with a dedicated circuit.
    - Level 2 EV charging station for 100 stalls, sharing one circuit between two stalls.
    - Remaining 238 stalls to have conduit infrastructure for future installation of EV chargers.

14.1 VIBRATION ISOLATION

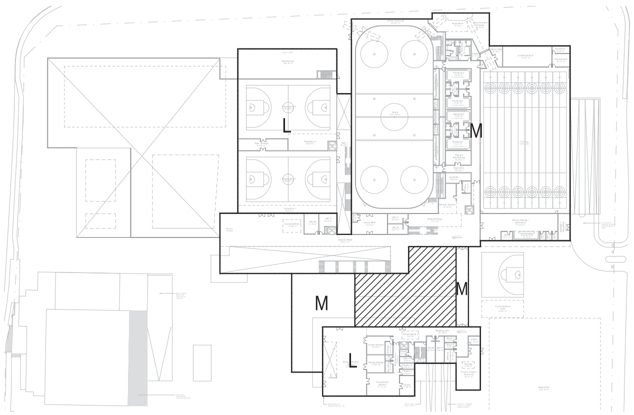
Provide vibration isolation (spring isolators) on all pieces of electrical equipment such as transformers and generators.



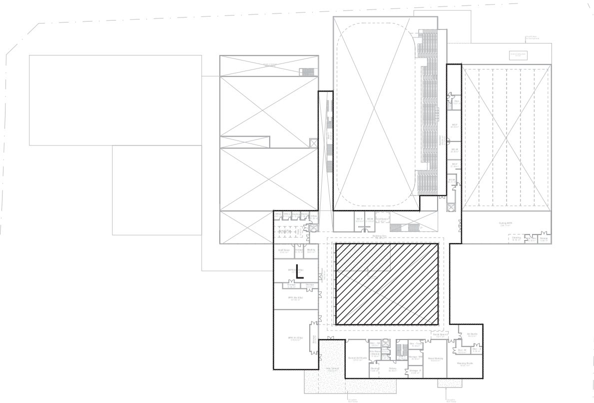
1 E151 LEVEL 1 PLAN (LOWER) 1:500



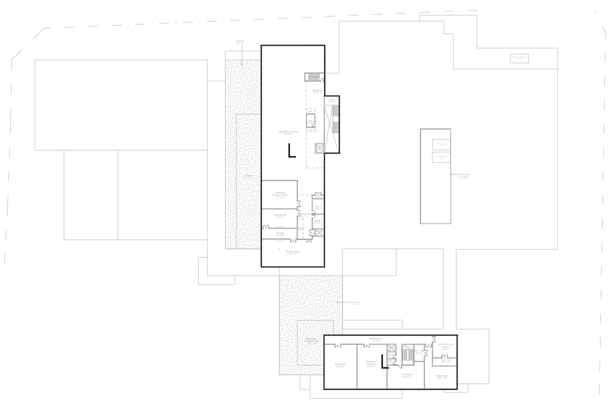
2 E151 LEVEL 1 PLAN (UPPER) 1:500



3 E151 LEVEL 2 PLAN 1:500



4 E151 LEVEL 3 PLAN 1:500



5 E151 LEVEL 4 PLAN 1:500

ABBREVIATIONS

- (H) HIGH COST LIGHTING ALLOWANCE
- (M) MEDIUM COST LIGHTING ALLOWANCE
- (L) LOW COST LIGHTING ALLOWANCE

AES PROJECT#: 2-18-046 ● DRAWN: AS

HCMA

CONSULTANT LOGO:

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AES
Designing A Better Tomorrow
CALGARY | EDMONTON
VANCOUVER | VICTORIA

Harry Jerome CRC

North Vancouver, BC

REVISION	DESCRIPTION	DATE
1.	ISSUED FOR SD	2018.05.30

North

LIGHTING COST ALLOWANCE

E151

SCALE: AS NOTED

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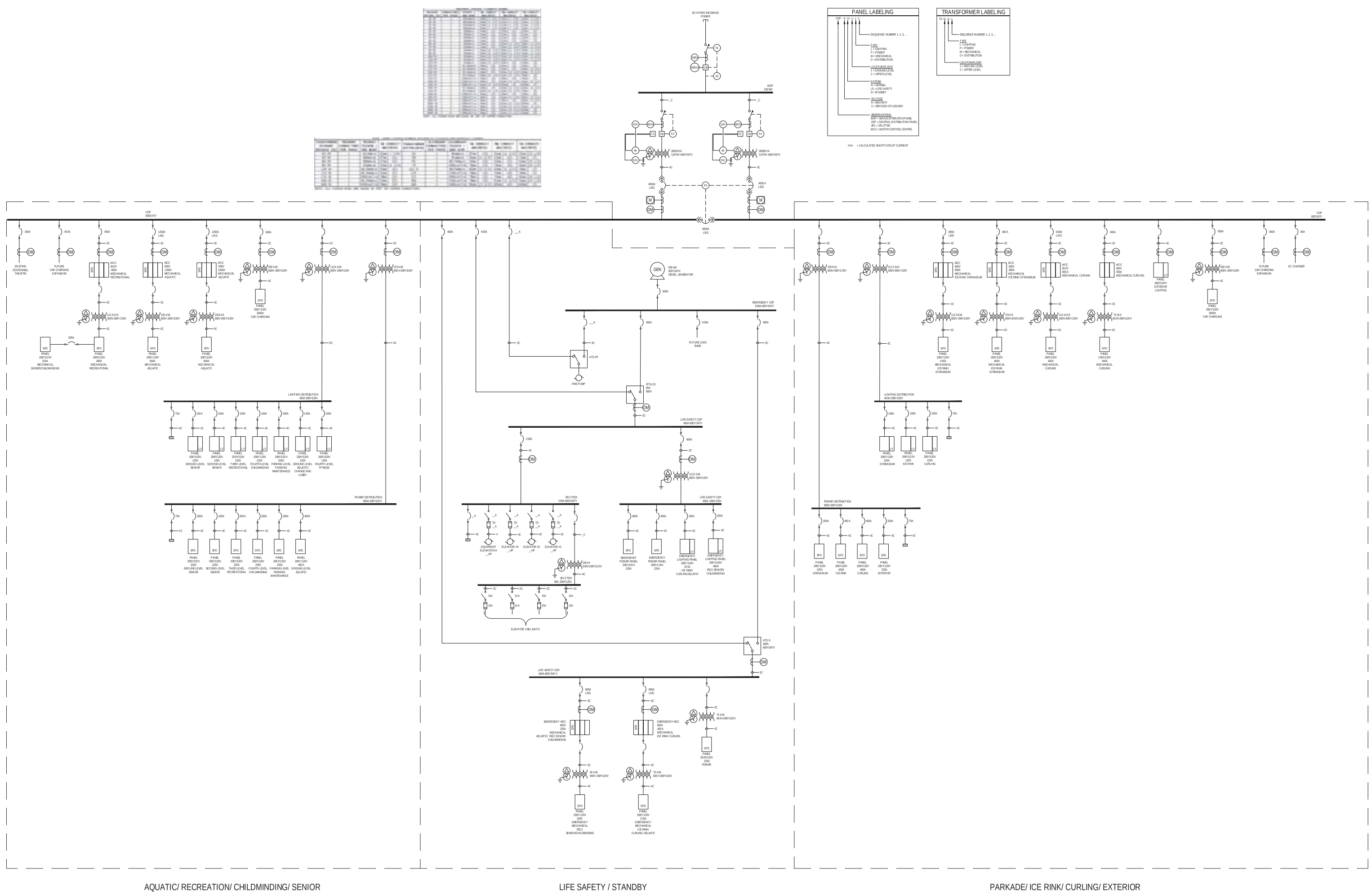

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Harry Jerome CRC
North Vancouver, BC

REVISION	DESCRIPTION	DATE
1	ISSUED FOR SD	2018.05.30

SINGLE LINE DIAGRAM

E250

SCALE: AS NOTED

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AES PROJECT#: 2-18-046 ● **DRAWN:** AS

6.5 Civil Drawings & Report

Date	01-Jun-18
Printed	05-Jun-18
Estimator	EZ
Checked	TMJS

Harry Jerome CRC
2300 Lonsdale Avenue, North Vancouver

A&M Project No. **17-1105**
Option 1

CONSTRUCTION COST ESTIMATE SUMMARY

STORM SEWER & STORMWATER MANAGEMENT

50% COST OF SANITARY SEWER

50% COST OF WATERWORKS

DISTRICT ENERGY UTILITY

APLIN MARTIN

Date	01-Jun-18
Printed	05-Jun-18
Estimator	EZ
Checked	TMJS

Harry Jerome CRC
2300 Lonsdale Avenue, North Vancouver

A&M Project No. 17-1105
Option 1

STORM SEWER

MMCD	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
	SINGLE PIPE - IMPORTED BACKFILL				
	750 mm diameter				
02721	2 - 3 m	lin.m.	154.6		
	900 mm diameter				
02721	2 - 3 m	lin.m.	177.6		
	MANHOLES and APPURTENANCES				
	Bases & Tops				
02725	1500 mm	each	3.0		
	Riser Sections				
02725	1500 mm	v.m.	7.7		
	Aluminum Safety Platforms				
	1500 mm	each	3.0		
	MISCELLANEOUS				
	Video Inspection - Main Pipes	lin.m.	407.2		
02721	Tie-in to Existing Storm Sewer	each	4.0		
	RESTORATION				
02512	Machine Placed Permanent Asphalt Restoration	cu.m.	82.4		
02523	Sidewalk 100mm Concrete (c/w Gr Base) - Broom Finish	sq.m.	5.6		
02522	Barrier Curb with Gutter - Wide Base with gravel & prep.	lin.m	2.0		
	Sodding & Topsoil - 150mm	sq.m.	245.7		
02233	Granular Base	cu.m.	61.8		
	TOTAL STORM SEWER				

ASSUMPTIONS/NOTES:

APLIN MARTIN

Date	01-Jun-18
Printed	05-Jun-18
Estimator	EZ
Checked	TMJS

Harry Jerome CRC
2300 Lonsdale Avenue, North Vancouver

A&M Project No. 17-1105
Option 1

SANITARY SEWER

MMCD	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
	SINGLE PIPE - IMPORTED BACKFILL				
	300 mm diameter				
02731	0 - 2 m	lin.m.	241.9		
	MANHOLES and APPURTENANCES				
	Bases & Tops				
02725	1050 mm	each	2.0		
	Riser Shafts				
02725	1050 mm	v.m.	2.0		
	Appurtenances				
02725	Re-bench Existing MH	each	2.0		
	SERVICE CONNECTIONS				
	Service Connections				
02731	200 mm Single - Imported Backfill	lin.m	7.6		
	CAP ENDS				
	150mm	each	1.0		
	200mm	each	1.0		
	MISCELLANEOUS				
	Video Inspection - Main Pipes	lin.m.	241.9		
	Video Inspection - Service Connections	lin.m.	7.6		
02731	Tie-in to Existing Sanitary Sewer	each	5.0		
	RESTORATION				
02512	Machine Placed Permanent Asphalt Restoration	cu.m.	73.7		
02523	Sidewalk 100mm Concrete (c/w Gr Base) - Broom Finish	sq.m.	2.1		
02522	Barrier Curb with Gutter - Wide Base with gravel & prep.	lin.m	1.5		
	Sodding & Topsoil - 150mm	sq.m.	2.2		
02233	Granular Base	cu.m.	55.3		
	TOTAL SANITARY SEWER				

ASSUMPTIONS/NOTES:

APLIN MARTIN

Date	01-Jun-18
Printed	05-Jun-18
Estimator	EZ
Checked	TMJS

Harry Jerome CRC
2300 Lonsdale Avenue, North Vancouver

A&M Project No. 17-1105
Option 1

WATERWORKS

MMCD	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
	WATER MAINS				
	Imported Backfill				
02666	300mm	lin.m.	225.1		
	APPURTENANCES				
	Tees				
02666	250mm	each	1.0		
	Bends				
02666	300mm	each	1.0		
	Gate Valves				
02666	250mm	each	1.0		
02666	300mm	each	3.0		
	Reducers				
02666	300mm - Maximum Dia.	each	2.0		
	SERVICE CONNECTIONS				
	Multi-Family, Commercial & Industrial				
	200mm Fire & 200mm Domestic (C/w Double Check Assembly, Chamber, Meter, Etc.)	each	1.0		
	MISCELLANEOUS				
02666	Water Main Testing & Sterilization	lin.m.	225.1		
02666	Concrete Thrust Blocks	each	3.0		
	Wet Tap Connections				
	300mm x 200mm	each	2.0		
	RESTORATION				
02512	Machine Placed Permanent Asphalt Restoration	cu.m.	71.1		
02522	Barrier Curb with Gutter - Wide Base with gravel & prep.	lin.m	1.5		
02523	Driveway - 200mm (c/w Gr Base)	sq.m.	5.5		
02233	Granular Base	cu.m.	53.3		
	TOTAL WATER WORKS				

ASSUMPTIONS/NOTES:

APLIN MARTIN

Date	01-Jun-18
Printed	05-Jun-18
Estimator	EZ
Checked	TMJS

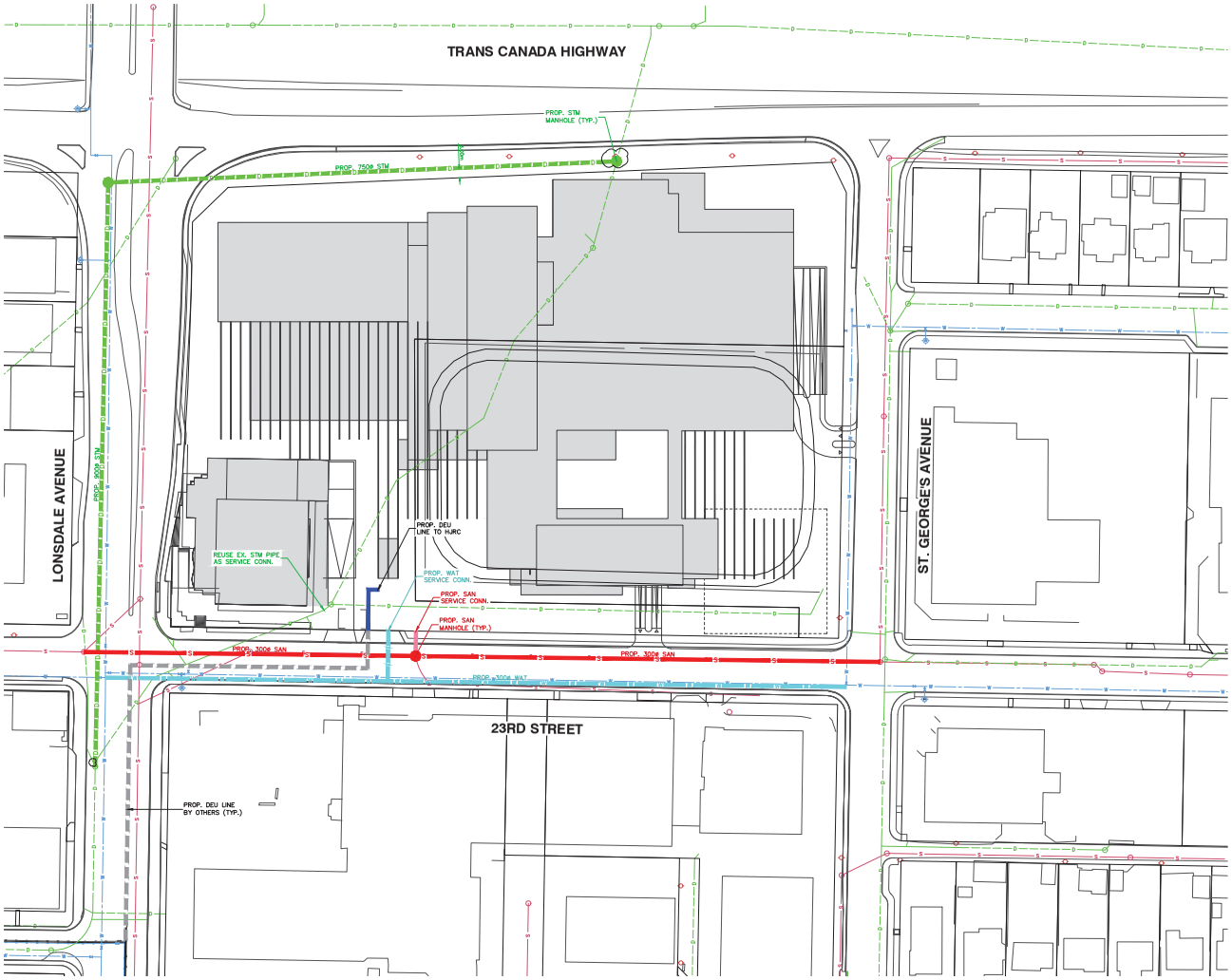
Harry Jerome CRC
2300 Lonsdale Avenue, North Vancouver

A&M Project No. 17-1105
Option 1

DISTRICT ENERGY UTILITY

MMCD	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
	COLD WATER MAINS				
	Imported Backfill				
02666	200mm	lin.m.	167.0		
	HOT WATER MAINS				
02666	200mm	lin.m.	167.0		
	COMUNICATION DUCT BANK				
	2 - 50mm Duct Bank	lin.m.	167.0		
	APPURTENANCES				
	Bends				
02666	200mm	each	4.0		
	Gate Valves				
02666	200mm	each	2.0		
	SERVICE CONNECTIONS				
	Multi-Family, Commercial & Industrial				
	200mm Duo Service (C/w Double Check Assembly, Chamber, Meter, Etc.)	each	1.0		
	Service Vault	each	1.0		
	MISCELLANEOUS				
02666	Water Main Testing & Sterilization	lin.m.	334.0		
	Wet Tap Connections				
02666	200mm x 200mm	each	2.0		
	RESTORATION				
02512	Machine Placed Permanent Asphalt Restoration	cu.m.	66.8		
02522	Barrier Curb with Gutter - Wide Base with gravel & prep.	lin.m	2.0		
02523	Driveway - 200mm (c/w Gr Base)	sq.m.	7.3		
02233	Granular Base	cu.m.	50.1		
	TOTAL WATER WORKS				

ASSUMPTIONS/NOTES:



PROJECT#: 17-1105 DRAWN: AS

HCMA

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Harry Jerome CRC
North Vancouver, BC

REVISION	DESCRIPTION	DATE
1	FOR PRICING	JUNE/18

SERVICING PLAN OPTION 1

01

SCALE: 1:500

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6.6 Sustainability Report

July 18, 2018

Harry Jerome Community Recreation Centre Sustainable Design Vision Report

Prepared for: Paul Fast, Principal,
HCMA Architecture + Design
675 W Hastings St #400,
Vancouver, BC V6B 1N2

Prepared by Dave Ramslie, Principal
Integral Group LLC
180-200 Granville Street
Vancouver, BC V6C 1Z2

Introduction:

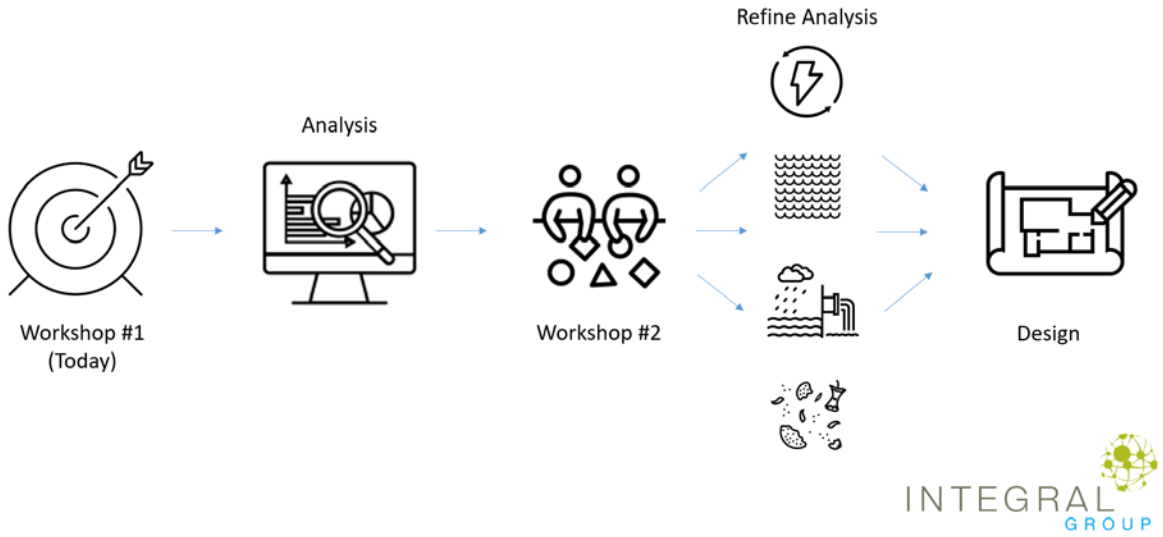
The Harry Jerome Community and Recreation Centre project began by working with numerous stakeholders to identify a clear vision for the project. The created vision outlined specific principles, goals and strategies that would guide the design process and the project team at key decision making moments along the way. Among other aspects to the overall vision, there were specific sustainability principles and goals outlined.

Principle: **The Harry Jerome Community Recreation Centre will be a global example of social and environmental sustainability and resilience.**

Goal: **Meet the City's climate action plan targets - The City's 2011 corporate climate action plan set a target of a 25% reduction of overall emissions below 2007 levels by 2020. As the existing HJCRC accounts for 27% of the City's overall corporate greenhouse gas emissions, there is an opportunity to demonstrate leadership and significantly reduce corporate GHG emissions. The redevelopment of HJCRC has long been a key component of the City's corporate Climate action plan.**

To help the project reach the desired environmental sustainability goals and principles, Integral group have worked with the design team to analyze potential sustainability strategies possible. The purpose of this document is to summarize the outcomes of the sustainability workshops for the Harry Jerome Community Recreation Centre redevelopment. The document will summarize the process, analysis and outcomes of recommended environmental sustainability targets to be explored for the purposes of costing and further design development as the project progresses.

Figure 1: Schematic Design Sustainability Process Map:



Executive Summary:

City and NVRCC staff along with the design team met over a 4-month period to develop a sustainability strategy for the project. The strategy is based on a combination of specific quantitative targets related to energy and carbon, and tactical design targets such as maximizing rain water re-use on site. While a broad range of sustainability topics were discussed in the meetings, carbon was identified as being the primary focus for the City of North Vancouver. As a result, this report, and the attached energy modelling summary, provide more detail in this area.

With specific regards to carbon performance we note that The Harry Jerome Community Recreation Centre has a highly complex building program, with a mixture of very energy intensive uses such as pools and ice rinks. Despite these challenges, staff and design team came to consensus on a design approach that reduced the Carbon Intensity of the project from a building based on the minimum requirements of National Energy Code of Canada for Buildings 2011 at 23/kg's of $CO_2e/m^2/yr$ to approximately 10.5 kg of $CO_2e/m^2/yr$. This is a reduction of 54%, and while impressive falls short of staff's desired target of 2-3 kg of $CO_2e/m^2/yr$. that is required to meet Council adopted overall corporate GHG reduction targets. This may be overcome by using carbon credits owned by the City or by further refinement of the design in later stages of the project.

Other recommendations in the report include:

1. **Water & Storm Water: Maximize water and rainwater re-use on site.**
2. **Internal Environmental Quality & Materials HJCRC should be designed with a minimum 50-year design life for its major components and track the carbon intensity of construction materials.**
3. **Sustainable Transportation: The project should minimize the need for automobile use and be a catalyst for non-auto-mode transportation, and realize its strategic location as potential EV charging hub.**

Harry Jerome Community Recreation Centre Attribute Summary:
The Harry Jerome Community Recreation Centre is a 23,821 m² project proposed to be located at the north east corner of Lonsdale and 23rd Ave. The project replaces an older facility by the same name that is currently located directly south of the new project site. The project will include the following uses:

- Aquatic Centre with 50m tank, leisure pool, hot pools, steam, and sauna
- Fitness Centre
- Gymnasiums
- Silver Harbour Seniors Activity Centre
- Youth Centre
- Multipurpose Rooms
- Arts & cultural spaces
- Arena with 500 spectator seats
- Curling Facility
- Food services
- Outdoor sports courts
- Underground parking

The 2011 Corporate Climate Action Plan set a target of reducing corporate emissions by 25% over 2007 levels by 2020. The current community recreation centre accounts for 27% of the City's corporate GHG emissions, and the new facility is a significant project that will need to achieve substantial GHG reductions to meet these commitments.

The project is subject to the City of North Vancouver's district energy connection requirements, which requires Lonsdale Energy Corp (LEC) to supply all its heating needs, including space heating and domestic hot water heating. LEC is continuously exploring new ways to innovate and increase the sustainability of its district energy system. Currently, LEC operates 8 Mini-Plants and is using alternative energy sources including a hydronic solar panel array on the roof of the Library, a geo-exchange field under and around the School District 44 head office, as well as recovery of rejected heat from the cooling process used in LEC's cooling customer buildings. These sources are used in priority and directly offset energy that would otherwise be generated by using natural gas fired boilers in LEC's systems.

In addition to these sources, LEC entered into an agreement with the Greater Vancouver Sewerage and Drainage District (GVS&DD) in 2017 to purchase thermal energy by recovering heat from the effluent of the North Shore Waste Water Treatment Plant (NSWWTP) which is currently under construction. Heat delivery is expected to commence in 2021. GVS&DD has estimated that GHG emissions will be reduced by 7,200 tonnes per year, aligning with both LEC and the City's visions of climate action, reducing greenhouse gas emissions and improving sustainability.
.

Strategy Development Process:

The integrated design process used to develop the recommended sustainable design targets developed for this project had three components:

1. **Background research on what targets could be considered**
2. **Two staff and design team workshops**
3. **Energy modelling and analysis**

The background research was to establish possible targets for the project based on precedents from similar projects in order to establish a range of possible outcomes. The workshops were a forum where by staff and the design team could share information and interrogate the data shared by the consultants. Participants worked to come to consensus on what the optimal targets could be for this project. Finally, the analysis done as part of this project was to use parametric modelling to evaluate thousands of possible outcomes via energy modelling in order to establish design directions specifically for energy and carbon targets.

The project team chose to define and breakdown the sustainability goals and principles for the project in the following categories: Carbon/Energy, Water, IEQ, Materials, Ecology, Storm water, Sustainable Transportation, and health and wellness.

With regards to workshops themselves they were attended by a broad cross section of City and North Vancouver Recreation and Culture Commisison staff who are concerned with both the planning, design and future operations of the proposed recreation centre.

IDP Process Participants:

Client Team	Consultant Team	Other

Participant	**Group:**	**Participant**	**Group:**
Barbara Pearce	City of North Vancouver – Strategic Initiatives	Darryl Condon	HCMA
Heather Reinhold	City of North Vancouver – Strategic Initiatives	Paul Fast	HCMA
Dianna Foldi	City of North Vancouver – Strategic Initiatives	Zina Berrada	HCMA
Heather Turner	North Vancouver Recreation and Cultural Commission	Harold Stewart;	AME
Gary Houg	North Vancouver – Recreation and Cultural Commission	David Fooks	Morrison Hershfeild
Tim Ryce	City of North Vancouver – Buildings & Inspections	Sunny.Ghataurah	AES
Caroline Jackson	City of North Vancouver – Sustainability	Dave Ramslie;	Integral Group
Ben Themens	Lonsdale Energy Corp	Emilie Adin	Citry of North Vancouver – Planning and Development
Ivan Tang	Lonsdale Energy Corp	Scott Sinclair	SES– Energy Advisor to City of North Vancouver

Recommendations:

The Sustainability Workshop outcomes were broken down by topic, and then by principles, goals and tactics to explore. The content should be considered as draft and subject to refinement by the client and consultant team as the project is developed further.

Topic: Carbon & Energy

This topic was a specific area of focus for this project given that currently the Harry Jerome Community Recreation Centre accounts for 29% of the City's corporate building greenhouse gas emissions.

Principle(s):

1. This building should minimize GHG emissions consistent with Council adopted target for Corporate GHG reductions.
2. A portion of this building could seek Zero Carbon Design Certification as defined by the CaGBC's Zero Carbon Building Standard.
3. The Project team should conduct a cradle-to-grave lifecycle Cost Assessment (LCA) to report the embodied carbon and other GHG emissions associated with building materials.

The Design team reviewed the current CNV targets with regards to GHG emissions for corporate buildings and the City's recently adopted rezoning policy that references the BC Energy Step code.

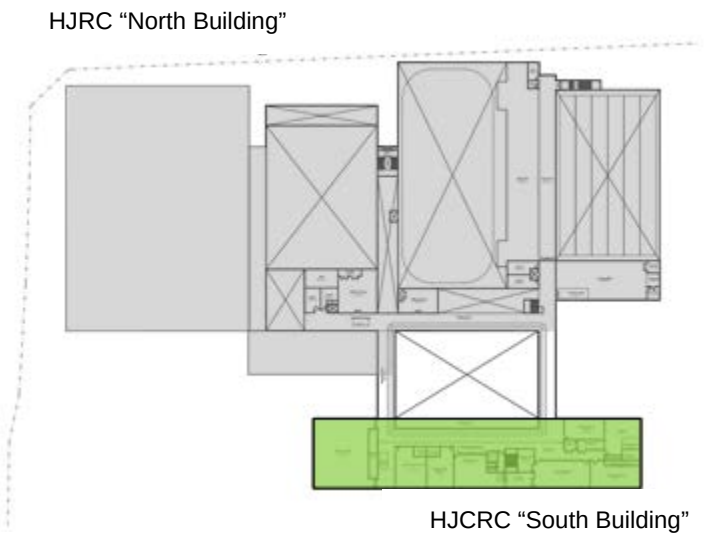
For the Step Code: The City is targeting the achievement of Step 3 of the BC Energy Step Code for rezoned projects. While the step currently does not apply to community recreation centres, the Thermal Energy Demand Intensity target of 30 kwh/m^2/yr. is consistent with the upper levels of Step Code for commercial and Multi Family Buildings. It is also the minimum requirement for building targeting the Zero Carbon Building Standard.

For corporate buildings: Staff estimate that to achieve the council adopted emissions reductions required for corporate buildings this project will have to emit no more than 2-3 kg of GHG/m^2/yr. This is a reduction from the current facility which produces approximately 46 kg's of GHG/m^2/yr.

Overall GHG reduction Strategy:

It should be noted that the HJCRC program is a challenging one to reconcile with deep emissions reductions. The pool, ice rink and curling sheets are energy intensive. As a result, we propose that the project as a whole target deep reductions utilizing a high-performance building enclosure and make use of some on-site renewable energy production in the form of solar thermal, based on an analysis of operating compatibility and economic payback. We further recommend for the purposes of exploration and the demonstration of sustainability leadership that the client explore Zero Carbon Building certification on the community centre portion of the building to the south of the main building which also included the Silver Harbour Seniors Activity Centre. (High-lighted in green in Figure 2 below.)

Figure 2: Building Schematic



Link: https://www.cagbc.org/cagbcdocs/zerocarbon/CaGBC_Zero_Carbon_Building_Standard_EN.pdf

It should be noted that there were some initial design explorations to explore the application of the Passive House Standard to the project but the requirements of the standard were deemed incompatible with health and safety requirements for operating pools in British Columbia. Specifically, the temperature on the pool deck for Lifeguards to work in was deemed too high.

Schematic Energy Modelling Results:

The energy modelling team worked with the Architectural, Mechanical and Electrical teams on this project to develop a range of possible energy and carbon savings measures for this project. The purpose of this was to test different packages of energy efficiency measure in order to determine the best approach. Below is matrix that summarizes these results and identifies the recommended approach.

Design Option	Roof R-Value	Wall R-Value	Window to Wall Ratio	Window Performance	SHGC	Parkade lighting savings	Other Measures	GHG Emissions	Cost
Base Design	R-30	R-30	48%	Double Glazed U-0.35	0.35	20%	None	11.3 $kgCO_2e/m^2$	NA
Option 1	R-40	R-30	38%	Triple Glazed U-0.25	0.4	30%	Solar*	10.1 $kgCO_2e/m^2$	$$
Option 2	R-40	R-30	48%	Triple Glazed U-0.25	0.4	30%	Solar*	10.3 $kgCO_2e/m^2$	$$$
Option 3	R-40	R-30	48%	Double Glazed U-0.30	0.4	30%	Solar*	10.5 $kgCO_2e/m^2$	$

**Solar thermal collectors on rooftop*

Option 1 Is a focussed approach to envelope. It has the lowest glazing ratio which was highlighted as a design challenge by both the client and the architectural team with regards to providing high quality day-lit spaces.

Option 2 Is an option whereby the original glazing target of 48% was used as the organizing principle. This design used triple glazing to make up for the fact that there were higher amounts of windows. This is the most expensive option given the large amounts of triple glazing.

Option 3 This option provides a modest improvement in carbon performance over the baseline option resulting from the installation of solar thermal collectors but does not have the costlier triple glazed windows found in Option's 1 and 2. **While the GHG savings achieved by this option are only marginal, Integral Group recommends that future design development work be done based on Option 3.**

For more specifics on the outcomes of the energy modelling analysis please see the energy modelling summary attached to this report.

It should be noted that Lonsdale Energy Corp. (LEC) estimates that based on the upcoming development of the Sewage Heat Recovery Project from the North Shore Waste Water Treatment Plant, it is expected that 20,000 to 30,000 MWh of carbon neutral energy will be delivered to directly offset natural gas input, thereby significantly reducing the carbon intensity of heat supplied by LEC. In 2017, LEC delivered 48,600 MWh of heat to its customers. More refined estimates from LEC were not available at the time of this report so a place holder reduction in carbon intensity of 40% was applied to the results noted above.

Further Reduction to the Carbon Intensity of Building:

1. **Further Design Optimisation of Envelope:** The current limits of the energy model are not capable of recognizing the benefits of insulating some portions of the building better that would be cost effective and optimize its performance. For example, we estimate that significant savings could be realized from instituting an aggressive airtightness and insulating strategy in the pool portion of the project.

2. **Mechanical optimisation & supplemental heat pumps:** Similar to envelope optimisation we estimate that there may be opportunities to optimize the mechanical system to further balance the heating a cooling system and utilize waste heat through the installation of heat pumps owned and operated by LEC, to be further explored for both technical and economical feasibility.

3. **Green Gas Credits:** In the development of the Sewage Heat Recovery Project the City of North Vancouver has acquired rights to some Renewable Natural Gas Credits. These are credits for biologically derived natural gas that does not have any climate change impact. The application of these credits to this project could significantly reduce the GHG impact of the project however this would be a temporary measure that would need to be restored by purchasing more renewable natural gas once these credits expire in 10 years.

Actions:	**Potential Reduction**	**Running Total**
Option 3 (recommended approach)	NA	10.5 kg $CO_2e/m^2/yr$
Further Design Optimisation of Envelope	1 kg $CO_2e/m^2/yr$	9.5 kg $CO_2e/m^2/yr$
Mechanical optimisation & supplemental heat	0.5 kg $CO_2e/m^2/yr$	9.0 kg $CO_2e/m^2/yr$
Green Gas Credits	Unknown	<9.0 kg $CO_2e/m^2/yr$

Integral Group notes that if all the further reductions identified in this report are achieved the project may still be short of the target of 2-3 kg's required to comply with the 2011 Corporate Climate Action Plan depending on how the CNV's carbon credits are applied.

Other Design Goals:

Throughout the course of the integrated design process there were a number of other design goals that emerged through the dialogue. These while more general in nature but spoke to realising specific design opportunities that relate to climate and energy that had the broad support of the design team. These are goals that the design team should advance through the next phases of design and construction. They include:

- Maximize heat recovery on-site.
- Include as much natural daylight in the project as possible,
- Target no natural gas use on site

- Create a best in class commissioning plan that comprehensively integrates design, operations, and occupant education.

Topic: Water & Storm Water

Principle(s):

1. Maximize water and rainwater re-use on site

2. With regards to water and storm water planning, treat the new Harry Jerome Community Recreation Centre site as a part of larger precinct that includes the park and other retail and residential uses.

The design team noted that given the buildings use and the unique connection the North Shore has to natural water systems HJRC represented a unique opportunity to reuse substantial amounts of rainwater for pool filling and top up and flushing by utilizing the already existing water purification technology required for the pool. The design team felt that this was a unique education opportunity to engage residents on the subject of water conservation and re-use.

Therefore, the specific design recommendation for this area of the report is to **Maximize rainwater re-use and treatment for pool and hot tub water top up, as well as toilet flushing**. This can substantially reduce the amount of water consumed in the facility as these end uses are consistent all year.

Other Water Related Design Goals include:

In addition to making use of reclaimed rain water the design team identified a number of other goals that had broad consensus. They included the following:

- Use native and adaptive planting
- Explore opportunities to re-establish historical streams and creeks on site.
- Optimize plumbing design to minimize the need for recirculation.
- Use appropriate fixtures and fittings to reduce potable water use.

Topic: Internal Environmental Quality & Materials

Principle(s):

1. This is a legacy building that should be designed with a minimum 50-year design life for its major components. Durable products and materials should be used and designed to be easily maintained and if required replaced.
2. The building will embody a deep commitment to community health in both its design, construction and operation.

As noted above in the energy and carbon section, a recommended that **a full embodied carbon assessment should be done on the project to better understand the impacts of material choices on climate change.**

In addition to the above noted principles the design team identified the following goals that should be further explored during the design process. They include:

- Explore the application of the Fitwel Building Standard to better understand the health and wellness impacts of design decisions.
- Minimize Chlorine use in the building.
- Explore the use of low embodied carbon materials.
- Target the use of low VOC materials.

Topic: Sustainable Transportation

Principle(s):

1. The project should minimize the need for automobile use and be a catalyst for non-auto-mode transportation
2. The project should integrate electric vehicle charging and realize its strategic location as potential EV charging hub.

The project should integrate a comprehensive electric vehicle charging strategy that includes both Level 2 and Level 3 charging. For the sustainable transportation area of this project the design team recommendation is that the: **building should consider a minimum of 33% of stalls to be supplied with Level 2 charging.**

Other sustainable transportation goals that the design team identified that should be further developed in the design process include:

- Optimize pick up and drop off areas.
- Provide secure safe bike parking for guests and staff.
- Explore pooled or shared parking with neighbouring developments.

Topic: Other Initiatives

Principle(s):

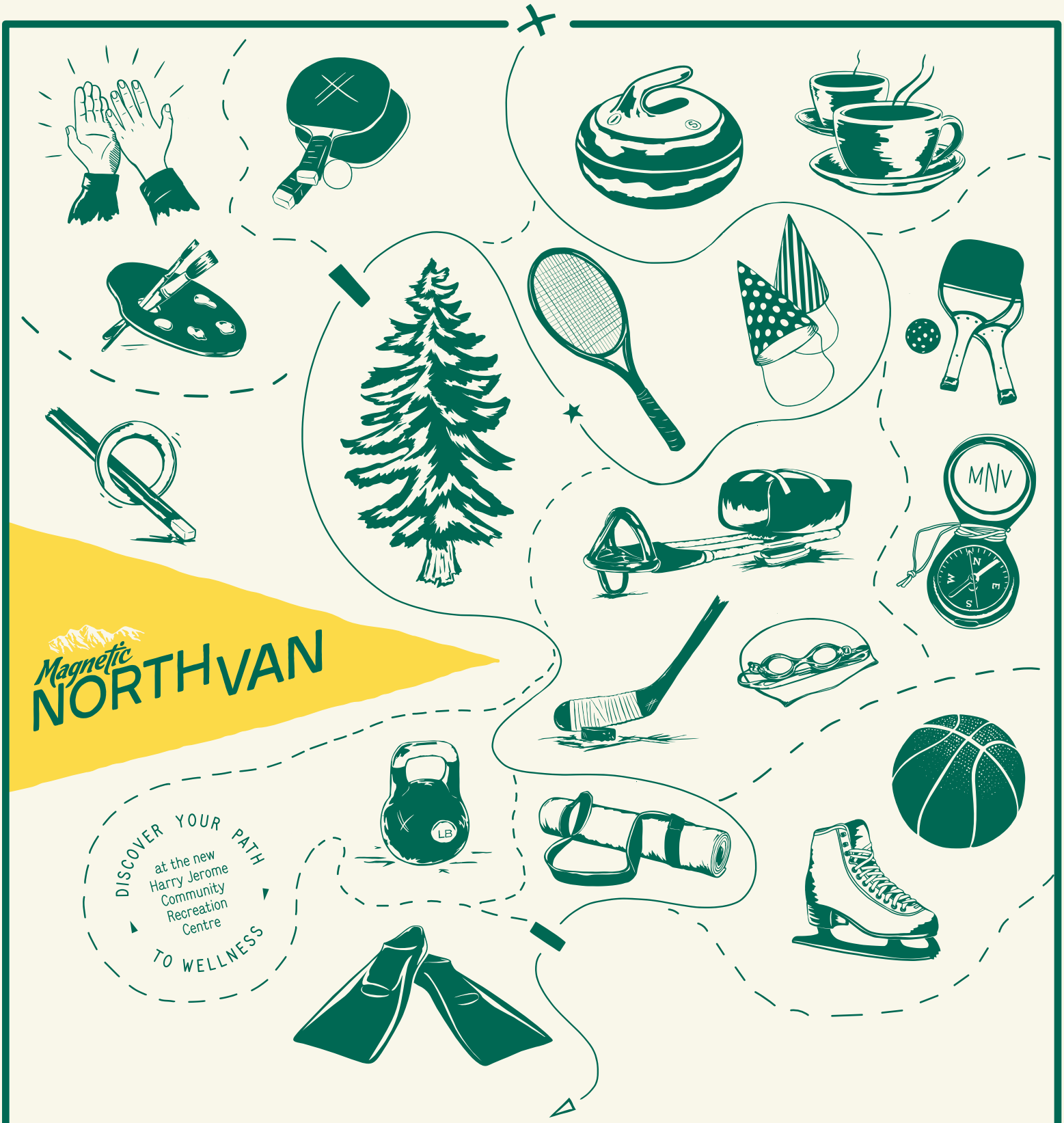
1. This project should integrate food growing and production on site.
2. This project should consider smart building design that reduces operational costs and optimizes the occupant experience and comfort.
3. Share sustainable building operation strategies with staff and users.

Other Initiatives Goals:

- Use design strategies that clearly communicate the environmental achievements of the project specifically with regards to water and energy.

In summation the Harry Jerome Community Recreation Centre project has a demanding energy intensive program, but also has several opportunities to reduce its carbon footprint. Continued design development and analysis will be required as the project evolves to ensure that the project supports the corporate climate action targets. In addition to carbon there are a number of opportunities to advance sustainability more broadly on several fronts as the design evolves. Specifically, in the areas of water conservation, and low carbon materials. Thank you for your time in reviewing this summary document. Please do not hesitate to contact me at dramslie@integralgroup.com or 604 307 7184 if you have any questions regarding any of its contents.

6.7 Community & Stakeholder Engagement Summaries



HARRY JEROME COMMUNITY RECREATION CENTRE
COMMUNITY & STAKEHOLDER ENGAGEMENT

Phase 1 Results Summary | May 2018

Revision 1

city of north vancouver
NORTH VANCOUVER Recreation & Culture
HCMA Architecture + Design

Table of Contents

Survey Introduction

This report presents a summary of the feedback received from the phase 1 community and stakeholder engagement survey for the new Harry Jerome Community Recreation Centre. A total of 900 respondents completed the survey during the Ideas Fair on February 15, 2018 at North Vancouver City Hall, as well as during the survey period that ran from February 15 to March 2, 2018. The survey was available online as well as in paper copy.

The purpose of this survey was to find out what the community's activity and program priorities are for the new community recreation centre. This includes areas for indoor and outdoor programs, events, and casual recreation as well as social and cultural activities. The findings of this survey will be used to inform the overall vision and design of the centre.

The survey was conducted online through the project's microsite, magneticnorthvan.ca, and was promoted through posters, email, social media, and both the City of North Vancouver's and North Vancouver Recreation and Culture's websites. Community ambassadors, who were local high school students, were present at both the Ideas Fair and busy public locations, such as Lonsdale Quay and Harry Jerome Community Recreation Centre, during the survey period with iPads for community members to fill out the survey. Paper copies of the survey were also available at the Ideas Fair and in the lobby of Harry Jerome Community Recreation Centre. The objective of the promotion and public presence for the survey was to reach as many community members as possible, representing a wide range of community recreation users.

The survey analysis on the following pages summarizes both quantitative (multiple choice) and qualitative (open-ended) questions.

Respondents were asked specific questions about anticipated frequency of use, and the importance of various places for activity within the following areas:

- Community and social spaces
- Arts and culture spaces
- Aquatic spaces
- Fitness and recreation spaces
- Senior spaces
- Youth spaces
- Child and family spaces
- Arena spaces
- Outdoor spaces

Ideas Fair

An Ideas Fair took place at North Vancouver City Hall on February 15, 2018 and the interactive station was moved to the Harry Jerome Community Recreation Centre afterward. The Ideas Fair and the interactive station at Harry Jerome Community Recreation Centre saw many visitors.

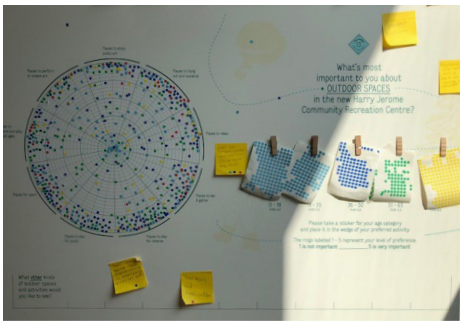
The Ideas Fair consisted of 10 visually engaging and interactive boards with area for community feedback on the community's activity and program priorities for the new community recreation centre. Almost 400 comments were collected on sticky-notes about what is important to community members in the new community recreation centre.

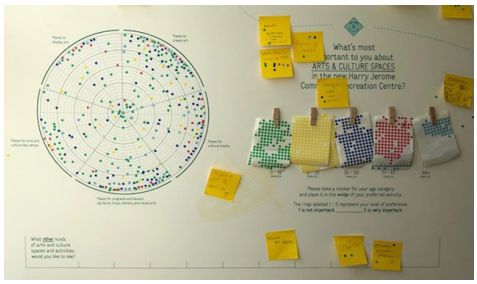
Ideas Fair at North Vancouver City Hall.

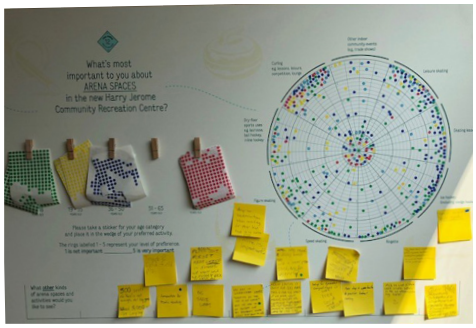
Interactive station at Harry Jerome Community Recreation Center.

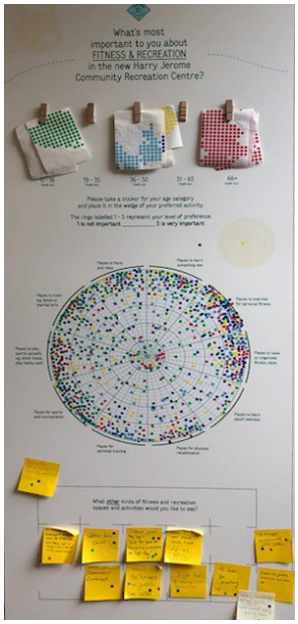
A graphic facilitator was at the Ideas Fair drawing how community members described their best possible experience at the new Harry Jerome Community Recreation Centre. Below is the final drawing.

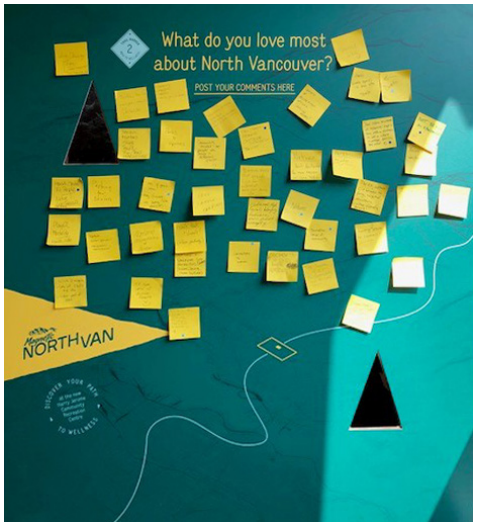
Graphic facilitator: Corrina Keeling











Interactive station with community feedback.

General Findings

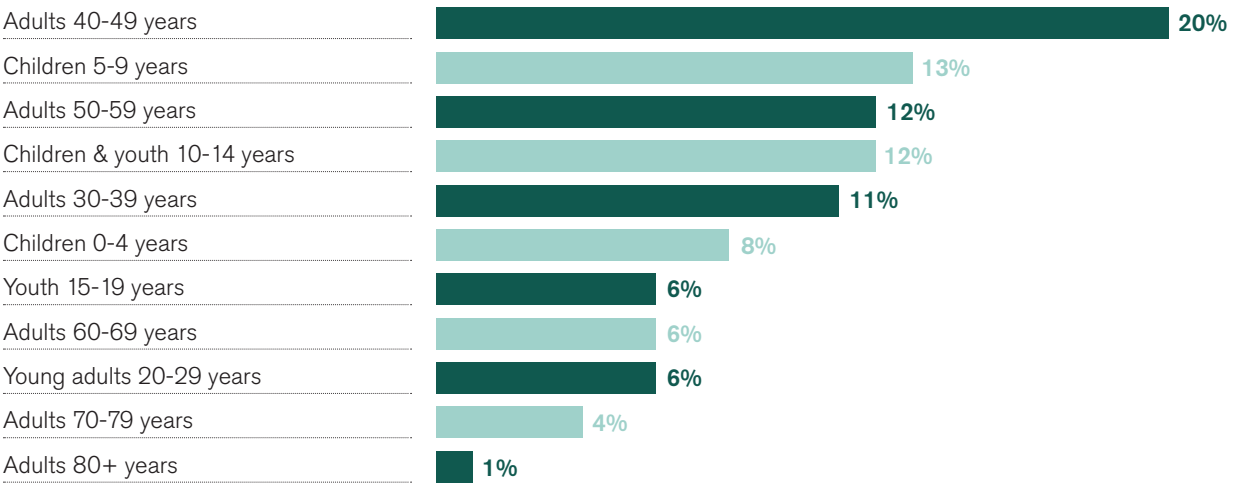
Number of Respondents
900 respondents completed the survey.

Clubs and Organized Groups
52% of respondents reported they or their family are a member of a recreation or community club, or another organized group. 8% of respondents indicated they participate in soccer, 8% reported participation in hockey, and 5% indicated association with or participation a swimming club or group, of which nearly half indicated belonging to Chena Swim Club. 5% of respondents indicated association with Flicka Gymnastics Club, and 3% reported participation in curling. 2% of respondents reported membership with a club or group but did not specify which one(s), and the remainder indicated association with various clubs, groups, community or aquatic centre attendance, and seniors centre attendance.

Household Demographic
Respondents were asked how many people are in their household and to identify all age ranges of those household members. On average, respondents had 3 people living in their household.

Respondents selected multiple age groups representing the ages of their household members. A total of 2,056 selections were made across the different age groups. The five highest represented age groups were adults ranging from 40-49 years of age, which represented 20% of household members; children ranging from 5-9 years of age representing 13% of household members; adults ranging from 50-59 years of age and children and youth ranging from 10-14 years of age both representing 12% of household members; and adults 30-39 years of age representing 11% of members.

AGE OF HOUSEHOLD MEMBERS



Frequency of Use
50% or more of respondents said that they would use community and social, aquatic, and fitness and recreation spaces one or more times a week, compared to approximately 25% for arts and culture, arena, and outdoor spaces. Arts and culture spaces were the only non-age defined spaces where a different frequency was most reported, with 25% of respondents saying they were not sure how often they would use the spaces, and 24% saying they would use them once a month.

Refer to parts 2 through 9 for a more detailed report of frequency of use for each type of space.

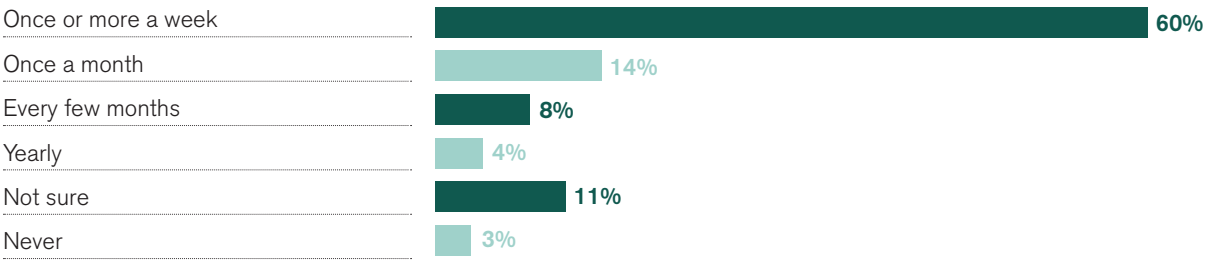
Common Themes
Several common themes emerged throughout the survey responses and open comments. The following is a list, in no particular order, of noted themes from the survey:

- Importance of spaces to socialize within the centre
- Opportunities to learn and play for all ages
- Importance of leisure and recreation in aquatic activities and services
- Connection to outdoors within the building, enhanced outdoor experiences in landscaping
- Focus on leisure and public skate programming for arena uses
- Importance of recruitment into recreation and cultural activities

Community & Social Spaces

Frequency of Use
The two most anticipated frequencies of use had 60% of respondents report they would use community and social spaces once or more a week and 14% stating they would use them once a month.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places for kids to learn and play", and "places to discover a new interest" were ranked the highest in importance. Though related to socializing, "places to enjoy a coffee/tea and socialize" ranked higher than simply "places to socialize."

The lowest ranked spaces included "places to lounge," "places to socialize," and "places to cook or have meals with others." "Places to cook or have meals with others" ranked the lowest of any question in the survey, receiving the most rankings of 1 for spaces that are not age defined.

IMPORTANCE OF SPACES

Open-ended Comments

168 (19%) respondents provided open-ended comments when choosing "other" for ranking the importance of community and social spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

It should be a welcoming and inclusive for anyone that wants to come use the facility.

This social space needs to be suitable for all ages so that families with young child can also go and spend time and there is a safe space for the little ones to play.

There are a bunch of cultural and recreational amenities that the Centre currently provides that will be great to replace and improve if possible. A coffee shop is less important than the other things listed.

That they include everyone, seniors and children/families.

Places for the Muffin Cafe so that people with developmental disabilities in our community are not displaced. They garner significant benefits from the work they do in that cafe.

Community evening programs from new languages to arts… Community kitchen space for events also allows cooking lessons. Space should be for all members of the community regardless of how long they have been in NVan or the country for that matter, age, orientation, skin colour, etc. Really neat to have a display showcasing the different cultures of the North Shore including First Nations.

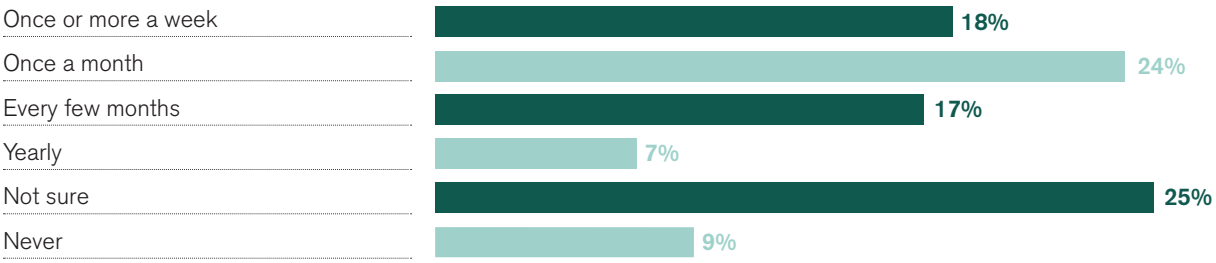
Comfortable viewing areas to watch your children's activities.

Coffee shops and people's homes can achieve this without wasting space for empty rooms. Please utilize space for activities that needs specific rooms.

Arts & Culture Spaces

Frequency of Use
The two most anticipated frequencies of use had 25% of respondents report they were not sure how often they would use arts and culture spaces, and 24% stating they would use them once a month.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places for programs and lessons," "places for arts and culture day camps," and "places for cultural events" ranked highest, above "places to create art" and "places to display art."

IMPORTANCE OF SPACES

Open-ended Comments

59 (7%) respondents provided open-ended comments when choosing "other" for ranking the importance of arts and culture spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Wide range of arts and culture courses, including youth lessons which I feel are currently lacking.

Would be great to create a community mural as a welcome feature.

This will create opportunities for aspiring artist who are looking for a platform to show talent, and people can learn new things.

That these spaces don't take over necessary gym and exercise space, and that adequate parking is provided.

Pottery. I would like the facility to have lots of arts programs for all ages, so we won't have to go to another rec centre location as we do now.

Places for public learning and discussion of arts and culture issues.

Places for ALL ages to do art (not just kids, though I have kids)...perhaps some ways in which multi-generations can do art together, dance together etc. Let's get our community connected!

Jam sessions for music and North Shore performers.

I love when the Bonsai society comes to HJ! So much fun.

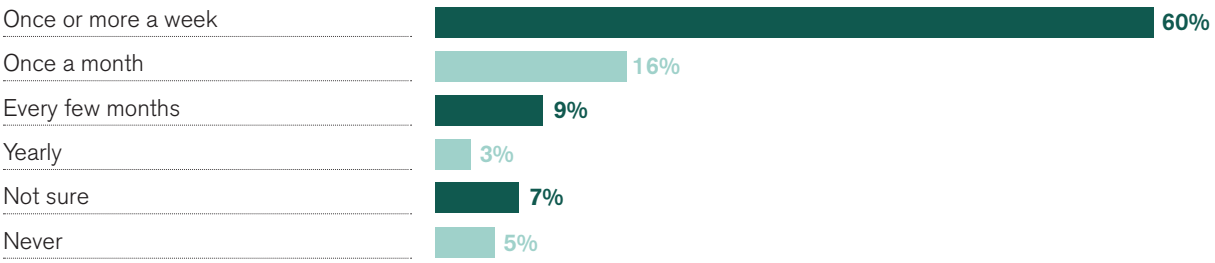
A safe, ideally "sprung" wooden floor for dance classes and fitness classes, and social dances, throughout the facility. Wood on concrete is hard on the joints.

I'd like to have more open use art and creative spaces: for instance, spaces that could be used for dying textiles, doing print-making, weaving and spinning, other fiber arts. Similar to ceramics studios as collective spaces, but with more flexibility for multiple arts uses.

Aquatic Spaces

Frequency of Use
The two most anticipated frequencies of use showed 60% of respondents noting they would use aquatic spaces once or more a week, and 16% stating they would use them once a month.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places for leisure and recreation swimming" ranked a full point above "space for training or competition." "Places for leisure and recreation swimming," "places for swimming for personal fitness," and "places for learning how to swim and be safe around water," all ranked well above 4.

IMPORTANCE OF SPACES

Open-ended Comments

145 (16%) respondents provided open-ended comments when choosing "other" for ranking the importance of aquatic spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

A kid focused aquatic leisure area with warmer water would be great.

All swimming pools I've been to in the Lower Mainland are busy and popular with all ages. We need the swimming facilities to be large and serve many purposes (play time for little and bigger kids, lessons) for all ages. Multiple pools and dividers will allow different activities to occur concurrently. Hot tubs are popular, so a big one, or two pools (a cooler one for kids who can't sit still) would be good.

Aquatics facilities should aim to reduce the gaps in aquatic opportunities. A wide range of aquatic activities should be supported. Young and old should be able to participate at their level of ability. The aim should be to allow everyone to participate throughout their entire lives to achieve a higher level of fitness and health for the entire population. It should allow greater participation by elementary, secondary and university students. Aquatics facilities provide great cross training, rehab and recovery opportunities that complement other sports.

50m pool. There are 3 leisure pools in the NVRC and 4 public leisure pools on the north shore. A competition pool for athletes of all aquatic sports disciplines is essential to a strong athletics community. From triathlon, competitive swimming and diving, water polo, synchro etc... the north shore has produced Olympic and world champion caliber athletes who have had to leave their community to train after outgrowing our local facilities.

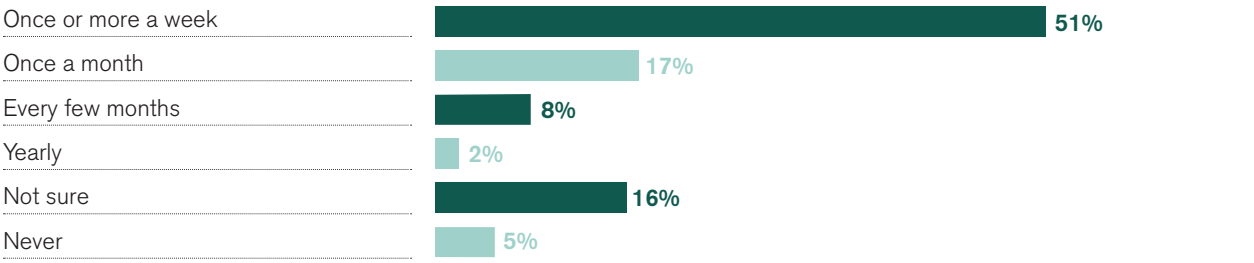
Tactile signage. Coin instead of token lockers, that adds an extra step. Working water wheelchairs and other accessibility considerations. Grab bars available around facility not just in change rooms.

Warm pool water and multiple whirlpools; private change rooms;… views of the mountains from the pool area. Outdoor hot tubs covered by gazebo roofs.

Fitness and Recreation Spaces

Frequency of Use
The two most anticipated frequencies of use showed 51% of respondents said they would use fitness and recreation spaces once or more a week with 17% saying they would use them once a month.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

While "places to exercise for personal fitness", "places to train," "places for sports and tournaments," and "places to take an organized fitness class" all ranked high, so did "places to play sports casually" and "places to learn something new."

IMPORTANCE OF SPACES

Open-ended Comments

80 (9%) respondents provided open-ended comments when choosing "other" for ranking the importance of fitness and recreation spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Gymnasium space is always in huge demand - please consider building two or three.

Having multi-fitness spaces such as spin rooms but also general training rooms is essential. I like how things have been set up at the new Delbrook centre with a large combined aerobic/weight area but also a dedicated space for group spinning etc.

I would like the facility to have lots of recreational programs for all ages, so we won't have to go to another rec centre location as we often do now.

Ideally change room for these areas are not combined with pool change room.

Places that offer opportunities for multiple age groups at the same time. i.e. children's, youth AND adult at the same time, rather than the traditional limited usage of one group at a time.

Please include drop-in classes and classes for different fitness levels.

These facilities are meant to be built to include fitness and recreation that will last generations.

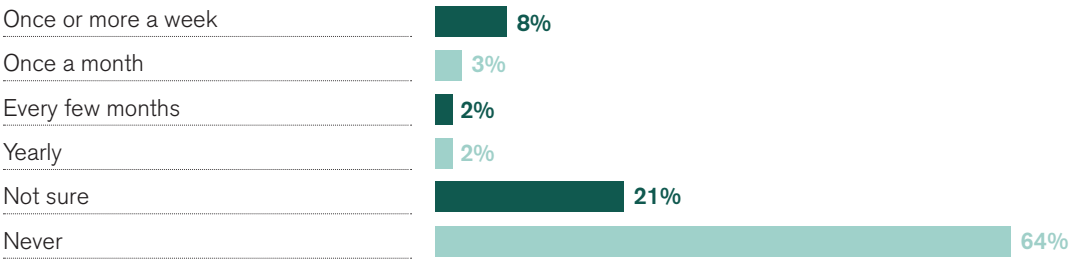
We want our kids! to be able to do fitness classes, martial arts, learn something new etc.

The current Harry Jerome has a unique feature, the Circuit Training Room. Please consider having such a room in the new facility. This separate space allows for the large number of well attended Circuit Training classes that currently use that space. Other facilities that use shared space within a weight room have only a few classes a week and therefore do not infringe on the other patrons. HJ has a large number of classes which would impact on one weight room only.

Seniors' Spaces

Frequency of Use
The three most anticipated frequencies of use showed 64% of respondents stating they would never use seniors' spaces, 21% reporting they are not sure how frequently they would use them, and 8% saying they would use them once or more a week.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places to socialize or play games" and "places to meet" ranked the highest, closely followed by "places to be creative," "places for hobbies," and "places to play sports." "Quiet places" ranked the lowest.

IMPORTANCE OF SPACES

Open-ended Comments
33 (4%) respondents provided open-ended comments when choosing "other" for ranking the importance of seniors' spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Well lit, large tables, drop-in times, reduced prices, craft rooms open every day for every type of activity.

Space and programming for seniors and children to interact would benefit both groups greatly.

Place for ballroom dancing. A wooden floor for ballroom dancing next to a kitchen for coffee and tea is very important to me. Needs to be suitable for holding monthly dinner dances presently held in Silver Harbor and Tuesday drop in ballroom dancing held in the morning at Silver Harbor. We need parking for Silver Harbor.

Important to have a place for seniors to gather and stay active...a place "to go" for seniors to socialize.

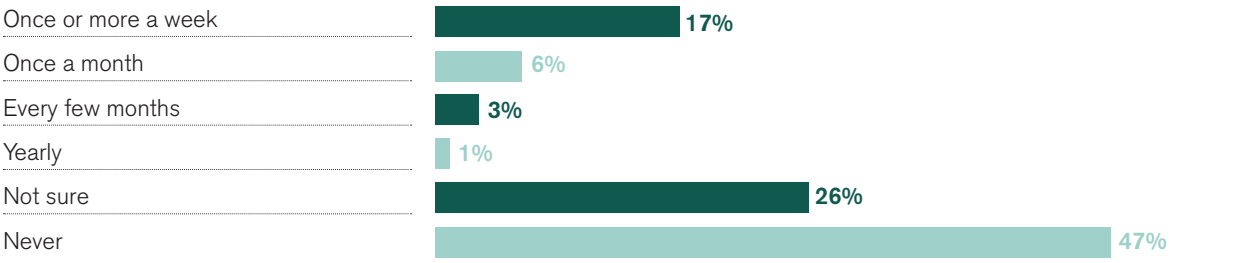
As a future senior, I have said everything is important!

Activities should be available after work hours and weekends too. More and more seniors are still working. Including me. :)

Youth Spaces

Frequency of Use
The three most anticipated frequencies of use showed 47% of respondents saying they would never use youth spaces, 26% were not sure how frequently they would use them, and 17% reported they would use them once or more a week.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places to play sports," "places to socialize and play games," and "places to be creative" ranked the highest, while "places to meet" and "places to study" ranked the lowest.

IMPORTANCE OF SPACES

Open-ended Comments

23 (3%) respondents provided open-ended comments when choosing "other" for ranking the importance of youth spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Somewhere for teens to have lots of opportunity for either drop-in socializing, drop-in sports, drop-in clubs

Youth programs should spark new interests in youth and foster friendship cooperation and community spirit.

Some kids go to youth lounge while parents work, I think it is important to meet friends, have a safe dependable place to go with positive influences.

Kids will study at the library. If you're going to make a space for teenagers/youth, you have to give the space, but they make it their own. Let them paint it and furnish it. Let the skateboard inside or out. They want to be different; give them a space that is different and allows them to express themselves.

Include places for teenagers (for self expression) to dance and create art, listen to music, create music and to socialize. We don't really have places in the community for teenagers 13-18 to do these things.

In its early days the Harry Jerome Centre provided a much needed outlet for the youth of North Vancouver in the wake of the riots that occurred in the 60s. The new facility will need to continue that tradition in the wake of the general reduction in public spaces and densification of the North Shore.

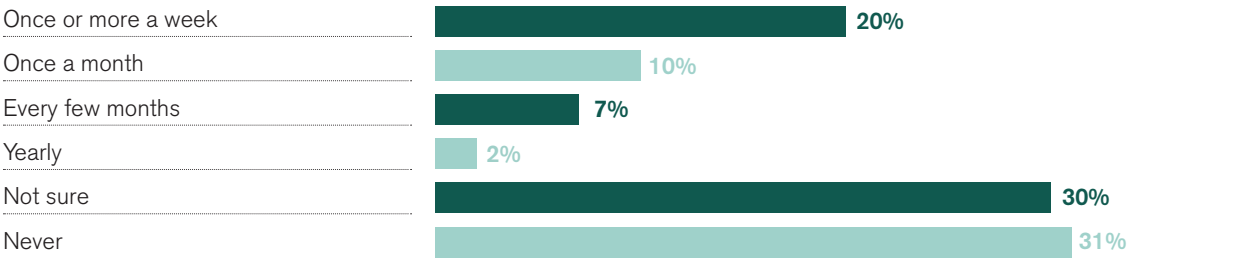
Creating youth program and space so that it is a welcoming and helpful to LGBTQ youth.

Youth Center right up front, not hidden away. Youth can become volunteers, participants, have a safe place to hang out. Space for all ages. Employee who engages people to participate, show people around, explain what is available...

Children & Family Spaces

Frequency of Use
The three most anticipated frequencies of use showed 31% of respondents stating they would never use children and family spaces, 30% were not sure how frequently they would use them, and 20% saying they would use them once or more a week.

FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places to play," and "places for enhanced natural outdoor play" ranked the highest. "Quiet places" and "nursing area" ranked the lowest.

IMPORTANCE OF SPACES

Open-ended Comments

17 (2%) respondents provided open-ended comments when choosing "other" for ranking the importance of children and family spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Places for children to play when it's raining outside.

Outdoor playgrounds and indoor play areas are ideal, with a good range of skill level.

Offer innovative play spaces - not over-relying on basic play equipment, but more interactive spaces ie. see Science World for example.

Nursing area for those that want privacy but any woman should be able to nurse anywhere policy.

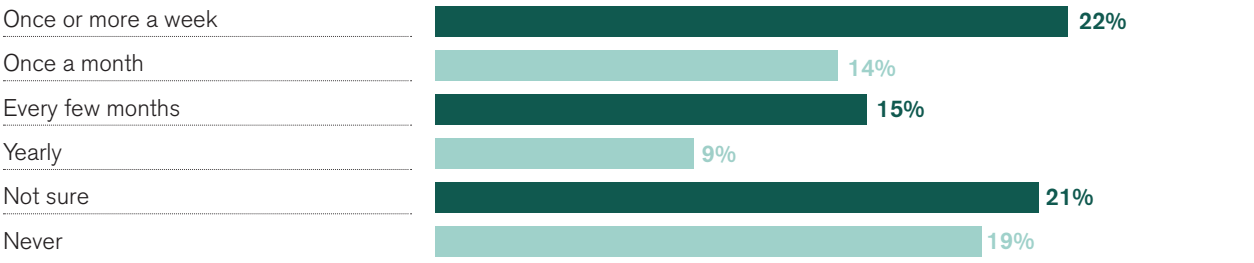
Many kids in this area live in apartments and thrive in the play areas of the rec center.

Important to me as I would definitely take grandchildren there regularly.

Arena Spaces

Frequency of Use
The top two most anticipated frequencies of use showed 22% of respondents saying they would use arena spaces once or more a week and 21% stating they were unsure how often they would use them.

FREQUENCY OF USE



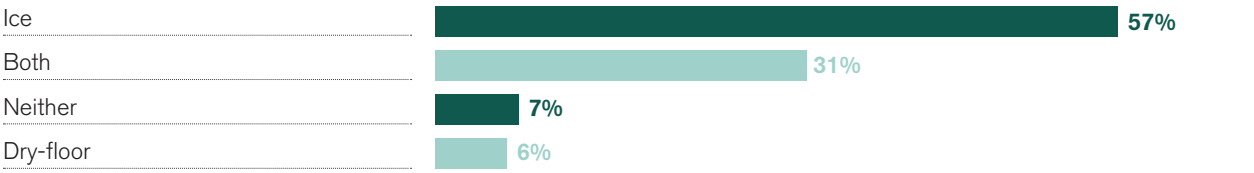
Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Leisure skating" and "skating lessons" were the highest ranked uses, while "ringette" ranked the lowest.

IMPORTANCE OF SPACES

Respondents were also asked if they were mainly interested in using the arena for ice or dry-floor use. Responses showed nearly twice as many people interested in ice use over both ice and dry-floor use, with little interest in solely dry-floor use.

ARENA USE



Open-ended Comments

45 (5%) respondents provided open-ended comments when choosing "other" for ranking the importance of arena spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Would love to learn all of these sports.

Would be nice to offer ice sports that aren't readily available unless you belong to a sports club on the North Shore.

Kids that don't play organized hockey would love a chance to come to a free skate/hockey session. A casual opportunity to come and play with a stick and puck.

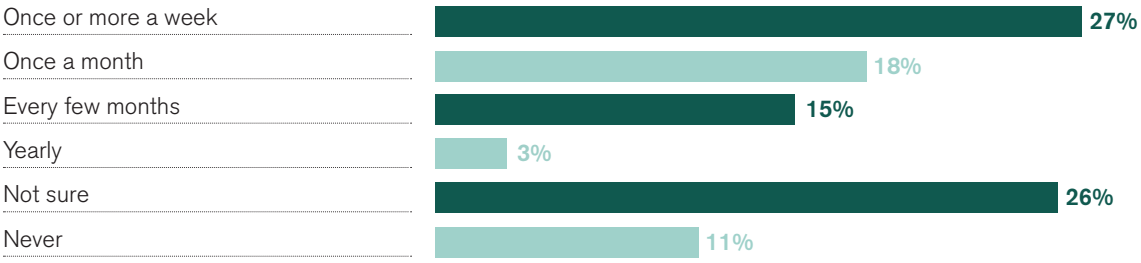
Will be great to have curling space after the North Shore Winter Club stopped clubs playing there.

Family skates with music where we are not intimidated by folks who skate fast and cut in to slower skaters.

Outdoor Spaces

Frequency of Use
The top two most anticipated frequencies of use showed 27% of respondents reporting they would use outdoor spaces once or more a week and 26% stating they were unsure how often they would use them.

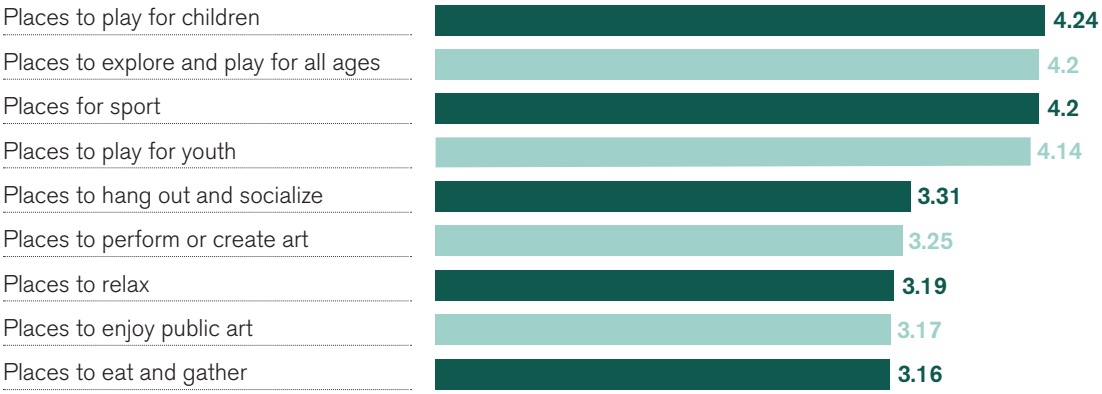
FREQUENCY OF USE



Activity & Program Priorities
Respondents were asked to rate the importance of a variety of types of spaces on a scale of 1 (not important) to 5 (very important). Respondents could also choose "other" and provide an open-ended response.

"Places to explore and play for all ages" ranked as very closely with "places to play for children," "places to play for youth," and "places for sport." These uses ranked above "places to hang out and socialize," "places eat and gather," "places to relax," "places to perform or create art," and "places to enjoy public art."

IMPORTANCE OF SPACES



Open-ended Comments

46 (5%) respondents provided open-ended comments when choosing "other" for ranking the importance of outdoor spaces. Below is a selection of comments representing the diversity of responses as well as noted themes:

Would be so proud to have a lovely piece of public art in our neighborhood!!!

Useable indoor space should definitely be prioritized over outdoor space, but it would be nice to have open, sunny sitting areas, playground space, and maybe small outdoor sports spaces (bball/floor hockey courts, etc.). Some sitting areas in a garden setting with public art would be welcome.

Definitely try to take advantage of outdoor views inside and on the roof of the rec centre, especially looking north and west (looking south will be a wall of condos!). A decent café on the roof could have some of the best views on the North Shore and could attract people to the rec centre just for that.

The gardens at Harry Jerome have always been beautiful and a wonderful place particularly for children to play and parents to enjoy.

Seating, grass, shade protection, water facilities for hot days (something simple would serve the purpose) & safe (have older kids play farther away so noise (skateboards) or stray balls won't impact others).

Quiet green space to get away from frantic pace of city getting more and more populated.

Places that are not always booked or scheduled for organized sport. A playground that accommodates a variety of different ages for families with kids with an age spread.

Advancing the Vision

Respondents were asked "What do you think needs to be included in the new Harry Jerome Community Recreation Centre so that it advances the vision and best serves you and the North Vancouver Community?" 330 (37%) respondents provided comments; below is a selection of comments representing the diversity of responses as well as noted themes:

A cafe such as Starbucks or Delaney's is important to provide the desired atmosphere described above. This would have seating that spills out into the foyer (See West Van aquatic centre) to create a casual, social environment.

A place where people can express their creativity, pursue interests and play.

A range of programs available - from beginner to very advanced.

Also, we need good outdoor spaces for older children (10+ years). All current outdoor spaces that have equipment are for children 7 or younger. Playgrounds are non-existent for older children - more Parkour spaces would benefit older children and adults.

As well as being a facility for the local community it should strive to attract sporting events to give the community a chance to see and participate in such events.

Connection to & appreciation of nature; a place where all types of people (age, race, sex, etc) feel comfortable, included and safe; quiet spaces as well as busy/active ones; a coffee shop; a yoga studio.

Ensure that all members of the community feel welcome and ensure that the centre celebrates the diversity of cultures and traditions on the north shore.

Connected spaces, not segregated for the elderly, young, etc., but mixed. Art work in the space. Comfortable seating. Coffee, tea area.

I think it should have a warm and welcoming gathering space indoors as well as outside, so that the community can enjoy socializing together before and after programs as well as for special events and other connecting opportunities.

More spaces that reflect and encourage creativity and respond to emerging trends in health, wellness, meditation, farm-table, environmental stewardship, kindness, fun, inter-generational play, organized community engagement (dances, lectures, artists in residence, etc).

I love the vision. It is a change to the current competitive approach to community. My child is in several club sports and we are often treated as an annoyance or a "competitor". I used to do both Rec and club things but the attitude has driven me away from Rec classes. Hoping with a community of inclusion we can find a way for all to thrive at HJ.

Additional Comments

Respondents were asked “Anything else we’ve missed that you would like to tell us?” 236 (26%) respondents provided comments; below is a selection of comments representing the diversity of responses as well as noted themes:

The Harry Jerome Centre will offer greater opportunities for youth to develop leadership skills through volunteering, skill development, part-time and full time employment that will help them start their resumes and careers in their chosen field. The new facility will be a visionary legacy for the City of North Vancouver for the next sixty years as the present facility has been to the vision of the City planners in the 1960s.

Can’t emphasize parking enough.

If the curling space is included, build it in a size and shape that it can be re purposed as another ice rink if curling is not supported enough in the future.

Outdoor sport courts for pick up basketball would be great!

Parking at the new Delbrook was under-built and discourages families from using it more often.

The pool should be appealing to all ages. Fun for kids and functional for adults, seniors and youth.

Please do what you can to integrate seniors with children and youth. This is such a healthy way to approach recreation.

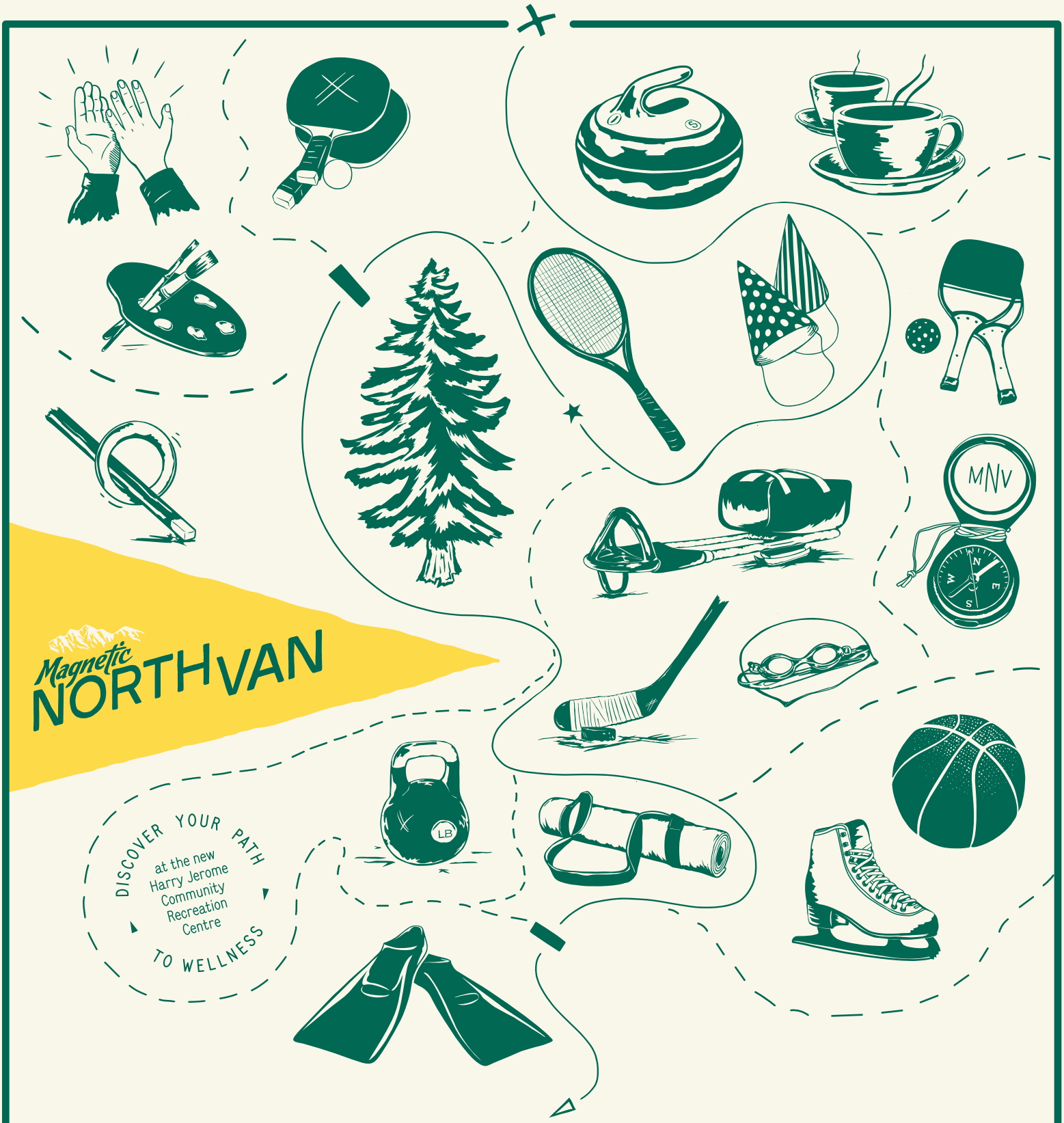
The outdoor running track is disappearing. Can there be a running or walking track around the building? Covered and secure bike storage. How about a space to explore effect of different levels of accessibility - not old limited mobility but blind, deaf, etc.

Let’s plan and build for the future and not for today. Leave a wellness and fitness centre that will last 80yrs.

Keep the Muffin Café!!!

I think adding a 50m pool to Harry Jerome will finally bring the North Shore up to speed in terms of aquatics and wellness. The health, social and economic benefits of this 50m pool will be felt for decades to come.

Flicka gymnastics needs to remain a part of Harry Jerome.



HARRY JEROME COMMUNITY RECREATION CENTRE
COMMUNITY & STAKEHOLDER ENGAGEMENT

Phase 2 Summary | May 2018

Revision 1

city of north vancouver
NORTH VANCOUVER Recreation & Culture
HCMA Architecture + Design

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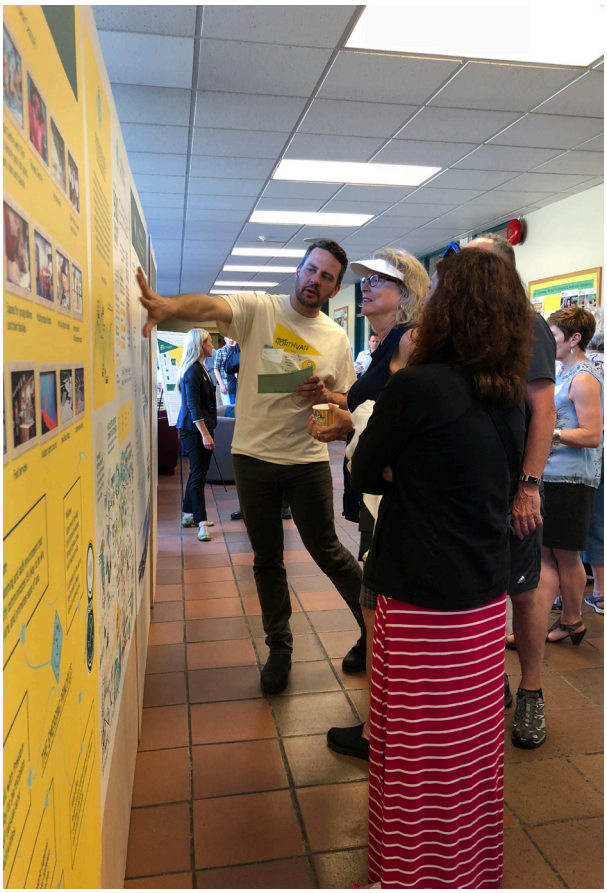


Information Session at Harry Jerome Community Recreation Centre.

Introduction

This report presents a summary of the feedback received from the phase 2 community and stakeholder engagement Information Session for the new Harry Jerome Community Recreation Centre. A total of 50 attendants signed-in with their names, postal codes, and email addresses at the Information Session on May 23, 2018 at Harry Jerome Community Recreation Centre (HJCRC). Many more attendants were observed at the Information Session.

The purpose of this Information Session was to share with the community what we heard from the Ideas Fair and survey in February-March 2018 and how it influenced the emerging concept design, and to hear the community's thoughts about what role this exciting new facility could play in our community.

The Information Session provided informative graphic boards showing the community what the planning team heard in phase 1 of community and stakeholder engagement, the emerging concept design, as well as how the community's feedback in the phase 1 survey, which sought the community's activity and program priorities for the new HJCRC, was incorporated in the emerging concept design.

General Findings

Attendants expressed general support and enthusiasm for the emerging concept design for the new HJCRC. A number of attendants noted their appreciation for the Information Session and were looking forward to using the new centre. Attendants noted continuity from the Vision and Principles presented at the Ideas Fair in phase 1, as well as the emerging concept design's response to the results of the phase 1 survey.

The planning team noted a strong representation from both the aquatic and curling communities at the Information Session. Many attendants representing the aquatic community expressed support for the 50m pool, with some community members expressing concern over the resources required to provide and operate a 50m pool within the City of North Vancouver. Representatives of the curling community strongly expressed support for the inclusion of a curling facility within HJCRC, many of whom noted they are traveling off the North Shore to participate in curling following the closure of the curling facility at the North Shore Winter Club.

Some attendants discussed the overall scale of both the new HJCRC and the residential development to be placed on the existing HJCRC site; however, there was acknowledgement by many that the area was "tired" and due for a renewal. Some attendants expressed concerns about increased traffic and parking needs as the area becomes denser.

Some attendants expressed the desire for outdoor tennis courts. Other comments heard included the need to have casual, unprogrammed space for spontaneous outdoor activities as neighbours noted the ongoing use of the current Norseman field by locals.

Information was also available about North Vancouver Lawn Bowling and Flicka Gymnastics as part of simultaneous projects, which some attendants were keen to find out more information about.

Written Comments

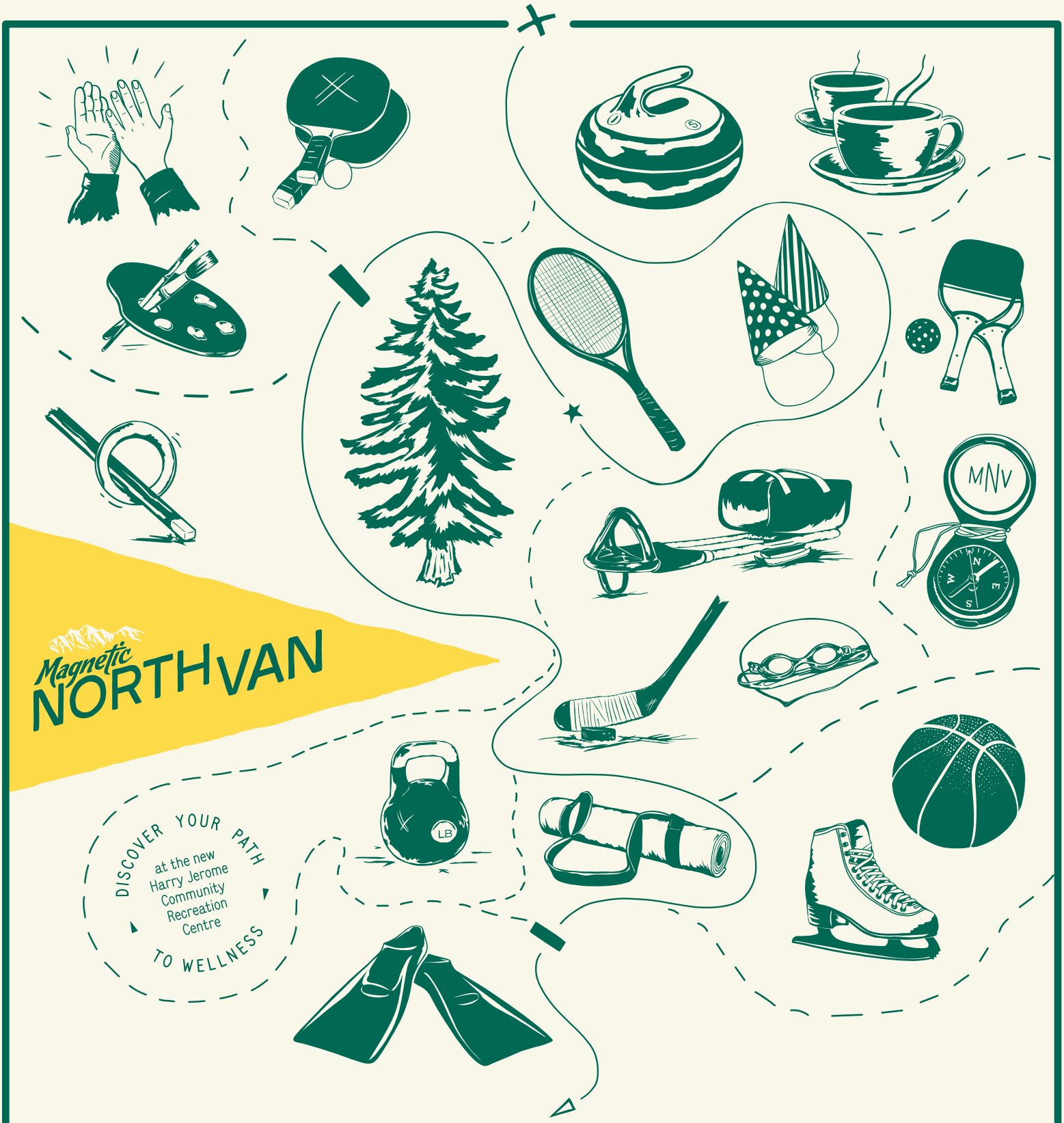
Number of Comment Cards
43 attendants completed a comment card. Many comment cards contained multiple comments; a high-level summary of themes in comments is below:

Theme	# of comments
Support for curling facility	27
Support for emerging concept design	5
Concern for scale of 50m pool	5
Concern for traffic	5
Concern for density / size	5
Support for 50m pool	4
Support for tennis	2
Other suggestions (miscellaneous themes)	9

Conclusion

The Information Session attendants generally expressed support for the emerging concept design and enthusiasm for the the new Harry Jerome Community Recreation Centre. Attendants were keen to learn more about the new centre and were appreciative of the Information Session to update the community on how their feedback from phase 1 of community and stakeholder engagement, which sought the community's activity and program priorities for the new HJCRC, was incorporated in the emerging concept design.

6.8 Skate Plaza Summary & Report



HARRY JEROME COMMUNITY RECREATION CENTRE
COMMUNITY & STAKEHOLDER ENGAGEMENT

Skate Plaza Design Workshops Summary | April - May 2018

Revision 1

city of north vancouver
NORTH VANCOUVER Recreation & Culture
NEWLINE SKATEPARKS
HCMA Architecture + Design

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Top: Design Workshop 1.
Bottom: CityFEST.

Introduction

This report presents a summary of the feedback received from the City Skate Park community and other stakeholders as part of a public engagement process for the proposed new Harry Jerome Community Recreation Centre (HJCRC).

Three events took place in the Spring of 2018: Design Workshop 1 on April 14 at Centennial Theatre, CityFEST on May 5 adjacent to the existing City Skate Park, and Design Workshop 2 on May 22 at Centennial Theatre. All events were open to the public; sign-up was available online or by phone for those that wanted to register ahead of the workshops, and drop-ins were welcome.

The purpose of the public engagement was to hear the City Skate Park community's ideas about how they'll use the temporary and proposed new skate plaza. A participant feedback form was provided at each of the design workshops to record the community's feedback in relation to the materials presented at the workshops.

Design Workshop 1

The first Design Workshop was held in the lobby of the Centennial Theatre, which neighbours the existing City Skate Park. Graphic boards showing precedent images and options for skate plaza features, materials, and the overall flavour of the plaza were presented. Approximately 25 people attended this workshop where we gathered input as to what local City Skate Park users wanted to see in the new and temporary skate plaza.

The workshop included a presentation by the skate plaza designers, New Line Skateparks, two "dotmocracy" (voting with dots) exercises on the graphic boards, participant feedback forms, and an open group discussion. The participant feedback form sought information on where the participant currently lives, their current riding ability level, what the participant's interest in the new skate plaza is, what is important about the overall design of the skate plaza, desired feature-types for the temporary and new skate plaza, and any additional thoughts, comments, or ideas they'd like to share.

The workshop was very conversational with participants sharing both what they cherish about the existing skate park, as well as what they'd like to see in the new skate plaza. Some main themes were noted during the workshop and recorded in the participant feedback form. The things most noted to make the existing skate plaza unique are the flow and ease of movement, the wide variety of ledge features, and the "cornerstone" high starting point that allows views and surveillance through the entire plaza before a rider takes off on a line or ride. A fairly unanimous desire was noted for a seating / viewing / social space for skate plaza users in a new "cornerstone" high starting point. Low to medium impact stair sets along with technical flatground features were strongly desired as features for the new skate plaza.

CityFEST

We attended CityFEST, the largest Youth Week event in the Lower Mainland, with a booth to provide information and seek feedback about the new skate plaza and its proposed location. The annual event is located at the site of the existing City Skate Park and surrounding area. 40 people were polled at the event, of which 38 expressed support for the new skate plaza. Two people expressed concerns that were not specific to the skate plaza, rather to the overall HJCRC redevelopment.

While the purpose of this event was to reach a wide variety of community members, including those that may not use the new skate plaza, the opportunity was also seized to obtain additional insight into the wants and needs of the City Skate Park users. We recorded ideas and comments from their conversations with the community on a large flip-chart.

Design Workshop 2

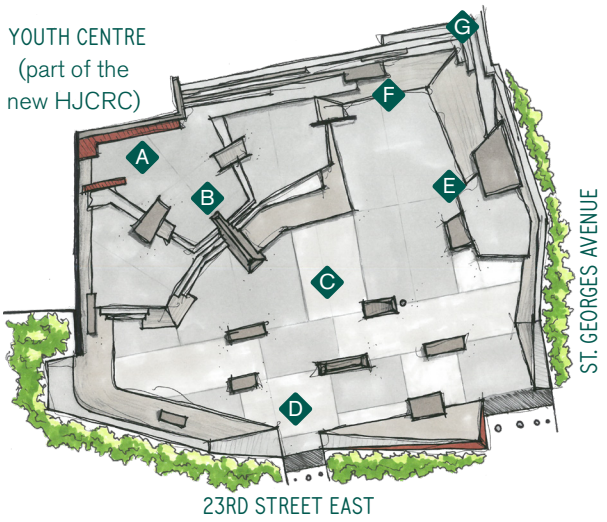
The second Design Workshop was held at Centennial Theatre and presented two conceptual designs for the new skate plaza, which were based on the input received at Design Workshop 1 and CityFEST. The emerging concept designs were presented with the differences between the two clearly highlighted. Approximately 30 participants attended this workshop where we gathered feedback on their preferred concept design.

An open and informed conversation followed, with the opportunities and challenges of each concept design being explored. Questions were posed both from the participants to the planning team and from the planning team to the participants, resulting in a robust discussion. Following the discussion, participants filled out feedback forms. The participant feedback form sought information on where the participant currently lives, what the participant's interest in the new skate plaza is, and which of the two skate plaza concept design options they preferred and why.

Concept 1 was preferred with 92% of participants selecting this as their preferred option.

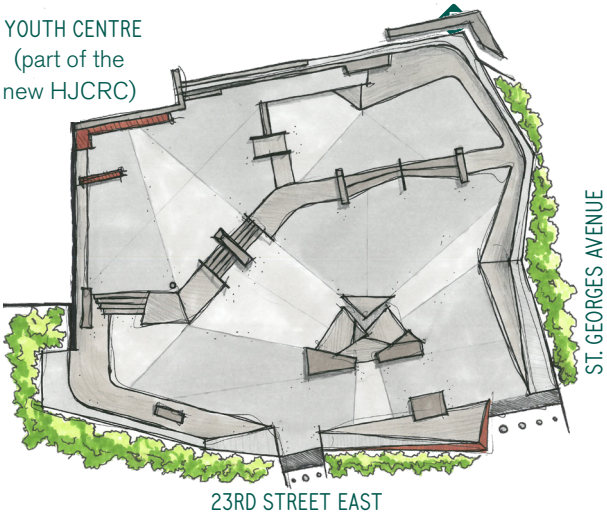
Other main themes noted in conversation and written comments included the incorporation of a roof structure covering a significant portion, but not all, of the plaza, as well as lighting for evening, shoulder and winter season use. An outdoor water fountain was also noted as important by multiple participants.

Concept Option 1



- A CHILL ZONE AND STARTING AREA
- B RAISED UP SIZE: 3 UP, 2 UP, 2 DOWN, 3 DOWN WITH MAIN 5 SET
- C FLATGROUND ZONE
- D PERIMITER FLOW BANK, TRANNY FEATURES
- E LEDGE MANNIES, LEDGES INTO BANK
- F LEDGES, MANNIES INTO BANK, BANK TO LEDGES
- G VIEWING AND SEATING AREA

Concept Option 2



- A CHILL ZONE AND STARTING AREA
- B RAISED ZONE WITH 2, 3 AND 5 SETS
- C FLATGROUND ZONE
- D PERIMITER FLOW BANK, TRANNY FEATURES
- E LEDGE MANNY INTO BANK, BANK TO LEDGES
- F VIEWING AND SEATING AREA

NOTE: SKATE PLAZA WILL BE PARTIALLY COVERED

Next Steps

City of North Vancouver Council consideration of the project is anticipated in July 2018. Should the overall Harry Jerome Community Recreation Centre project be approved, the design teams will proceed with detailed design of both the temporary and permanent Skate Plazas as part of the overall project process. There will be opportunity for further feedback from the skate plaza users and community later in 2018 and early 2019.

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MEMORANDUM

DATE:	2018-07-17	**RWDI #:** 1801600
TO:	Paul Fast - HCMA	**EMAIL:** p.fast@hcma.ca
CC:	Dan Lyzun, P. Eng. - RWDI	**EMAIL:** Dan.Lyzun@rwdi.com
	Chris Fraser, P. Eng. – RWDI	**Chris.Fraser@rwdi.com**
FROM:	Anoushka Rajan, EIT – RWDI	**EMAIL:** Anoushka.rajan@rwdi.com
RE:	**SITE VISIT RESULTS & PRELIMINARY RECOMMENDATIONS HARRY JEROME COMMUNITY RECREATION CENTER CITY OF NORTH VANCOUVER, BC**	

Paul,

We have now completed our preliminary review and recommendations for the relocation of the City Skate Park, currently located at the corner of Lonsdale Ave and the Highway 1 Eastbound on-ramp. The discussion and recommendations noted herein are based on:

- the current ambient sound levels at the new proposed site, and
- typical noise levels as measured at the current skatepark, similar skateparks around Metro Vancouver, and similar studies as documented in various research papers,

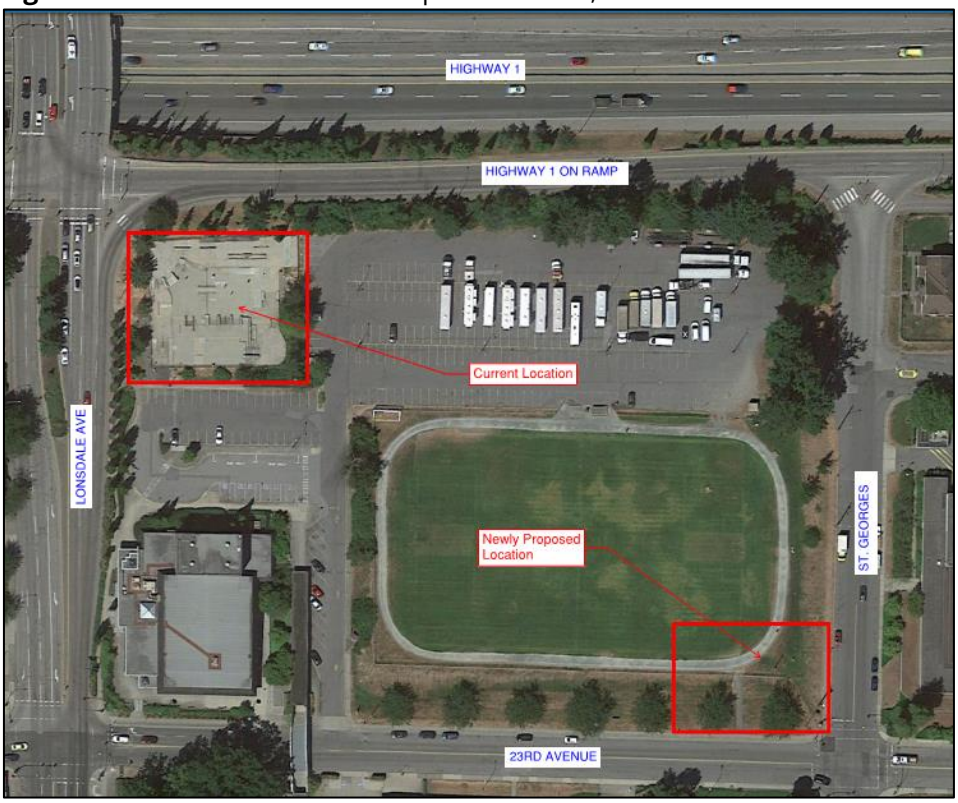
The recommendations noted herein are intended to minimize the potential 'annoyance' from the skatepark as experienced by neighbors should the skatepark is relocated.

BACKGROUND

The current and proposed future location of the City Skate Park are shown in Figures 1A & 1B below. Currently, there are no sensitive receptors to the south and east of the park. The park is bound on the north and west by high-traffic roads. As such, the dominant noise source for any receptors along Lonsdale avenue, is expected to be traffic noise.

Figure 1A: Current & New Skatepark Location, View

Figure 1B: current and New Skatepark Location, View 2



We reviewed several studies on the noise impact of skateparks on adjacent communities (as noted in the REREFENCES section below), and note that skateparks are often (but not always) located along busy roads or in commercial areas, which reduces the disturbance and impact of the 'skatepark-specific' noise on adjacent receptors.

While the proposed relocation site is at the intersection of two arterial roads, the ambient noise due to traffic is not expected to be as high as at the current location. Therefore, our recommendations noted below are aimed at reducing/controlling the average skatepark noise to be at or below the average ambient noise during the daytime, such that the skatepark is not seen as a 'disturbance' by the neighboring occupants.

MEASUREMENTS

To characterize the ambient noise condition around the new site, and the typical noise from a skatepark, we took several measurements around the current and proposed skatepark location. We also took a few other measurements at similar skateparks in Metro Vancouver, to characterize the typical noise environment in similar parks with different occupants (age, weight, size) and to validate the measurements taken at the current Lonsdale skatepark.

North Vancouver – Lonsdale Skatepark and Harry Jerome Community Center

On Saturday April 14th, we conducted several measurements along 23rd Street, Lonsdale Avenue and St Georges Avenue. Each measurement was 15 – 20 minutes long, to capture the ambient noise condition on a weekend, which is typically quieter than on a weekday. The measurement locations and values are shown in Figure 2 below.

Similar Skateparks – Surrey, Port Moody

We also visited the Cloverdale Youth Park and the Rocky Point Park skatepark – both of which are concrete skateparks.

The Cloverdale skatepark is slightly larger than the current Lonsdale skatepark, has a 'shelter' above the central part of the skatepark, and has similar features including rails, ramps, half-bowls and jump-ledges. During the time of the measurement, there were 18 people in the park, of whom 8 were active skaters and 5 were bikers. The measurement location and value is shown in Figure 3 below.

The Rocky Point skatepark has a smaller area than the current Lonsdale park, and is fully open. There were 8 people at the park, of whom 4 were bikers and 1 was an active skater. The Rocky Point skatepark had fewer rails and jump ledges than the Cloverdale skatepark and the Lonsdale skatepark. The measurement location and value is shown in Figure 4 below.

Figure 2: Location of Ambient Noise Measurements, North Vancouver

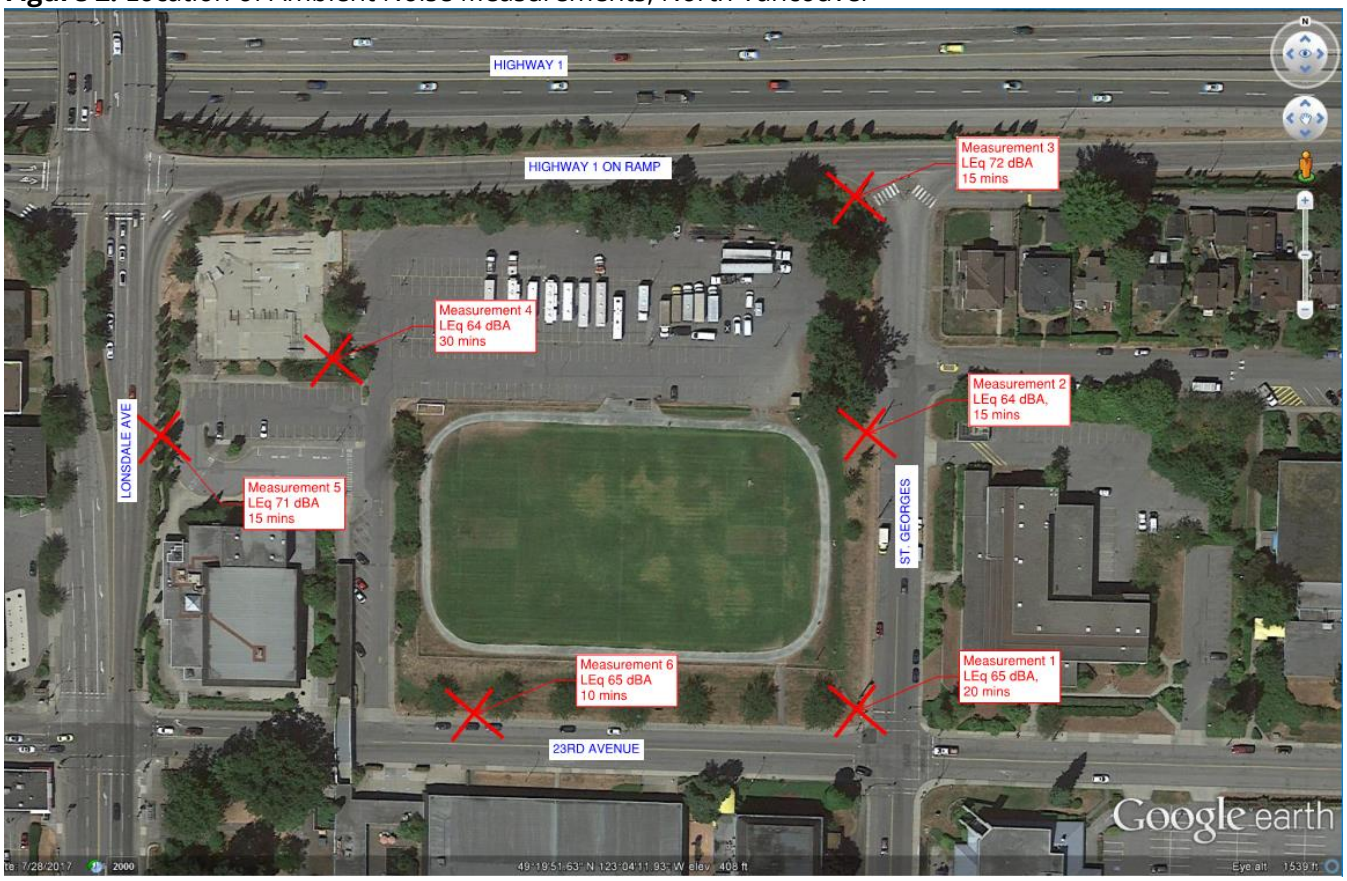


Figure 3: Location of Ambient Noise Measurements, Cloverdale Youth Park

Figure 4: Location of Ambient Noise Measurements, Rocky Point Park

RESULTS

We measured the ambient noise level at each location. The results are shown in Table 1 below. The measurement results at each location are also shown in Figure 1 above.

Table 1: Ambient Noise Level Measured at Each Location

Location	Comments	Leq (measured)
1	Dominant noise source was traffic on 23rd. When there was no traffic, some highway noise was audible. A few (~5) pedestrians passed by.	65 dBA
2	Primarily local traffic into and out of the parking lot. Steady 'hum' from highway noise was audible; large/heavy truck noise was also audible	64 dBA
3	Dominant noise was from vehicles on the on-ramp; when no vehicles on the on-ramp, highway traffic was clearly audible	72 dBA
4*	Skate park measurement – dominant noise sources were people talking, skate-related activity (jumps and falls), and some traffic noise (measured at the southeast corner of the skatepark)	64 dBA
5	Dominant noise source was traffic on Lonsdale	71 dBA
6	Dominant noise source was traffic on Lonsdale, especially when no local traffic.	65 dBA
7*	Cloverdale Skatepark Measurement – dominant noise was skate-related activity, people talking/shouting, and traffic noise.	60 dBA
8*	Rocky Point Skatepark Measurement – dominant noise was skate-related activity, people talking/shouting, traffic noise and overflight noise .	57 dBA

***Note:**

- For these measurements, other events (e.g. loud vehicle pass-bys, instances of overflight noise, or vehicles with loud music playing) that were dominant and very audible over the skatepark noise were excluded during the data-analysis stage, and the values indicated represent the Leq post-analysis.
- These skatepark measurements were conducted along the edge of the skatepark for easy comparison with ambient noise levels, also measured at the edges of the site.

DISCUSSION

The ambient average daytime noise level around the new City Skate Park location is 64 – 65 dBA (Leq). We therefore expect that a 55 - 60 dBA, Leq daytime noise level from the skate park is likely to not be very audible over the background noise from traffic; Typically, a 10 dB difference is required for inaudibility. The audibility might come from recognizable speech vs. broad band traffic noise.

Further, these values represent the equivalent noise level averaged over the measurement duration (Leq), and do not guarantee inaudibility for instantaneous, impulse events, such as single skate jumps.

Based on the measurements at the skateparks, i.e. measurement #4, #7 and #8, the predicted skatepark noise level at the edge of a typical skatepark is 57 – 64 dBA, Leq. In comparison to the 64-65 dBA (i.e. the Leq ambient noise level at the proposed location of the skatepark; the edge of the skatepark), we expect that on average, the daytime skatepark noise will be similar to, or lower than, the ambient noise level. While instantaneous events such as jumps or falls could be audible above the background noise, the overall average skatepark noise should not be highly audible over the background noise.

We offer the following recommendations/suggestions to reduce the noise impact of the skate park on the adjacent, neighboring residences and premises. These recommendations/suggestions are based on similar studies on the impact of skateparks on communities.

Skate park Surface

In a variety of studies, skateparks with wooden and/or metal ramps have been found to be noisier than those with concrete ramps. We therefore recommend:

1. Constructing the skatepark primarily of concrete.

Distance between the Skatepark and Adjacent Residences

In addition to skate jumps and wheel noise, conversation and music in stake parks have also been cited as disturbances to neighboring residences

As sound propagates away from the source, the sound pressure levels decrease (typically on the order of 6 dB for every doubling of distance from the source). Therefore, noise levels received from the skateparks can be reduced by:

2. Increasing, as much as possible, the distance between the park and the closest adjacent residence.

Barriers around the Skatepark

Visual barriers between the skatepark and neighboring occupants would further help reduce the skatepark noise received. We therefore recommend:

3. A 1.5 m – 2.0 m grassy berm along 23rd and St Georges.

The grassy berm could serve as a seating area for spectators and bystanders, and will help block the direct transmission pathway of sound from the skatepark to the adjacent properties. We note that the feasibility of adding the berm is at the discretion of the City.

Skatepark Covering

We note that there are two skateparks in Metro Vancouver, the Cloverdale Youth park (Cloverdale, BC) and the Chuck Bailey Skatepark (Surrey, BC), that include a covering over the central portion of the skatepark. In view of this, we suggest you consider:

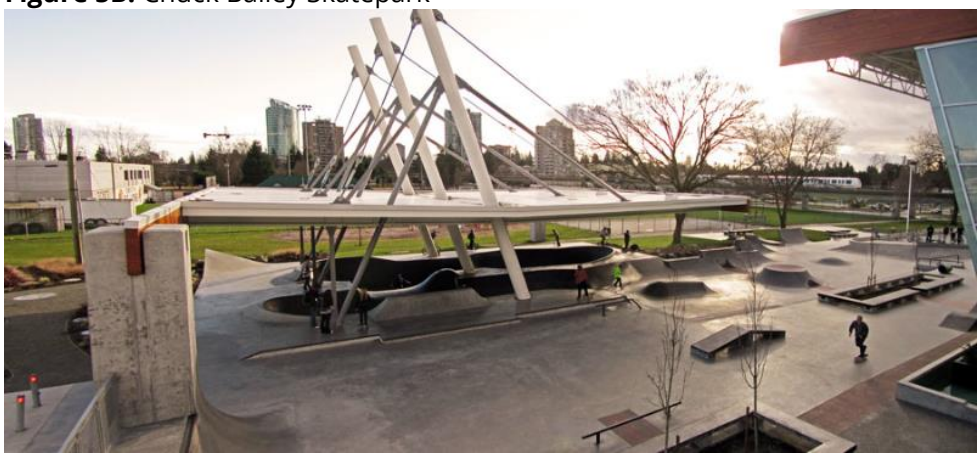
4. Adding a cover over all, or part, of the skatepark.

Such a covering would help reduce sound transmission to the upper floors of adjacent buildings, by providing a barrier along the direct sound transmission pathway, from the skatepark to upper floors. Further, the covering will allow for increased skatepark use during periods of rain or extreme sun/heat.

Images of these coverings are shown in Figures 5A and 5B below.

Figure 5A: Cloverdale Youth Park

Figure 5B: Chuck Bailey Skatepark



Nighttime Noise Control

During the night, we expect that the background noise levels will be lower than the levels measured during the daytime. As such, skate park levels that may be acceptable (and not as audible) during the daytime, may be audible and perceptibly "disturbing" during the evening. We therefore recommend controls to limit stake park activity to daylight hours, including:

5. Posted signage limiting park hours; from 8:00AM to dusk for example.
6. Minimal park lighting (i.e. lighting only what is necessary for emergency), to discourage nighttime use.

Other Findings

Based on several studies of stake parks and their impact on communities, common findings are that:

- Skateparks have similar impacts to basketball courts on neighboring residences; basketball courts, are often more commonly accepted facilities.
- Neighbors of existing skateparks have predominantly moderate views of skateparks
- Neighborhood context matters; with the skatepark located around a community center facility, neighbors are more likely to be tolerant of the skatepark noise than they would have been were the skatepark is a stand-alone area, and not part of a recreation center.

If you have any further questions, please feel free to reach out to us at any time.

Yours very truly,
RWDI AIR Inc.

Anoushka Rajan, EIT
Acoustician

Dan Lyzun, P. Eng.
Technical Director

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- “The Urban Grind – Skateparks: Neighborhood Perceptions and Planning Realities” by Aperio Consulting

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