# THE CITY OF DAWSON

Box 308 Dawson City, YT Y0B 1G0
PH: 867-993-7400 FAX: 867-993-7434
www.cityofdawson.ca

**NOTICE OF SPECIAL COUNCIL MEETING**
**#C24-17**

This is to inform you a special meeting of City Council will be held as follows:

**DATE OF MEETING:** THURSDAY, SEPTEMBER 19, 2024

**PLACE OF MEETING:** COUNCIL CHAMBERS, CITY OFFICE

**TIME OF MEETING:** 7:00 PM

**PURPOSE OF MEETING:**

1. Call to Order
2. Review of Investing in Canada Infrastructure Program (ICIP) Funding Application Submission Package-New Rec Centre
3. Public Questions
4. Adjournment

Date Meeting Requested: September 6, 2024
Special Council Meeting request by: Brennan Lister, Councillor & Alexander Somerville, Councillor

**Original signed by:**
CAO, David Henderson

September 10, 2024
Date

**Join Zoom Meeting**
https://us02web.zoom.us/j/87852376245?pwd=m9H2C17hJVGrd5V4qYv09CfnGq10ZK.1
**Meeting ID:** 878 5237 6245
**Passcode:** 347429

**REQUEST FOR SPECIAL COUNCIL MEETING**
**#C24-17**

As per Municipal Act Section 184, Special Meetings must be requested in writing by either:

a) Mayor
b) Two Councillors

Date of Request: September 6, 2024
Special Council Meeting request by: Brennan Lister, Councillor & Alexander Somerville, Councillor

**Original signed by:**
Councillor, Brennan Lister

September 10, 2024
Date

**Original signed by:**
Councillor, Alexander Somerville

September 10, 2024
Date

# City of Dawson
## Report to Council

| | |
|---|---|
| Agenda Item | Dawson City Recreation Centre – Project Update |
| Prepared By | Paul Robitaille, Parks and Recreation Manager |
| Meeting Date | September 19, 2024 |
| References (Bylaws, Policy, Leg.) | |
| Attachments | 1. *Dawson Recreation Centre - Conceptual Design Report*<br>2. *Dawson Recreation Centre - Operations and Maintenance Estimates* |

| | |
|---|---|
| x | Council Decision |
| | Council Direction |
| | Council Information |
| | Closed Meeting |

**Recommendation**

That Council review and approve the attached conceptual plans for submission by Yukon Government to the Government of Canada's *Investing in Canada Infrastructure Program*.

**Executive Summary**

A new Recreation Centre is being planned at the intersection of Dome Road and the North Klondike Highway (Lot 1059, Quad 116 B/3). The project is managed by the Yukon Government, with the City of Dawson as the future end user.

Both the Yukon Government and the Government of Canada have committed a total of Sixty-Five million ($65,000,000) in capital funding for the design and construction of this facility, through the Investing in Canada Infrastructure Program (ICIP). However, this funding is contingent on submitting a conceptual design for the facility by September 30, 2024. Council is now being asked to provide direction on whether to proceed with the funding application through ICIP.

Attached is the Concept Design Report (*Dawson Recreation Centre - Conceptual Design Report*) from the project contractor, which includes a site plan, floor plan, functional space program, energy estimates, and additional details about the facility. Administration has also provided estimates for the operation and maintenance of the facility (*Dawson Recreation Centre - Operations and Maintenance Estimates*), which are discussed below. The design reflects recommendations from the project management team, based on public engagement, discussions with the Recreation Board (acting as the advisory committee), and operational considerations.

Should City of Dawson proceed with this application and process, we will be committing to the facility's footprint, amenities, and location, though further changes may occur as we move into more detailed design phases.

**Background**

In 2017, the City of Dawson Council initiated plans for a new recreation facility (C17-29-13). The City's administration partnered with the Yukon Government's Infrastructure Branch to manage the project. This collaboration led to the decision to locate the facility at the intersection of Dome Road and the Klondike Highway (Lot 1059, Quad 116 B/3), approved by Council in 2019 (C-19-13-08).

A Feasibility Study, completed in 2021, guided the planning process, incorporating extensive community, Council, and administrative engagement. Six building options, each offering different amenities, were presented to Council. Based on these discussions, Council chose to move forward with the amenities outlined in Option 1 at Dome Road, with the possibility of future expansions or refinements (C21-19-12).

On December 5, 2023, during a Committee of the Whole meeting, Council publicly reviewed the project schematics and Class C cost estimates. The capital cost was projected at $103 million, with an additional $1.5 million for annual operating and maintenance costs—significantly higher than expected. Consequently, at the December 19, 2023, Council meeting, administration was directed to develop a strategy to align the project with a $65 million budget.

Administration returned to Council on January 16, 2024 (C-24-01), recommending a Progressive-Design-Build approach and the creation of an advisory body for the project. Council approved both recommendations (C-24-01-06). On February 6, 2024, at a Committee of the Whole meeting (CW-24-01), it was clarified that the Recreation Board would serve as the advisory group, with its chair, Peter Menzies, joining the project management team.

The Yukon Government then issued a tender for the Progressive-Design-Build, awarded to Wildstone Construction, supported by Stantec and S.no architecture. Regular meetings between the Yukon Government, the contractor, and the City of Dawson are helping shape the facility's design and layout.

Two workshops, held on July 16 and August 7, facilitated discussions on values, areas for consideration, and deliverables for the parties involved. A public Meet and Greet was also held on July 17 at the Art and Margaret Fry Recreation Centre, offering residents a chance to learn about the project and provide input.

Since then, ongoing meetings have continued to guide the process. On August 15, Council received an update on the project. Council, as the final decision-making authority for the City of Dawson, is expected to make a resolution by September 25th on the conceptual design and amenities for the new facility.

**Discussion / Analysis**

- **What is Council Committing To:** Council is being asked to approve moving forward with an application for the Investing in Canada Infrastructure Program (ICIP), which will be processed by the Yukon Government. Should Council choose to proceed, critical elements like the location, footprint, funding model, and minimum amenities will be determined. Design development will continue through the winter, with the goal of preparing for construction to start as early as 2025 or 2026.

- **ICIP Funding:** The ICIP funding application requires recipients to submit a shovel-ready project which, at this stage, must include:
    - 1. A designated location
    - 2. Conceptual floor plan
    - 3. Conceptual site plan
    - 4. Elevation drawings (Massing)
    - 5. Code review
    - 6. Methodology for project engagement and completion

- **Potential Changes Following This Decision:** As more information becomes available, adjustments may be made to the floor plan, site plan, elevations, and building systems. These changes will be guided by the established framework, which includes the location, footprint size, budget, minimum amenities, and funding model. At this stage, Council is asked to focus on the items required for the ICIP funding submission.

- **Project Values:** The following values were identified by the project management team and advisory group as key drivers for guiding the recommendations on this project:

    - Value 1 – Flexible Design: Our vision for the Community Recreational Center is to create an adaptable hub that enhances residents' quality of life. We are committed to inclusivity, removing barriers for all, and introducing diverse programs. The multifunctional facility will be adaptable for different uses and seasons, ensuring it meets changing community needs while promoting health and wellness. Strategically connected to infrastructure and designed for long-term use, it will offer versatile spaces for year-round community engagement.

    - Value 2 – Community Hub: The Rec Centre will honor local values and heritage, serving as a hub for wellness, health, and safety. It will be an accessible space welcoming Dawson’s diverse population and user groups.

    - Value 3 – Resiliency, Operations, and Maintenance: The recreation center will be durable, easy to maintain, and designed for local and future climate conditions. It will feature affordable whole-life costings and be constructed with appropriate, long-lasting materials.

- **Conceptual Design Report:** The attached conceptual design report (Dawson Recreation Centre – Conceptual Design Report) serves as the foundation for the ICIP funding application and includes essential project details. The following key points are worth noting:

    - Designated Location: The facility will be located at the southeast corner of Dome Road and the Klondike Highway, as approved by Council motion (C-19-13-08). This site was chosen for its favorable ground conditions and availability. The development will integrate with surrounding neighborhoods, existing trails, and nearby parks.

    - Conceptual Floorplan (P. 6-7): The current floor plan proposes a footprint of 5330m2 facility, which includes the following amenities: skating rink, two curling sheets, a community programming room/curling lounge, community kitchen, multi-purpose room, fitness center, indoor play area, offices, storage, and supporting rooms. Key points to consider:

        - Footprint: The proposed footprint of 5,330 m² is 1060 m² larger than the existing facility. Both the contractor and project management team deem this size appropriate, balancing an increase in space and amenities with capital and operational feasibility. The location and size of specific amenities are not yet finalized. At this stage, the focus should remain on the overall footprint and included amenities, with further refinement expected as the design progresses.

        - Functional Program/Amenities (Page 3): The listed amenities reflect recommendations from the advisory group, administration, and community engagement efforts. The sizes of these spaces are subject to adjustment as the design evolves. Administration's recommendations aim to balance the needs of the advisory group, public input, staff priorities, and operational sustainability for a facility of this scale.

    - Site Plan (P.8-9): The current conceptual site plan places the facility perpendicular to the Klondike Highway. Key considerations include:

        - Parking: The current zoning bylaw requires 556 parking stalls (1 stall per 10 m²), but administration strongly recommends pursuing a variance or amendment. The proposed plan includes 116 parking stalls, with overflow parking available at Crocus Bluff Park.

        - Site Development: The site will be elevated to meet projected flood levels, requiring significant fill across the project area. To reduce costs, the developed area will be minimized where possible.

        - Sunlight: The design maximizes natural light by positioning public-facing amenities such as the office, fitness center, indoor play area, and multi-purpose room towards the south and southeast. Areas that do not require natural light, such as storage and logistical rooms, are targeted to face north and northeast, as much as possible.

    - Massing (P. 9-11): Preliminary elevation drawings are provided, though they will likely evolve in the detailed design phase. Notable features include glazing to enhance natural light, distinct entrances, the use of wood to harmonize with the landscape, and efforts to create a visually appealing facility.

    - Code Review (Regulatory Analysis & Zoning Bylaw – P. 11-15): A preliminary code review outlines the total building occupancy (400 people) and expected occupancy for each space. It also addresses fire safety, building height, and other essential regulatory details. This review will become more detailed as the design progresses. The zoning bylaw review outlines the framework and constraints set by municipal legislation.

    - Building Systems (P. 16-47): Although this is a conceptual design, pages 16-47 discuss potential building systems based on the contractor's expertise and project values. These considerations inform energy modeling and estimates for capital, operations, and maintenance costs. Should we be directed to proceed, these systems still have the opportunity to be reconsidered.

    - Energy Modeling (P. 48-57): An early-stage analysis was conducted to estimate the heating and electrical costs for the facility. Using the details of the floorplan and building systems, these projected costs are included in the Operations and Maintenance Estimates discussed below. The goal is to create a facility that is significantly more energy-efficient than the 2020 National Energy Code of Canada for Buildings. The current plan includes propane heating with an electric backup system. This analysis is preliminary and will undergo further review as the design process advances.

- **Project Methodology:** This project is being managed through a collaborative effort involving multiple organizations, using a progressive design-build method. A local advisory group, qualified contractors, and extensive prior studies are all contributing to the process. Based on these factors, we are confident in the project's progress and our ability to successfully complete this facility. Key points include:

    - Progressive Design-Build: This method fosters collaborative decision-making between the client, design team, and construction company. It offers transparency in costing, reduces contingencies, enables value engineering to maximize the budget, and creates a cooperative process throughout the project.

    - Previous Work: The City of Dawson and Yukon Government have conducted extensive research and planning on building a new recreation facility. These previous studies, which included significant public engagement, Council feedback, and administrative input, form the foundation of the current concept and help expedite the process.

- Who's Involved:
  - Yukon Government: The Infrastructure Development Branch oversees project management, collaborating with branches such as Land Development, Building Inspection, Transportation Engineering, and others as needed. The Yukon Government is responsible for capital costs, contracting, site development, regulatory compliance, environmental offsetting, permitting, and more.
  - City of Dawson: As the future operator of the facility, the City is actively participating in the project management team, making recommendations, and collaborating with the local advisory group. The City will be responsible for the operation and maintenance of the building post-construction.
  - Local Advisory Group: The City of Dawson's Recreation Board serves as the advisory group for this project. It includes 11 members, including two Tr'ondëk Hwëch'in representatives and community leaders in recreation. The group provides community input and advises on project aspects. The chairperson, Peter Menzies, sits on the project management team
  - Contractors: Wildstone Construction, along with Stantec and S.no Architecture, has been contracted by the Yukon Government for Phase 1A of the project. Additional contractors are involved for other components.
  - Owner's Advisors Team: A team of consultants is advising the Yukon Government to ensure best practices, provide expert recommendations, and validate estimates and plans.
- Community Engagement: Past community engagement around the recreation centre plans has been instrumental in shaping the current project. The Recreation Board continues to act as a liaison for residents, advising on the project. With the initial floor plan in place, we plan to engage with user groups to gather further input on operations, amenities, and the layout of the facility.

**Fiscal Impact**

- **Capital Estimates**:
  - This building is budgeted to cost sixty-five million dollars ($65,000,000).
  - Capital costs for this building are the responsibility of Yukon Government and the Government of Canada.
  - Class D Estimates have been provided to the Project Management Team that have the project on budget.
  - Once the design reaches a certain maturity, the contractor commits to a construction contract price ensuring the project won't exceed the targeted capital budget.
- **Operation and Maintenance Estimates**:
  - Estimates on Operations and Maintenance have been provided by administration based on our current plans for operation of this facility. The contractor on this project provided us with energy estimates based on modelling.
  - Our target has been to spend, at a maximum, one million dollars ($1,000,000) per year on this facility. Current estimates have us under this amount.
  - Aside from the additional indoor playground and multi-purpose space, the new facility is not significantly different in size and scope from our current facilities. We expect to see efficiencies from the consolidation of staff and facilities and have provided estimates reflective of the actual costs in our current facilities.
  - The amenities included will shape both its operations and staffing requirements. Administration currently recommends relocating all year-round staff to this facility to operate more efficiently. We expect to maintain a similar operational plan for most areas, with adjustments for any new amenities. A key aspect of our conceptual plan assumes the disposal, sale, or lease of the Art and Margaret Fry Recreation Centre and the Waterfront Building, removing them from our expense lines and operational costs.
  - Staffing levels in this estimate have been kept at our current level in this estimate. We are reviewing the structure from other facilities and may recommend job description reviews or new positions in the future. At this stage, our goal is to aim to operate this facility with as few staff as best practices dictate.
  - Our estimates are based on operating this facility year-round, but with individual amenities remaining seasonal (skating rink, curling rink mainly). During the summer, we would operate this facility with significantly smaller on-site staffing level.
  - The Comprehensive Municipal Grant (CMG) is an amount received by each Yukon municipality each year from the Yukon Government to assist them with meeting their service delivery responsibilities. Based on our expansion of facilities, as well as an ongoing review of this grant, we expect to see an increase in our revenues from this fund, which is reflected in our estimates.

- In summary, we expect there to be an increase to expenses at this facility, but we also expect an increase to our Comprehensive Municipal Grant, and some conservative increases in revenues. Based on the information we have we are confident this building will not result in an unaffordable facility for our community to operate.

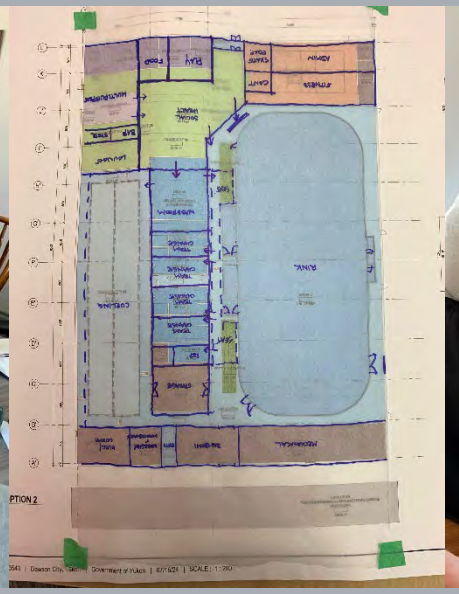
- **Equipment Costs:**
  - New equipment and furnishings are not included in the capital investment from the Government of Canada or the Yukon Government. While we plan to repurpose as much of the existing equipment from our current facilities as possible for the new recreation centre, additional equipment will still be required to fully outfit the space. Although a comprehensive list of needed items is not yet available, we anticipate this will be a manageable cost, potentially covered by reserves or gradually through annual allocations from existing or new grant agreements.

**Timeline**

- September 25 – If directed to proceed, ICIP Funding package submitted to Yukon Government
- September 30 – If directed to proceed, Yukon Government submits ICIP Funding Package Submitted.
- October 1 – if directed to proceed, Phase 1B of design commences

| Approved by | Signature | Position | Date |
|---|---|---|---|
| Paul Robitaille | Paul Robitaille | A/CAO | Sep 18, 2024 |

# Dawson Recreation Centre



# Agenda

1. Introductions
2. Project Status
3. Proposed Floor Plans
4. Site Plan
5. Building Massing
6. Questions

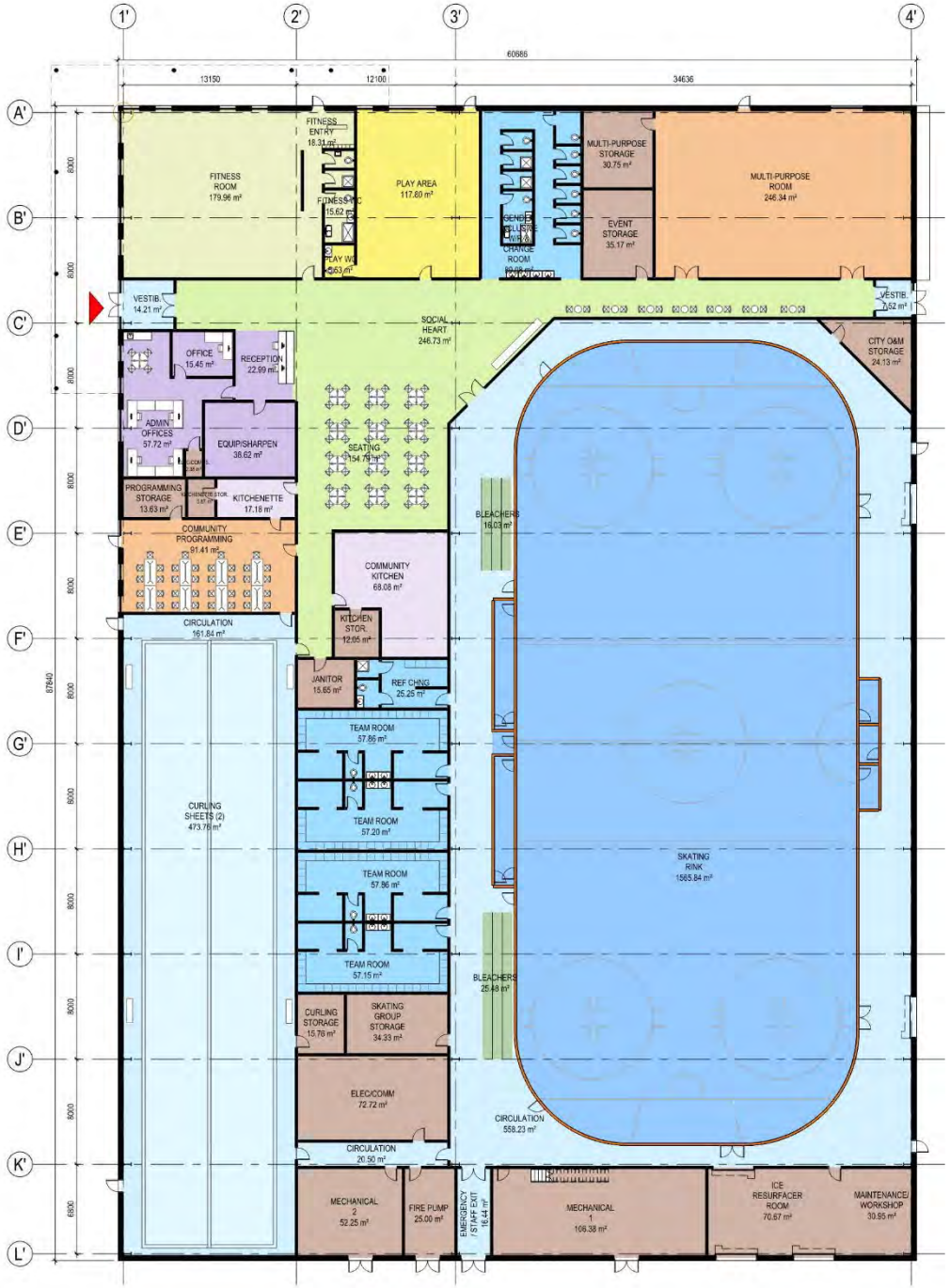
# Introductions

# Project Status

- Current design intent is to provide recreation and community amenities in a simplified building, that can be constructed within the available budget and is easy to operate and maintain over the course of its lifetime.
- Latest floor plan reflects the summary of many discussions with YG, CoD, Wildstone and the design team
- Building orientation on the site plan reflects the community's preference to date, but this can still be adjusted in the next phase.
- Massing and elevations presented today are a starting point in the discussion about the look of the building. Community feedback will be incorporated in the next phase.
- The concept design presented today will be added to the ICIP funding application, but it does not represent the final design version. More discussions and changes will still be made during the next phase.

# Proposed Floor Plan

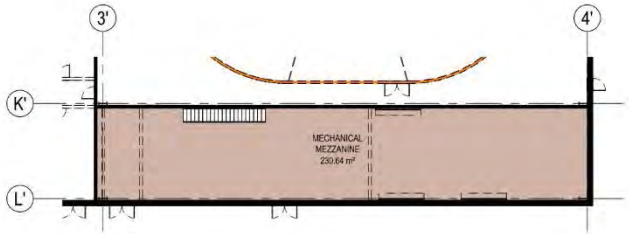
DAWSON RECREATION CENTER




Schema 1 Legend

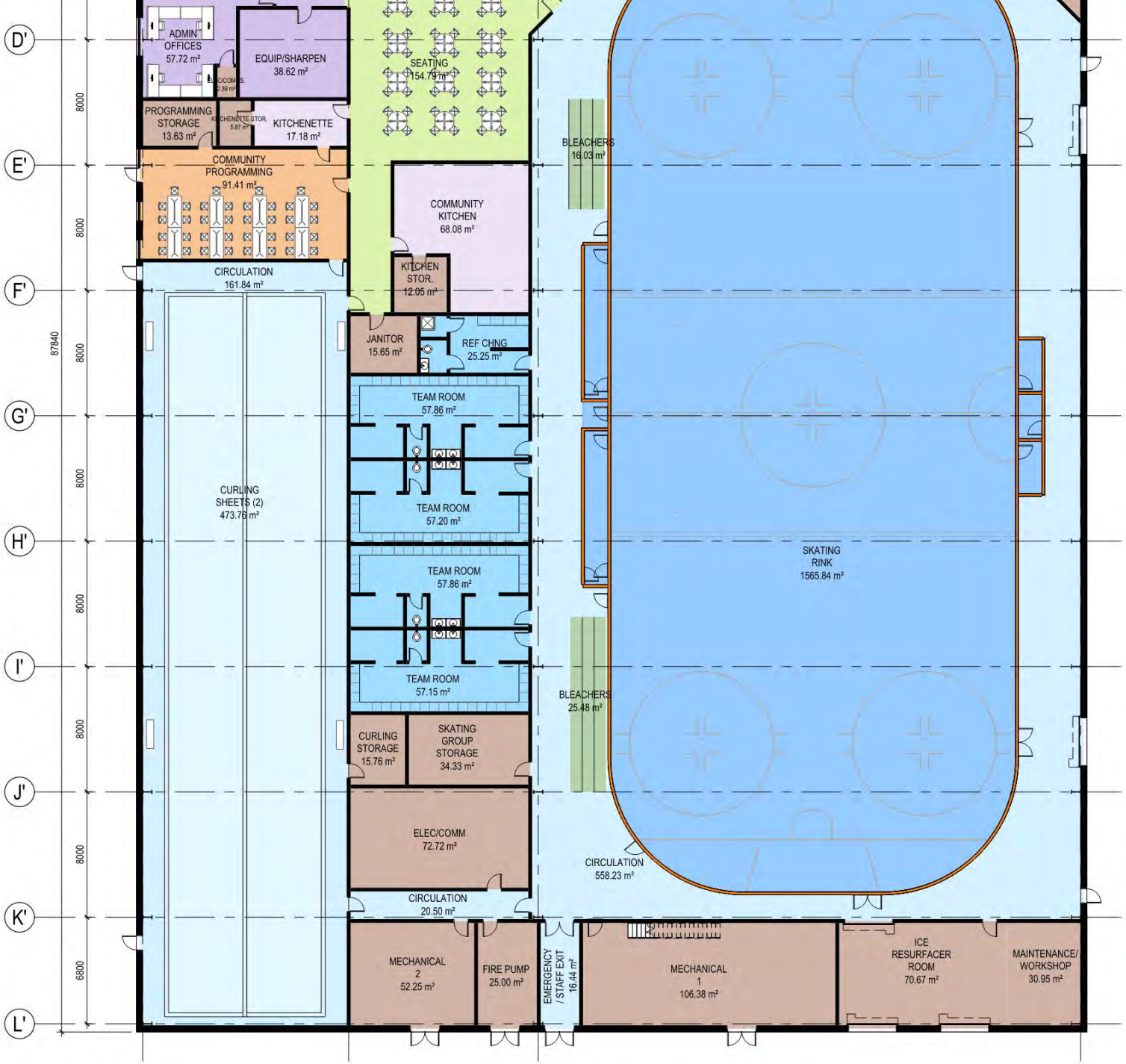
- CIRCULATION
- CONTROL DESK/ADMIN
- CURLING SHEETS
- FITNESS
- FOOD SERVICE
- JANITORIAL
- OUTDOOR SERVICE
- PLAY AREA
- PROGRAMMING
- SERVICES
- SKATING RINK
- SOCIAL HEART
- STORAGE
- VIEWING
- WASHROOMS/CHANGEROOMS

**BUILDING FOOTPRINT: 5330m2**



DAWSON RECREATION CENTER

DAWSON RECREATION CENTER



# Site Plan

**DAWSON CITY RECREATION CENTRE**

**LEGAL DESCRIPTION:** LOT 1059 QUAD 1168/03
**CURRENT LAND USE:** P2 INSTITUTIONAL
**LAND OWNER:** YUKON GOVERNMENT

**PROPOSED BUILDING AREA:** 5,330M2

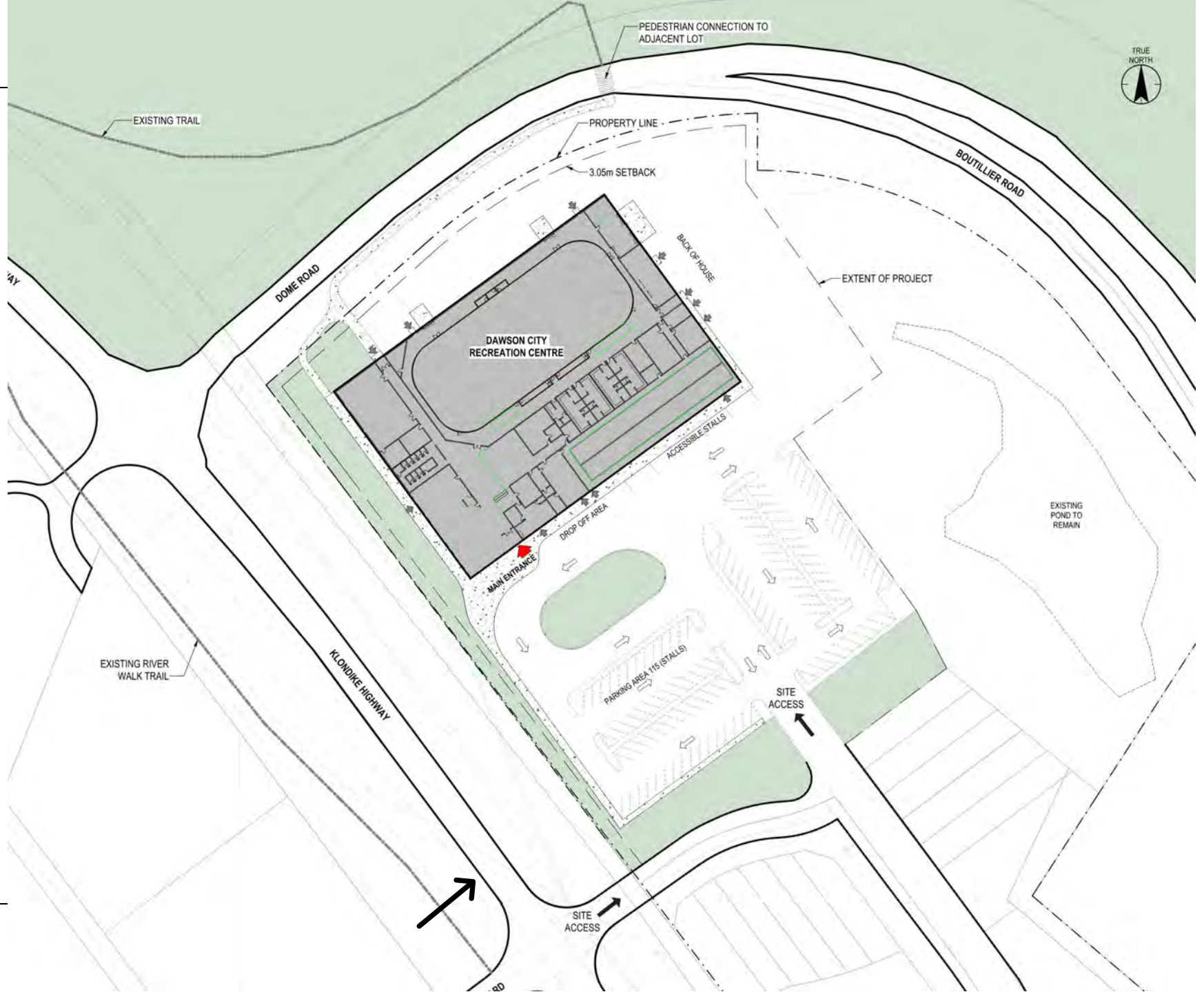
PARKING CALCULATION
-1 PER 10M2 OF FLOOR AREA
-5330/10= 533 STALLS REQ.
LOADING SPACES CALCULATION (OFF STREET)
-GREATER THAN 4,000M2 IN FLOOR AREA = 3

**PROS:**

- GREATER NUMBER OF PARKING STALLS ON FRONT
- GOOD ACCESS TO BACK OF HOUSE USING A LARGE TRANSPORT TRUCK
- MAIN ENTRY FACING SOUTH, VISIBLE FROM SOUTH ACCESS
- BACK OF HOUSE IS FACING AWAY FROM MOST TRAFFIC
- PEDESTRIAN CONNECTION TO CROCUS BLUFF PARK ALONG WEST/NORTH SIDE OF FACILITY
- SITE ENTRANCE/EXIT FROM KLONDIKE HIGHWAY

**CONS:**

- MAIN ENTRY INTO FACILITY IS NOT DIRECT WHEN APPROACHING FROM NORTH
- OUTDOOR CONNECTION FROM SKATING RINK IS LOST
- BUILDING ENCROACHES ONTO THE NORTHEAST SIDE OF SITE REQUIRING MORE FILL FOR SITE PREPARATION
- BUILDING SERVICES SPACES ARE FAR AWAY FROM THE CITY MAIN LINES ALONG THE HIGHWAY



# Building Massing

DAWSON RECREATION CENTER

SOUTHWEST CORNER - MAIN ENTRY/FITNESS ENTRY

BIRD'S EYE VIEW

NORTHWEST CORNER - MULTI-PURPOSE

SOUTH VIEW - MAIN ENTRY

# Questions?

# Thank you

# Dawson Recreation Centre

Conceptual Design Report

Prepared for:
Wildstone Construction Group

September 13, 2024

Prepared by:
Stantec Architecture Ltd. in partnership with S.no Architecture

Project/File:
144903543


Stantec Architecture Ltd.

S.no

The conclusions in the Report titled Dawson Recreation Centre are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Wildstone (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by Stantec Architecture Ltd in partnership with S.no Architecture

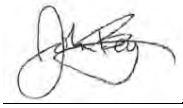
Reviewed by

Signature

Thor Flender, Architectural Designer

Printed Name

Approved by



Signature

John Berg, Principal, Architect of Record

Printed Name

# Table of Contents

**List of Tables**

**List of Figures**



**List of Appendices**

# Executive Summary

Stantec Architecture in partnership with s.no architecture have been engaged by Wildstone to provide architectural and engineering services for a new Recreation Centre in Dawson City. The intent of this report is to provide a conceptual design for the new recreation centre that includes the community's recreational needs in a building that can be constructed within the available funding.

Using as reference, the work previously completed by Associated Engineering, we reviewed the initial functional program with the community and adjusted it to suit the updated list of priority amenity needs. That allowed us to reduce the building footprint compared to previous work and fit within the available funding that dictated a maximum building footprint. We are currently proposing a 5,330m$^2$ 1-storey recreation centre using a pre-engineered structure and a rectangular footprint. The main amenities included within are as follows: skating rink, curling rink, multi-purpose room, fitness centre, indoor play area, community kitchen, office area and a social heart. These spaces are served by additional logistical spaces required for the functioning of each amenity space and the overall building.

Based on the proposed architectural concept, building systems descriptions have been provided that include structural, mechanical, electrical and civil disciplines. These descriptions are high-level and provide an idea of would be provided for this building and what will be further verified and detailed in future phases of the project. The energy model report provides additional information in terms of building energy performance using the building systems chosen. It also provides some initial high-level O&M costing for building heat and energy use.

# 1 Project Background

Stantec together with Sno architecture have been retained by Wildstone to form part of the Progressive Design Build team providing architecture and engineering consulting services for Yukon Government (YG) and the City of Dawson (CoD) for the design for the new recreation centre in Dawson City.

The new recreation centre will replace the existing Art & Margret Fry Recreation Centre, which is at the end of its life and cannot continue to serve the community.

In 2023 YG engaged Associated Engineering and Republic Architecture to provide an initial design for the new Dawson City Recreation Centre. Following community engagement, that team produced a functional program and overall design that responded to the community's functional needs and appeared to include all the existing recreation centre's programs and additional program spaces. However, the class D cost estimate of this design was significantly over project budget. Funding this project is being completed through the ICIP funding stream and the total project budget is $65M, inclusive of all construction costs, fees and owner expenses. The project objectives as stated in the RFP are to design a building in the most simplistic way, prioritising functionality, and minimizing O&M costs over aesthetics. These statements have directed the design approach.

Following this first design exercise that ended in the project being terminated, YG shifted its procurement approach to a Progressive Design Build (PDB) approach where the costing exercise is verified at concept design phase to ensure constructability within the available budget.

For this new scope of work, the PDB team built upon the design work already completed by the previous team and determined a building size that would fit within the available budget / funding. At the commencement of re-design, Wildstone completed a high-level costing exercise based on the previous design to arrive at a price per square metre. Using that price information, the PDB team determined a maximum feasible building size that can be built within the available budget. In addition, we looked at the previous design to find efficiencies in building layout, reduced circulation, refine the functional program space sizes where possible and removal of the second floor.

The PDB team (Wildstone/Stantec/S.no) used the original Functional Program to engage further with the community to determine a priority list of functions and develop a new design in a collaborative approach. This design report includes feedback received from YG, the City of Dawson (CoD), the Dawson Recreation Committee and best building practices for construction to propose an efficient building design that incorporates the majority of functions desired by the community.

# 2 Applicable Codes and Standards

The building design will comply with the following list of codes, standards and by-laws that will guide the project. Where there is overlap, the most stringent code or standard shall apply:

- National Building Code of Canada 2020
- National Energy Code for Buildings 2020
- National Fire Code of Canada 2020
- The City of Dawson Zoning Bylaw No. 2018-2019
- Government of Yukon: Design Guidelines and Technical Standards (this will be used as guideline, though it has been confirmed by YG that on this project it can be deviated from if needed)
- National Fire Protection Agency Documents (NFPA)
- CSA B651-23 Accessible Design for the Built Environment
- Additional codes or standards as noted in each discipline's report section
- Hockey Canada Rule Book
- Curling Canada Sheet Standards

# 3 Design Criteria

## 3.1 Functional Program

The PDB team met with YG and the CoD to review the initial Functional Program and provide below a list of priorities to be included in the new design. Functional spaces noted as “must have” would constitute a project requirement while “nice to have” would be considered only if space and if the budget would allow it. These discussions included all project stakeholders and provided a minimum list of amenities to provide overall wellness and recreation opportunities for the community.

| Room Name | Program Area recommendation from Recreation Board | Concept Floor Plan | Notes (proposed concept) |
|---|---|---|---|
| **RECREATION AMENITIES** | | | |
| **Hockey Rink** | 1,950.00 | 1,565.00 | Rink, team benches, penalty boxes, timekeeper’s box |
| Hockey Rink Circulation | | 558.00 | Arena circulation - spectators viewing standing around dasher boards |
| Hockey Rink Spectator Viewing Area (unheated) | | 41.00 | Bleachers seating |
| Change Room 1 | 55.00 | 57.00 | 1 toilet, 2 showers |
| Change Room 2 | 55.00 | 57.00 | 1 toilet, 2 showers |
| Change Room 3 | 55.00 | 57.00 | 1 toilet, 2 showers |
| Change Room 4 | 55.00 | 57.00 | 1 toilet, 2 showers |
| Referee Change Room | | 25.00 | Includes shower |
| Skate Sharpening/Equipment Rental | 30.00 | 38.00 | Combines skate sharpening with equipment rentals. Includes circulation within the room and a connection from control desk to admin offices. |
| Ice Re-surfacer Room | 70.00 | 70.00 | Area to accommodate Ice re-surfacer & pit. Includes maintenance/workshop area. See Logistics below |
| Ice Plant (Refrigeration) | | - | Outdoor ice plant, not included in the building footprint |

| | | | |
|---|---|---|---|
| City O&M Storage | 100.00 | 24.00 | Storage space only for skating rink O&M equipment |
| Skating Group Storage | | 34.00 | Storage only for the skating user group |
| **Curling Rink** | 670.00 | 473.00 | Two Curling sheets |
| Curling Circulation | | 161.00 | Circulation around the two Curling sheets. Benches on the sides |
| Changing Area/Lockers/Storage | 4.00 | - | |
| Curling storage | | 15.00 | Used for Ice King and Curling equipment |
| **Multipurpose Room** | 510.00 | 246.00 | |
| Multi-purpose Storage | 30.00 | 30.00 | |
| Event storage | | 35.00 | |
| **Fitness** | | 212.00 | Includes separate entry and washrooms/showers/changer ooms |
| Walking Track | | - | |
| **Indoor Playground** | 100.00 | 117.00 | |
| Indoor playground washroom | | 5 | |
| **Sub-Total** | **3,696.00** | **3,877.00** | |
| **COMMUNITY AMENITIES** | | | |
| Social Heart | 300.00 | 246.00 | Includes viewing area into skating rink, bench seating for skate change adjacent to equipment rentals |
| **Community Kitchen** | 125.00 | 68.00 | |
| Community Kitchen Storage | | 12.00 | |
| Seating | | 154.00 | Heated viewing area into skating rink |
| Community programming | | 91.00 | Viewing area into the curling rink and social heart seating |
| Programming storage | | 13.00 | |
| Kitchenette | | 17.00 | |
| Kitchenette storage | | 6.00 | |
| **Full Team Office** | 100.00 | 73.00 | Includes 4 workstations, 1 managers office, kitchenette w/ 4 chairs and table |

| | | | |
|---|---|---|---|
| Reception | | 23.00 | Space for 2 staff |
| **Sub-Total** | **525.00** | **703.00** | |
| **LOGISTICS** | | | |
| Vestibule | | 22.00 | Two vestibules combined |
| Circulation | | 20.00 | |
| Emergency / staff exit | | 16.00 | |
| Gender inclusive washrooms & change rooms | 150.00 | 89.00 | Includes 8 toilets, 2 shower stalls |
| Janitor Room | 10.00 | 15.00 | One janitor room for the entire facility |
| Workshop/Maintenance | 40.00 | 31.00 | Combined space with the Ice re-surfacer room |
| Electrical/Communications | 50.00 | 72.00 | |
| Secondary Electrical/Communications | | 2.00 | May be required due to distances. |
| Mechanical Room | 122.00 | 183.00 | Combines two mechanical rooms and fire pump room |
| Second floor/ mechanical mezzanine | | 230.00 | Used for ventilation system |
| Outdoor services | | | 200 $m^2$ outdoors for chillers, generator, transformer, some ice plant equipment, garbage, cold storage, fuel oil etc. |
| **Sub-Total** | **372.00** | **680.00** | |
| | | | |
| **NET TOTAL** | **4,593.00** | **5,260.00** | |
| | | | |
| Gross up - walls only | | 300.00 | |
| **Total gross area (incl. second floor/mezzanine)** | | **5,560.00** | Includes mechanical mezzanine |
| **Total building footprint** | | **5,330.00** | |

A gross-up factor is usually included in a functional program spreadsheet to account for wall thicknesses, circulation and non-occupiable spaces. However, in the functional program presented here, the circulation and non-occupiable spaces are identified in line items, leaving only the wall thickness to be included in the gross up factor.

# 3.2 Design Concept

## 3.2.1 Floor Plan

Below is the proposed floor plan for the Dawson Recreation Centre as resulted from the team collaboration and following the project requirements and functional program. Full scale drawings are available in Appendix A.

This design proposes a one-storey building that will include the following major functional spaces: a hockey rink, curling rink, multi-purpose room, fitness room, indoor playground area and a community kitchen. These spaces are complemented by rooms for building services, storage, washrooms, changerooms, and other supporting program requirements. Providing a single storey building reduces the area required for stairs, elevators and circulation and helps propose a simple and compact floor plan that is also beneficial from a construction perspective and reducing O + M costs.

The building is generally aligned to fit within a rectangular floor plan where the two largest components, with sizes determined by the required sports, hockey rink and curling ice sheets, are positioned parallel to each other. At the narrow end of the two cold spaces, the smaller recreational and community amenities are proposed – fitness, multi-purpose, play area, community kitchen, community programming. A large social heart opens up from the main entry and it is intended to connect all functions of the building and provide an overall community gathering area. From the ‘social heart’, one can either access a recreation/amenity space or gather around the seating space for viewing into the skating rink.

The multi-purpose room can be used for small sports events or larger social events such as banquets. The Fitness Centre has been positioned to allow entry from the exterior and can operate independently of the Dawson Recreation Centre regular hours. It has its own separate entrance, washrooms, showers and changerooms.

Support and logistical areas, including office area, storage, maintenance areas, are positioned for effective entry to and from spaces and in proximity to the areas they service.


*Figure 1: Concept Floor Plan*

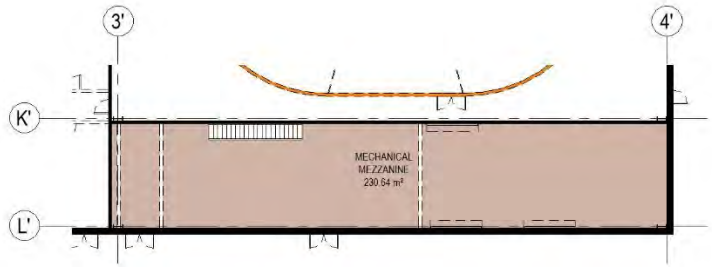



*Figure 2: Mechanical Mezzanine*

### 3.2.2 Site Plan

The new Recreation Centre is proposed to be located in the City of Dawson, near existing outdoor sports fields, the river walking pathway, and along the Klondike Highway. The site has been mined extensively in the past, leaving a highly uneven terrain. For placing the building onto this site, we need to minimize the amount the fill required to prepare the site and raise it to the elevation required by the 200-year floodplain level this project is taking into consideration. For more details on the site, refer to the Civil section of this report.

The new building is proposed to be located on the northwest side of the site with a general building orientation perpendicular on to Klondike Highway. In this orientation, the main entrance and office area are facing south, the fitness centre, play area and multi-purpose room are facing west taking advantage of natural light. With the majority of functions facing the highway, the areas that do not require natural light and the back of house equipment are proposed to be located to the far east side. This orientation also offers the opportunity to create a pedestrian secondary entrance on the northwest side of the building in direct connection with the Crocus Fields across Dome Road.

The main vehicular access onto the site is proposed from the Klondike Highway side and Joe Henry Road. This access point will serve both the recreation centre and the future residential development located south of the new facility. On the recreation centre site, a gravel parking area is proposed south of the facility, and it can accommodate approximately 116 parking stalls.

Pedestrian access is proposed from the north connected with the existing trails across Dome Road and along the highway connecting the site with the downtown area. A cross walk connecting the river walk with the site should be considered for pedestrian safety.


*Figure 3: Site Plan*

## 3.2.3 Building Massing

The exterior design strategy for the Dawson City Recreation Centre is to utilize the pre-engineered shell with strategic additions of architectural highlights and features to reduce the scale of the building. As a highly visible municipal building along the primary approach into the Dawson townsite, much consideration was given to the portions of the building facing the Klondike Highway. The building serves as an architectural landmark as visitors and residents alike enter the town.

A canopy along the south and west facing elevations serves to highlight the main entrance to the facility as well as the secondary entrance to the fitness centre. The canopy provides shelter for pedestrians from weather conditions such as rain and snow, and prevents ice build-up along the main access sidewalk. Additionally, the canopy offers a nod to the heavy use of verandahs in historical architecture representative of the Gold Rush Era present within Dawson City.


*Figure 4: Exterior Massing / Concept Rendering – South Elevation*

Visual warmth is added to the architecture through the use of wood-look siding along the west elevation and near the main entrance. Wooden accents speak to the land and the environment, connecting the building with the surrounding landscape. Opportunities exist on these sections of feature siding for artwork that reflects local and/or First Nation artists.

Accent colours are utilized at the main entrance along with the fitness centre entrance to further highlight these two access points to the building.

Glazing is added into the main programmatic spaces such as the multi-purpose room, fitness centre, play area, administration offices, and community programming room. In combination with interior glazing between the play area and the social heart, elongated glazing at the exterior of the play area serves to allow for deeper penetration of sunlight into the social heart. Glazing is withheld from both the skating rink and curling rink as the ice surfaces benefit from less natural light.


*Figure 5: Exterior Massing / Concept Rendering – West Elevation*

## 3.3 Regulatory Analysis

### 3.3.1 NBCC 2020 analysis

The National Building Code of Canada 2020 summary is presented below to outline the general building code requirements for the proposed building size and layout. The following table is only a preliminary summary building code provided for project coordination, future project information and to inform the opinion of probable cost. Detailed requirements identified in the NBCC and other applicable legislation apply. Interpretation of applicable codes is subject to the authorities having jurisdiction.

| BUILDING CODE SUMMARY (DRAFT) | | | | |
|---|---|---|---|---|
| ITEM | REMARKS | | | REFERENCE NBCC 2020 |
| BASIS OF SUMMARY | NATIONAL BUILDING CODE OF CANADA 2020 | | | |
| BUILDING HEIGHT | 1 STOREY | | | 1.4.1.2. |
| BUILDING AREA | MAIN FLOOR AREA | 5330 m² | | |

| | | | | | |
|---|---|---|---|---|---|
| | MECHANICAL MEZZANINE | 230 m² | <10% OF FLOOR AREA | | |
| BUILDING CLASSIFICATION | MAJOR OCCUPANCY | GROUP A, DIVISION 3, - ASSEMBLY OCCUPANCY (ARENA-TYPE BUILDING) | | | 3.1.2.3. |
| FLAME-SPREAD RATING | INTERIOR WALL AND CEILING FINISHES | 150 | MAXIMUM FLAME-SPREAD RATING | | TABLE 3.1.13.2. |
| | EXITS (NOT APPLICABLE) | 25 | MAXIMUM FLAME-SPREAD RATING | | 3.3.2.8 (1) |
| | LOBBIES (NOT APPLICABLE) | 25 | MAXIMUM FLAME-SPREAD RATING | | |
| | VERTICAL SERVICE SPACE (NOT APPLICABLE) | 25 | MAXIMUM FLAME-SPREAD RATING | | |
| OCCUPANT LOAD | DRESSING ROOMS (21 PERSONS PER DRESSING ROOM) | 21 PERSONS x 4 | 84 | | TABLE 3.1.17.1. |
| | REFEREE DRESSING ROOMS (4 PERSONS PER DRESSING ROOM) | 3 PERSONS x 2 | 6 | | |
| | SKATING RINK BLEACHERS | 450mm / SPECTATOR (75 + 48) | 123 | | |
| | CURLING RINK | 4 TEAMS x 4 | 16 | | |
| | CURLING LOUNGE | 91m² / 1.85m² PER PERSON | 50 | | |
| | LOBBY (SOCIAL HEART) | 246m² / 1.85m² PER PERSON | 133 | | |
| | LOBBY SEATING | 62 SEATS | 62 | | |
| | ADMINISTRATION + EQUIPMENT / SHARPENING | 8 STAFF | 8 | | |
| | MULTI-PURPOSE ROOM | 246m² / 1.2m² PER PERSON | 205 | | |
| | PLAY AREA | 117m² / 4.6m² PER PERSON | 26 | | |
| | FITNESS | 180m² / 4.6m² PER PERSON | 40 | | |
| | COMMUNITY KITCHEN | 68m² / 9.3m² PER PERSON | 8 | | |
| | ICE RE-SURFACER / MAINTENANCE | 101m² / 28m² PER PERSON | 4 | | |
| | TOTAL CALCULATED OCCUPANT LOAD | | 765 | | |
| EXCEPTIONS IN DETERMINING BUILDING HEIGHT | THE SPACE ABOVE A MEZZANINE NEED NOT BE CONSIDERED AS A STOREY IN CALCULATING THE BUILDING HEIGHT, PROVIDED THE AGGREGATE AREA OF MEZZANINES THAT ARE NOT SUPERIMPOSED AND DO NOT MEET THE CONDITIONS OF SENTENCE (3) DOES NOT EXCEED 10% OF THE FLOOR AREA IN WHICH THEY ARE LOCATED. | | | | 3.2.1.1.(4) |
| BUILDING FIRE SAFETY | GROUP A, DIVISION 3, ONE STOREY, SPRINKLERED | | | | 3.2.2.33 |
| | COMBUSTIBLE OR NONCOMBUSTIBLE CONSTRUCTION | | | | |
| | BUILDING IS SPRINKLERED THROUGHOUT | | | | |
| | NOT MORE THAN ONE STOREY IN BUILDING HEIGHT | | | | |
| | HAS A BUILDING AREA NOT MORE THAN 7,200 m2 | | | | |

| | | | | |
|---|---|---|---|---|
| LIMITING DISTANCE | TBD | | | TABLE 3.2.3.1.-D |
| REQUIREMENT OF A FIRE ALARM SYSTEM | EXCEPT AS PERMITTED IN SENTENCES (2), (3), AND (5), A FIRE ALARM SYSTEM SHALL BE INSTALLED IN BUILDINGS IN WHICH AN AUTOMATIC SPRINKLER SYSTEM IS INSTALLED. | | | 3.2.4.1.(1) |
| LOCATION OF ACCESS ROUTES | ACCESS TO THE PRINCIPAL ENTRANCE LOCATED NOT LESS THAN 3m AND NOT MORE THAN 15m FROM THE CLOSEST PORTION OF THE ACCESS ROUTE REQUIRED FOR FIRE DEPARTMENT USE | | | 3.2.5.5.(1) |
| ACCESS ROUTE DESIGN | REQUIRED TO HAVE A CLEAR WIDTH NOT LESS THAN 6 M<br>HAVE A CENTRE-LINE RADIUS NOT LESS THAN 12 M<br>HAVE AN OVERHEAD CLEARANCE NOT LESS THAN 5 M<br>HAVE A CHANGE OF GRADIENT NOT MORE THAN 1 IN 12.5 OVER A MINIMUM DISTANCE OF 15 M | | | 3.2.5.6.(1) |
| FIRE DEPARTMENT CONNECTIONS | LOCATED SO THAT THE DISTANCE FROM THE FIRE DEPARTMENT CONNECTION TO A HYDRANT IS NOT MORE THAN 45 M AND IS UNOBSTRUCTED. | | | 3.2.5.15. |
| FIRE SEPARATIONS | JANITOR ROOMS | 0 HR FRR | | 3.3.1.22.(3) |
| | EXITS | NOT APPLICABLE | | 3.4.4.1.(1) |
| | STORAGE GARAGE (ICE RESURFACER ROOM) | 1.5 HR FRR | | 3.3.5.6. (1) |
| | SERVICE ROOMS | 1 HR FRR | | 3.6.2.1.(1) |
| | VERTICAL SERVICE SHAFTS | NOT REQUIRED | | TABLE 3.6.3.1. |
| FIRE SEPARATIONS AND CLOSURES | 45 MIN FIRE SEPARATION<br>1 H FIRE SEPARATION<br>1.5 HR FIRE SEPARATION | =<br><br> | 45 MIN CLOSURE<br>45 MIN CLOSURE<br>1 HR CLOSURE | TABLE 3.1.8.4. |
| MINIMUM NUMBER OF EXITS | EXCEPT AS PERMITTED BY SENTENCES (2) TO (4), EVERY FLOOR AREA INTENDED FOR OCCUPANCY SHALL BE SERVED BY AT LEAST 2 EXITS. | | | 3.4.2.1.(1) |
| LOCATION OF EXITS | EXCEPT AS PERMITTED BY SENTENCES (2) AND 3.3.2.5.(6), IF MORE THAN ONE EXIT IS REQUIRED FROM A FLOOR AREA, THE EXITS SHALL BE LOCATED SO THAT THE TRAVEL DISTANCE TO AT LEAST ONE EXIT SHALL NOT BE MORE THAN 45m IN A FLOOR AREA THAT CONTAINS AN OCCUPANCY OTHER THAN A HIGH-HAZARD INDUSTRIAL OCCUPANCY, PROVIDED IT IS SPRINKLERED THROUGHOUT. | | | 3.4.2.5.(1)(C) |
| EXIT WIDTH | A) 6.1 MM PER PERSON FOR RAMPS WITH A SLOPE OF NOT MORE THAN 1 IN 8, DOORWAYS, CORRIDORS AND PASSAGEWAYS<br>B) 8 MM PER PERSON FOR STAIRS<br>C) 9.2 MM PER PERSON FOR RAMPS FOR RAMPS WITH A SLOPE OF MORE THAN 1 IN 8, OR STAIRS, OTHER THAN STAIRS CONFORMING TO CLAUSE (B). | | | 3.4.3.2.(1) |
| BARRIER-FREE PATH OF TRAVEL | THE UNOBSTRUCTED WIDTH OF A BARRIER FREE PATH OF TRAVEL SHALL BE NOT LESS THAN 1000mm.<br>EVERY DOORWAY THAT IS LOCATED IN A BARRIER-FREE PATH OF TRAVEL SHALL HAVE A CLEAR WIDTH NOT LESS THAN 850mm WHEN THE DOORS ARE IN THE OPEN POSITION. | | | 3.8.3.2.(1)<br>3.8.3.6.(2) |
| | WATER CLOSETS REQUIRED | FIXTURES PROVIDED | LAVATORIES PROVIDED | |
| PUBLIC WASHROOMS | ACCOMMODATES 250 PERSONS | 8 GENDER NEUTRAL WATER CLOSETS | 4 PLUS 1 PER BF WASHROOM | TABLE 3.7.2.2.-A |
| PLAY AREA | ACCOMMODATES 10 PERSONS | 1 WATER CLOSET SERVING PLAY AREA | 1 | |

| | | | | |
|---|---|---|---|---|
| FITNESS ROOM | ACCOMMODATES 50 PERSONS | 2 WATER CLOSETS SERVING FITNESS ROOM | 1 PER WASHROOM | |
| TEAM / REFEREE CHANGE ROOMS | ACCOMMODATES 84 + 6 PERSONS | 1 WATER CLOSET PER DRESSING / REFEREE ROOM | 2 PER DRESSING ROOM<br>1 REFEREE DRESSING ROOM | |
| MAX OCCUPANT LOAD BASED ON WASHROOM COUNT | 400 PERSONS | | | |

Based on this preliminary code review, the proposed maximum building occupant load is a stipulated 400 persons dictated by the public washroom count, even though the calculated occupant load based on functional space sizes would allow up to 765 persons.

## 3.3.2 Zoning Bylaw

The lot proposed for the recreation centre is located at the bottom of Dome Road at the intersection with Klondike Highway. It is a 23,475 $m^2$ sized lot located on a heavily altered terrain that requires a lot of preparation in advance of building construction.

From a land use bylaw perspective, it is located in a P2 Institutional zone that allows for a recreation centre.

The following use(s) are permitted in the P2 zone:

| | |
|---|---|
| • accessory building or structure<br>• cemeteries<br>• childcare centre<br>• community recreation facility<br>• cultural events or display<br>• emergency and protective services<br>• exhibition and convention facilities<br>• healthcare facility<br>• heritage resources<br>• library | • mixed use development (Bylaw 2021-15 passed on August 3, 2022)<br>• museum<br>• natural science exhibit and interpretive signage<br>• offices (Bylaw 2021-15 passed on August 3, 2022)<br>• religious assembly facilities<br>• service efficiency link<br>• school<br>• vendor, commercial<br>• vendor, food |

P2 minimum parcel requirements:

- Minimum setback from:
  - » front parcel line: 3.05m
  - » interior side parcel line: 3.05m
  - » exterior side parcel line: 3.05m
  - » rear parcel line: 3.05m
- Maximum building height 10.67 m – based on the approved final building massing, the total building height might exceed the height noted in the bylaws

Parking:

- Parking spaces: 1 per 10$m^2$ of floor area – based on current floor area, there are 533 parking stalls required. The lot does not allow for this number of parking stalls to be accommodated
- Parking space dimensions: min. 2.74m wide or 6.10m long or have a vertical clearance of min. 2.29m

Based on the final approved building design and site plan layout, a variance application will most likely be required to accommodate a lower parking space count and an increased building height.

# 4 Architectural Systems

## 4.1 Energy Efficiency

In subarctic and arctic climate zones the thermal performance of the building envelope is an important consideration and serves to provide lower operating costs and occupant comfort. Thermal insulation values for foundation, exterior wall and roof assemblies shall meet, or exceed the National Energy Code of Canada 2020 requirements. A compact design also adds to the energy efficiency and simplifies construction while lowering capital costs. Air leakage and thermal bridging issues are the major causes of deterioration, energy loss and interior service issues for buildings. The addition of insulation to the exterior of the building's structural frame has been demonstrated:

- to be an effective means to increase the effective insulation value and therefore to lower the operating costs of a building.
- to reduce thermal bridging, risk of condensation and deterioration.
- to provide a comfortable interior environment: high thermal insulation value floor, wall and roof construction assembly to work in combination with an efficient HVAC system to ensure consistent interior temperature with code required humidity levels. Too much humidity will deteriorate materials.

To minimize air infiltration, heat loss and possible mold, a continuous air and vapour membrane is required. The layering and thicknesses of construction materials shall be carefully designed to prevent condensation and increase energy efficiency.

Construction Assembly options to be considered:

- Insulated Metal Panels located entirely on the exterior of the bearing structure, which reduces thermal bridging and the risk of condensation. Mechanical and electrical installations can be placed in the bearing wall cavity without compromising the vapor barrier and airtightness of the building.
- Increased insulation values will lower the heating and overall operation costs of the building and will also lower its carbon footprint.

The goal for this building is to meet or exceed the insulation values outlined in the National Energy Building Code (NECB) 2020. However, for buildings located in the sub-arctic and arctic zones of Yukon, it is good building practice to provide the best building envelope possible to help with overall building energy performance. Refer to Section 9 for more details on building energy performance and building envelope R-values.

# 4.2 Construction Assemblies

The predominant concept for the construction materials and assemblies for the new building is centered on functionality for its purpose, durability and aesthetics. The recreation centre requires its own specific materials, and those requirements are addressed below.

- Building Envelope Robustness: Design the envelope system that provides protection from weather conditions and premature deterioration, which requires an airtight and watertight system.
- Reduction of Thermal Bridging: Exoskeleton insulation is most effective to minimize thermal bridging with an energy efficient fastening
- Aesthetics: Consider visually pleasing materials and colours that increase occupant's well-being and improve their demeanor.
- Environmentally Friendly Materials: We all have a responsibility to our environment and sustainability of earth's resources and using low volatile organic compounds will improve the occupant's health.

## 4.2.1 Building Envelope

### 4.2.1.1 Exterior Walls and Roofs

Based on project requirements and the pre-engineered structural system, it is proposed that the building will be enclosed using an insulated metal panel (IMP) system of the highest energy performance available installed on exterior walls and roofs. IMP systems provide good airtightness, perform well thermally, are economical, and are fast to install as all of the critical elements of the building envelope are incorporated into a single panelized system. These panels are composed of an outer layer of steel cladding over foam insulation with a superior RSI of up to 1.4 per 25mm (R-8 per inch). A rainscreen layer of siding material can be added over the IMP where required or desired for protection or aesthetics.

### 4.2.1.2 Foundations

The concrete foundation will be designed as per the structural section of this report. Two layers of rigid insulation, 200mm thick, will be added under the areas with ice (skating rink and curling ice sheets).

### 4.2.1.3 Exterior Doors and Windows

The main entrance, exterior doors and windows will be constructed to meet the performance requirements of the Code. Specific materials will be further investigated in the next phase of the project based on their performance, cost and aesthetics.

# 5 Structural Systems

## 5.1 Structural Systems Summary

The structural system for the Dawson Recreation Centre will primarily consist of a pre-engineered steel frame supported on a series of concrete spread footings and strip footings. The gravity system of the pre-engineered steel superstructure will consist of tapered built-up steel ribs with secondary light gage Z-shape or C-shape purlins. The mechanical mezzanine on the second floor will be made up of steel beams and a concrete slab on metal deck. The lateral system will consist of steel bracing along the building perimeter. Gravity and lateral loads will be transferred from the superstructure to the concrete foundation which will bear on engineered fill. The first story of the building will be a slab on grade supported on engineered fill.

Due to the site's location near the Klondike River and due to the tailings left over after years of mining activities, significant excavations and site work are required to prepare the site for the construction of foundation elements and to raise the building elevation above the 200-year floodplain. The building systems section of this report will discuss site preparations in more detail.

## 5.2 Codes and Standards

### 5.2.1 Building Code

- National Building Code of Canada 2020
- User's Guide – National Building Code 2020: Part 4 Division B

### 5.2.2 Material Codes & Acceptable Products

- CAN/CSA-A23.1-24 Concrete Materials and Methods of Concrete Construction
- CAN/CSA-A23.2-24 Method of Test for Concrete
- CAN/CSA-A23.3-24 Design of Concrete Structures for Buildings
- CAN/CSA S16-24 Limit States Design of Steel Structures
- CSA S136-16 North American specifications for the design of cold-formed steel structural members.
- Anchorage / Fastening – Simpson Strong-Tie & Hilti Products.

# 5.3 Design Loads and Criteria

## 5.3.1 Importance Factor

The building has a “high” importance factor as defined in the 2020 National Building Code for buildings that could potentially be used as shelters, such as recreational centres. This factor represents the basis of Structural design with additional load factors as follows.

*Table 1: Importance Category Load Factors*

| | **High Importance Factor** | | **Normal Importance Factor** | |
|---|---|---|---|---|
| **Load** | Ultimate Limit State | Service Limit State | Ultimate Limit State | Service Limit State |
| **Snow** | 1.15 | 0.9 | 1 | 0.9 |
| **Wind** | 1.15 | 0.75 | 1 | 0.75 |
| **Seismic** | 1.3 | - | 1 | - |

* The Service Limit State importance factor for seismic loads will conform to the corresponding clauses outlined in the 2020 National Building Code.

## 5.3.2 Vertical Loading

*Table 2: Vertical Loads*

| **Level and Location** | **Superimposed Dead Load (kPa)** | | **Live/Snow Load (kPa)** |
|---|---|---|---|
| Roof | Roof | 0.5 | 2.85 + Additional Snow Accumulation*<br>1.0 Roof Live Load |
| | Mech. and Elec. | 0.5 | |
| Main Floor | Floor Finishes + Partitions | 1.0 | 4.8 All areas unless noted otherwise<br>6.0 Zamboni storage room |
| Mechanical Mezzanine | Floor Finishes + Partitions | 0.5 | 3.6 Equipment areas and service rooms |
| | Mech. and Elec. | 0.5 | |

* Snow accumulation loads will be considered where there are non-uniform elevations with the procedure outlined in the 2020 National Building Code for multi-level roofs.

*Table 3: Concentrated Loads*

| **Level and Location** | **Concentrated Live Load (kN)** | **Loaded Area (mm)** |
|---|---|---|
| Main Floor Ice Re-surfacer Loading | 36 | 120x120 |

*Table 4: Snow and Rain Load Criteria*

| Parameter | Value |
|---|---|
| Snow Load (1/50yr), $S_S$ | 2.9 |
| Rain Load (1/50yr), $S_r$ | 0.1 |
| Basic Snow (kPa), S | 2.85 |
| 15 Minute Rain | 10 |
| One Day Rain (1/50yr) | 49 |

### 5.3.3 Lateral Loading

*Table 5: Wind Design Criteria*

| Parameter | Value |
|---|---|
| Reference Hourly Wind Pressure (1/10yr) | 0.22 |
| Reference Hourly Wind Pressure (1/50yr) | 0.31 |
| Exposure Class | Open Terrain |
| Enclosure Classification | Enclosed |
| Internal Pressure Coefficient, $C_{pi}$ | Category 1: -0.15 to 0.0 |

*Table 6: Seismic Design Criteria*

| Parameter | Value |
|---|---|
| Seismic Category | SC4 |
| Site Class | C |
| Lateral Systems | Conventional Construction<br>Braced Frames (Pre-Eng building) |
| Mapped Spectral Acceleration Parameters | $S_a(0.2) = 0.622$ |
| | $S_a(0.5) = 0.505$ |
| | $S_a(1.0) = 0.305$ |
| | $S_a(2.0) = 0.183$ |
| | $S_a(5.0) = 0.0716$ |
| | $S_a(10.0) = 0.0414$ |
| Peak ground Acceleration (PGA) | 0.259 |
| Peak Ground Velocity (PGV) | 0.314 |

### 5.3.4 Deflection Criteria

#### 5.3.4.1 Vertical Deflection

All typical framing elements will be designed for a maximum dead load deflection of L/240 and a maximum total deflection of L/360, where L is the span length of the member.

#### 5.3.4.2 Lateral Deflection

The pre-engineered metal building will be designed for a maximum lateral deflection of H/500, where H is the height of the building.

# 5.4 Building Systems

## 5.4.1 Building Materials

| | |
|---|---|
| Concrete spread footings, strip footings, foundation walls, and slab on grade | f'c = 35 MPa (28-day strength)<br>Exposure class F2 |
| Primary built-up steel rib members | Fy = 355 MPa (ASTM A572M) |
| Secondary purlins (C/Z shape) | Fy= 230 MPa – 400 MPa |
| Bolts | ASTM A325M or ASTM A490M |
| Anchor rods | ASTM F1554M Grade 36 |
| Concrete reinforcing | CAN/CSA-G30.18R Grade 400 |

## 5.4.2 Building Foundation

### 5.4.2.1 Site Preparation

The foundation system will be based on the recommendations provided in the geotechnical report prepared by Tetra Tech Canada Inc. titled *Detailed Geotechnical Evaluation, Proposed Recreation Site near the Bottom of Dome Road, Dawson City, Yukon,* dated March 3rd, 2021. The report recommends excavating all loose, soft, disturbed, or otherwise unsuitable material down to an elevation of 1.5 meters above the groundwater table, located around 6 meters below grade, and replacing the volume with engineered fill. Due to the proximity to the Klondike River, the building site will be raised an additional 4 meters above the current grade. As a result, groundwater is not expected to impact the building foundations. Additionally, because the engineered fill will consist of gravel tailings that are not susceptible to frost and because the groundwater will not be in contact with the structure, seasonal frost protection is not required.

### 5.4.2.2 Concrete Foundations

The pre-engineered metal building will be supported by a concrete foundation. The steel columns will be supported by concrete spread footings that are approximately 2.5m x 2.5m on plan and 0.6m thick. The metal building cladding will be supported at level 1 by a 200mm thick concrete foundation wall on a 0.4m wide x 0.205m thick strip footing. Following the recommendations in the geotechnical report, the footings will extend 1.0m below the finish grade.

The first level of the building will be a 100mm slab on grade in the non-rink areas. The slab areas under the ice rink and curling sheets will be a 150mm thick refrigerated concrete slab on top of two layers of

rigid insulation and a 250-400 mm thick sand layer. The sand layer will contain heated piping to protect the ground below from freezing and damaging the ice rink slab.

### 5.4.3 Superstructure

The framing system will be a pre-engineered steel frame with tapered built-up rib beams and columns. Secondary purlin members will be cold formed C and/or Z shapes and will support the insulated metal roof and cladding panels. The frames will be designed by the supplier through performance verification and prefabricated in factory before being transported to site.

### 5.4.4 Structural Quantities

The following concrete reinforcing quantities may be used to estimate the total tonnage of reinforcing required for the concrete foundations.

| | |
|---|---|
| Refrigerated concrete slab on grade | 12 kg/m$^2$ |
| Typical concrete slab on grade | 5 kg/m$^2$ |
| Concrete spread footings | 60 kg/m$^3$ |
| Concrete strip footings | 32 kg/m$^3$ |
| Concrete foundation walls | 60 kg/m$^3$ |
| Retaining walls | 90 kg/m$^3$ |

# 6 Mechanical Systems

## 6.1 General Mechanical Summary

The Mechanical systems will provide a comfortable and safe environment for the building occupants and meet the diverse process and program requirements while being robust, reliable, easily maintainable and efficient. The systems will provide a prudent blend of life cycle initial capital, operating and maintenance costs and will be simple in design, easy to maintain and repair, and incorporate equipment redundancy.

Mechanical systems will include plumbing, fire protection and HVAC. Plumbing will be from the municipal services with combined potable and fire water main, water recirculation, and sanitary sewer. Domestic hot water will be from an energy efficient direct-fired domestic hot water heating system with pre-heat from the ice plant heat recovery system.

Mechanical fire protection will encompass passive protection systems that include rated fire stopping and fire dampers plus active systems using handheld fire extinguishers and an automatic sprinkler system.

Heating to the center will be by a central propane fired heating plant. Heating and ventilation will be through a decoupled air/water system with terminal space heating, central ventilation systems with heat recovery and economizer cooling.

The refrigeration system for the ice arena and the curling rink will be a purpose-built ammonia refrigeration arena ice plant. The system will be capable of capturing waste heat to support processes related to the ice plant as well as building heating and ventilation. The plant will be installed in a dedicated mechanical room with the safety systems required for a class T machine room.

The ice arena and curling rink floors will be served by a buried header system with loops in the chilled slab at 100mm on centre. A separate header and pump will be provided for each of the chilled slabs. A warm floor system will be installed below the ice floors, to prevent the build up of permafrost and damage to the building structure, with piping at 300mm on centre.

## 6.2 Codes and Standards

### 6.2.1 Building Codes

Mechanical systems will be in general conformity with ASHRAE standards and norms for similar facilities, the Government of Yukon Technical Design Standards latest edition, and to the requirements of the latest addition and applicable amendments of the National Building Code of Canada including but not necessarily limited to:

- National Building Code of Canada (2020);
- National Fire Code of Canada (2020);

- National Plumbing Code of Canada (2020);
- National Energy Code for Buildings (2020);
- NFPA 13, Installation of Sprinkler Systems;
- NFPA 10, Portable Fire Extinguishers;
- NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilation Systems;
- CAN/CSA-B64.10-21, Manual for the Selection, Installation, Maintenance, and Field Testing of Backflow Prevention Devices;
- CAN/CSA-B52-18, Mechanical Refrigeration Code;
- CAN/CSA B139-19, Installation Code for Oil Burning Equipment;
- National Sanitation Foundation (NFS) International Standard 50;
- Government of Yukon 2022 Design Requirements and Technical Standards;
- Applicable CSA standards;
- Applicable ASHRAE standards;
- Applicable ASPE standards; and
- Applicable SMACNA Design and Construction Guidelines

Design conditions for the new recreation centre will be based on National Building Code of Canada statistical 1% winter and 2.5% summer norms and ASHRAE 2015 HVAC Applications.

## 6.3 Plumbing

### 6.3.1 Services

Water services will be through a single point connection into the Recreation Centre from the Municipal main running parallel with the Klondike Highway. The water will enter the facility in the fire pump room where duplex circulators will provide continuous circulation back to the main. The water meter, reduced pressure backflow preventer, and domestic water pressure booster pumps will also be located in this room.

The Recreation Centre's water service will be a combined fire and potable water service. Information provided by the client indicates that a 200dia water main is located immediately southwest of the proposed site along the Klondike Highway. The hydrant flow results provided by the City of Dawson Public Works Manager indicates that the main is adequate to provide the required capacity to the new recreation center through a new 200dia connection. This main size is preliminary and will be adjusted as needed as design progresses. This will have to be confirmed prior to completion of detailed design by completing a Fire Flow test as per the requirements of NFPA 291 "Recommended Practice for Water Flow Testing and Marking of Hydrants".

Firewater will be by connection to the 200mmdia combined service. Suitable hydraulic flow is expected; however, suitable pressure is not expected to be available from the municipal system and as a result a fire pump will be required. This will be verified during development of more detailed design through hydraulic testing, once the water hydrant flow test has been received.

Firewater will be distributed to the building through a fire water main. The fire water main will have a double check valve assembly, central backflow preventer. A fire department connection, capable of supplying into the fire water main, will be installed at the mechanical fire pump room.

For exposure fire suppression, a water hydrant is required within the required 45m distance to the Main Building fire department connection, this could be achieved by the hydrant at the dome road, depending on the final building site plan.

Potable water will also be supplied from the combined water service. In a manner similar to the firewater, potable water will be distributed to the main building through a DCW main.

Sanitary drainage will be by gravity from the Recreation Centre to the Municipal C4 lift station across the highway. Refer to Civil section 8.1.3.

A duplex lift station with high level alarm will be installed for the ice pit in the Ice Re-surfacer room. The drain from these pumps will run by gravity to the building main.

The building sanitary drain preliminary size will be 150mm.

### 6.3.2 Storm Water

Site drainage and site storm water systems are not included in the mechanical scope of work. Refer to Civil section 8.1.4.

### 6.3.3 Sanitary and Plumbing Systems

All plumbing and drainage systems will be designed to the requirements of the National Plumbing Code and applicable ASPE, NSF and ASHRAE standards.

Sanitary services will be through the buried municipal water and sanitary systems.

Potable water will be from the new common firewater/domestic main connecting at a single utility revenue metering point in the Recreation Centre Fire Pump room. The potable water will be distributed to the building through a DCW main.

Means of providing water softening may be required. End user reports indicate other facilities in the community have had pipe and equipment premature failure due to water quality issues. Preliminarily duplex water softeners with resin based media and automatic backwash will be included.

Domestic hot water will be through a distributed system with direct fired hot water heaters in the mechanical room. The domestic hot water heating will be by duplex direct fired storage heaters. The minimum storage and recovery capacities of the heaters will be suitable so that each heater can meet 67% of the peak DHW demand, providing backup on the heaters for normal operation. This approach was selected so that domestic hot water can be provided during summer months while the heating plant is shut down. The preliminary peak hot water demand was calculated to be 1318 L/Hr plus 337L/Hr (for ice resurfacer fill) for a total of 1655L/Hr. The basis of design for equipment would be two AO Smith commercial gas hot water heater (MXI BTH-250(A).)

The domestic cold water to the storage heaters will be pre-heated using waste heat from the ice plant through a flat plate heat exchanger.

The domestic hot water system will distribute service water at a single temperature of 70°C. This operating temperature will ensure protection of the system from L. pneumophila bacteria that can colonize in DHW systems that operate at 46°C or lower, and when inhaled cause Legionnaires disease.

To provide scald guard protection for the 70°C hot water distribution, all fixtures will be provided with scald guard mixing faucets or local temperature and pressure compensating mixing valves that will ensure maximum water temperatures at the fixtures of 43°C. This system will provide best practice for both safety and infection control.

Re-circulation will be provided on the DHW heating systems in the building to ensure DHW on demand. A recirculation pump will be provided.

Plumbing fixtures in the building will be ultra-low water consumption.

Water closets will be vitreous china with hardwired and battery backup non-touch metered flush valves. Water closets will be HET 4.8L flush. All flush valve water closets will be required to achieve a MaP Testing Program rating of 1000 and will be vitreous china, elongated bowl.

For all lavatories, hard wired infrared activated faucets with battery back-up will be used to provide a high level of hygiene. They will be stainless steel with offset P-traps and open grid strainers.

DW piping will be rigid copper piping with sweat or grooved fittings or as noted. DW piping will be sized at a maximum 2.0m/s for cold water and 1.2m/s for all hot water piping. All distribution piping will be insulated to the requirements of ASHRAE 90.1-2022, Energy Standard for Buildings Except Low-Rise Residential Buildings and the Canadian National Energy Code for Buildings-2020.

All piping 50mm and smaller can be PEX except that none of this piping will be exposed to the public.

Plastic, squeeze-type eyewash stations will be provided in remote local areas including the janitor’s room, the kitchen, the boiler room, and the ice plant room.

Floor drains will be provided based on program requirements and will be with trap guards.

Funnel floor drains will be supplied in the ventilation room, boiler room, and the ice plant room and will also have trap guards.

Sanitary drainage will be by gravity. For sanitary service, a minimum slope of 1:100 will be maintained for all drainage piping below the floor. Sanitary drainage piping will be fire rated PVC suitable for use in combustible building construction. All cleanouts will be serviced through the floor or from a wall above the floor.

A grease trap will be provided in the kitchen.

For the drain from the ice pit a lift station will be necessary, located in the Ice Re-surfacer Room. The lift station will be a packaged drainage system with duplex pumps, control, and a high-level alarm.

A non-freeze wall hydrant in the Ice Re-Surfacer room will be provided to supply hot water to the Ice-Re-Surfacer.

## 6.4 Fire Protection Systems

Passive and active fire protection systems will be provided.

Fire extinguishers will be provided to the requirements of NFPA 10 and the Authority Having Jurisdiction. General use fire extinguishers will be dry chemical Type ABC. Kitchen extinguishers where grease fires may occur will be Type K. Electrical and equipment room extinguishers will be clean agent. All extinguishers in general access and public areas will be in semi-recessed or fully recessed cabinets. Extinguishers in service areas and technical spaces will be hanger mounted.

Firewater for the Recreation Centre will be by connection to the 200mm dia combined main in the Fire pump room. Based on the hydrant flow information provided by the client suitable hydraulic flow and pressure are not expected to be available from the municipal system and as a result a fire pump is required. The fire water main will be with a central backflow preventer located in the service entrance room.

A diesel fired fire pump has been selected as the preliminary basis of design. The advantages of a diesel pump are its ability to operate independently of the electrical grid and is therefore still effective if there is a power outage. Diesel pumps are designed for robust working conditions and are long-lasting. An electrical pump option was considered but this would result in also needing an emergency generator to be installed on site as well. This designation comes with higher operation and maintenance requirements. The basis of design preliminary selection is an Armstrong 6x5 LY-F with a design flow of 750 USGPM.

The building will be fully sprinklered with a wet pipe sprinkler system in fully heated areas, and a dry sprinkler system in the arena areas with low heat, all to the requirements of NFPA 13 and the Authority Having Jurisdiction. NFPA 13 requires freeze protection in areas below 4ºC. Therefore, strictly speaking, we do not require a dry system for the arena areas. But with the concern of power outages causing the heating to fail for periods of time, a dry sprinkler system is recommended in these areas. Freeze protected sprinklers in the form of dry heads will be included as necessary in vestibules, etc.

General building Hazard Classification is evaluated at Light Hazard except Ordinary Group 1and 2 for the following locations:

- NFPA 13 Ordinary Group 1 Hazard Areas:
  - » Mechanical Rooms;
  - » Mechanical Mezzanine;
  - » Kitchen Service Area; and
  - » Locations of obstructed construction.
- NFPA 13 Ordinary Group 2 Hazard Areas:
  - » Storage Rooms;
  - » Janitor Rooms;

A Fire department connection for firewater will be provided at the mechanical/fire pump room allowing supply of firewater from the responding department independent to the condition of the fire water main.

All sprinklers in the Kitchen will be fully recessed. Sprinklers elsewhere in the Recreation Centre will be a combination of semi recessed and exposed pendent and upright. All sprinklers will be quick Response.

A wet chemical hood suppression system to the requirements of NFPA 96 will be provided to the main kitchen grease ventilation hood and will be provided by the kitchen equipment supplier.

A standpipe system is not required.

## 6.5 Fuel Systems

The fuel source will be Propane. It is available in quantity in the community with regular delivery schedules. Main propane storage will be exterior to the building to minimize construction costs with the fuel transfer being assisted through the use of electric battery blankets and/or a vaporizer if necessary.

In addition, the heating plant will be augmented by heat recovery from the Arena ice plant. The recovered heat from the ice plant will be used for the reheat coils for the air handling units serving the building. It will also be used for preheating the domestic hot water, and melting ice in the ice pit.

The main components of the propane supply system will consist of the main storage tanks, vaporizer, battery blankets, and two stage pressure reducing regulators. All propane equipment will be ULC listed and CSA certified and installed to the requirements of the National Fire Code of Canada and CAN/CSA-B149- Natural Gas and Propane Installation Code.

The main propane tanks will be above grade horizontal cylinder type.

The fuel tanks basis of design is two 5,000 USG horizontal cylindrical tanks. This has been based on the boilers operating at design conditions, with no heat recovery from the ice plant, for a total of 14 days. Since these conditions should not occur, especially simultaneously, it is expected that under normal

conditions this oil tank should be sufficient for longer than 14 days of operation. There will be an alarm on the tank to warn of a low oil level.

The kitchen appliances will be gas-fired.

The fire pump will be diesel fired.

## 6.6 Heating Systems

Building heating will be through a hydronic heating system

A central heating plant is planned to be able to provide all the necessary hydronic heating for the Recreation Centre through propane fired boilers. Also waste heat from the ice plant will be used to reheat the fresh air for the air handling units and as a preheat source for the domestic hot water system. In this way, it may be capable of providing heat required for a peak demand scenario for all ventilation and domestic water demands, depending upon how much heat is available from the ice plant.

The heat from the ice plant will be the primary heat source with heat from the boilers providing back-up as required. As noted previously, waste heat from the ice plant will be used to preheat the domestic cold water supply to the domestic hot water heaters.

Heating plant sizing will be as per the Yukon Government Technical Design Standards for a Category 1 Building. That is 3 boilers each sized at 50% of design load for a total capacity of 150% under design conditions. This will ensure that in the event of failure of one boiler, the Recreation Centre will be able to maintain full functionality.

Preliminary total peak design operating load for the recreation center is 815 kW. Therefore, the minimum required boiler size is 50% x 815 = 408 kW. When this is derated for using glycol, the minimum required boiler capacity is 449 kW.

The fuel oil heating boilers will be high efficiency condensing stainless steel vertical tube boilers (propane fired – up to 96% efficient) such as the Weil-McLain SVF boilers. A Weil-McLain boiler model SVF2000 has been selected as a preliminary basis of design with a net heating capacity of 490 kW and a 10:1 turndown ratio.

The heating plant will be configured primary/secondary to allow decoupling of the primary heating system from the secondary distribution to the buildings.  The primary secondary configuration will reduce standby losses in the primary heating.  Each boiler will be provided with an individual primary injection pump. system decoupling will ensure that the Yukon Government technical design standard guidelines are adhered to, and glycol is not used in the boilers directly. This will also ensure the secondary network will not be susceptible to freezing.

The secondary pumps for the building heating will be sized 2N to provide backup and will be with variable speed drives to reduce energy use.

The heating system media will be burst protected using a propylene glycol solution. High film temperature inhibited propylene glycol; Dowfrost HD at 50% glycol - 50% water will be used and supplied through a packaged open pressure fill system with gear pressure pump.

Space heating for the office and similar interior areas will be through radiant ceiling panels and baseboard radiators. In addition, radiant ceiling panels will be used for change rooms, washrooms, shower rooms and other interior areas. Overhead, hung, radiant panels will also be used to heat the bleacher area.

Netting will be provided to prevent debris from being thrown on the units. High recovery unit heaters and cabinet unit heaters will be provided to heat the mechanical rooms, the ice re-surfacer room, ice plant room, rink space, curling space, gym, fitness areas, and the vestibules respectively. Baseboard radiation will be used in the Janitors/Mechanical room.

Heat tracing will be installed in the ice pit for melting frozen material that is dumped there. This unit will be heated from the waste heat from the ice plant.

Heating piping will be steel with welded and threaded joints and insulated throughout to meet the requirements of ASHRAE 90.1--2022, Energy Standard for Buildings Except Low-Rise Residential Buildings and the Canadian National Energy Code for Buildings-2020. Copper will be used to connect to radiant heating panels and baseboard radiation. PEX will be used for the hydronic heat trace. In general, reverse return heating piping will be used.

There will be a chimney and combustion air intakes for each boiler will be run as per the manufacturer's recommendations and all applicable codes and standards.

## 6.7 Ventilation Systems

Ventilation to the recreation centre will be through multiple air handling units supplemented by service systems in the Mechanical Rooms, Electrical Room, and Ice-Resurfacer Room. The main air handling units preliminary descriptions are as follows:

| Tag | Area Served | Preliminary Capacity (L/s) | Supply Air Temperature(ºC) | Air Handling Unit Type | Preliminary Mounting Location |
|---|---|---|---|---|---|
| AHU-1.1 | Curling Lanes | 762 | 12 | 100% Outdoor Air Dual Core ERV | Mechanical Mezzanine |
| AHU-1.2 | Hockey Rink | 2098 | 12 | 100% Outdoor Air Dual Core ERV | Mechanical Mezzanine |
| AHU-1.3 | Interior Spaces | 2140 | 21 | 100% Outdoor Air Dual Core ERV | Mechanical Mezzanine |
| AHU-1.4 | Fitness Room | 342 | 21 | 100% Outdoor Air Dual Core ERV | Fitness Area Ceiling Space |

| | | | | | |
|---|---|---|---|---|---|
| MUA-1.1 | Kitchen | 1881 | 21 | Kitchen Make Up Air | Mechanical Mezzanine or Above kitchen space |

AHU-1.1 and AHU-1.2 will provide ventilation to the curling lanes and ice rink, respectively. The systems will be 100% outdoor air dual core heat recovery units. The systems will supply minimum 12 ºC air when occupied and minimum 5 ºC air when unoccupied, as controlled by NOx, humidity, and CO2 levels. AHU-1.3 and AHU-1.4 will supply air to the interior spaces and fitness center at a temperature of 21ºC.

These units will also use waste heat from the ice plant to reheat supply air. The systems will use fixed outdoor air intake/outlet equipment. The air handling unit configuration will be as follows: the intakes will be fitted with removable particulate filters (MERV 7) upstream of a hydronic pre-heat coil. The pre-heat coil will ensure that during extreme low temperature events that the equipment never takes in air at a lower temperature than the minimum low temperature ratings that the units are tested to operate in. Each unit will be fitted with a cartridge filter (MERV 13) and two reheat coils. The first coil will use recovered waste heat from the refrigeration plant and the second will be served by the hydronic system. This way the units will always prioritize using waste heat to heat incoming fresh air.

Supply air from each unit will be distributed through low velocity ductwork (in the cold spaces) and medium velocity ductwork to the other spaces. Air will be returned in common spaces in the rink and curling lane spaces, and returned through washrooms and changerooms for the interior spaces and fitness center space.

The storage rooms, janitor rooms, and skate sharpening room will have dedicated exhaust fans and make up air will be transferred to the space from adjacent spaces through transfer grilles.

The Elec/Comms room and mechanical rooms will have dedicated cooling fans. Each of these will be paired with intake ducts complete with a return air grill pulling air from the space. Two motorized dampers will modulate to ensure the make up air will be tempered to cool the space but avoid freezing the area adjacent to the air inlet.

All systems will be installed so that service accessing is available.

Fire dampers will be installed in keeping with architectural fire walls.

The kitchen range hood will have a cyclonic grease filter. The range hood will be connected to a ULC/NFPA listed inline exhaust fan. All duct work for the range hood will be welded steel, insulated, and installed to the requirements of NFPA 96 and insulated for full length using a UL/FM rated 2hr duct wrap. The kitchen exhaust system will be complete with a VFD and comprehensive sensor system so that kitchen exhaust air increases only as much as necessary during kitchen operations so that costs of air reheating are minimized. This system will be interlocked with a dedicated make up air unit and hydronic heating coil that will provide tempered make up air to the kitchen space while the exhaust fan is operating.

## 6.8 Dehumidification Systems

There will be two packaged ice rink defoggers by RefPlus or equal to control the humidity levels in the rink space and two in the curling lanes. Usage of these units will be minimized by also using fresh air from AHU-1.2 and AHU-1.2.

## 6.9 Ice Plant Summary

Refrigeration system serving the ice arena and curling floor will be an 80-ton ammonia refrigerant system. The plant will consist of two (2) screw compressors, two (2) direct expansion (DX) plate and frame chillers one serving the ice arena and one the curling floor, two (2) cold floor pumps one for each ice slab, two (2) warm floor pumps one per ice rink, a condenser heat exchanger for heat rejection, a glycol pump for the condenser fluid, oil and compressor cooling pump, snow melt heat recovery pump, and an adiabatic cooler for heat rejection when the heat cannot be accommodated by the building. The system will also be provided with an ammonia dispersal water tank with minimum of one gallon water per pound of refrigerant minimum or as per code which ever is greater. The building system will tie into the heat rejection glycol system and provide waste heat to the building.

The plant will be served by a dedicated motor control center (MCC) supplied by the refrigeration contractor. The MCC will be supplied from the building electrical service with an approximately 600-amp service. Control of the refrigeration plant will be by means of a stand-alone control system also provided by the refrigeration contractor. Monitoring of the refrigeration plant will be provided to the facility BMS system.

The refrigeration system will be mounted in a dedicated plant room that will be constructed to the requirements of CSA B52 class T machine rooms. The room will be continuously ventilated by a mechanical ventilation system to maintain space conditions as per the refrigeration code. Emergency ventilation will be provided to the space to evacuate the air in the case of a refrigerant leak as per the CSA B52 code standards. A refrigeration detection system will be provided for the refrigerant mechanical room that will provide alarming at the access points along with visual and audible alerts. Evacuation overrides and other ice plant emergency controls will be provided in the vestibule accessing the mechanical refrigeration plant room.

Chilled brine will be circulated from the mechanical refrigeration plant room to the refrigerated slabs by means of a buried header system. A separate header will be provided for each of the refrigerated slabs, the headers will be HDPE piping with HDPE piping loops attached to the header by means of fusion welds. The piping loops in the refrigerated slabs will be 100mm on center and 25mm diameter. Below the chilled slabs will be a warm floor to prevent permafrost forming below the slab and causing damage to the arena structure. The warm floors will also be served by a HDPE header system with HDPE pipe loops. In the case of the heating system the piping will be 300mm on center and 25mm diameter, the piping and headers will be connected by means of fusion welds.

# 6.10 Controls

A complete automatic control and alarm system will be provided for all mechanical systems. Control will be from the latest generation of web browser based Building Management System (BMS).

The system will use BACnet open protocol communications making it suitable for interface to any third party vendor equipment controls. The system design is to have a fail-safe design to ensure continued system operation regardless of the BMS status using manufacturer proprietary controllers wherever possible with the BMS used for initiating control and monitoring only.

Controllers will be capable of standalone operation and will communicate using BACnet IP for communications over a peerless network. Located on the LAN shall be a web server that will operate both as the system server and as a web based Internet server that will allow control functions, report functions, all data base generation and modification functions as described for typical BMS work-stations to be completed via the Internet from any remote site with Internet access.

Control for packaged equipment will be through the unit manufacturer supplied and programmed PCU's (programmable control units). For all equipment, open protocol BACnet IP communications is to be provided between the PCU's and the BMS.

For on-site diagnostics and control, a workstation interface will be connected to the BMS. After hours monitoring and alarm system trouble is to be reported through SMS message or email connections to smart phones to allow communications to maintenance personnel for critical system trouble, i.e. heating system failure. The BMS shall also allow remote monitoring and control of the buildings through Internet based communications. As a requirement of the project closeout, it will be necessary for the BMS contractor to provide successful communications from the site using the Internet based communications.

Air handling unit control will include supply air temperature reset, fan speed control, economizer cooling, energy recovery control and full status and alarm. Terminal unit control on the air systems will include space temperature and occupied/unoccupied set back.

Heating plant control will include boiler staging and water temperature reset. Heating pump control will include automatic pump sequencing and pump speed control to provide improved energy efficiency and equipment life cycle.

Heating terminal unit control will be proportional, with the exception of cabinet and unit heaters. All terminal unit control will be resident on the BMS and include night set back and after hours override temperature control. Local control of all thermostats by staff in non-public areas will be included. Temperature control in public areas will be through the BMS.

Critical alarms will be reported through the BMS using digital pager or email connections. In addition connection to auto dialers, where supplied by electrical will also be included for critical alarms.

# 7 Electrical Systems

## 7.1 General Electrical Requirements

Electrical systems shall be in compliance with the current edition of the Canadian Electrical Code and requirements of the Local Authorities Having Jurisdiction. Minimum wire size will be #12. Minimum conduit size will be 21mm. Panels will be identified with laminated phenolic nameplates.

Arc flash labelling will be provided on all electrical equipment required in accordance with CEC and CSA Z462. All electrical materials specified will be ULC listed, or CSA approved for the application.

## 7.2 Electrical Service & Power Distribution

### 7.2.1 Normal Power

Utility coordination will follow in future phases. It is expected that he hydro overhead lines will be pole mounted along the south portion of the site and come on to the property to a dip pole along the south east corner of the facility near the back of house area. Utility transformer will be on a concrete pad about 3m from the building exterior. The incoming electrical service will be 1200A, 347/600V, 3-phase, 4-wire, which will fed underground to the main distribution panel (MDP). Provisions will be made for YEC representative to access YEC meter. Final location of out-door utility transformer and service routing will be further coordinated with YEC as the design progresses.

The electrical main distribution (MDP-1) will be located in the main electrical room. MDP-1 will contain wire way for incoming utility service, main circuit breaker for the facility, CT/PT section for hydro metering and feeder breaker section(s) as needed. MDP-1 will feed mechanical loads, ice plant(s) and step-transformer (s) serving the 120/208V panels. Mechanical equipment will be fed from a separate system from the remainder of the building. Ample panelboards will be provided to pick up both 600V and 120/208V equipment off of the mechanical distribution. Key distribution units will be equipped with surge suppression devices. Allowance for active harmonic filter (AHF) will be made on the mechanical distribution. Efforts will be made to select mechanical equipment with passive filters to mitigate negative effect of harmonics on the system.

Power and lighting will be served out of 120/208V panels. The minimum breaker size for these panels will be 100A-3P. Panel feeder breaker size will be reviewed during detailed design. Minimum panelboard rating will be 225A, 42-circuit. Panelboards will be suitable for bolt-on breakers.

Convenience receptacles will be located throughout the facility to suit architectural layout. Power will be provided for all mechanical equipment.  Power will be provided for all specialty equipment, such as audio racks, scoreboard, etc.

A complete grounding system consisting of ground rods, buried copper conductors, and other components will be provided to meet the requirements of the Canadian Electrical Code and as suitable for the site conditions in Dawson City.

A complete bonding system will be provided throughout the facility to meet the requirements of the Canadian Electrical Code.

### 7.2.2 Stand-by Power

This building is not classified as a post-disaster building. All life safety systems will be on battery power source as permitted by CEC. Allowance for a standby power system including a stand-by generator will be made in the design. Generator size and associated distribution will be reviewed during detailed design.

## 7.3 Lighting

### 7.3.1 Interior Lighting

Luminaires will be selected to suit the architectural layout and space utilization. Illumination levels will follow IES guidelines. LED will be the primary type of light source used throughout.

Where suitable aircraft cable suspended, or ceiling recessed direct/indirect luminaires will be utilized in public areas and offices. Ceiling mounted direct luminaires will be used in service areas. Luminaires in change rooms and washrooms will be equipped to with more robust luminairs.

In the skating rink and curling area, luminaires will be high-bay type with an impact-resistant lens, attached to the underside of the roof structure. LED light engines will be high-CRI, 4000K. Final mounting will be reviewed during detailed design.

Lighting control in common areas, such as corridors, lobbies, and public washrooms will be low voltage switching and sensors with a master controller. Local switching will control lighting in individual rooms. Dimming controls will be provided for the rink lighting.

Unswitched night-lights will be provided in corridors and hallways.

### 7.3.2 Exterior Lighting

LED luminaires will be utilized for exterior lighting. Illumination levels will follow IES guidelines. All exterior luminaires to be cut-off type. Wall-mounted luminaires will be installed on building perimeter. Exterior lighting will be controlled by a time clock and photocell.

Greater site lighting of the parking lot is not included at this point. Electrical distribution will be designed to accommodate parking lot lighting in the future.

# 7.4 Life Safety Systems

## 7.4.1 Emergency Lighting & Exit Signage

DC battery banks and emergency luminaries will be provided throughout the facility to meet Building Code emergency illumination requirements.

Pictorial style (“running man”) exit signs complete with LED light modules will be provided at the designated means of egress as required by the National Building Code.

## 7.4.2 Fire Alarm System

A remote annunciator will be located at the main entrance to the arena. Automatic fire detectors will be provided to meet Building Code requirements. Manual pull stations will be installed at means of egress. Audible/visual alarm devices will be provided throughout the building to meet the required audibility levels. Fire alarm system shall supervise the sprinkler system via flow and tamper switches. The system will be equipped with an alarm communicator to a 24hr monitoring facility.

# 7.5 Voice/Data Communication Systems

New telecommunication lines will be supplied by NorthwesTel to the main communication backboard in the Elec/Comm room. The services will be delivered underground from existing utility underground vault or pole to the main communication backboard in the Main Elec/Comms. room. Allow for a minimum of 25-pair CAT3 24AWG copper cable from Telecom Demark to Small Elec/Comms room near Admin Office.

UPS to be supplied by Owner and installed by contractor. Power to the UPS will be designed to suite client UPS requirements.

A wall mounted rack will be provided in the small Elec/Comms room. The rack will be complete with a required number of Category 6 copper patch panel. Category 6 cables will be extended from the rack to each voice/data outlet. Single Category 6 cable will be provided for each voice only outlet location. Category 6 cables will be provided for each digital display, Voice/data outlets in offices and other areas where computer workstations are expected.

## 7.5.1 Wireless Networks

Single Category 6 cable will be provided for each Wireless access point (WAP) location along with a receptacle for the WAP device.

## 7.5.2 Public Address System

A system of speakers shall be provided throughout the facility to facilitate overhead announcements. The speakers shall be zoned according to functional areas of the floor.

The PA system will be interlocked with the building fire alarm system to interrupt audio programming during fire alarm.

### 7.5.3 Clock System

IP-connected clocks will be provided throughout the building at corridors and individual usage spaces. The central control unit will be located in the electrical room.

## 7.6 Security Systems

### 7.6.1 Intrusion Alarm

An intrusion alarm system will be provided throughout the building and will include a control keypad at main entrances, door contracts at all exterior doors and motion sensors near exterior doors., motion sensors in major corridors and hallways and near exterior doors, and interior and exterior sirens. The central control unit will be located in the electrical room.

### 7.6.2 Access Control

An electronic access control system will be provided based on to meet the facility security requirements and monitor all access points into the building. The system will be comprised of electronic door locks, card readers (swipe and proximity readers) and other associated equipment. All controlled access points will be electronically connected to a central monitoring system, so that access to and from areas can be both programmed and recorded. The system will be coordinated with door hardware selections for this project.

### 7.6.3 Video Surveillance

Provisions will be made for video surveillance system for future installation. Quantities and locations of devices will be coordinated during detail design.

# 8 Civil and Site Servicing

## 8.1 General Civil Requirements

The following sections summarizes the site grading, building siting constraints, site access and parking as well as nearby water, sanitary and stormwater infrastructure.

Key documents for the civil design include:

- Drawings: 1995 Water & Sewer Expansion Project. Callison Expansion – Phase 1 – Asbuilt. Prepared by Shiltec. Dated 6 February 1997.
- Report: City of Dawson Water Reservoir Replacement Study. Prepared by Associated Engineering. Dated July 2020.
- Report: The City of Dawson. Infrastructure Facility Assessment Report. Prepared by EarthTech. Dated March 2007.
- Report: Detailed Geotechnical Evaluation. Proposed Recreation Centre Site near Bottom of Dome Road. Prepared by Tetra Tech. Dated 3 March 2021.
- Report: Dome Road Wastewater Servicing Assessment. Feasibility Report. Prepared by Greenwood Engineering Solutions (GES). Dated 23 August 2023.
- Report: Klondike Highway Subdivision – Costing Update. Prepared by Stantec. Dated 12 January 2024.
- Guidelines: Ministry of Water, Land and Air Protection Province of British Columbia (MWLAPBC). 2004. Flood Hazard Area Land Use Management Guidelines. Amended by Ministry of Forests, Lands, Natural Resource Operations and Rural Development. January 1, 2018.
- Standards: National Standards of Canada, CSA S503:20. Community drainage planning, design and maintenance in northern communities. Dated March 2021.

### 8.1.1 Site Grading and Building Siting

The Dawson Recreation Center site (the Project Site) is situated on Parcel F of the proposed Klondike Highway Subdivision. This is an underdeveloped area at the Dome Road and Klondike Highway intersection across from Crocus Fields. Parcel F was historically used for mining and as a gravel pit; it is primarily clear of vegetation with some willows and shrubs around small tailings ponds. The parcel is generally flat with a gentle slope downwards towards the east.

Parcel D, south of Parcel F in the proposed Klondike Highway Subdivision, will be a future residential subdivision. Parcel D currently has active mining claims that need to be resolved prior to development, as well as same additional environmental investigations. Parcel D and F boundaries within the proposed Klondike Highway Subdivision are shown in Figure 6.

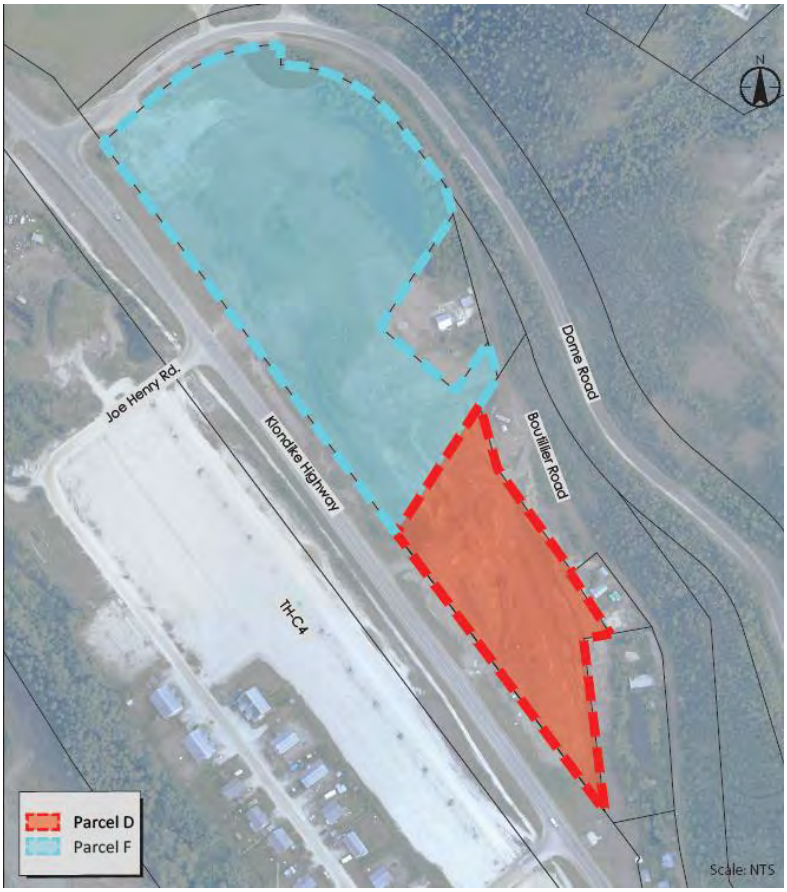



*Figure 6: Parcel D and F of the proposed Klondike Highway Subdivision*

The Project Site is located adjacent to the Klondike River and flood hazards should be considered in advancement of the design. A Flood Construction Level (FCL) should be used in detailed design in order to keep living spaces and areas used for storage of goods damageable by floodwater above flood levels (MWLAPBC 2018)

Typically, flood mapping and flood policy provide a FCL. Flood mapping is currently underway, expected to be completed by Fall 2025. The timeline for flood policy establishment in the Yukon is unknown. Therefore, a FCL was defined for the Project Site to evaluate the cost associated with land development for the site (Stantec, 2024). A 0.5 % annual exceedance probability (1:200-year) event was considered for the flood event with a freeboard height above the water surface elevation of 1.0 m. The 1:200-year event with the highest water surface elevation was an ice jam on the Klondike River of 323.5 m. This resulted in a recommended FCL of 324.5 m based on available information. There is the potential for the FCL level to be re-evaluated for the Project Site as flood maps are provided by the Dawson City & Klondike Valley Flood Mapping Study, currently underway via Government of Yukon, Department of Environment, Water Resources Branch.

#### 8.1.1.1 Regulatory

The following regulatory applications will be required prior to detailed design and construction of the Dawson Recreation Center:

- Yukon Environmental Socio-Economic Assessment Board (YESAB), Project Proposal Application and Approval
- Department of Fisheries and Oceans (DFO), Fisheries Act Authorization (FAA)
- Water License Amendment

The Project Proposal was submitted to YESAB based on the lotting configuration proposed in the Klondike Highway Master Plan. A Decision Document was issued on May 30th, 2024, with the following recommendation:

- YESAB: Prior to development, the Proponent shall come to an agreement with overlapping placer claim holders

  NEW Term: The Proponent shall notify holders of overlapping placer claims about the project schedule and make reasonable efforts to develop resolutions.

The Project Site plan has since changed since the Decision Document has been issued. As the new site excludes activities from the original proposal, such as not infilling Pond D-1, no further action should be required with YESAB..

A Fisheries Act Authorization application was submitted fall of 2023 but due to the lack of information surrounding the entire Project Site, including the outfall from the stormwater management pond to the Klondike River and the residential development, the application was not approved. As site details are confirmed, an updated application will be able to be submitted to DFO.

A Fisheries Act Authorization is required due to fish being found in Ponds D-1 and D-2 and habitat destruction required for Pond D-2. Pond D-2 will be infilled to accommodate the Dawson Recreation Center. The figure below demonstrates the location of the ponds referenced above.


*Figure 7: Tailings Pond Locations*

A draft Water License Amendment has been prepared based on the lotting configuration presented in the Klondike Highway Master Plan. The draft document will need to be updated based on the most current lotting configuration and submitted to the Yukon Water Board.

### 8.1.2 Water

The water distribution system in Dawson City is mainly buried and made up of insulated high-density polyurethan (HDPE) pipe, much of which was installed around 1980. The system is setup in six single-pipe recirculating loops. Heat addition is provided at the water treatment plant, while flows in the loops are controlled at the pumphouse and valve chamber located at Princess Street / 5$^{th}$ Avenue. The water treatment plant was recently upgraded, and new water reservoirs are currently under construction to meet the current and future populations of Dawson City.

The existing water system is fed by four groundwater wells along the Yukon River.

The current available capacity in the existing 200 mm diameter water main, constructed in 1995 along the Klondike Highway, is sufficient to provide domestic and fire protection requirements for the Recreation Centre.

An evaluation of the suitability of water supply for the building is provided in the Section 6.3 Plumbing.

### 8.1.3 Sanitary

The sanitary sewer system in Dawson City is mainly comprised of buried, insulated HDPE pipe, much of which was installed around 1980. Sanitary sewer pipes in the permafrost areas of town were replaced in 1993. Dawson City uses the so-called “superpipe” system for sanitary sewer mains, where a DR17 HDPE carrier pipe is insulated with urethane foams and installed inside of a steel culvert casing pipe. The purpose of this type of pipe is to prevent freezing and deal with permafrost. Sanitary sewage is currently being treated at the 5$^{th}$ Avenue Wastewater Treatment Plant (WWTP) in Dawson City. The seasonal fluctuations between low winter and high summer populations have been a challenge at the WWTP. The existing Dome Road Lift Station is currently being used a transfer station that received sewage from the baseball recreation area, Crocus Fields; sewage is then trucked from the lift station to the WWTP. Dome Road Lift Station will be properly decommissioned and demolished prior to the development of the Dawson Recreation Center. Collection of sewage from Crocus Fields will be considered under a separate project.

The selected option for sanitary servicing of the Klondike Highway Subdivision (KHS) is to utilize the existing C4 lift station to receive all the flows, including the Recreation Centre. Gravity sewer infrastructure would be constructed from the KHS to the existing gravity sewer on Joe Henry Road. In addition, there are also plans for additional residential buildings and a Training Center/Education Facility in the C4 subdivision that would contribute flows to the C4 Lift Station (GES, 2023).

The combined peak sanitary and infiltration flow estimate for the Recreation Centre is 2.3 L/s and for the Training Center/Education Facility is 2.0 L/s (GES, 2023). The combined peak sanitary, bleeder infiltration flow estimate for the KHS residential area (Parcel D/F) and full residential buildout of the C4 subdivision is 13.9 L/s (GES, 2023).

The existing operating conditions of the C4 lift station (GES, 2023):

- Capacity with one pump running: 10.8 L/s
- Capacity with two pumps running: 13.6 L/s
- Winter flows (100 – 120 $m^3$/day) 1.39 L/s
- Winter pump run time 2.3 hours/day
- Summer flows (65 – 80 $m^3$/day) 0.93 L/s
- Summer pump run time 1.0 hours/day

The highest flows expected at the C4 lift station based on existing flows and the addition of the Recreation Centre would be 3.7 L/s (~320 $m^3$/day) in winter, which would result in a pump run time of approximately 6.5 hours/day.

The highest flows expected at the C4 lift station based on KHS residential area (Parcel D/F), full residential buildout of the C4 subdivision, and the Recreation Centre would be 16.2 L/s (~1400 $m^3$/day), which would exceed the existing pump capacity of the C4 lift station.

Further discussions with stakeholders are required to determine the timelines for full buildout of the KHS residential area, C4 subdivision, and Training Center/Education Facility to determine the need for upgrades to the C4 lift station. However, considering the additional flows estimated from the Recreation Center do not exceed the capacity based on existing flows.

As per the Plumbing section, 6.3, water from the ice melt pit will be pumped into sanitary sewer for the building and may result in higher flows temporarily during pumping. Restriction of this flow rate or providing a surge manhole will be considered during detailed design.

## 8.1.4 Stormwater

### 8.1.4.1 Existing Conditions

The existing drainage characteristics shown in Figure 8 must consider the current conditions and future areas. The stormwater system in made up of multiple catchment areas with Parcels D/F being at the end of the system. Drainage north of Dome Road is generally in the south direction; however, surface runoff patterns are scattered, runoff is likely reduced, and peak flow rates are likely dampened by the depression storage and corresponding infiltration in the tailings piles and excavation pits of previous mine activities. Catchment 101 does not receive drainage from upstream areas. Drainage is eventually collected in a roadside ditch at the south end of catchment 101, on the east/north side of Dome Road. The ditch conveys runoff down the hill on the inside bend of the road, until one of four cross culverts convey them under Dome Road into either catchment 104 (for the farthest upstream culvert) or catchment 103 (for the downstream three culverts). Catchment 104 discharges to the Klondike River. To Stantec's knowledge, catchment 103 does not have an outlet to convey water across the Klondike Highway to the Klondike River, and instead accumulates water in depression storage areas adjacent to Boutillier Road. It is believed that water collected in the depression areas of catchment 103 either i) evaporates or ii) gradually infiltrates into the ground, travelling underneath the Klondike Highway via groundwater flow and eventually exfiltrating into the Klondike River.

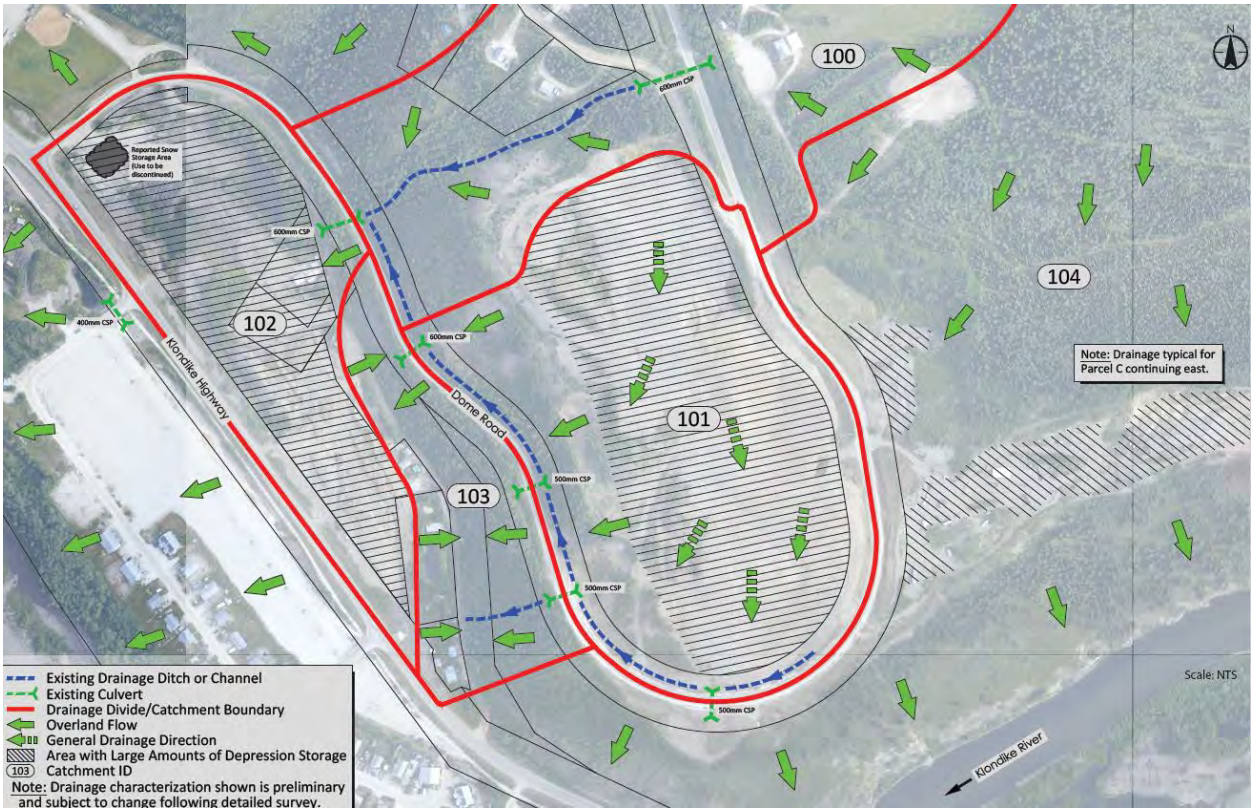



*Figure 8: Existing Stormwater Catchments*

Catchment 104 consists of distributed overland flow south with occasional concentration of flow into small channels along the steep Klondike River valley wall. The mining activities north of Dome Road have likely introduced areas of depression storage, although the attenuation or infiltration impacts of these depressions is likely to be minor considering the size of the catchment and steep gradients in upslope and downslope areas.

Parcel D/ F represents almost the entire area of catchment 102, which under existing conditions accepts upstream drainage from catchment 100 through a culvert beneath Dome Road. Dawson City uses the northwest corner of Parcel D/ F as a snow dump location throughout the winter. Parcel D/ F within catchment 102 does not have a consistent drainage direction; rather, water collects in depression storage areas scattered throughout the area such as tailings ponds. Catchment 102 does not appear to have an outlet which conveys water across the Klondike Highway to the Klondike River. Similar to catchment 103, the information available suggests that water collected in the depression storage areas of catchment 102 either i) evaporates or ii) gradually infiltrates into the ground, travelling underneath the Klondike Highway via groundwater flow and eventually exfiltrating into the Klondike River.

The existing lack of outlets and reliance on infiltration and groundwater flow for ultimate discharge to the Klondike River is a challenge for drainage planning and stormwater servicing conditions for the Project Site. The grading and land use change in these development blocks (decreased depression storage,

increased impervious cover) will likely decrease the infiltration volumes in the catchments, meaning peak flows uncontrolled) and runoff volumes will increase.

#### 8.1.4.2 Stormwater Management

Proposed drainage planning and stormwater management will follow the guidelines of the *Community drainage planning, design, and maintenance in northern communities* (CSA 2020) in addition to stormwater management best management practices used for residential developments in Canada. Some of these best management practices include matching of peak flow rates from existing vs. proposed conditions, matching runoff, and infiltration volumes through existing vs. proposed water balance analysis and performing erosion threshold analyses for receiving channels. The standards and best management practices listed above have been developed over time to reduce the risk of damage by developments to adjacent infrastructure, private property, and the natural environment. The standards and best management practices are applicable to the Project Site planning given that the lot grading and impervious cover increases are likely to increase runoff rates and volumes.

Therefore, proposed stormwater servicing will consider the following components in the engineering design for the development Parcels:

- General preservation of existing drainage boundaries and pathways
- General preservation of existing infiltration, evaporation, and runoff volumes
- Stormwater management facility (SWMF) sized to the major design event (to be determined)
- Improvements, repairs, or replacements at five of the existing culverts to satisfy proposed drainage requirements
- Lot drainage from back to front, sending runoff to the ditch network and ponds
- New ditches along one or both sides of the proposed roads (in accordance with CSA 2020) to convey drainage to stormwater ponds or receiving systems
- Culverts as required to connect ditches and ponds
- Creation (or adaptation) of a snow management plan whereby snow is removed from the development areas over the winter may help to decrease runoff rates and volumes, thereby reducing stress on the drainage and stormwater management infrastructure.

Parcel D/ F will utilize a ditch and culvert network to convey surface drainage from the developed area to a SWMF sized to the major design event in the center of the proposed Klondike Highway Subdivision. This facility is located in an existing tailings pond and will be enhanced to support the requirements of the developed area and open space amenities. The SWMF will attenuate peak flows however will not mitigate the increased runoff volumes from the development. A new culvert will be required beneath the Klondike Highway to convey the controlled runoff to the Klondike River system. Given the existing infiltration characteristics, infiltration galleries may be considered if feasible given lot/road layout and seasonal groundwater levels. A groundwater monitoring was completed at Parcel D/ F to gain a better understanding of seasonal groundwater levels, this has informed the feasibility and infiltration capacity of potential infiltration galleries. The current use of snow dump should be discontinued, and a snow

management strategy should be developed to reduce snow loading in the developed areas. Stormwater management of the Dawon Recreation Center parcel will be coordinated with proposed development of the Klondike Highway Subdivision.

### 8.1.5 Site Access

The Project Site is bounded by Dome Road to the north, Boutillier Road to the east, Klondike Highway to the west, and the new access road for the KHS to the south.

The main access to the Project Site will be from the Klondike Highway, perpendicular to the northern access to C4 Subdivision, via Joe Henry Road. Access to the site from Dome Road was considered not feasible due to grading constraints within the Project Site and proximity to the Klondike Highway intersection.

### 8.1.6 Parking

The requirements for parking at the Project Site, per the City of Dawson Zoning Bylaw 2018-19, are summarized under Section 3.3.2 Zoning .

Per the Zoning Bylaw, 533 parking stalls are required; the Project Site will not accommodate this number of stalls therefore a variance application will be required to lower the number of required stalls. The proposed site configuration allows for five accessible parking stalls and 110 standard parking stalls. There is potential to have overflow parking across Dome Road at Crocus Fields.

# 9 Energy Modeling

## 9.1 Energy Modeling Summary

**Energy Simulation Software:** IES VE 2023
**Reference Standard:** NECB 2020

The Dawson Recreation Center is a new recreational facility that is to be constructed in Dawson City, YT as described in the architectural section of this report.

Energy modelling was performed to determine the potential design solutions that would meet the project's building performance targets. The model is based on available drawings, specifications, and estimations as noted in the Assumptions Summary. The following table represents the current energy performance of the building:

**Dawson Recreation Center, energy modelling analysis results:**

| Item | Value |
|---|---|
| **Energy Savings Compared to NECB 2020 Reference Model (%)** | **23%** |
| **GHG Savings Compared to NECB 2020 Reference Model (%)** | **5%** |
| **TEUI (kWh/m$^2$/year)** | **352** |
| **TEDI (kWh/m$^2$/year)** | **292** |

Some of the key elements critical to improved energy performance of the design are listed below:

- Efficient envelope design (triple pane windows, highly insulted metal panels, on roof and walls);
- Low-temperature heating loops paired with condensing propane boilers;
- Ice plant condenser connected to hot water heating loop affecting heat recovery;
- Desiccant dehumidification system for ice and curling rinks;
- Dual core energy recovery (90% effective) for major air handling systems;
- Efficient lighting design.

The modelling reveals that the current design exceeds the NECB 2020 by 23%.

# 9.2 Introduction

Stantec has been contracted to perform an energy study for a Dawson Recreational Center located in Dawson, Yukon. This section report summarizes the energy model simulation results based on the concept design set.

## 9.2.1 Energy Performance Targets

A whole-building energy model is required to demonstrate compliance with the National Energy Code of Canada Building (NECB) 2020.

## 9.2.2 Energy Modelling Methodology

A whole-building compliance energy model is required to demonstrate energy performance improvement compared to the NECB 2020.

An energy model has been created in IESVE 2023 based on the initial architectural floor plans, mechanical design information provided and typical early-stage design assumptions. A variety of design measures (e.g. envelope, DHW, HVAC systems, HVAC plants) were taken into consideration. Model results are scaled appropriately (i.e. based on floor area, wall/roof/window area, number of floors, and occupancy) to represent the building design on site. The reference building was modelled to NECB 2020 Section 8.4.4 – Building Energy Target of the Reference Building. Given this is an early-stage analysis, the design is flexible to change as the project progresses.

## 9.2.3 Dawson Recreation Center - Description

The building includes an ice rink, a curling, a fitness room, a playing area, and other spaces type which all are listed in the table below.

*Table 7: The floor area of each space type*

| Space type | Floor Area($m^2$) |
|---|---|
| ICE Rink and Surrounding Area | 2240 |
| Curling and Surrounding Area | 671 |
| Fitness Room | 213 |
| Playing Area | 572 |
| Social Heart | 416 |
| Mechanical and Electrical | 302 |
| Kitchen | 90 |
| Team Room | 275 |
| Offices, Community Programming | 513 |
| Other Interior Spaces | 38 |
| Total | 5330 |

### 9.2.4 Inputs and assumptions

The detailed inputs for the energy model can be found in section 9.5 Model Inputs. A summary of key parameters is provided below.

*Table 8: Key Parameters for Proposed Design*

| Key Parameter | Dawson Recreation Center |
|---|---|
| Total Area | 5353 $m^2$ |
| Conditioning Setpoints | Surrounding ICE Rink and Curling:<br>12°C Heating<br>Storage, Janitor, Mechanical Room, etc: 18°C Heating<br><br>Fitness Room, Offices, and other interior spaces: Main 21°C Heating, Setback, 18°C Heating |
| Schedule | NECB B<br>Ice plant operation: mid-September - April |
| Roof Performance | $R_{eff}$-41 |
| Exterior Wall Performance | $R_{eff}$ 27.5 |
| Slab Performance | F 0.3, R 15 Full insulated ICE Rink and Curling, others F 0.65 R 7.5 1.2 m |
| Window Performance | R-4 (USI 1.4) |
| Door Performance | R-4 (USI 1.4) |
| Lighting Power Density | Average 5.75 $w/m^2$ |
| Boiler Efficiency | 90% |
| Ventilation Energy Recovery | 0.90 |
| Ventilation rate | ICE Rink: 2140 (l/s) |

| | |
|---|---|
| | Curling: 777 (l/s)<br>Fitness Room: 341 (l/s)<br>Interior Spaces: 3154 (l/s) |

*Table 9: Utility Rates and GHG Emissions Factor*

| | Electricity | Propane |
|---|---|---|
| **GHG Emissions Factor ($gCO_2e/kWh$)** | **80.00** | **32.60** |
| **Utility Rates ($/kWh)** | **0.13** | **0.16** |
| **Demand($/kW)** | **7.39** | **-** |

## 9.2.5 Software Tool

The energy models for the Dawson Recreational Center were completed using IES VE 2023, the most recent version of the Integrated Environmental Solutions energy modelling platform.

## 9.2.6 Building Rendering and Zoning Diagrams

### 9.2.6.1 Dawson Recreational Center

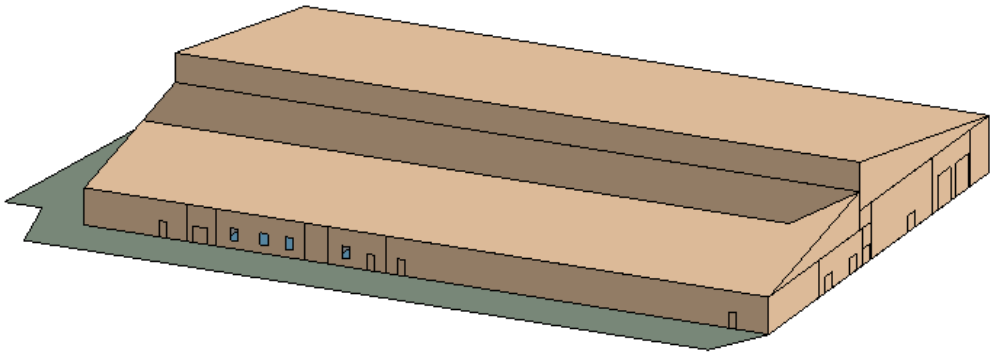


*Figure 9: Dawson Recreation Center Rendering*

- Model (39)
  - Maintenance
  - Zamboni
  - Mechanical
  - Emergency Exit
  - Electrical room
  - Storage
  - Team Room
  - Ref Change
  - Janitor
  - Kitchen
  - Storage Kitchen
  - Community Programming
  - Kitchen
  - Storage
  - Office
  - Equip/Sharpen
  - Fitness Room
  - Washroom
  - Washroom 2
  - Play Area
  - Storage
  - Storage Ice Rink
  - Multi Purpose Room
  - Corridor
  - Mechanical 2
  - Roof East 2
  - Mechanical 2
  - Roof west 2
  - Vestibule
  - Vestibule
  - Social Heart
  - Roof East
  - Roof West
  - ICE
  - ICE C
  - Surrounding ICE Rink
  - Surrounding Curling
  - ICE Ground
  - ICE Curling Ground

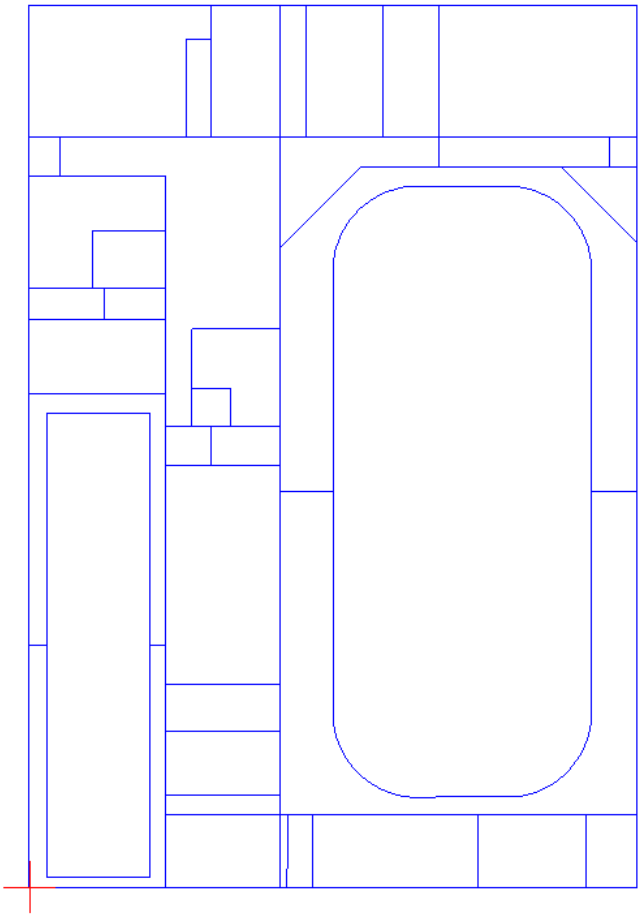


*Figure 10: Dawson Recreation Center Zoning*

## 9.3 Results

The below table summarizes the results of the reference building and proposed building energy models.

*Table 10: Dawson Recreation Center Energy Modeling Results Summary*

| Item | Value |
|---|---|
| **Energy Savings Compared to NECB 2020 Reference Model (%)** | **23%** |
| **GHG Savings Compared to NECB 2020 Reference Model (%)** | **5%** |
| **TEUI (kWh/m$^2$/year)** | **352** |
| **TEDI (kWh/m$^2$/year)** | **292** |

The proposed design achieves energy savings of 23% compared to the NECB 2020 and 5% GHG savings compared to NECB 2020.

### 9.3.1 Energy Use Breakdown

The following graphs and table summarize the energy use breakdown of the proposed design for the Dawson Recreational Center relative to the NECB 2020 reference building.

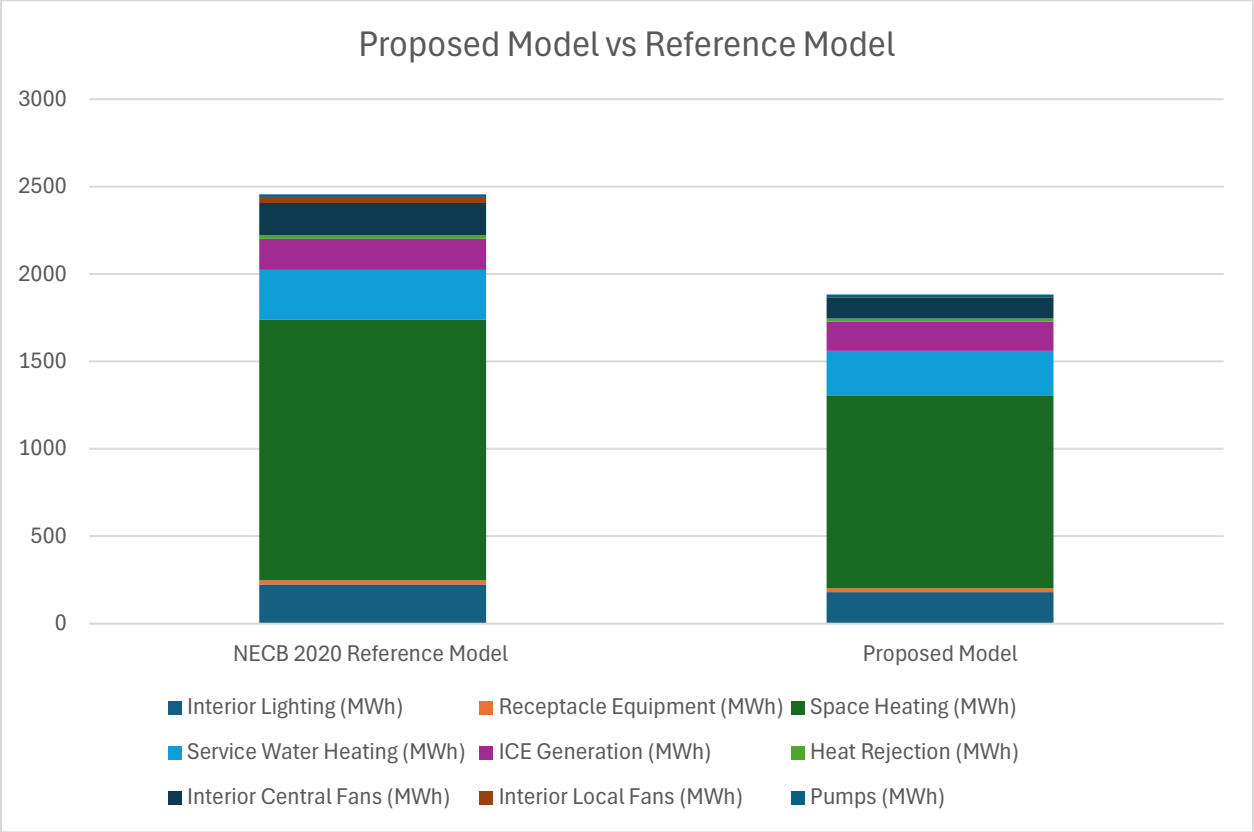



*Figure 11: Energy Use Breakdown*

*Table 11: Dawson Recreational Center Energy End Use Breakdown*

| Energy End Use Breakdown (MWh/yeah) | NECB 2020 Reference | Proposed Model | Savings (%) |
|---|---|---|---|
| Interior Lighting | 225.1 | 180.1 | 20% |
| Receptacle Equipment | 23.3 | 23.3 | 0% |
| Space Heating | 1453.8 | 1062.7 | 27% |
| Service Water Heating | 283.0 | 258.5 | 9% |
| Ice Generation | 177.8 | 166.8 | 6% |
| Heat Rejection | 22.2 | 16.9 | 24% |
| Fans | 217.5 | 121.7 | 44% |
| Pumps | 12.8 | 14.6 | -14% |
| **Total** | **2455.3** | **1883.1** | **23%** |

As per the energy breakdown between the Proposed Design and Reference, the majority of savings come from space heating, lighting, domestic hot water, and fan power. The figure below shows that a majority of the energy used by the Proposed building is consumed for space heating.

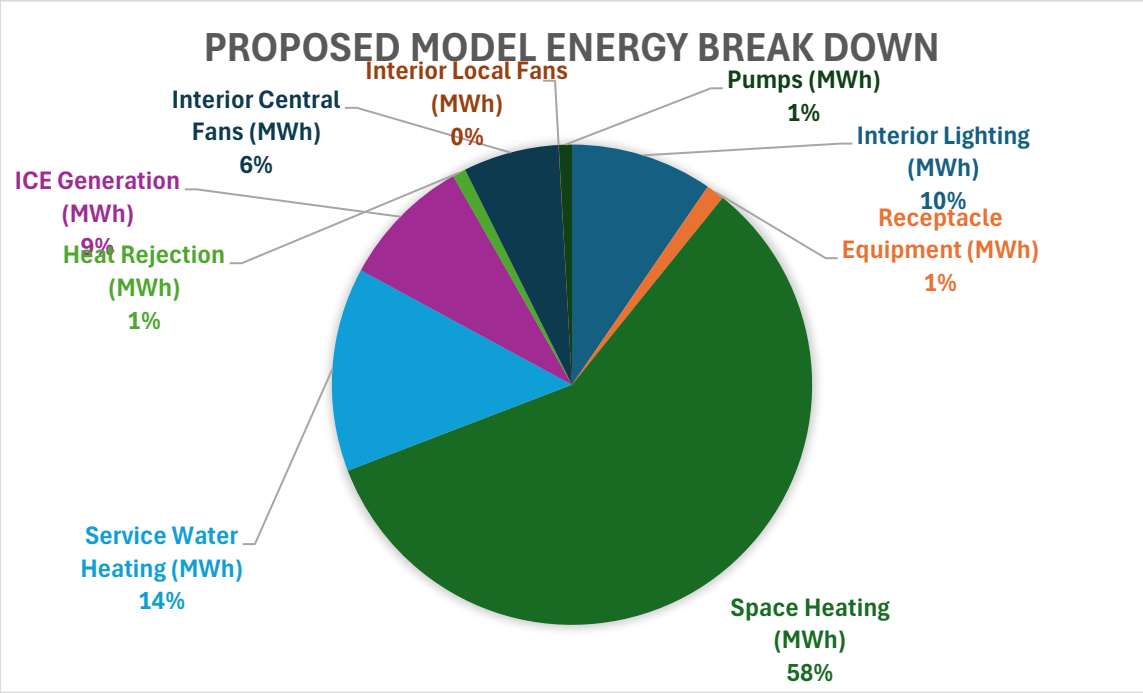



*Figure 12: Energy Use Breakdown of The Proposed Design*

The end-use breakdown, as illustrated in the figure, reveals the largest end-use is attributed to space heating (note this includes ventilation heating as well). This is to be expected given the building is situated in Dawson City which is under the Climate Zone 8 category (sub-arctic). Additionally, large amounts of heating energy are required to provide humidity control through the use of desiccant systems. The next largest end use is attributed to service water heating at 14% of overall energy consumption. This accounts for the ice resurfacing loads in addition to the general service hot water loads (lavatories, kitchen, showers, etc.). Other significant loads included lighting and cooling which account for 10% and 9% of the annual energy respectively. The cooling load is seasonal and attributed to the ice plant which is considered to operate from mid-September to April.

*Table 12: TEUI and TEDI Proposed and Reference Model*

| | NECB 2020 Reference | Proposed Model | Savings |
|---|---|---|---|
| **TEUI (kWh/m²/year)** | 459 | 352 | 23% |
| **TEDI (kWh/m²/year)** | 350 | 292 | 17% |

### 9.3.2 GHG Emissions

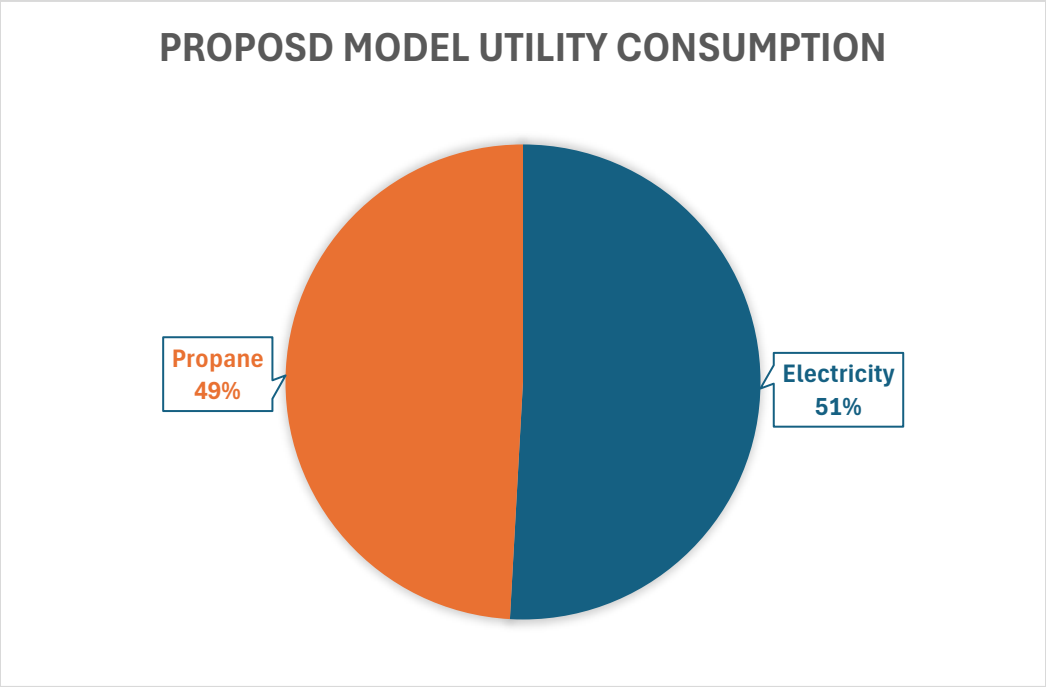



*Figure 13: Proposed Model Utility Consumption*

*Table 13: GHG emissions of the Proposed and Reference Model*

| | NECB 2020 Reference | Proposed Model | Savings |
|---|---|---|---|
| **Electricity(tCO2e/year)** | 54 | 77 | -41% |
| **Propane (tCO2e/year)** | 58 | 30 | 48% |
| **Total (tCO2e/year)** | 112 | 107 | 5% |

### 9.3.3 Operation Cost

The Table 14below shows the operational cost of the proposed and reference model.

*Table 14 Operational Cost of the Proposed and Reference Model*

| | NECB 2020 Reference | Proposed Model | Savings |
|---|---|---|---|
| **Electricity($/year)** | 155,099 | 235,778 | -52% |
| **Propane ($/year)** | 292,868 | 152,560 | 48% |
| **Total ($/year)** | 447,967 | 388,338 | 13% |

## 9.4 Study Limitation

This report was prepared by Stantec for Wildstone Construction Group. The material in this report reflects Stantec's judgment in light of the information available to it at the time of preparation. The energy use and saving calculations are estimates of savings potential and are not guaranteed. This simulation is not a prediction of actual energy performance which may vary due to weather, occupancy, accuracy of simulation tools used, installed equipment performance, operations procedures, and systems and loads not covered under the energy standard such as non-regulated plug load equipment such as computers. Instead, this simulation is to compare the relative energy performance of design features for the Proposed Building (with identical weather, occupancy patterns and plug loads) to the NECB 2020 reference building.

Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Stantec accepts no responsibility for damages if any suffered by any third party as a result of decisions made or actions based on this report.

## 9.5 Model Inputs

The following table summarizes the inputs and assumptions used in the model of Dawson Recreation Center.

| General | | | | |
|---|---|---|---|---|
| Project name and location | | Dawson Recreation Center | | |
| Building Type(s) | | Recreation Center | | |
| Modelled floor area ($m^2$) | | 5353 | | |
| Reference Standard | | NECB 2020 Part 8 | | |
| Modelling Software | | IESVE 2023.5.1.0 | | |
| Climate Zone | | 8 | | |
| Design Weather Temperature | | Summer: 26°C DB, 16°C WB | | NECB 2020 Table C-1 |
| | | Winter: -51°C | | |
| Degree Days Below 18°C | | 8120 | | |
| Weather File | | CAN_YT_Dawson.City.AP.719660_TMYx.2009-2023 | | |
| Category | Detail | Proposed Building | Reference Building | Notes |
| Building Envelope | External walls | Insulated metal panels with 152mm insulation (poly-iso) – 35% deration considered for thermal bridging<br><br>Reff- 27.5 | R- 34.4 | Reference wall as per NECB 2020. |

| | | | | | |
|---|---|---|---|---|---|
| | Roof | Insulated metal panels with 152mm insulation (poly-iso)<br><br>Reff - 41 | R-51 | Reference roof as per NECB 2020. | |
| | Ground Floor | F 0.3, R 15 Full insulated ICE Rink and Curling, others F 0.65 R 7.5 1.2 m | F 0.3, R 15 Full insulated | Reference Slab as per NECB 2020. | |
| | Glazing | Triple pane aluminum windows with thermally broken spacers and low e-coating | NECB 2020 | Reference glazing specifications as per NECB 2020. | |
| | U-value ($W/m^2.k$) | U-1.40 | 1.44 | | |
| | SHGC | 0.39 | 0.39 | | |
| | SC | 0.45 | 0.45 | | |
| | FDWR | 3.0% | 20.0% | Reference FDWR as per NECB 2020. | |
| | Infiltration ($l/s/m^2$ of façade) | 1.57 | 1.57 | Infiltration is calculated as per NECB 2020 Section 8.4.2.9. | |
| Category | Space | Proposed Building | Reference Building | Schedule | Notes |
| Lighting power densities ($W/m^2$) | ICE Rink & Curling | 7.44 | 8.93 | NECB B | Reference per NECB Table 4.2.1.6 |
| | Fitness Center & Play Area | 7.36 | 8.83 | NECB B | |
| | Social Heart | 7.20 | 8.64 | NECB B | |
| | Team Room | 4.48 | 5.38 | NECB B | |
| | Corridors | 3.52 | 4.22 | NECB B | |
| | Mech/Elec | 3.68 | 4.42 | NECB A | |
| | Storage | 3.28 | 3.94 | NECB A | |
| Plug Loads ($W/m^2$) | ICE Rink & Curling | 0.00 | | NECB B | As per NECB 2020 Table A-8.4.3.2(2) B |
| | Fitness Center & Play Area | 1.50 | | NECB B | |
| | Social Heart | 1.00 | | NECB B | |
| | Team Room | 2.50 | | NECB B | |
| | Corridors | 0.00 | | NECB B | |
| | Mech/Elec | 1.00 | | NECB A | |
| | Storage | 1.00 | | NECB A | |
| Occupancy ($m^2$/person) | ICE Rink & Curling | 5 | | NECB B | As per NECB 2020 Table A-8.4.3.2(2) B |
| | Fitness Center & Play Area | 5 | | NECB B | |
| | Social Heart | 10 | | NECB B | |

| | | | | | |
|---|---|---|---|---|---|
| | Team Room | 10 | | NECB B | |
| | Corridors | 100 | | NECB B | |
| | Mech/Elec | 200 | | NECB A | |
| | Storage | 100 | | NECB A | |
| Category | Space | Proposed Building | Reference Building | Schedule | Notes |
| Mechanical System | ICE Rink & Curling | VAV AHU with Preheat and Reheat Heating, with Propane Condensing Boilers Plant | CAV AHU Four pipe fan coil with Propane Boilers Plant | | Reference system as per NECB 2020 Table 8.4.4.7.-A |
| | Heating setpoint | 12°C | 12°C | on continuously | |
| | Preheat Coil Target Temperature | -15 °C | -15 °C | on continuously | |
| | Heating Efficiency | Boilers: 90% | Boilers: NECB 2020 Curve | | |
| | Fans (W/l/s) | 1.64 | NECB Fan power | | As per NECB 2020 Section 8.4.4.18 |
| | ERV Efficiency (%) | 90% | 50% | | Reference ERV As per NECB 2020 Section 8.4.4.19 |
| | Fitness Center, Play Area and Interior Spaces | VAV AHU with Preheat and Reheat Heating, with Propane Condensing Boilers Plant | CAV Packaged Rooftop unit, Furnace, Hydronic baseboards | | |
| | Heating Setpoint | Main :21°C, Set Back:18°C | Main :21°C, Set Back:18°C | | |
| | Preheat Coil Target Temperature | -15 °C | -15 °C | on continuously | |
| | Heating Efficiency | Boilers: 90% | Boilers: NECB 2020 Curve | | |
| | Fans (W/l/s) | 1.64 | NECB Fan power | | As per NECB 2020 Section 8.4.4.18 |
| | ERV Efficiency (%) | 90% | 50% | | As per NECB 2020 Section 8.4.4.19 |

| | | | | | |
|---|---|---|---|---|---|
| | Mechanical, Storage, etc | Cabinet Unit Heater with Propane Condensing Boilers Plant | Cabinet Unit Heater with Fuel Fired Boilers Plant | | |
| | Heating Setpoint | 18°C | 18°C | on continuously | |
| | Heating Efficiency | Boilers: 90% | Boilers: NECB 2020 Curve | | |
| | Fans (W/l/s) | 1.64 | NECB Fan power | | |
| | ICE Plant | Electric Chiller with Water Source Heat Exchanger Recovery Heat to HWL | Electric Chiller with Water Source Heat Exchanger Recovering Heat to HWL | | |
| | Cooling Efficiency | COP: 3 | COP: 3 | | |
| | Dehumidification System | 2x Thermoplus IRD ice rink defoggers for both the hockey and curling rinks | 2x Thermoplus IRD ice rink defoggers for both the hockey and curling rinks | | |
| | **Ventilation(L/s)** | ICE Rink: 2140<br>Curling: 777<br>Fitness Room: 341<br>Interior Spaces: 3154 | ICE Rink: 2140<br>Curling: 777<br>Fitness Room: 341<br>Interior Spaces: 3154 | | |
| | Service Water Heating Type | Propane Boilers | Fuel Fired Boilers | NECB B | |
| | Service Water Heating load max | 1655(L/h) | Matches Proposed | | |

# Divider Name

# Appendix A Concept Drawings

**DAWSON CITY RECREATION CENTRE**

**LEGAL DESCRIPTION:** LOT 1059 QUAD 1168/03
**CURRENT LAND USE:** P2 INSTITUTIONAL
**LAND OWNER:** YUKON GOVERNMENT

**PROPOSED BUILDING AREA:** 5,330M2

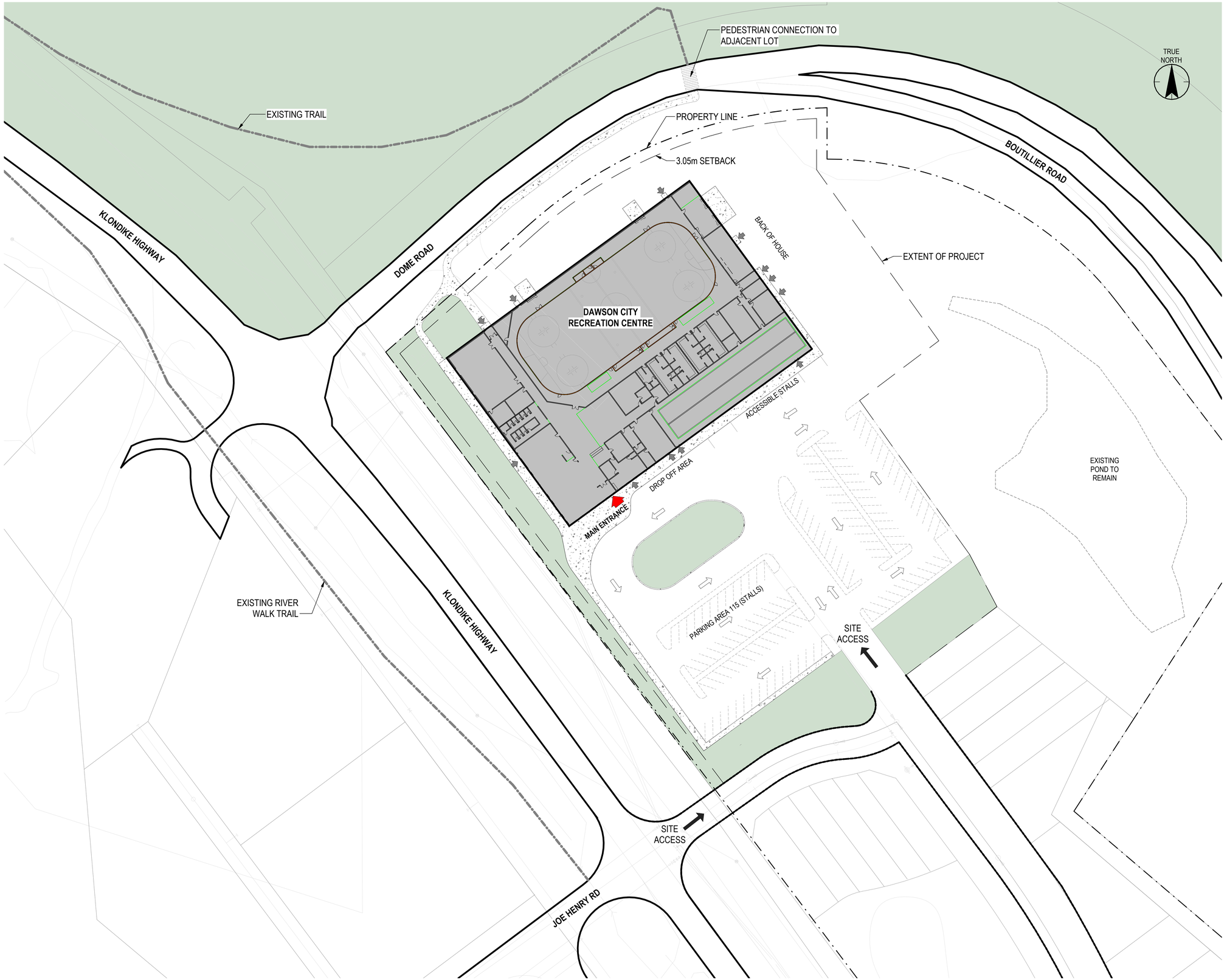
PARKING CALCULATION
-1 PER 10M2 OF FLOOR AREA
-5330/10= 533 STALLS REQ.
LOADING SPACES CALCULATION (OFF STREET)
-GREATER THAN 4,000M2 IN FLOOR AREA = 3

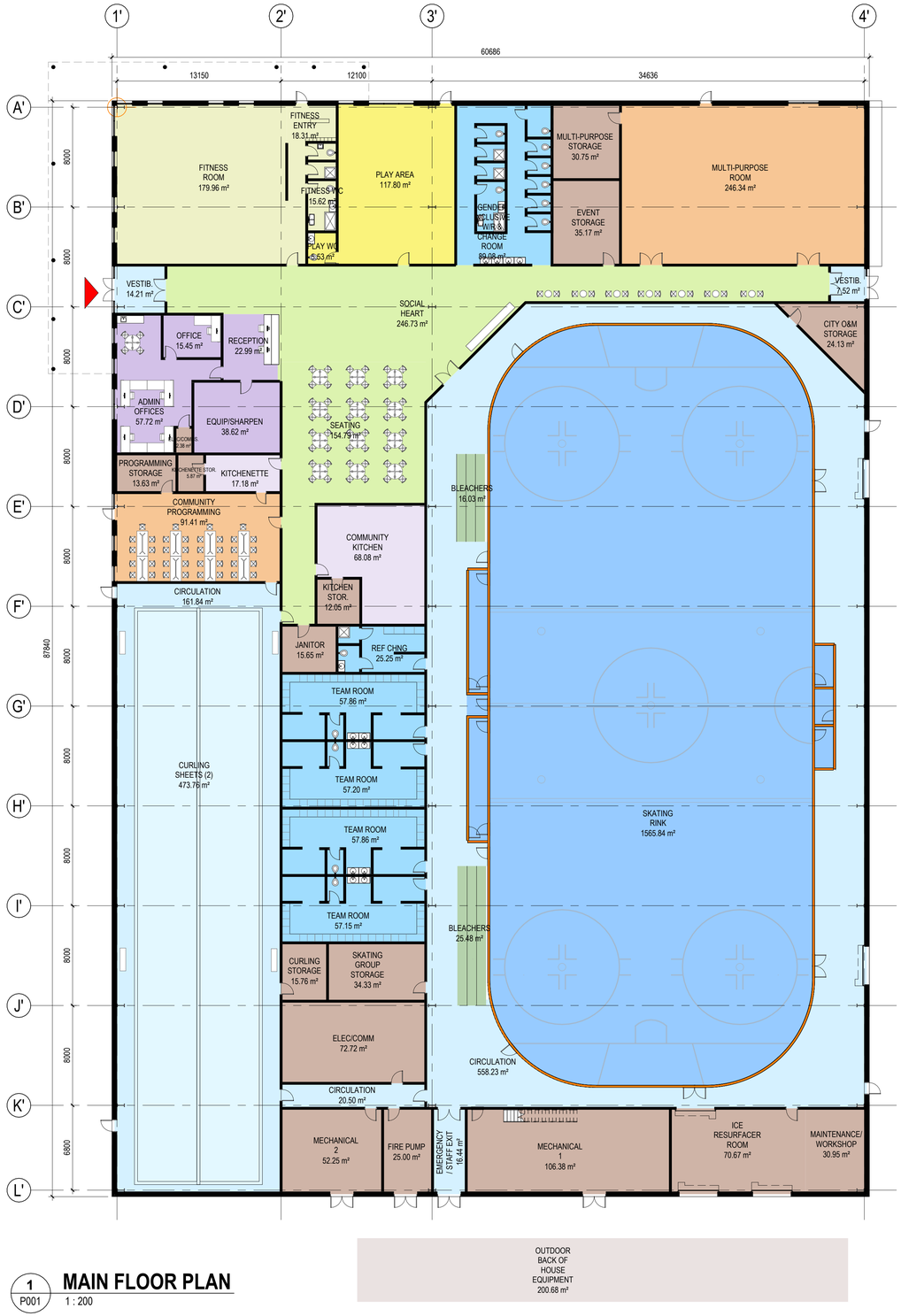
**PROS:**

- GREATER NUMBER OF PARKING STALLS ON FRONT
- GOOD ACCESS TO BACK OF HOUSE USING A LARGE TRANSPORT TRUCK
- MAIN ENTRY FACING SOUTH, VISIBLE FROM SOUTH ACCESS
- BACK OF HOUSE IS FACING AWAY FROM MOST TRAFFIC
- PEDESTRIAN CONNECTION TO CROCUS BLUFF PARK ALONG WEST/NORTH SIDE OF FACILITY
- SITE ENTRANCE/EXIT FROM KLONDIKE HIGHWAY

**CONS:**

- MAIN ENTRY INTO FACILITY IS NOT DIRECT WHEN APPROACHING FROM NORTH
- OUTDOOR CONNECTION FROM SKATING RINK IS LOST
- BUILDING ENCROACHES ONTO THE NORTHEAST SIDE OF SITE REQUIRING MORE FILL FOR SITE PREPARATION
- BUILDING SERVICES SPACES ARE FAR AWAY FROM THE CITY MAIN LINES ALONG THE HIGHWAY



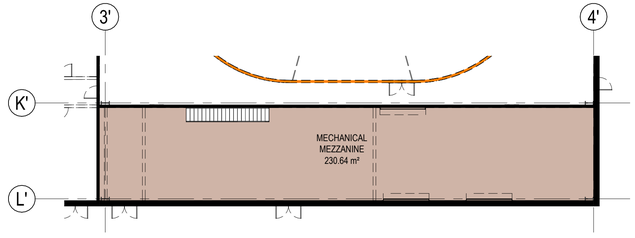



1 P001 **MAIN FLOOR PLAN**
1 : 200

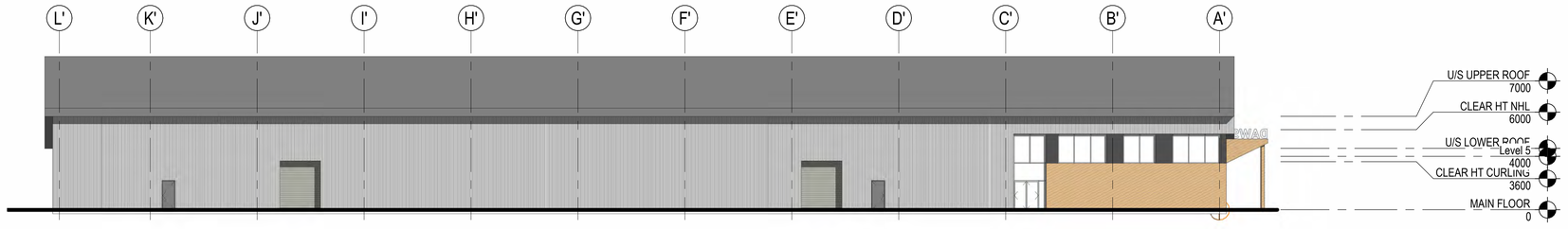
Schema 1 Legend

- CIRCULATION
- CONTROL DESK/ADMIN
- CURLING SHEETS
- FITNESS
- FOOD SERVICE
- JANITORIAL
- OUTDOOR SERVICE
- PLAY AREA
- PROGRAMMING
- SERVICES
- SKATING RINK
- SOCIAL HEART
- STORAGE
- VIEWING
- WASHROOMS/CHANGEROOMS

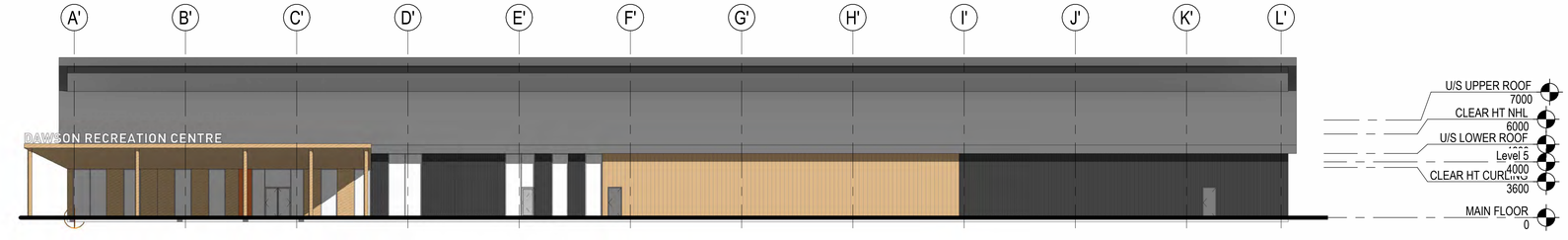
**BUILDING FOOTPRINT: 5330m2**



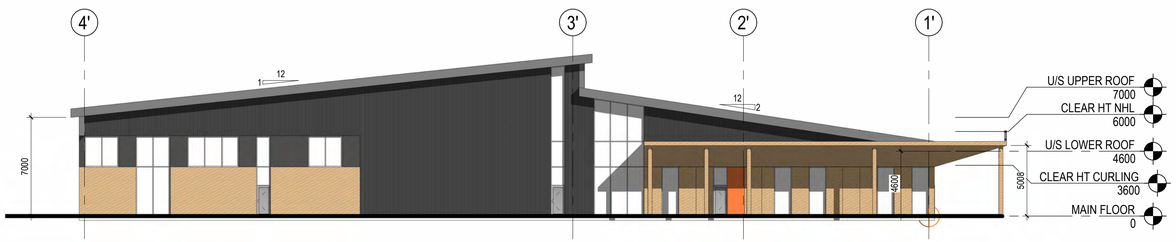

2 P001 **MEZZANINE PLAN**
1 : 200



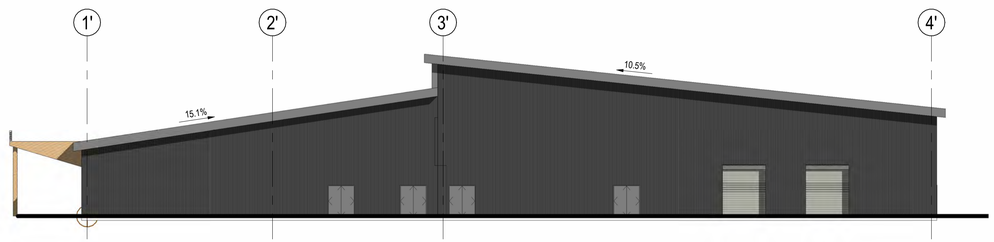

**1 P002 NORTH ELEVATION**
1 : 200




**4 P002 SOUTH ELEVATION**
1 : 200




**2 P002 WEST ELEVATION**
1 : 200




**3 P002 EAST ELEVATION**
1 : 200

SOUTHWEST CORNER - MAIN ENTRY/FITNESS ENTRY


BIRD'S EYE VIEW

NORTHWEST CORNER - MULTI-PURPOSE

SOUTH VIEW - MAIN ENTRY

# City of Dawson New Rec Centre - Operations and Maintenance Estimates

*This is an initial draft. More details are to come as information is gathered and design refines on this project.

| Cost Area | | 2024 Rec Centre | New Rec Center | Difference |
|---|---|---|---|---|
| | square m | 4,270 | 5,330 | 1,060 |
| | Asset Value | 12,000,000 | 43,000,000 | |
| | insured Value | 30,000,000 | 43,000,000 | |
| **Revenues** | | | | |
| CMG (@0.3%) | | 36,000 | 129,000 | 93,000 |
| Ice Surface Rentals | | 55,000 | 55,000 | - |
| Equipment rentals | | 6,000 | 6,000 | - |
| Skate sharpening | | 3,500 | 3,500 | - |
| Multi-Purpose Room Rentals | | | 10,000 | 10,000 |
| sponsorships | | 7,500 | 7,500 | - |
| Curling Club | | 5,000 | 5,000 | - |
| Kitchen Lease | | 9,000 | 9,000 | - |
| Fitness Centre access | | 62,232 | 62,232 | - |
| | total | 184,232 | 287,232 | 103,000 |
| **Expenses** | | | | |
| **Rec Centre** | | | | |
| wages/benefits | | 250,000 | 261,000 | 11,000 |
| Building R&M | | 125,000 | 75,000 | (50,000) |
| Building Insurance | | 115,000 | 205,000 | 90,000 |
| Equipment R&M | | 12,500 | 17,625 | 5,125 |
| electricity | | 175,000 | 235,778 | 60,778 |
| heating | | 107,625 | 152,560 | 44,935 |
| electricity | | | | |
| heating | | | | |
| contracted services | | 6,000 | 10,000 | 4,000 |
| operating supplies | | 6,000 | 10,000 | 4,000 |
| | sub total | 797,125 | 966,963 | 169,838 |
| **Waterfront Building** | | | | |
| wages/benefits | | 11,000 | - | (11,000) |
| Building R&M | | 7,000 | - | (7,000) |
| Building insurance | | 4,200 | - | (4,200) |
| Equipment R&M | | 5,125 | - | (5,125) |
| Electricity | | 6,500 | - | (6,500) |
| Heating | | 7,688 | - | (7,688) |
| operating supplies | | 2,400 | - | (2,400) |
| | sub total | 43,913 | - | (43,913) |
| | Total Revenues | 184,232 | 287,232 | 103,000 |
| | Total Expenses | 841,038 | 966,963 | 125,925 |
| | Net | (656,806) | (679,731) | (22,925) |