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 COMMITTEE OF THE WHOLE MEETING #CW21-14

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

DATE OF MEETING: TUESDAY, JUNE 8, 2021
PLACE OF MEETING: COUNCIL CHAMBERS, CITY OFFICE
TIME OF MEETING: 7:00 PM

PURPOSE OF MEETING:

1. **DELEGATIONS & GUESTS**
   a) Klondike Development Organization- Financials and Projects Presentation

2. **MINUTES**
   a) Committee of the Whole Meeting Minutes CW21-11 of May 11, 2021
   b) Special Committee of the Whole Meeting Minutes CW21-12 of May 18, 2021

3. **BUSINESS ARISING FROM MINUTES**
   a) Committee of the Whole Meeting Minutes CW21-11 of May 11, 2021
   b) Special Committee of the Whole Meeting Minutes CW21-12 May 18, 2021

4. **SPECIAL MEETING, COMMITTEE, AND DEPARTMENTAL REPORTS**
   a) Request for Decision: YG Land Development Branch Projects- Infill 1 and 2
   b) Request for Decision: Little Blue Day Care-Lot 20, Government Reserve Addition
   c) Request for Decision: Townsite Vacant Lots
   d) Request for Decision: Climate Change-Adaption Planning
   e) Gold Rush Campground Lease

5. **BYLAWS AND POLICIES**
   a) Flagpole Policy

6. **CORRESPONDENCE**
   a) Heritage Advisory Committee Meeting Minutes-HAC#21-08
   b) Colin McDowell, V.P. Operations, Yukon Housing Corp. RE: YHC Community Needs Assessment
   c) Monthly Policing Report- April
   d) Ricky Mawunganidze, Executive Director, Klondike Visitor's Association RE: Advisory Position
   e) Xander Mann RE: Block Q, Ladue Estate
   f) Aaron Woroniuk RE: Block Q Vote
   g) Nate Jones RE: Block Q Decision
   h) Sue Lancaster, Chairperson, Klondike Visitor's Association Board RE: Lease Termination at Gold Rush Campground

7. **PUBLIC QUESTIONS**

8. **IN CAMERA**
   a) Legal Related Matters

DATE MEETING REQUESTED: May 25, 2021
MEETING REQUESTED BY: WAYNE POTOROKA, MAYOR

Original signed by: June 4, 2021
Cory Bellmore, CAO Date

MINUTES OF COMMITTEE OF WHOLE MEETING CW21-11 of the Council of the City of Dawson called for 7:00 PM on Tuesday, May 11, 2021, City of Dawson Council Chambers

PRESENT:	Mayor	Wayne Potoroka
	Councillor	Stephen Johnson
	Councillor	Bill Kendrick
	Councillor	Natasha Ayoub
	Councillor	Molly Shore
REGRETS:		
ALSO PRESENT:	CAO	Cory Bellmore
	EA	Elizabeth Grenon
	CDO	Stephanie Pawluk
	Rec Manager	Paul Robitaille

Agenda Item: Call to Order

The Chair, Wayne Potoroka called the meeting to order at 7:00 p.m.

Agenda Item: Agenda

CW21-11-01 Moved by Mayor Potoroka, seconded by Councillor Johnson that the agenda for Committee of the Whole meeting CW21-11 be accepted as amended.
Carried 5-0

- Change meeting date from Wednesday to Tuesday.

Agenda Item: Minutes

a) Committee of the Whole Meeting Minutes CW21-09 of April 21, 2021

CW21-11-02 Moved by Councillor Kendrick, seconded by Mayor Potoroka that the minutes of Committee of the Whole meeting CW21-09 of April 21, 2021 be accepted as amended.
Carried 5-0

- Starting at Resolution #CW21-09-06 to CW21-09-08 change vote from 4-0 to 5-0.

b) Special Committee of the Whole Meeting Minutes CW21-10 of April 26, 2021

CW21-11-03 Moved by Councillor Kendrick, seconded by Councillor Ayoub that the minutes of Special Committee of the Whole meeting CW21-10 of April 26, 2021 be accepted as presented.
Carried 5-0

Agenda Item: Business Arising from Minutes

a) Committee of the Whole Meeting Minutes CW21-09 of April 21, 2021

Council had some questions/comments from the minutes:

- The new rec centre location decision meeting should be held at another public meeting (Special Committee of the Whole) that is accessible via Zoom and should be highly advertised, i.e., social media, post office, news paper (if possible), etc.
- Is there new information on the Lagoon?

Agenda Item: Special Meeting, Committee and Departmental Reports

a) Request for Decision: Billy Bigg's Municipal Historic Site Designation

CW21-11-04 Moved by Councillor Kendrick, seconded by Councillor Johnson that Committee of the Whole forward the Billy Bigg's Municipal Historic Site nomination package and Bylaw #2021-08 to Council for First Reading.
Carried 5-0

b) Request for Decision: Harrington's Store Municipal Historic Site Designation

CW21-11-05 Moved by Councillor Johnson, seconded by Councillor Kendrick that Committee of the Whole forward the Harrington's Store Municipal Historic Site nomination package and Bylaw #2021-08 to Council for First Reading.
Carried 5-0

c) Request for Decision: Front Street Lease with Yukon Government

CW21-11-06 Moved by Councillor Johnson, seconded by Councillor Kendrick that Committee of the Whole forward to Council to authorize administration to enter into a 5-year lease agreement with Yukon Government to lease the parcel of land comprising of 1.9 Hectares, more or less, on Front Street, adjacent to CLSR 8338A, Quad 116B/03, with the term ending on December 31, 2026.
Carried 5-0

d) Information Report: Dome Road What We Heard Report

CW21-11-07 Moved by Councillor Johnson, seconded by Councillor Ayoub that Committee of the Whole accept the Dome Road What We Heard Report as information.
Carried 5-0

Agenda Item: Bylaws and Policies

a) Council Remuneration Bylaw 2018-10 Review

CW21-11-08 Moved by Councillor Ayoub, seconded by Councillor Kendrick that Committee of the Whole review Bylaw# 2018-10, being the Council Remuneration Bylaw.
Carried 5-0

Council requested the bylaw be brought back to another Committee of the Whole meeting.

Agenda Item: Correspondence

CW21-11-09 Moved by Mayor Potoroka, seconded by Councillor Johnson that Committee of the Whole acknowledges receipt of correspondence from:
a) Tr'ondëk Hwëch'in RE: Emergency Act
b) Heritage Advisory Committee Meeting Minutes #HAC 21-03, HAC 21-05 and HAC 21-06
provided for informational purposes.
Carried 5-0

Council inquired that if there is an emergency, i.e., flood, fire, etc., who declares the emergency? Tr'ondëk Hwëch'in or City of Dawson?

Agenda Item: Public Questions

Alex Sommerville: What do Councillors hope to learn or expect to hear at the Special Committee of the Whole meeting for the rec centre location?
Council: Don't expect to hear anything new but want to give people the opportunity to weigh in one last time before a decision is made.

Agenda Item: In Camera

CW21-11-10 Moved by Councillor Johnson, seconded by Councillor Kendrick that Committee of the Whole move into a closed session for the purposes of discussing a legal related matter as authorized by section 213 (3) of the *Municipal Act*.
Carried 5-0

CW21-11-11 Moved by Mayor Potoroka, seconded by Councillor Kendrick that Committee of the Whole reverts to an open session of Committee of the Whole to extend the meeting.
Carried 5-0

CW21-11-12 Moved by Mayor Potoroka, seconded by Councillor Ayoub that meeting CW21-11 be extended not to exceed one hour.
Carried 5-0

CW21-11-13 Moved by Mayor Potoroka, seconded by Councillor Kendrick that Committee of the Whole move back into a closed session for the purposes of discussing a legal related matter as authorized by section 213 (3) of the *Municipal Act*.
Carried 5-0

CW21-11-14 Moved by Councillor Johnson, seconded by Mayor Potoroka that Committee of the Whole reverts to an open session of Committee of the Whole and proceeds with the agenda.
Carried 5-0

Agenda Item: Adjournment

CW21-11-15 Moved by Mayor Potoroka, seconded by Councillor Ayoub that Committee of the Whole meeting CW21-11 be adjourned at 11:00 p.m. with the next regular meeting of Committee of the Whole being June 1, 2021.
Carried 5-0

THE MINUTES OF COMMITTEE OF WHOLE MEETING CW21-11 WERE APPROVED BY COMMITTEE OF WHOLE RESOLUTION #CW21-12-__ AT COMMITTEE OF WHOLE MEETING CW21-12 OF JUNE 1, 2021.

Wayne Potoroka, Chair

Cory Bellmore, CAO

MINUTES OF SPECIAL COMMITTEE OF WHOLE MEETING CW21-12 of the Council of the City of Dawson called for 5:30 PM on Tuesday, May 26, 18, City of Dawson Council Chambers

PRESENT:	Mayor	Wayne Potoroka
	Councillor	Stephen Johnson
	Councillor	Bill Kendrick
	Councillor	Natasha Ayoub
	Councillor	Molly Shore
REGRETS:		
ALSO PRESENT:	CAO	Cory Bellmore
	EA	Elizabeth Grenon
	Rec Manager	Paul Robitaille

Agenda Item: Call to Order

The Chair, Wayne Potoroka called the meeting to order at 5:30 p.m.

Agenda Item: Agenda

CW21-12-01 Moved by Mayor Potoroka, seconded by Councillor Johnson that the agenda for Special Committee of the Whole meeting CW21-12 be accepted as presented.
Carried 5-0

Agenda Item: Delegations & Guests

a) Republic Architecture RE: Draft Rec Centre Feasibility Study

Republic Architecture gave an overview of the Draft Rec Centre Feasibility Study. General discussion included:

- Capital, operation and maintenance and site costs for each design at both potential sites
- Option matrix factors and weighting
- Recommendation, following all factors of the feasibility study

Agenda Item: Adjournment

CW21-12-02 Moved by Mayor Potoroka, seconded by Councillor Johnson that Special Committee of the Whole meeting CW21-12 be adjourned at 7:03 p.m. with the next regular meeting of Committee of the Whole being June 1, 2021.
Carried 5-0

THE MINUTES OF SPECIAL COMMITTEE OF THE WHOLE MEETING CW21-12 WERE APPROVED BY COMMITTEE OF THE WHOLE RESOLUTION #CW21-14-__ AT COMMITTEE OF WHOLE MEETING CW21-14 OF JUNE 8, 2021.

Wayne Potoroka, Chair

Cory Bellmore, CAO

Report to Council

☐ For Council Decision ☒ For Council Direction ☐ For Council Information

☐ In Camera

SUBJECT:	LDB Infill Projects 1 & 2	
PREPARED BY:	Stephanie Pawluk, CDO	**ATTACHMENTS:** 1. LDB Summary of Recommendations and Rationale 2. Infill Project #1 Concept Plan 3. Infill Project #2 Concept Plans
DATE:	June 4, 2021	
RELEVANT BYLAWS / POLICY / LEGISLATION: Municipal Act Official Community Plan Zoning Bylaw Land Development Protocol		

RECOMMENDATION

It is respectfully recommended that Committee of the Whole forward the following decisions to Council:

1. Pursue phased development of two commercial unserviced lots on the west side of the road in the short-term and two commercial unserviced lots on the east side of the road in a later phase for Infill Area 1.
2. Pursue serviced development of ~22 commercial lots at 0.3 to 1.0 acres in size for Infill Area 2.

ISSUE / BACKGROUND

The Yukon Government Land Development Branch (LDB) is pursuing infill lot development on three sites, following Council direction and as per the Official Community Plan. Council Resolution C19-15-10 directed administration to pursue commercial infill for sites 1 and2 and industrial infill for site 3. This Council direction to pursue commercial/industrial infill is noted following Council discussion surrounding the potential desire for residential use of Infill Areas 1 and 2 during the LDB's April 21st 2021 land development presentation to Council and Council meeting C21-11.

C19-15-10 Moved by Councillor Johnson, seconded by Councillor Ayoub that council direct administration to begin preliminary development planning work for Infill Areas 1, 2, and 3 and Dome Residential Areas A, C, and D, as shown in Development Boundary Maps 1 and 2.

Feasibility work and conceptual planning work has been conducted on Areas 1 and 2, and preliminary feasibility work has been conducted on Area 3. LDB is seeking Council decisions on development options for all three sites, and this information was presented to Committee of the Whole CW21-09 on April 21, 2021, and subsequently, at Council meeting C21-11 on April 28th, 2021 for decision. Council made a decision on infill site 3, but postponed the decisions for sites 1 and 2 as per the following resolutions:

Request for Decision- YG Land Development Branch Infill Projects 1-3:

C21-11-11 Moved by Councillor Shore, seconded by Mayor Potoroka that Council direct administration to pursue the potential option of releasing a raw land parcel (Infill #3) to the private sector for development.

Motion Carried 5-0

C21-11-12 Moved by Mayor Potoroka, seconded by Councillor Johnson that Council postpone to a Committee of the Whole meeting the discussion of:

1. Pursuing phased development of two unserviced lots on the west side of the road in the short-term and two unserviced lots on the east side of the road in a later phase for Infill Area 1.
2. Pursuing serviced development of ~22 lots at 0.3 to 1.0 acres in size for Infill Area 2.

Motion Carried 4-1

ANALYSIS

This section is intended to address the questions and concerns that were raised by Council during the April 28th meeting.

Land Use Designation

These sites are designated as Mixed Use in the Official Community Plan. The Mixed Use OCP designation allows for Industrial or Commercial Mixed Use zoning. Residential zoning (R1, R2 & R3) is not permitted under this OCP designation.

LDB has taken direction from both the OCP and Council Resolution C19-15-10 and has spent funds on these studies based on this direction. LDB requires firm direction on the envisioned use of the sites before allocating further resources to this development. Following direction, LDB will be applying for a rezoning, given that these sites are currently zoned Industrial and Future Planning, for a modified C2 zoning. More detailed discussions about the nuances of this rezoning are to be had following receipt of a rezoning application.

Land Use Needs

Council expressed the desire to have a higher-level conversation about land use regarding what is needed and the timing in which different land use classes will come available in Dawson. LDB provided the following response:

- *In our workplan that we submitted to Council, we provided targeted lot deliveries for all types of projects. This includes:*
    - *North End Development – 16 serviced residential lots; release in 2021*
    - *Dome Road Development – serviced residential lots; phase 1 tentatively targeted for release in 2022. Lots could be provided over the long-term, with Phase 1 providing ~10-20 lots.*
    - *Vacant Lot Releases – 3-4 serviced residential lots; release in 2021. Potentially more lots can be released as identified in the vacant lots review and mapping program.*
    - *Dredge Pond II – country residential development; release in 2023. Lots could be provided over the long-term, with approximate total number of lots ranging from 20-70.*
- *The above mentioned projects all provide residential lots; while the Infill 1-3 sites are the only commercial/industrial sites identified in Dawson. It would make sense to pursue these as commercial as it follows the OCP, are in areas where there is neighbouring commercial/industrial uses, etc. We are hoping that Infill 1 and 3 (not 2) will be made available in late 2021. Overall, it's important to have a balance of land use projects so we're not specifically targeting only one land use (residential) and disregarding others (commercial/industrial). We feel that the residential projects above sufficiently addresses the residential priority in the short and long term.*
- *KDO prepared a report in 2017 here: https://www.klondikedevelopment.com/wp-content/uploads/2011/03/2017-Dawson-BRE-Survey-Results.pdf. The report looked at the state of businesses within Dawson and forecasted short-term demand. The report found that businesses are growing (45% of businesses have expanded in last two years); growth in the mining, construction, and services sectors is occurring; and most businesses expect sales and profit to continue increasing. This report does help to indicate that there is commercial and industrial demand. As well, the report found that "land shortages" was one of the barriers to future expansion.*
- *Accessory residential uses are still allowed in the C2 zone which would help indirectly address residential demand as well. Live/work type uses would be ideal fits in these two areas.*

- *The following OCP goals supports this proposed C2 land use:*
    - *Section 8.0 Economic Development – "Ensuring there is an adequate supply of commercial and industrial land"; "Thriving and supported economic sectors"; "New economic sectors have an opportunity to succeed"; and "The needs of Dawson's population are met through local commercial development".*

Site 1 Right of Way

Council expressed concern over the right of way width proposed for site 1. The concern was that the proposed road right of way, as outlined in the concept plan, is too wide and does not match the character of the area. LDB provided the following response:

Please refer to the road cross section for the Infill 1 road below. This sketch is included in the Stantec Feasibility and Costing Report for sites 1 and 2. LDB spoke to Stantec and their reasoning for the 18m road ROW is that the best practice is actually 20m for commercial/industrial roads. They feel that 18m is sufficient though, but recommends against a further reduction in the width. The current cross section would allow for 8m of travel lane width, and 10 m total for road shoulders, drainage ditches, and frontage buffer along the lots. Ditching would be proposed, but a specific design would be completed as part of the detailed design of the road. One question is whether the CoD would take on the ownership and maintenance of the road as is typical practice. If the CoD feels that the road does not need formal improvements then we wouldn't need to do any roadwork. If the CoD feels it does need improvements to the structure, alignment, etc. of the road then YG would need to incorporate that work into the detailed design which would cost money, but is something we would have to abide by.As a comparison, the ROW for Rabbit Creek Road is approximately 30 m and the ROW for Bonanza Creek Road is approximately 60 m. So the 18 m wide ROW is quite narrow compared to these other roads, which admittedly serve as collector roads.

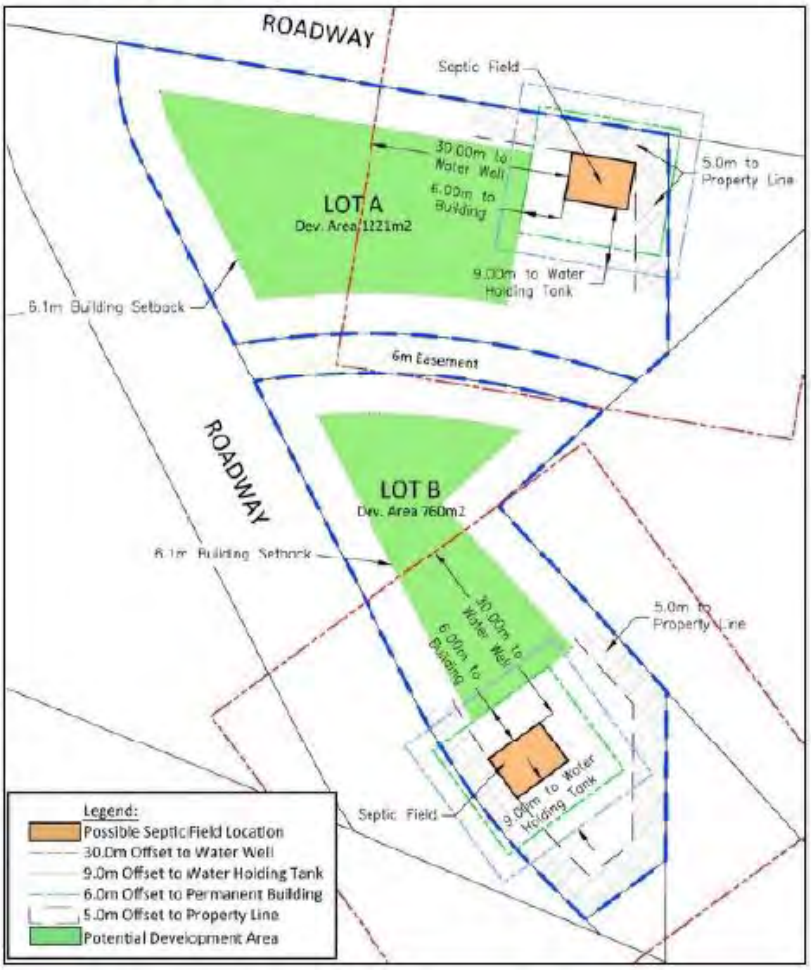
Figure 3 – Roadway Cross-Section

Septic Systems

Questions arose surrounding logistics of lot layout in regard to septic systems, including the minimum lot size/shape to facilitate a viable septic system. This issue arose in relation to the apprehension regarding the undersized lots in infill site 1. LDB provided the following response:

Feasibility of on-site septic systems was examined by both Tetra Tech (who did the detailed geotechnical/hydrological work) and Stantec (who did the planning and concept work). Tetra Tech's investigations included a test-pitting field program on the site. Based on the results of the field program, the entire site (all four lots) is considered suitable for development. The report noted that the mining tailings underlying the site are considered acceptable for on-site sewage disposal system design and construction. Septic systems should be installed in areas of the existing mine tailings (which is the majority of the area) and not in areas of former ponds. Some design standards and specifications will need to be incorporated into future septic systems (e.g. installing a sand filter to assist with percolation). However, absorption field, shallow absorption trench, and chamber systems are all considered appropriate for the study area. In addition, Stantec provided the attached sketch showing required setbacks from YG Environmental Health for the two eastern lots (A and B) which are the smaller lots. Lots C and D are larger and are almost entirely comprised of mine tailings so there are even less constraints. The sketch shows that regulatory setbacks between septic systems and well, buildings, and property lines can be met.

Figure 4 – Septic Field Analysis



*Septic field size/location shown is suggestive only and may require relocation based on site conditions.
*Offsets shown are for the lot the septic field is shown on and development on adjacent lots may impact septic field location and/or development of the site.
*Development area represents total developable area. Structures shall be located outside of existing tailings ponds.

Concept Plans & Recommendations

The concept plans and recommendations for each site were presented to Committee of the Whole on April 21, 2021. Please refer to the attached *LDB Summary of Recommendations and Rationale* for further analysis of the options.

Work done to date includes:

- Infill Area 1:
    - Feasibility work (Phase 1 ESA, desktop and drilling geotechnical studies, heritage assessments, pond assessments).
    - Planning report with conceptual site plan options.
    - Consultation with TH.
- Infill Area 2:
    - Feasibility work (Phase 1 ESA, desktop and drilling geotechnical studies, heritage assessments, pond assessments).
    - Planning report with conceptual site plan options.
    - Work plan outlining CoD & YG roles & responsibilities.

Options

Infill Area 1 Options:

.1 Pursue phased development -two unserviced commercial lots on the west side of the road in the short-term and two commercial lots on the east side of the road in a later phase. **LDB recommendation.**
.2 Create a larger four lot commercial development and release at same time.
.3 Do not proceed with the development.

Infill Area 2 Options:

.1 Pursue serviced commercial development: ~22 lots at 0.3 to 1.0 acres in size. **LDB recommendation.**
.2 Pursue unserviced commercial development: 9 lots at 1.0 acres in size.
.3 Consider joint development with adjacent parcels.
.4 Do not proceed with development.

APPROVAL		
NAME:	Cory Bellmore, CAO	**SIGNATURE:** C Bellmore
DATE:	June 4, 2021	

April 28 City of Dawson Regular Council Meeting

Commercial/Industrial Infill Sites 1, 2, 3 – YG LDB Recommendations

Site	LDB's Recommendations	Justification for Recommendations
Commercial/Industrial Infill 1 – 2-4 Lot Unserviced Development	• Development will be an unserviced development similar to existing lots in area. Well and septic systems can be installed by property owner.	• The nearest water and sanitary services are located in the Klondike Highway which is approximately 300 m away. Extending services for a small development of 4 lots is not cost recoverable and would mean the project cannot proceed.
	• Pursue a phased approach where 2 lots on west side can be released in short-term; and 2 lots on east side can be a later phase.	• Lots on west side have less constraints and can be released sooner, which will address short-term commercial lot demand.
	• Rezone lots from M1 (Industrial) to C2 (Commercial).	• Rezoning to commercial supports the OCP (currently designates area as Mixed-Use). Rezoning to residential is not supported in the OCP. • Original direction received from Council in a 2019 Resolution was for industrial or commercial development in these infill sites. • LDB has spent money on the premise this is a commercial development based on Council direction. • Addresses commercial lot demand. Other residential projects will address residential lot demand. • However, C2 zoning also allows for residential uses so a buyer could potentially develop a residential use along with a commercial use on their property. • Rezoning to C2 will help address comments and concerns received from TH regarding impacts to the resident living on their C-75FS Settlement Parcel to the south. C2 zoning supports lighter commercial uses and will prohibit industrial uses that could produce more noise or other nuisances. In addition, the parcels could be amended with an additional zoning restriction to increase the setbacks for buildings to the southern property line to 10 m (currently its 6 m). This will address TH's comments as well. • The area appears to be a transition zone to more intensive industrial uses to the east (Callison). Nearby parcels are also zoned C2, so this zoning appears appropriate.

Site	LDB's Recommendations	Justification for Recommendations
Commercial/Industrial Infill 2 – ~22 Lot Serviced Development	• Development will be a serviced development with water and sewer extended into subdivision. Final servicing decisions will be made during detailed design phase.	• There is nearby water and sanitary services running along highway. Lot sizes can be reduced due to servicing.
	• Pursue an approximately 22 lot (or more) serviced development with lots ranging in size from 0.3 to 1.0 acres.	• Extending services will still be expensive due to geotechnical considerations (e.g. tailing ponds). The number of lots should be maximized to ensure cost recovery. Development could be a unique commercial development supporting smaller scale live/work businesses (e.g. trades centre, contractor services, artists, etc.). A range of lot sizes would be provided for buyers who may want more of a conventional commercial lot; or a smaller lot.
	• Rezone area from FP (Future Planning) to C2 (Commercial). A special modification to the C2 zone should be considered to lower the minimum C2 lot size from 1 acre to 0.3 acres.	• Original direction received from Council in a 2019 Resolution was for industrial or commercial development for this infill # 2 site. • LDB has spent money on the premise this is a commercial development based on Council direction. • Addresses commercial lot demand. Other residential projects will address residential lot demand. • However, C2 zoning also allows for residential uses so a buyer could potentially develop a residential use along with a commercial use on their property. This could be a unique live/work area. • Existing nearby parcels are zoned C2, so this zoning would be compatible. • C2 zoning doesn't allow for intensive industrial uses such as junkyards, heavy equipment storage, and bulk fuel depots. • TH comments to date on this site have been preliminary but some concerns have been expressed about developing too close to the Klondike River. A riparian setback has been applied respecting a sufficient distance from the river. There may be an opportunity to work with TH regarding joint development. The 22 lot option could allow for this.

Project 1: Commercial/Industrial Infill Area 1

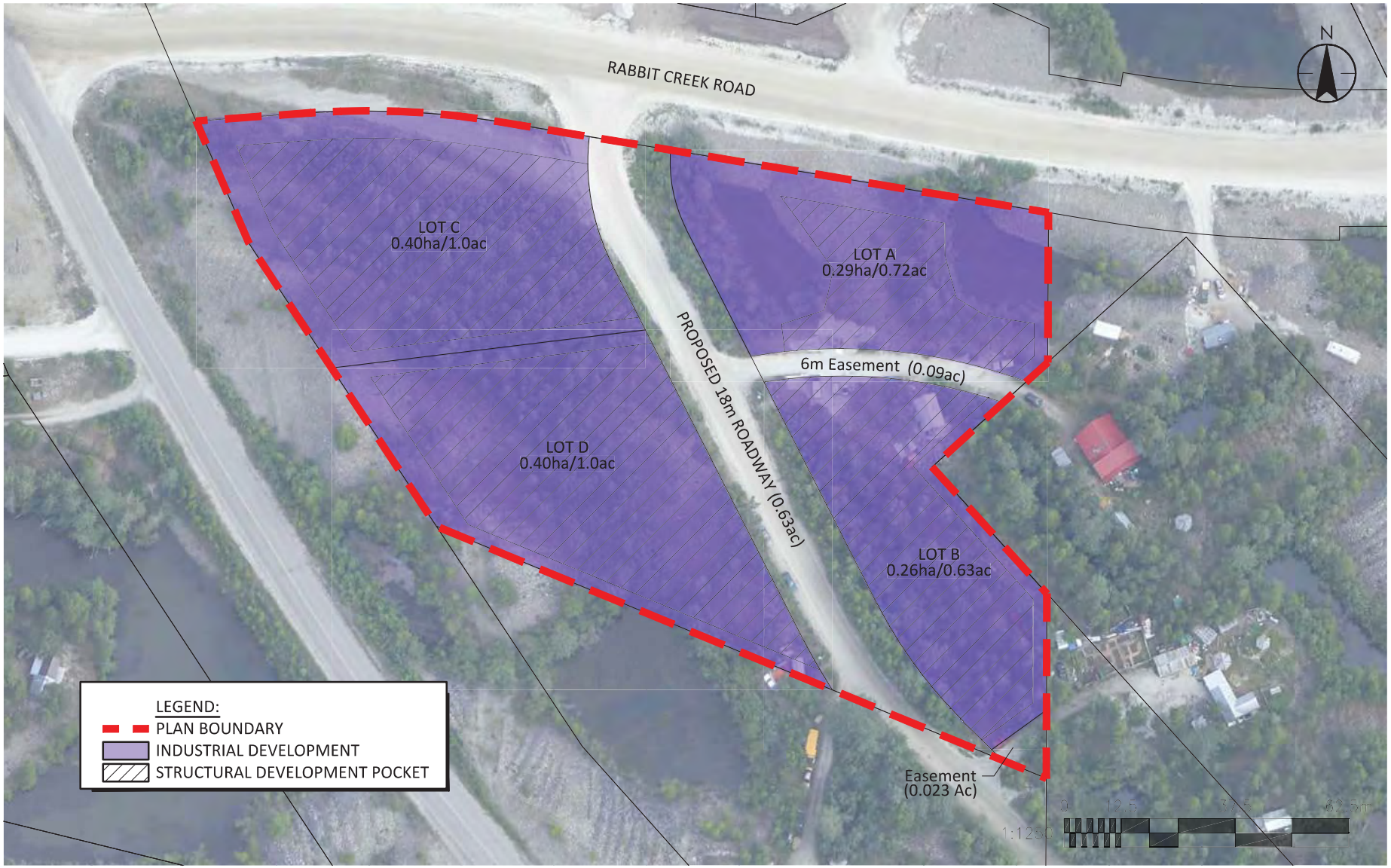


Figure 2.0

Infill Site #1 - 4 Lot Development

Prepared for:
Government of Yukon

Stantec
#1100, 4900-50th Street, Red Deer, AB T4N1X7
Ph:(403) 341-3320 Fx:(403) 342-0969

DRAWN BY: SAS
CHECKED BY: GCL
SCALE:1:1,250
PROJECT #: 144903045

April, 2021

Project 2: Commercial/Industrial Infill Area 2

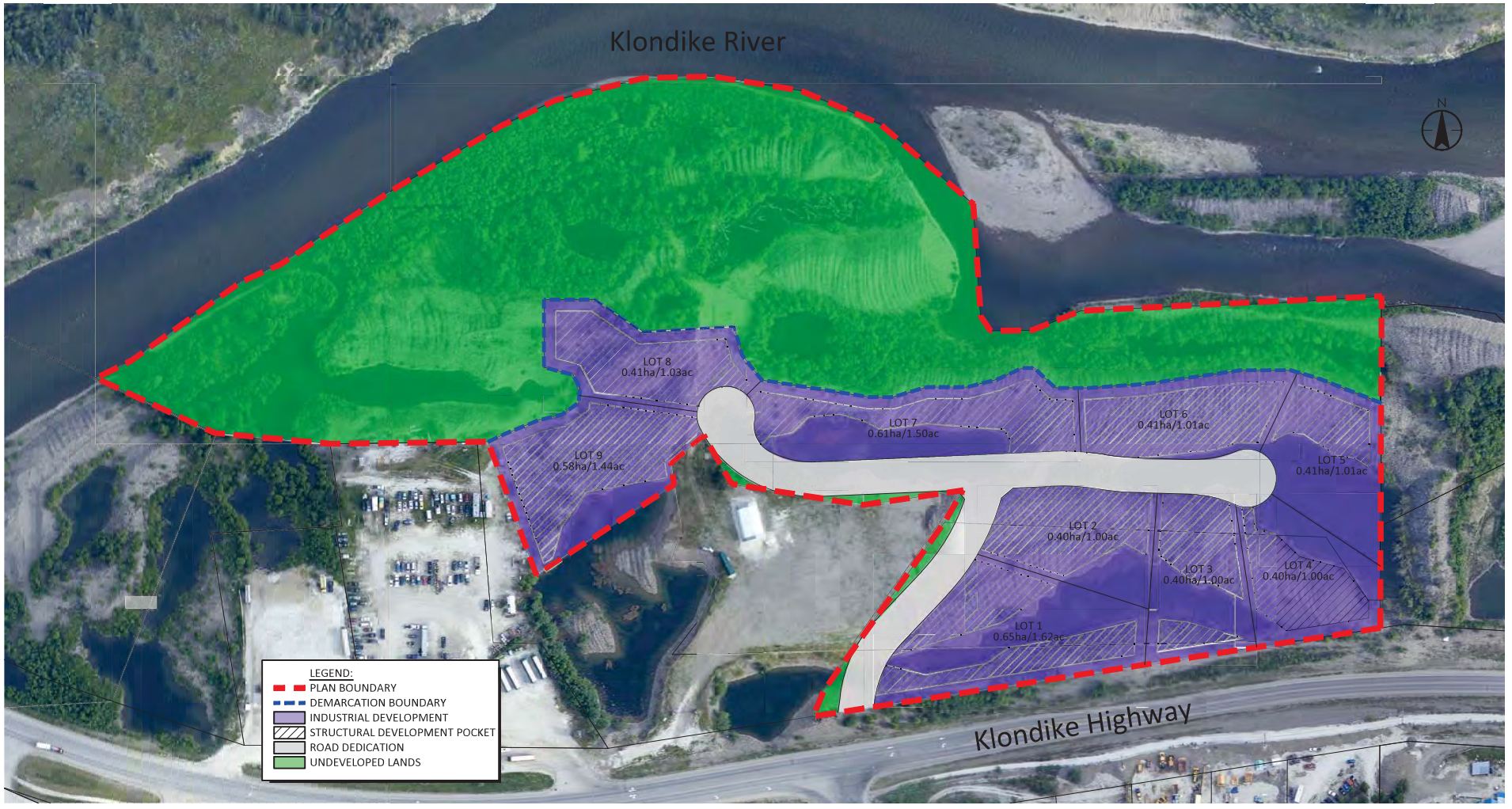


Figure 6.0 - Option A

Infill Site #2 - 9 Lot Cul-de-sac (1.0ac Lots)

1:2000 0 20 60 100m

Prepared for:
Government of Yukon

DRAWN BY: SAS
CHECKED BY: GCL
SCALE: 1:2000
PROJECT #:

April, 2021

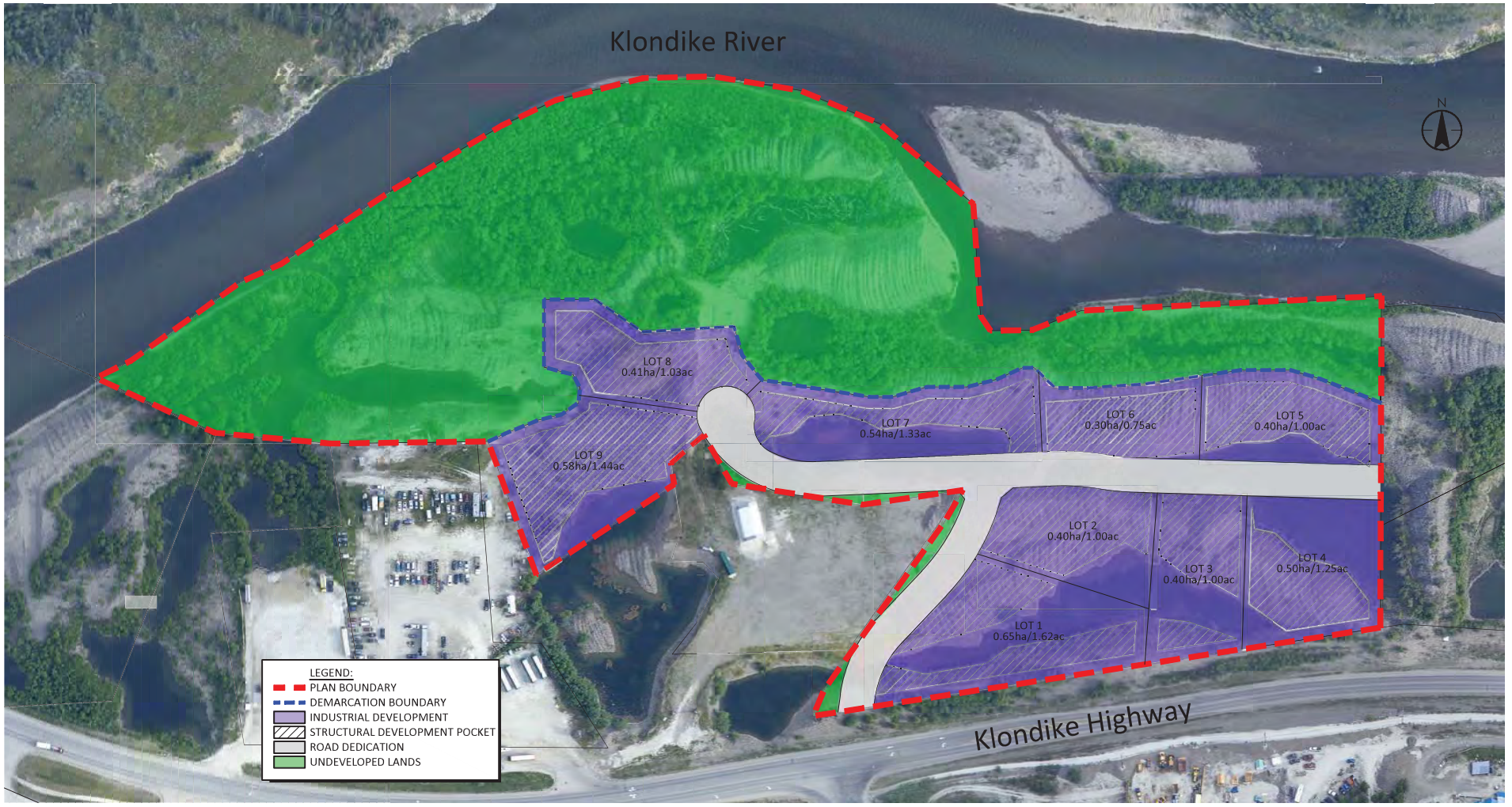


Figure 7.0 - Option A-1

Infill Site #2 - 9 Lot Cul-de-sac (1.0ac Lots)

1:2000 0 20 60 100m

Prepared for:
Government of Yukon

DRAWN BY: SAS
CHECKED BY: GCL
SCALE: 1:2000
PROJECT #:

April, 2021

Updated 21/04/14, 2:35 PM By: SSTAFFORD

V:\1128\TEMPORARY\1128 DWF IND\DRAWING\NORTH SITE\FIGURE 3.DWG

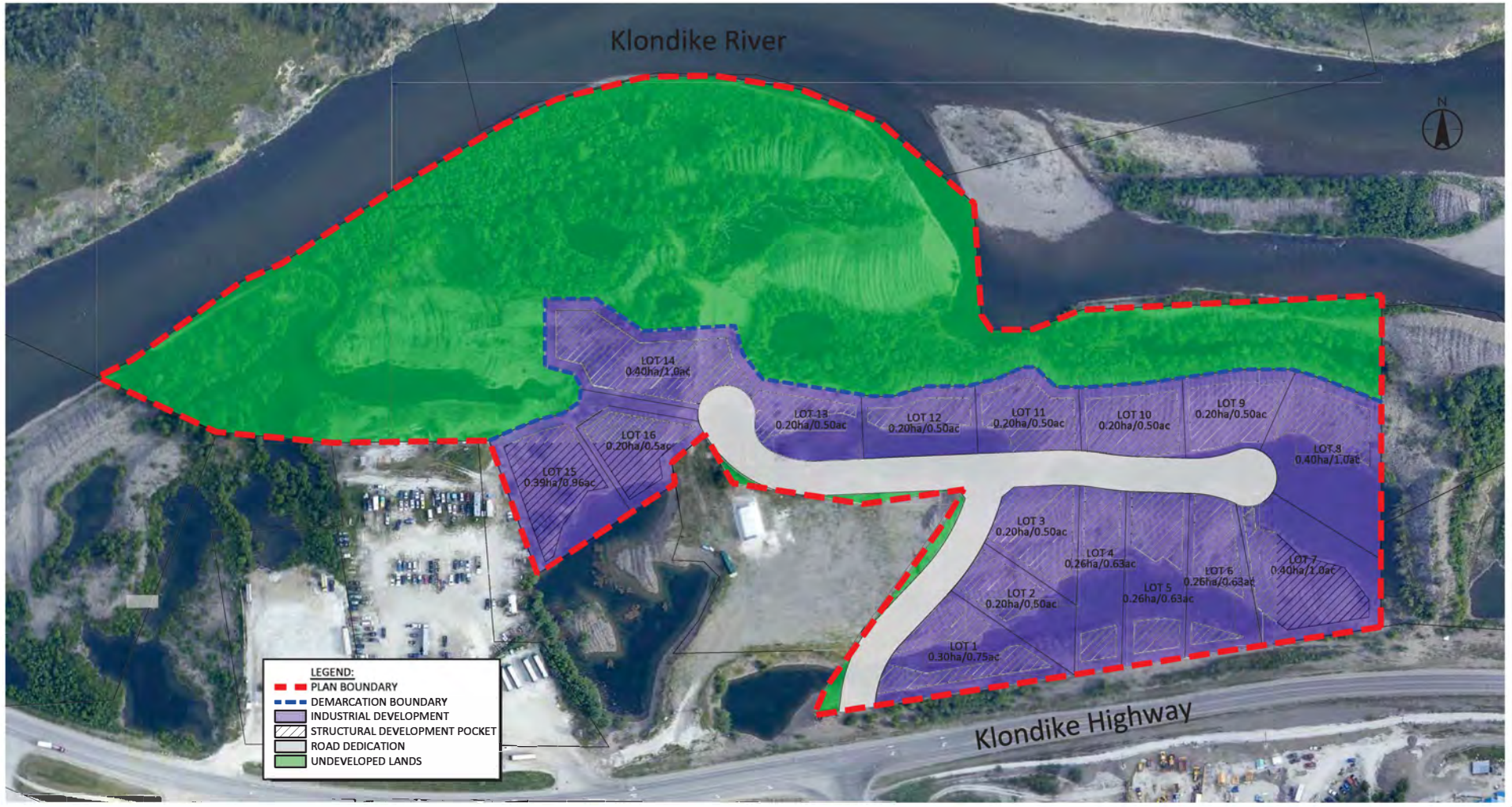


Figure 8.0 - Option B

Infill Site #2 - 16 Lot Cul-de-sac (Mixed sized lots)

1:2000 0 20 60 100m

Prepared for: Government of Yukon

DRAWN BY: SAS
CHECKED BY: GCL
SCALE: 1:2000
PROJECT #:

April, 2021

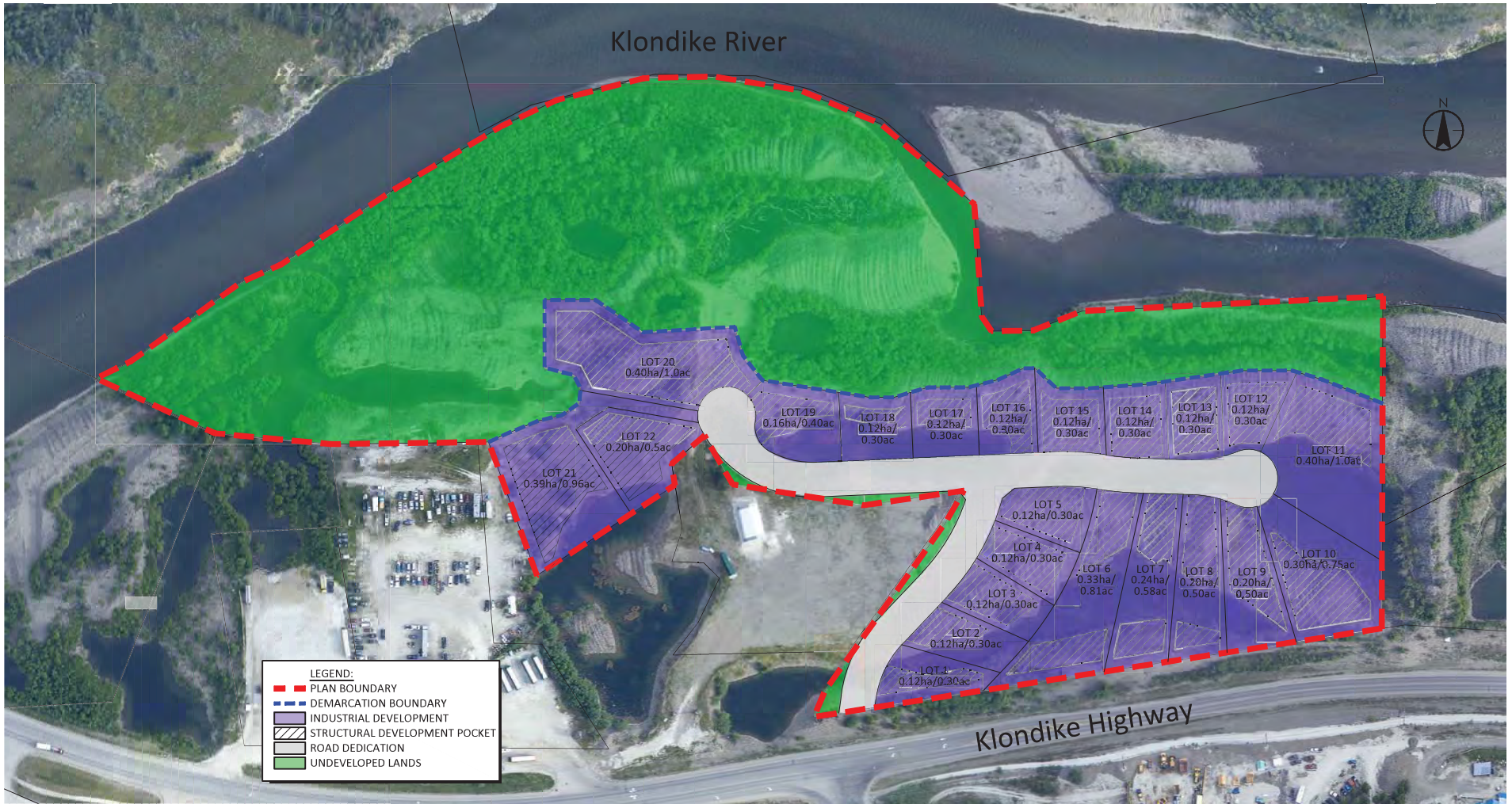


Figure 10.0 - Option C

Infill Site #2 - 22 Lot Cul-de-sac (Mixed sized lots)

1:2000 0 20 60 100m

Prepared for:
Government of Yukon

DRAWN BY: SAS
CHECKED BY: GCL
SCALE: 1:2000
PROJECT #:

April, 2021

Report to Council

☐	For Council Decision	☒	For Council Direction	☐	For Council Information

☐ In Camera

SUBJECT:	Little Blue Daycare Request for Lot 20, Government Reserve Addition	
PREPARED BY:	Cory Bellmore, CAO	**ATTACHMENTS:** 1. Research on history of Lot 20, Gov't Reserve Addition 2. Sale of Municipal Lands Policy #2018-03 3. Procurement Policy #14-02
DATE:	June 4, 2021	
RELEVANT BYLAWS / POLICY / LEGISLATION: 2018-03- Sale of Municipal Lands Policy #14-02- Procurement Policy		

RECOMMENDATION

It is respectfully recommended that Committee of the Whole provide direction on the request from the Little Blue Day Care and to follow the Sale of Municipal Lands Policy #2018-03.

ISSUE / BACKGROUND

Please refer to the Research History document provided with this RFD.

ANALYSIS

The Sale of Municipal Lands Policy #2018-03 should be followed.

APPROVAL		
NAME:	Cory Bellmore, CAO	**SIGNATURE:** C Bellmore
DATE:	June 4, 2021	

Lot 20, Government Reserve Addition Research

2011

- Resolution# C11-27-18: issue a Request for Expressions of Interest (RFEI)

2012

- Meeting C12-07: Low Impact Development (LID) discuss RFEI (proposed residential project)
- Resolution# C12-07-06: Council approves LID's residential project
- Meeting C12-10: Little Blue Daycare wanted lot to remain as Parks & Greenspace
- Meeting C12-16: area residents (Chris Ball) want lot to remain as greenspace
- Official Community Plan Bylaw #12-23: Lot beside Daycare (block 20) was proposed to be for residential (LID). Prior to third and final reading delegation from Little Blue Daycare (including the children) requested council designate the lot as park. Third and final reading of bylaw designated the lot as Park.

2013

- Meeting C13-11: was noted that LID project was terminated due to public input. Correspondence from Chris Ball RE: didn't want the lot to be developed or sold

2015

- August 18, 2015 COW Meeting: Little Blue Daycare requested lot exchange beside daycare to allow for their plans (August 2015 see attached).
- Submissions were also made at the December 8th, 2015 Public Hearing. (one submission attached for info)
- OCP bylaw amended (bylaw #15-12) to change land designation of this lot to Institutional.

2016

- Zoning Bylaw amended (bylaw #16-08) to change zoning to institutional. Third and final reading August 16, 2016.

2018

- New OCP and Zoning Bylaws. Lot is designated as P2 Zone – Public and Institutional Zone. Childcare centre is an allowable use.

2021

- Little Blue Daycare requests lot for expansion of Daycare.

  Proposal (possibly one or all of these ideas will be done):

  1) With the current plans for the build they would have 30% of the property dedicated to green space. They would clear up the area and maintain a "greenbelt area". This allows for a maintained corridor between Church St and the park behind.
  2) Erect a monument dedicated to the previous use of the lot as a residential day school. They would work with the local First Nation Government to ensure it was done appropriately and respectfully.
  3) The playground they create would be accessible to the community allowing for age-appropriate outdoor space.

- They would like to build a new building on the proposed lot as well as updating the original building for an after school/summer camp

City of Dawson

Sale of Municipal Lands Policy
2018-03

1. POLICY STATEMENT

a) The City of Dawson wishes to ensure that all land within the municipal boundary is utilized to its full potential wherever possible. There are instances in which is may be in the public interest to consider that a given parcel could be developed to its highest and best use through municipal disposition of the land.

2. OBJECTIVES

a) It is the purpose of this policy to:

i. Establish the framework for the process of disposition of municipal land.
ii. Replace the Sale of Municipal Lands Policy #2014-04, which shall be repealed.

3. DEFINITIONS

ADJACENT PROPERTY: an adjacent property is a property that shares a property line with the subject property. Properties that would share a property line but are bisected by an alley are considered adjacent for the purposes of this definition.

PERMANENTLY CLOSED ROADWAY: a surveyed road right-of-way in the control of the City of Dawson that has been permanently closed by by-law through the process outlined in the Maintenance of Alleys Policy.

FULL LOT: a lot that meets the minimum lot size requirement for the zone it falls within as per the Zoning By-Law designation currently in effect at the time of disposition.

PARTIAL LOT: a lot that does not meet the minimum lot size requirement for the zone it falls within as per the Zoning By-Law designation currently in effect at the time of disposition.

SUBDIVISION: for the purposes of this policy, a subdivision is the creation a group of 3 or more lots by the municipality with the intent to develop the lots or release the lots to the public for development. Lots in a new subdivision may be newly surveyed lots or vacant lots pre-existing in the survey fabric that are municipally owned and previously undeveloped.

SURPLUS LOT: an existing lot that has been deemed as excess to the municipality's needs and is not earmarked or under consideration by any department for any future City of Dawson project or facility. A lot must be deemed a surplus lot through consultation with all City departments prior to disposition to ensure that there is no

significant municipal interest in the land.

4. CRITERIA FOR RELEASE

a) A lot being considered for disposition must first be deemed a surplus lot through consultation with all City of Dawson departments.
b) In accordance with s. 4(a), a lot will be deemed surplus using the following process:
    i. Circulation of the proposal to all department heads requesting their comments on the proposal and will include a deadline for comment;
    ii. Comments shall include:
        1) an indication of whether or not the land is earmarked or under consideration for future use by that department;
        2) Confirmation of whether or not the department would support the land being deemed surplus; and
        3) Any other information that the department head wishes to be considered by administration and Council during the disposition of the land.
c) In accordance with s. 4(b) and 5(c), an assessment of whether or not the land can be deemed surplus should be included in the recommendation report to Council.
d) Disposition of land parcels must be completed in accordance with the Procurement Policy in effect at the time of disposition.
e) Disposition shall only occur in compliance with the title and transfer of title requirements of the Land Titles Act with respect to remainders and metes and bounds descriptions.
f) Unserviced full lots may be released for disposition in the sole discretion of Council.

5. DISPOSITION PROCESS: GENERAL

a) Land disposition may occur through one of the following mechanisms:
    i. Formal request to the Chief Administrative Officer from the interested party;
    ii. For new subdivisions and for multiple lots deemed surplus and released at the same time, a land lottery conducted by the Chief Administrative Officer or their delegate;
    iii. For individual lots deemed surplus, either a land lottery OR an expression of interest conducted by the Chief Administrative Officer or their delegate.
b) In the event of Subsection 4. a) i. above, Council is under no obligation to accept a request to purchase land.
c) Land disposition shall occur through three readings of a by-law in accordance with the Municipal Act. The Chief Administrative Officer or their delegate will prepare a report to Council with a recommendation to accept or reject the proposal.

6. DISPOSITION PROCESS: FULL LOT

a) Full lots, including lots in new subdivisions, shall only be sold under an Agreement for Sale that ensures development of the lot within a specified period of time with a permitted use for that zone as per the Zoning By-Law in effect at the time of disposition.
    i. All developments through an Agreement for Sale under this Policy are required to comply with all other municipal by-laws, including but not limited to the requirement to obtain a valid development permit.
    ii. All developments through an Agreement for Sale under this Policy must either be connected to the municipal water and sewer system OR provide documentation of Yukon Government Environmental Health approval of a sewage disposal system prior to commencing development.
    iii. Council may wish to develop a standardized Agreement for Sale document for consistent requirements, but at minimum the Agreement for Sale should outline the following:
        1) The name and full contact information of the purchaser;
        2) The legal description and civic address of the property under consideration;
        3) The sale price as determined by this policy;
        4) The building requirement of the lot; and
        5) Action to be taken in the event that any conditions are not met.
    iv. Unless otherwise specified, all development costs shall be borne by the purchaser.
    v. Extensions to an Agreement for Sale may only be granted in extenuating circumstances for a maximum period of one year, at the discretion of Council and at the written request of the purchaser prior to expiry of the Agreement for Sale.
    vi. Agreements for Sale are solely intended for the listed Purchaser and may not be transferred.
    vii. Title to the property shall remain in the possession of the City of Dawson until such time as all conditions, including the building requirement, are met.

b) Full lots deemed surplus shall be sold at a value per square foot that is equivalent to the average assessed value per square foot of each adjacent property, based on the current Assessment Roll in effect, to a minimum of $1.00 per square foot.

c) Not withstanding s. 6(b), a full lot that is determined through a municipal planning exercise to have no developable value to the City may be disposed of for $1.00 per square foot, at the sole discretion of Council. This may require a condition in the Agreement for Sale that the purchaser acknowledge and accept liability for the reason that the lot was determined to have no developable value.

d) Not withstanding s. 6(b), a new subdivision created through a municipal planning exercise for the intent of release to the public may be disposed of at a rate determined by a market value assessment.

7. DISPOSITION PROCESS: PARTIAL LOT

a) Partial lots may only be sold to the current legal owner of an adjacent property owner, and shall be subject to the following conditions:
   i. The partial lot shall be consolidated with the adjacent lot in accordance with the policies and procedures outlined in the Municipal Act, the Zoning By-Law, and the Subdivision By-Law.
   ii. The cost of consolidation and all associated costs, including but not limited to survey costs, shall be borne by the purchaser.
b) Partial lots shall be sold at a value of $1.00 per square foot.
c) In the event that the adjacent property owner is located across an alley from the subject parcel lot, the sale shall be conditional upon the permanent closure of the alley and subsequent purchase of the portion of the alley required to consolidate.

8. DISPOSITION PROCESS: PERMANENTLY CLOSED ROADWAY

a) Permanently closed roadways may be made available for purchase only to property owners adjacent to the subject property, and shall be subject to the following conditions:
   i. The permanently closed roadway shall be consolidated with the adjacent lot in accordance with the policies and procedures outlined in the Municipal Act, the Zoning By-Law, and the Subdivision By-Law.
   ii. The cost of consolidation and all associated costs, including but not limited to survey costs, shall be borne by the purchaser.
b) Disposition of permanently closed roadways, or portions thereof, shall only occur if the disposition does not remove or restrict access to any other surveyed parcel.
c) Permanently closed roadways shall be sold at a value of $1.00 per square foot.

POLICY TITLE:	Sale of Municipal Lands Policy
POLICY #:	2018-03
EFFECTIVE DATE:	September 18, 2018
ADOPTED BY COUNCIL ON:	September 18, 2018
RESOLUTION #:	C18-31-12

Original signed By:
Wayne Potoroka, Mayor
Cory Bellmore, CAO

____ ____
Mayor CAO

City of Dawson
Procurement Policy
14-02

1. Policy Statement

The City of Dawson Council directs the operation of the municipality through its approved programs and policy. The purpose of this policy is to establish purchasing guidelines to ensure the most cost effective and cost efficient methods are used to purchase goods and services for the municipality in the manner approved by Council.

2. Guiding Principles

The following principles will guide the procurement practices of the City of Dawson:

(a) Procurement policy provides a direction for the expenditure of funds to complete the programs approved by Council in the annual Operating and Capital Budget.

(b) Procurement policy and procedures should provide the most cost efficient and cost effective methods to purchase and dispose of all goods and services for operations of the City of Dawson.

(c) The procurement process is to be open, fair, and consistent.

(d) The City of Dawson utilizes a “triple-bottom line” methodology for determining procurement strategies. Therefore the total cost of acquisition is to be considered when making purchasing decisions or recommendations.

(e) Procurement methods are to encourage competitive bidding for the supply of goods and/or services.

(f) To use suppliers, who can be expected to provide satisfactory performance, based on:
(i) performance
(ii) previous contracts
(iii) financial and other resources to complete the contract bid upon
(iv) references

(g) To encourage opportunities to partner with the business community to provide services to and for the City of Dawson in a cost effective and cost efficient manner.

(h) To procure necessary goods and services with due regard to the preservation of the natural environment and to encourage suppliers to supply goods incorporating recycled materials where practical.

3. General

(1) This policy applies to all Business Units over which the City of Dawson has jurisdiction.

(2) The City of Dawson will be under no obligation to accept the lowest bid or any bid received in response to a verbal or written request.

(3) The City of Dawson may remove a supplier name from consideration for a contract for up to one year based on poor performance or non-performance on a contract.

4. Procurement Methodology

The appropriate method of procurement shall be determined as follows, unless waived by approval of Council, or as a result of a bona fide emergency situation, as defined in *Bona Fide Emergency* Section.

1. All Purchases with the exception of Proposals for Consulting Services:

   a. Formal public tenders or requests for proposals – all transactions anticipated to be greater than *$20,000.00*;

   b. Quotations (solicited from specified suppliers) – all transactions between and including *$2,000.00 to $20,000.00.* Quotations for transactions up to *$15,000.00* may be waived by authorisation of the CAO.

   c. Transactions up to *$2,000.00* will be left to the discretion of Departmental Managers or authorised delegates.

2. Proposal for the Purchase of Consulting Services

   a. Formal public proposal for all transactions anticipated being greater than *$30,000.00.*

   b. Quotations (solicited from specific suppliers) for all transactions between and including *$10,000.00 to $30,000.00.* Quotations for transactions up to *$20,000.00* may be waived by the authority of the CAO.

   c. Transactions up to *$10,000.00* to be left to the discretion of the departmental managers or authorised delegates.

5. Bona Fide Emergency

"Bona Fide Emergency" for the purposes of this policy includes the development of:

1. A situation which may endanger the health and/or safety of any City employee or member of the public; and/or;

2. A situation that may jeopardise City property and/or assets or property and/or assets of members of the public.
3.

6. Delegation of Authority.

The CAO has the authority to delegate signing authority to others but this authority may not be re-delegated. The Delegation of Authority form attached as Appendix 1 shall authorize this delegation.

7. Awarding of Contracts

1. Where budgeted, all ***capital expenditures*** shall be approved as follows:

Total Purchase Amount	Approval Authority
$5,000 or less	Department Head
$5,001 to $15,000	Chief Administrative Officer
$15,001 and above	Council

2. Where budgeted, all contracts for items other than capital expenditures shall be approved as follows:

Contract Detail	Approval Authority
Any contract in excess of $50,000 per annum	Council
Any contract for consulting services in excess of $25,000.	Council
Any contract (except consulting services) between $5,001 and $50,000	Chief Administrative Officer
Consulting Contract $5,001 to $25,000	Chief Administrative Officer
Consulting Contract $5,000 or less	Department Head

3. Notwithstanding the approval authorities noted above, Council may, by resolution, establish specific approval requirements for an individual project or transaction.

8. Disposal of City Assets

The CAO or authorised delegate shall provide authority for all disposal reports. Disposal of City assets, provided they have not been deemed garbage, shall be made either via a public bidding process or as directed by City Council. The CAO may approve donations to bona fide non-profit organisations up to an estimated value not to exceed *$2,000.00*. Requests for donations exceeding this amount shall be recommended to Council for authorisation.

9. Local Purchasing Preference

1. In considering tender results, the City of Dawson shall support the procurement of local services by authorizing local procurement in the following circumstances:

- Where the value of the transaction is under *$1,000* and the prices are within 5% of each other.
- Where the value of the transaction is between *$1,000 and $7,500* and the prices are within 4% of each other.
- Where the value of the transaction is between *$7,500 and $25,000* and the prices are within 3% of each other.
- Where the value of the transaction is more than *$25,000* and the prices are within 2% of each other to a *$10,000* maximum difference in bids.

2. To stock in inventory those goods required on a timely and/or repetitious basis, local purchasing shall be supported.

11. Appendixes

Appendix “A” – Delegation of Authority Form

POLICY TITLE: Procurement Policy
POLICY #: 14-02
EFFECTIVE DATE: June 10, 2014
ADOPTED BY COUNCIL ON: June 10, 2014
RESOLUTION #: C14-23-22

Originals signed by:
Wayne Potoroka, Mayor Jeff Renaud, CAO

Report to Council

☐ For Council Decision ☒ For Council Direction ☐ For Council Information

☐ In Camera

SUBJECT:	Townsite Vacant Lots	
PREPARED BY:	Stephanie Pawluk, CDO	**ATTACHMENTS:** 1. LDB Proposed Priority Lots to Investigate
DATE:	June 4, 2021	
RELEVANT BYLAWS / POLICY / LEGISLATION: Municipal Act Official Community Plan Zoning Bylaw Land Development Protocol		

RECOMMENDATION

It is respectfully recommended that Committee of the Whole provide direction on:

1. Identification of lots that are not to be pursued;
2. Identification of priority lots and envisioned land use; and
3. Required feasibility work.

ISSUE / BACKGROUND

The Yukon Government Land Development Branch (LDB), in conjunction with the Planning and Development Department, underwent a review of YG and City-owned vacant lots in the Historic Townsite. Through this process, 12 potential lot areas were identified (see attached for a map and description of these areas). These findings were initially presented at LDB's April 21st 2021 land development presentation to Council at Committee of the Whole meeting CW21-09.

The LDB and Administration are now seeking direction on the lots that are supported by Council for potential development and direction on feasibility study requirements.

ANALYSIS

A summary of the work done to date includes:

- List of vacant lots from CoD
- LDB revision of list to facilitate mapping
- Disposition review by LMB
- Slope assessment mapping
- Creation of web map to spatially capture list of vacant lots
- CoD interdepartmental review of vacant lots
- LDB review of vacant lots for high level development suitability

Based on LDB's Work Plan, next steps include the following:

- Council to provide direction on priority lots to focus on for potential development
- LDB confirmation of title on some parcels,
- updating webmap with additional information
- CoD looking into any agreements regarding development potential of some parcels/areas
- LDB to conduct high level review and proposed workplan based on priority lots identified

- LDB & CoD to determine roles/responsibilities

Once direction on priority lots has been received, LDB can proceed with stage 1 feasibility investigations (geotechnical, environmental, heritage), unless directed otherwise by Council (discussed below). LDB can manage and cover all costs associated with stage 1 investigations and not require these costs to be recoverable. The next stages of design (as needed) and implementation will need to be cost recoverable.

Feasibility work

The City must determine the extent of feasibility review that it is comfortable conducting on City-owned lots. The majority of these lots are City of Dawson owned (exceptions are areas 2 & 10). There are some regulations around heritage assessment work, but there are no regulations that require a municipality to conduct geotechnical or environmental investigations prior to selling land. YG's standard practice and recommendation is to conduct these assessments (geotechnical, heritage, and environmental) to better understand development potential and any constraints, potential liabilities, or risks.

APPROVAL		
NAME:	Cory Bellmore, CAO	**SIGNATURE:** 
DATE:	June 4, 2021	

Dawson Vacant Lots

Proposed Priority Lots to Investigate

April 15, 2021

1. **Informal Park Area**
   Lots 2 to 5, Block 2, Days Addition
   - CoD considering maintain area for public use (formalizing park use), however potential for 2 lots for development

2. **City Welcome Sign Area**
   Lots 3 to 8, Block 18, Government Reserve
   - Currently a small park area
   - potential for 2-4 lots for development

3. **302 Church Street**
   Block 20, Government Reserve
   - Adjacent Day Care
   - potential for 2-3 lots for development

4. **Vacant Land across from Gerties (corner of 4th & Queen)**
   Lots 16 to 20, Block L, Ladue Estate
   - current parking area for Gerties (CoD confirming if formal agreement/lease in place)
   - potential for 3-5 lots for development

5. **Vacant Lots adjacent existing Rec Centre**
   Lots 8 & 13, Block S, Ladue Estate
   - current parking for Rec Centre (may become available pending decision on new Rec Centre)
   - potential for 2 lots for development

6. **Adjacent Vacant Lands near Parks Canada Building**
   Lot 3, Block H, Ladue Estate
   - Potential parking area?
   - potential for 1 lot for development

7. **Proposed New Lot adjacent York Street Lift Station**
   New Lot 'B', Block C, Ladue Estate
   - Commercial lot being created through subdivision
   - potential for 1 lot for development

8. **Existing RV Park**
   Lots 1 to 20, Block Q, Ladue Estate
   - Current use as RV Park
   - Future use pending Council decision
   - potential for 20+ residential lots for development

9. **Vacant Lot off 6th Ave**
   Lot 3, Block Z, Ladue Estate
   - potential for 1 lot for development

10. **Lots behind Private Block 4 Development, North End**
    Lots 9 to 11, Block U, Government Addition
    - Likely has access constraints
    - potential for 3 lots for development

11. **Lots behind 7th Ave**
    Lots 21 to 24, Block LI, Ladue Estate
    - Anticipate access constraints
    - potential for 2-3 lots for development

12. **Larger area off Mary McLeod Road**
    Various Lots: Blocks A, V, W, X, Y, Z, Stewart Menzies Addition, & Block 13, Government Addition
    - Potential Country Residential lots
    - potential lot yield to be determined

Typical YG Workplan (may vary based on specific site and constraints/opportunities)

STAGE 1
- title confirmation
- zoning conformance review
- site inspection
- encroachment review
- review for other land uses (ie. dispositions, adjacent compatible uses, etc.)
- survey monument review
- access review
- servicing review (City services and telecommunications)
- feasibility review (geotechnical, environmental, heritage investigations)

STAGE 2
- planning
- civil design
- encroachment resolutions
- zoning amendments
- subdivision approval
- market value appraisals
- environmental remediation or other follow up from feasibility investigations

STAGE 3
- implementation of civil works (access or servicing)
- subdivision / survey / registration of new plan(s)

STAGE 4
- lot sales
- agreement for sale
- transfer title

Report to Council

[X] For Council Decision [ ] For Council Direction [X] For Council Information

[ ] In Camera

AGENDA ITEM:	Climate Change – Adaption Planning	
PREPARED BY:	Brodie Klemm	**ATTACHMENTS:** ▪ FPMBCL CoD Admin Bldg RCx Report ▪ FPMBCL CoD PW Shop RCx Report ▪ AMFRC Fuel Analysis ▪ PW Shop Fuel Analysis ▪ City Building Fuel Analysis 208-2021 ▪ City Hall Fuel Analysis ▪ MAGS Technical Specifications
DATE:	June 3, 2021	
RELEVANT BYLAWS / POLICY / LEGISLATION: ▪		

RECOMMENDATION

- Forward to council to direct administration to engage with Chief Isaac in regards to pursuing a feasibility study on district biomass heating system for our respective facilities and other buildings in the North End.
- Forward to council to direct administration to switch from oil to propane as a heating fuel and pursue further design & planning in regard to replacing existing oil-fired boilers within the Administration building with a hybrid propane boiler/heat pump system.
- Forward to council to direct administration to prepare an RFP for design, build and installation of a modern Building Management System for the Administration Building that will integrate the hybrid propane boiler/heat pump system as well as possible future biomass district heating system.
- Forward to council to direct administration to prepare an RFP for design, build and installation of a hydronic heating loop using boilers (propane or oil to be decided based on code requirements) within the Public Works building using completed recommissioning report as a basis of design.
- Forward to council to direct administration to prepare an RFP for design, build and installation of a ‘solar roof’ on the Public Works Shop that incorporates upgraded insulation levels and solar panels/shingles.
- Forward to council to direct administration to pursue energy mapping within municipal boundaries to identify the viability of local solar, wind and micro-hydro resources in order to develop a Dawson City Community Energy Plan
- Forward to council to direct administration to pursue funding for a pilot project utilising a Micro Auto Gasification System (MAGS) to address problematic waste disposal (cardboard, waste oil etc) while simultaneously recovering heat energy from this waste for use in appropriate facilities.
- Review and provide comments on the City of Dawson - Facility Energy Use Report card 20/21

ISSUE / PURPOSE

Council unanimously passed a resolution at their meeting on October 7, 2019 to implement changes that would reduce the environmental footprint and greenhouse gas emissions resulting from City operations. This plan will provide strategic direction for the municipality and has the potential to spur a number of new local industries related to energy production.

BACKGROUND SUMMARY

ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) level 2 energy audits were conducted on the Dawson City Administration Building and Dawson City Public Works Shop in January of 2020. These were conducted at the request of Energy Mines and Resources as a prerequisite for obtaining funding from the Community Institutional Energy Efficiency Program (CIEEP).

The results of these audits were reviewed and further researched by the Asset & Project Manager together with a Senior Energy Advisor from YG. Further recommissioning work was decided upon and administration engaged with Future-Proof My Building Consulting out of Whitehorse to perform a more detailed analysis of each to the two buildings and provide recommendations on how to best set each facility up for optimal energy performance now and into the future. A total of forty-six recommendations were received across both buildings with the major proposals including:

- Implementing a biomass district heating facility in collaboration with Chief Isaac to heat both CoD and Chief Isaac buildings as well as possibly Trinke Zho Daycare and the Parks Canada Maintenance compound
- Switching to propane as a heat source/backup heat source if biomass is installed in order to lower GHG emissions and mitigate environmental spill concerns.
- Upgrading the roof of the Public Works shop to accommodate higher insulation levels to reduce the required heat load and prevent seasonal ice-damming. Appropriate reinforcing is suggested to allow for the installation of solar infrastructure at a future date however this work may as well be done at the same time.
- Installing a Building Management System within the Administration building to increase overall efficiencies of all HVAC components

ANALYSIS / DISCUSSION

The Project Team has concluded the following to be necessary to continue to move its Climate Change adaption measures forwards:

1. Feasibility study of a Biomass District Heating System.

District Energy is a proven means of meeting demand for space heating, domestic hot-water and other services. It is well established in many Canadian cities and across Europe and Asia. The Asset & Project Manager along with the Building Maintenance team toured the local plant in Dawson as well as the Arctic Inland sawmill that supplies the plant with woodchips. Should Chief Isaac agree to partake in this project, a feasibility study is required to answer further questions including but not limited to:

- Number of buildings involved and their respective heat loads
- Understand how other buildings will best utilize the provided heat
- Most suited location(s) for the Plant
- Biomass supply and environmental impacts of harvesting increased amounts of fuel wood
- Engineering required to allow infrastructure that is buried in permafrost to be as safe as possible
- Opportunities for citizens to participate in the heating economy through the sale of fuel wood (as done in Teslin) and willow harvesting (as done in Old Crow)

2. Switching to Propane as a heat source.

Advantages of propane as a heat source include:

- Lower GHG emissions

- Operational efficiencies of up to 97%
- Biomass as the primary heat source with propane backup is the model that the territorial government are also working to implement.

Propane is not without its drawbacks however and further design and operational issues will need to be addressed such as:

- Propane will coagulate and cease to flow at temperatures below -42°C. Tank heaters exist to mitigate this issue and other options can also be explored
- Availability of qualified maintenance personnel within the municipality.

3. Upgrading the insulation and Installing Solar on the Roof of the Public Works Shop

In its current form, the roof of the PW shop is prone to ice-damming due to the limited amounts of insulation at the eaves. This allows warmed air from within the building to escape and melt the snow at the eaves which later re-freezes and can cause damage to the roof system, become a hazard for occupants and leads to water infiltration into the wall cavity during spring thawing.

An upgrade to the roof system would include:

- Adding 4-6” of additional insulating material
- Incorporating a venting space that allows air to circulate and prevent ice-damming
- Installing solar panels/shingles that would off-set a portion of the buildings electrical draw

Further solar energy mapping could be done of other City owned properties and incremental installation of solar infrastructure worked into future capital budgets.

4. Continuous energy improvements at the City’s major energy consuming facilities.

Building Maintenance personnel have implemented a number of energy saving changes across City facilities and in particular the Art & Margaret Fry Recreation Centre. The upstairs, unfinished office area of the AMFRC never had proper insulation or vapour barrier installed on the exterior walls nor had the ventilation ducting connected from the downstairs administrative area to the air handler.

These two factors resulted in the unfinished offices to be under a state of negative pressure, continuously drawing outside air in through the exterior walls into the building. Building Maintenance personnel rectified this situation in January of 2021 for a materials and labour cost of $5,050 and measured an immediate reduction in heating oil consumption. This combined with operational changes instigated by former Building Maintenance Technician Stephen Kurth has led to an increase in fuel efficiency since 2019 of 51.1%

This was accompanied by a significant increase in electrical usage compared to previous years. The chief reason for this was due to issues with the ‘free air’ component of the chiller system used to create the artificial ice surface. This system allows the chiller to shut-off when the ambient temperature is less than -25°C and utilises outside air to maintain the ice surface. Leaks detected within the system resulted in it being inoperable throughout the winter and hence the chiller was required to operate continuously throughout the season. These issues will be resolved for the 21/22 season.

Additional upgrades to the AMFRC scheduled for 2021 include replacing the metal halide bulbs that illuminate the rink surface with LED equivalents and installing a REAL Ice™ system that would reduce the amount of heating required for flood water, eliminate short-cycling of the boiler system and allow the temperature of the chiller to be raised several degrees.

Other energy saving measures instituted by Building Maintenance staff included:

- Applying window film on all double glazed windows in the Administration building, Public Works Shop and Minto Park Concession.
- Systematic air sealing of all facilities utilizing a FLIR C2 Thermal imaging camera and various sealing mediums including new weather stripping and door sweeps, spray foam, foam tapes and both batt and rigid insulation.
- Switching out of approximately 400 fluorescent bulbs across both the Admin and PW buildings to energy efficient, ballast-free LED equivalents
- Setting up the major facilities on the Energy Branch's 'Energy Star Portfolio Manager' energy benchmarking platform. This tool will track trends in energy usage and costs over time for all the major energy consuming facilities.
- Increased electrical usage at the Minto Park Concession was identified during the winter month and solutions are being investigated in regard to more efficient heating options and re-programming the use of the HRV to only operate when the building is occupied.

ALIGNMENT TO OFFICIAL COMMUNITY PLAN & STRATEGIC PRIORITIES

Council has encouraged and directed administration through a resolution in 2019 to ensure environmental footprint and greenhouse gas emissions resulting from City operations are part of the decision making process of municipal operations. This is a positive move to ensure we prioritize our response to the challenge of climate change.

This plan also meets OCP Guiding Principle 3.5 Promote Environmental Stewardship

APPROVAL		
NAME:	Cory Bellmore, CAO	**SIGNATURE:** 
DATE:	June 4, 2021	

2180 2nd Ave
Whitehorse, YT Y1A 5N6
Tel: 306.261.8846
www.FutureProofMyBuilding.com

Client: City of Dawson

Administration Building

Recommissioning and Engineering Assessment Report

Prepared by:

Shane Wolffe P.Eng, LEED AP BD+C, CEA
APEY Member No. 2428

Issued to Brodie Klemm

City of Dawson Project Manager

ProjectManager@cityofdawson.ca (867)993-7405

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Executive Summary

This report is a record of recommissioning and assessment activities of the City of Dawson Administration Building/Firehall located in Dawson City, Yukon. It explains components of the facility that were investigated during this project and provides guidance to building operators and project managers with regards to how to proceed with energy saving and greenhouse gas reducing projects. This project was initiated to aid proponents in bidding and provide a detailed scope of work as well as to comment on proposed ECMs from the Energy Audit Report.

Section 5 of this report defines the options available to the City of Dawson and should be fully considered prior to moving forward with implementing ECMs that may later have minor usage.

Proponents to the Request for Proposals should read this report and become familiar with it to assist with preparing their submission. Section 5 lays out the action items/criteria of the project that are being completed and bid on. The proponents are instructed to reference each item in section 5 individually as each item will be individually assessed according to the item reference number. This is intended to assist proponents with organizing their submissions and for the owner with regards to scoring proposals.[1]

At the request of the building owner this project focused on the future state of the building rather than its current state. Recommissioning activities took place during the winter.

Operators should familiarize themselves with recommissioning and energy auditing reports to assist with operating the building. Project managers should make themselves familiar with energy auditing and recommissioning reports prior to contracting services or making alterations to a building that has been recommissioned or energy audited to make the best usage of their time and resources. Energy Audit reports are a surface level investigation while recommissioning projects dig into the details of how a building is operating.

Operators should endeavour to continuously commission equipment through the life of a building.

Top recommendations to be implemented as part of this project include:

1. Install a biomass system to heat the Admin Building, Public Works Building and potentially Chief Isaac properties
2. Implement ECM-10 Control system to integrate other controls related ECMs
3. Insulate bay doors and metal exit doors
4. Implement ECM-3 LED Lighting Upgrades without occupancy sensors or dimmer switches
5. Implement ECM-17 Insulation Upgrade to roof
6. Upgrade boilers (optimally to propane) while funding is available

ECMs not recommended are:

1. Insulation upgrade to walls not recommended
2. Utilizing Energy Valve ECM-14 with Self Sensing Pumps ECM-6

[1] This report has a different layout than I expected because of the multiple options available to the City. Once the City selects which criteria to utilize, I will remove the components that are not applicable from section 5.

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1 - Introduction

Future Proof My Building Consulting Ltd. (FPMBC) was contracted by the City of Dawson to carry out recommissioning activities at the Fire Hall/Administration Building in Dawson, YT to identify sources of excessive energy usage in the facility and provide recommendations for the correction of mechanical, electrical and control systems that can save energy in the facility and reduce greenhouse gas (GHG) emissions. The project is intended to help clarify and facilitate the successful implementation of energy conservation measures (ECMs) noted in the Energy Audit Report issued by 3D Energy Limited on April 17, 2020. The Energy Audit inspection appears to have been conducted in January or February of 2019.

Site visits by FPMBC were carried out on December 15 and 17th to assess equipment and the building in general and test controls, mechanical and electrical systems within the building. During the thermal inspection on December 15 the outdoor air temperature was -21°C. On December 17, it was -37°C according to the Weather Network.

This report highlights issues identified and opportunities to save energy within the facility and shall help inform proponents of issues that must be addressed as part of energy efficiency upgrades to the building. Consultation with building operators, engineers, technicians, design consultants and contractors will likely be necessary to address the issues and opportunities identified within this report. This report in whole or in part can be issued to the appropriate parties to request resolutions, provide guidance with detailed designs, provide answers to inquiries or for the sake of providing clarification.

1.1 - Definitions, Acronyms etc.

ESC – Energy Solutions Centre

FPMBC – Future Proof My Building Consulting Ltd.

AHU – Air Handling Unit

AH – Air Handler also referred to as RTU and AHU

BMS - Building Management System – the computer/software that displays the graphics and allows a building operator to control components within the building. The BMS is essentially a SCADA system that displays trends, graphics and monitors the control system to visually describe the state of equipment within a building.

City – Referring to the City of Dawson

CU – Cooling Unit

Cx – short for commissioning

DMP/DMPR – Damper – a device that opens and closes to allow air flow or restrict airflow.

EAD – Exhaust Air Dampers – dampers that exhaust return air to the exterior

EF – Exhaust Fan – a fan that removes exhaust air from a zone

FC or FCU – Fan Coil Unit

HAND – Industry term for "Manual" mode or "ON"

HOA – Hand/OFF/AUTO – a switch that puts equipment in HAND (manual ON), OFF or Automatic as determined by the control system

HtgVlv – Heating Valve – A valve that opens in order to allow hot water to flow through it into a heating coil or radiating device.

HWST - Hot water supply temperature. The temperature of the water that is provided to the building by the boilers.

HWRT – Hot water return temperature. The temperature of the water that returns to the boilers after being used by equipment in the building.

IPP – Independent Power Producers Program – A program administered by the Energy Solutions Centre that allows for selling renewable energy to the grid.

MAD – Mixed Air Dampers – dampers that mix return air with outdoor air

MCC – Motor Control Centre – A switch that allows for turning large equipment such as fans and pumps ON/OFF in HAND/AUTO.

Night Setback – An algorithm that holds a zone at a temperature several degrees below the regular occupancy temperature. A night setback during heating season is typically 17°C or 18°C. Also called an "unoccupied mode." In the Yukon, summer temperatures do not typically require a setback temperature due to cool nights.

OAD – Outside Air Dampers – dampers that open to allow fresh air into an AHU.

OAT – Outside Air Temperature

PID – Proportional Integral Derivative – A mathematically derived equation that controls the behaviour of equipment. A good PID loop is a program that makes equipment find a steady state of operation without oscillating between overshooting and undershooting the desired output.

RCx – short for recommissioning. Recommissioning is a re-optimization process for existing buildings. It ensures building equipment and systems are operating optimally to meet current occupant needs. It provides a rigorous investigation approach to identify problems and integration issues.
The RCx primary focus is on identifying "low cost/no cost" operational improvements given the building's current usage to obtain comfort and energy savings. [2]

[2] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/pdf/fichier.php/codectec/En/2008-167/NRCan_RCx_Guide.pdf

Reset Schedule – an algorithm within the control system that automatically modulates the output temperatures of a boiler according to the OAT. A good reset schedule should be operator adjustable so that the operator can adjust the boiler water temperature at a given OAT according to the dynamics of a building. Warmer OATs allow for cooler boiler water and colder OATs require hotter boiler water to meet the demands of a building. In buildings without a reset schedule, the same temperature water is used whether it's -40°C or 15°C.

RTU – Roof Top Unit – supplies large amounts of tempered air to a building.

SAF – Supply Air Fan – The fan within the air handling unit that pushes air through the zone/ductwork/system as it pulls return air back and mixes it with outside air.

SAT – Supply Air Temperature – typically from an air handling unit

SATSP – Supply Air Temperature Setpoint - the temperature that the AHU should be providing

SHGC - Solar Heat Gain Coefficient – a measure of how well solar gains are transmitted through glass to allow heat to be captured by the glass. SHGC = 1 means that all light frequencies pass through and cause heating. SHGC = 0 means that all visible light is reflected. No window will ever reach SHGC of 1 or 0.

Shoulder Season – typically fall and spring in which heating is required at night or on cloudy days and cooling is required during the heat of the day. The shoulder season is typically when HVAC systems can overheat or cool a building and use excessive amounts of energy unnecessarily. In Yukon the shoulder season can also refer to summer operating conditions.

SWT – Supply Water Temperature – the temperature of water that is being delivered from the boilers to heating equipment

TStat – Thermostat – A device that measures temperature in a zone.

Trends – Trends are graphs of the status of a point as measured or set by a control system. Having the status of points displayed graphically allows an operator or energy manager to understand how well equipment is operating. This assists with determining options that can save energy in buildings and allows for experimentation with regards to scheduling etc.

UPS – Uninterrupted Power Supply – A battery bank that is attached to electrical equipment to prevent the equipment from shutting down or experiencing power failure/power quality issues.

VAV – Variable Air Volume box – A device that mixes and tempers air for delivery to a zone at a setpoint temperature

VFD – Variable Frequency Drive – A device that changes the frequency of power that is delivered to a motor in order to control the speed of the motor. Running a motor with a VFD provides significant efficiencies with regards to electrical energy used if the motor isn't running at full speed. VFDs can also introduce harmonics and slightly alter the power factor of a circuit.

1.2 - General Notes regarding building history and findings[3]

Located in Dawson City, Yukon, the Administration Building (also called city hall/fire hall) has two stories and was originally constructed in 1898 with an approximate floor area of 657 m^2. According to the information provided to Energy Auditors, an interior renovation was done to the existing building in 1999 as well as a total of 541 m^2 was added to the north and south of the existing building including mezzanine level on south side. This facility has a total gross floor area of approximately 1,198 m^2.

The admin building houses a museum, equipment room, association (staff) room, washrooms and ancillary spaces on main floor; offices, council chamber, meeting room, washrooms and ancillary spaces on second floor and mechanical room on mezzanine level.

The city hall component of the building is occupied from 8am to 6pm on weekdays and closed on weekends. There are 10-12 regular staff plus a maximum of 5 visitors. The Fire Hall component is open year-round with training one night per week which is attended by approximately 30 fire fighters.

Based on the heating oil consumption records for 2017-2019, the facility uses an annual average of 21,232L of fuel oil per year at $1.05/L. That is an annual fuel cost of $22,270. The cost of a gigajoule of oil at $1.05/L is $27.41. The existing oil boilers are predicted to have an efficiency of 68% in the Energy Audit, however they have been regularly maintained and tested to have an 84.8% and 84.9% efficiency. The cost to deliver 1GJ of energy from burning oil @ $1.05/L in an 85% efficient boiler is $32.24/GJ.

ECM-13 from the Energy Audit recommends implementing a biomass boiler for this building[4] and predicts an annual oil savings of 16,185L (32 t CO_2e yearly reduction). The cost of heat provided by biomass to Haines Junction and the City of Whitehorse is approximately $10/GJ[5] at $150/ton of dry chips. This cost is likely due to an existing market and availability of seasoned, dry chips. The biomass system currently operating in Dawson is paying the sawmill $28/GJ to provide chips to the Yukon Government operated facility[6].

According to Brodie Klemm, the oil tanks for the Admin building are at the end of life and are due for replacement. The cost of oil tank replacement should be factored into their replacement costs. The costs of cleaning up an oil spill and insurance should also be considered since they will factor into the ongoing costs of the system. Though a reduction in premium has not been guaranteed by the current

[3] Many of the statistics from this report have been referenced from the Energy Audit report.
[4] Ideally a biomass district heating system will be constructed for this building, the Public Works building and potentially multiple Chief Isaac properties as well as the City's woodshop to reduce operating expenses and GHG emissions from all buildings connected to the heating loop.
[5] The cost of biomass heating depends upon the moisture content of chips and cost of supplied wood per ton.
[6] The chip quality and dryness will directly affect the performance and efficiency of the biomass system and thus it is recommended to procure dry, seasoned chips. If Chief Isaac or Tr'ondëk Hwëchin have a stake in the biomass system, they will likely participate in the acquisition of wood chips at a more competitive rate while investing in infrastructure to improve chip quality.

insurance provider, there may be some financial incentive to reduce the risk and liability of using an oil-based system.

Based on the electricity consumption records for 2017-2019, the facility uses an annual average of 75,950 kWh of electricity per year with a max peak demand of 31.62 kW in 2018. This usage puts the facility in Block 4 of the new Yukon Energy rate schedule (2020) with a cost of $0.20/kWh and a demand charge of $10.85/kW. The switch gear for the building indicates a Maximum Horizontal Bus Capacity of 400A, Maximum Interrupting Capacity of 22KAIC, Bus Bracing of 50KA at 120V/208V.

The facility heating and cooling distribution methods are:

- High temperature hydronic (hot water) heating (serving perimeter baseboard heaters, unit heaters and heating coils in AHU and FCU).
- Conditioned forced air supplied to the spaces via ceiling mounted grilles/diffusers.
- Forced air heating through unit heaters.
- Convective heat through baseboard radiation.

Currently the Admin building is heated from the combustion of oil-burning aged equipment. There is a hydronic heating system that is used to distribute the heat as well as temper air for the building. This makes it a prime candidate for implementing biomass heating. To significantly reduce the GHGs consumed by the building as well as operational costs, implementing biomass heating in the Administration Building as well as at the Public Works Building is recommended.

There are multiple potential options for implementing biomass heating in the building. Section 3 of this report will discuss potential options for constructing a biomass district heating plant that can be utilized by the City of Dawson as well as potentially Chief Isaac.

2.0 – HVAC Equipment

2.1 – Boilers

Items: 5.1, 5.2, 5.3, 5.18

The building is heated by 2 large 483MBH (141.55kW) oil boilers that were installed in December 1999 according to nameplate stickers. These boilers operate between 180F and 210F (82.2°C and 98.9°C) with water temperatures ranging from 155F to 170F (68.3°C to 76.7°C). The system appears to simply maintain the water temperature as long as the boilers are on. There is no outdoor reset and there are no temperature sensors that report boiler temperatures to the existing control system. Thermometers should be added to the hot water supply and hot water return lines of each boiler when upgrades to the boilers are made.

Hot water is distributed through the system to radiant wall heaters, the air handling unit AHU-1, a fan coil unit and unit heaters. With the exception of AHU-1, this heat is regulated by simple thermostats that have no unoccupied settings. Thermostats for radiant heating were tested and observed to be

functioning, however they must be manually controlled on Fridays to provide setback energy savings. Currently the building operator drops the setpoint by 3°C on Fridays and resets them on Mondays. The zones respond well.

Figure 1: Two large 141.55kW oil boilers heat the Administration Building. The controls cabinet for the building is in the blue cabinet on the left side of the image.

The City of Dawson should decide if oil will continue to be the backup heat source once a biomass system is installed. The oil tank is at end of life and will need to be replaced soon. It may be advisable to change over all equipment within the Administration building to propane now since propane equipment is more efficient, allows for better temperature modulation, creates less GHGs, and has less risk and environmental concern attached to it. The cost alone to replace an oil tank and infrastructure with propane infrastructure may be offset by the cost of cleanup from an oil spill or leaking tank.

In terms of economics, propane typically outperforms oil in terms of cost per heat delivered and has the benefit of reduced GHG emissions. The cost of propane to the City of Dawson was quoted at $0.9141/L on April 27, 2021 which is 208% higher than the $0.44/L that the City of Whitehorse paid in 2019. This equates to a cost of $37.59/GJ of heat delivered when utilized in a 95% efficiency boiler. The cost of a gigajoule of energy delivered from burning oil @ $1.05/L in an 85% efficient furnace (maximum efficiency) is $32.24/GJ.

Regarding expected propane consumption if a biomass boiler is added, the following can be inferred. The Admin Building used an annual average of 21,232L (813.5GJ) of heating oil from 2017 to 2019. The boilers operate at ~85% efficiency, thus only ~691GJ of the 813.5GJ of delivered energy was used for heating by the oil boilers. **691GJ worth of propane used in a 95% efficient boiler(s) is 28,513L per year** if no other energy conservation measures are taken. Since the building will use significantly less energy from ECMs and be approximately 80% heated by biomass, it is reasonable to assume between 2,850L to 11,400L of propane per year (10% to 40% of current energy demand) once biomass is installed and other ECMs are implemented. The 40% figure is in case the biomass is down for a period in the winter. 2,850L @ $0.9141 = $2605/year to 11,400L @ $0.9141 = $10,420. The high end of propane usage is pure propane 28,050L @ $0.9141 = $25,640 per year.

A significant drawback of using propane in Dawson's extreme climate is that it has the potential to stop flowing when outdoor air temperatures are colder than -42°C. There is equipment that is designed to mitigate the chances of propane coagulating under these conditions such as a tank warming electric blanket. A greater issue may be a lack of infrastructure in place and the availability of being able to receive reliable propane deliveries. All of these should be considered prior to making the decision to change to propane.

According to the Superior Propane website[7], 500Gal (2000L) and 1000Gal (4000L) tanks are available. The number of deliveries the City intends in a year will determine the tanks chosen vs. cost per tank. For fewer deliveries and potentially a better cost per liter, select larger tanks. If there is a delivery charge it should be considered as part of the ongoing costs since a delivery to Dawson will likely be expensive and thus the City will want to limit deliveries as much as possible. It is likely that the high cost per liter factors delivery into the cost.

The decision to remain with oil as a backup heat source to biomass should be made prior to moving forward with any equipment upgrades or renovations. If oil remains as a backup heat source, the decision to implement backup oil boilers to the biomass heating system may be advisable, dependent upon the equipment options selected.

This report will assume that oil will remain the primary backup heat source to biomass.

2.2 – Radiant Heating

Hot water from the boiler is circulated through the building and is used as primary heating for the administration area as well as the fire hall. If a biomass boiler system is implemented as discussed in section 3, the existing hydronic system is highly advantageous for making use of the biomass heated water.

Radiant baseboard heating is used throughout the upstairs administrative part of the building. The radiant heating is controlled via manual thermostats which were tested during the site visit. All were found to be controlling the control valves. As part of BMS upgrades, these thermostats will optimally be replaced by operator adjustable thermostats that are monitored and controlled by the BMS. These

[7] https://www.superiorpropane.com/tank-sizes

thermostats must allow for occupancy scheduling. Zones that may be occupied after hours such as the Council Chambers should have an occupancy sensor or zone override button that keeps the zone at occupied temperatures after hours as required. This will allow for maintaining heating setpoints in winter as well as cooling setpoints during summer. The Council Chambers can reportedly overheat during summer months due to solar gains as it is located on the south west side of the building.

Unit heaters are used within the firehall to heat the firehall and museum. The unit heaters are currently controlled by manual thermostats that activate flow through the unit heater.

According to building operators, some radiant valves have been changed out as required due to failure. The installed valves can remain until their end of life however it is recommended that during boiler upgrades all radiant control valves be replaced with Normally Open control valves and the radiant system be drained to replace the glycol in the system. A strainer for the glycol system should also be added or replaced if it does not currently exist.

2.2.1 – Radiant Heating Recommissioning Notes

- The Council Chambers has radiant heating around the south west perimeter.
- City Hall Office/Reception office radiators extend into the reception area. This radiant loop is controlled from a thermostat within the reception office. When the thermostat was adjusted, the valve responded and flow through the loop occurred within 2 minutes.
- The CFO office stays sufficiently warm and is controlled from the thermostat located outside of the office. It appears that the thermostat is in the file room or possibly the reception office. CFO opens a window to provide cooling when necessary and does not want a thermostat added to the room.
- The photocopier appears to be controlled by a single thermostat located in the photocopier room.
- The Archive Room (interior file room) has its own thermostat and radiant heater.
- The thermostat located above the edge of a radiator and next to the hallway reportedly controls the bathroom radiator (valve located in the bathroom), adjacent hallway and North exit hallway. The radiator temperature increased to 48°C when activated by the thermostat.
- The mayor's office in the northwest corner has its own thermostat for radiant heating which runs along the north and west walls. The temperature increased from ~35°C to 50°C when tested.
- CAO office has a thermostat for the CAO and Executive Assistant office to the north. When inspected, the rads were sitting at 33°C and increased to 48°C when the thermostat was tested.
- City Planning Office on north wall has a thermostat for that office and for the bylaw office (north east most office). The rads were cool and increased as expected when tested.
- The fire chief office has a thermostat located near the door and baseboard heater. The office is on the east wall near the north most. The radiator temperature increased immediately when tested.
- The northeast stairwell has a unit heater on the ground floor which is controlled by a manual thermostat.

- There are two thermostats that are located in the Firehall Training/General purpose room. One appears to control radiant heating and the other is likely for air conditioning.
- The thermostat for unit heater 2-3 and 2-4 is located in the fire truck room on the south wall.

2.3 – Cooling Equipment

Item 5.4, 5.5

In the summer, the boilers are manually shut down and air conditioning must currently be manually activated. Stage 2 of the air conditioning must be run manually via the control system because the setpoints don't work. This indicates that there are relays wired to the automation system to activate the AC units. Without the relays and automation working correctly, the AC literally must be turned on and off by building operations staff according to the feedback of occupants. Air conditioning is typically activated in the mornings and turned off at night or if the office gets too cold. Upgrading the controls shall address the automatic control of cooling systems so that setpoints are met in automatic mode.

Of note, the AC equipment was installed in 2000 along with the rest of the HVAC equipment[8] and is nearing end of life. Installing a heat pump to replace the AC within the building would allow for cooling in the summer as well as GHG free heating in the summer and shoulder seasons. The cost to operate a heat pump for heating varies according to the heat pump and outdoor air temperature; the colder the OAT, the less efficient the heat pump operates for providing heat. A standard heat pump with a COP = 3 will cost $18.52/GJ and produces no GHGs if the Yukon grid is being fully powered by renewable energy.

If a heat pump is installed, it will likely only be useful until outdoor air temperatures are approximately 5°C, however this will prevent the boilers from being necessary for up to a couple of months and will prevent the building from overheating on temperate days when heating is required in the morning and cooling is required in the afternoons. A heat pump would also help to offset heating that is provided by a biomass boiler system. By not activating the boilers and pumping hot water through the radiant system, the building is less prone to overheating during the summer and shoulder seasons. A heat pump used in this way will require the controls to have a HeatPumpDisableTemp setting that will allow the building operator to disable the heat pump for heating when outdoor air temperatures are colder than an operator adjustable temperature of approximately 5°C. Installing a heat pump to replace the existing air conditioning equipment will require a detailed design, however it is likely that much of the AC infrastructure can be utilized with the heat pump.

2.4 – Air Handling Unit AHU-1[9]

Item 5.6

A conventional AHU provides ventilation to the offices upstairs, council chamber and general area of the main floor. The AHU is controlled via the existing controller. The current controller measures outdoor air

[8] According to Owen Kemp-Griffin, building operator.
[9] Some information from this section is taken from the Energy Audit Report.

temperature, supply air temperature, mixed air temperature, return air temperature and the heating valve position. A heating coil with controlled valve opens to temper the air based on a measured mixed air temperature to meet a supply air temperature setpoint. A large volume of outdoor air is available for free cooling via the outdoor air dampers on the AHU.

Figure 2: View of the AHU from both sides. Note the marked drain line on the floor for reference.

There is a simple control panel that is located at the entrance to the City Hall Reception area on the 2nd floor. This panel provides feedback regarding the AHU being in an ON or FAIL state. The panel tells the control system to manually run the AHU via "AHU ON" or to run according to commands from the existing controller via the "AUTO" setting. For the building operators to shut down the AHU at night to save energy, it was revealed through testing that the "AUTO" setting on this panel must be selected. When this panel is in AUTO setting, the operator can shut down AHU-1 by changing the AHU1_FAN_STATUS to OFF. This command shut down the supply air fan and return air fan, however the outside air dampers reportedly did not appear to close as they should. When restarted, the RAF activated first then the SAF after approximately a 20 second delay.

The existing control system does not allow for scheduling the AHU to be off or for occupancy. This panel will be removed when the BMS is upgraded.

According to the Energy Audit report, that AHU fresh air minimum damper position is set to 25%. While onsite it was observed that during winter, on extreme cold days the minimum outside air dampers are set to 15% via the BMS to save energy and maintain a comfortable environment. Occupants did not express complaints of lingering odors and the air quality within the upstairs area was high during the site visit[10].

[10] During the site visit the OAT was ~ -37°C and the plumbing trap for the building dried up due to the cold dry air. This caused fumes from the sewer system to enter the offices. The trap was filled with water and the OAD were opened beyond 15% overnight to clear out the smell and returned to 15% the following day. The smell from the disturbance was removed.

A visual inspection of these dampers makes them appear nearly closed, however by testing the dampers it was observed that they are controllable and open when commanded. Opening the dampers past 15% was observed to create a sufficiently large temperature drop within the AHU to significantly reduce the supply air temperature and increase the amount that the heating valve must open. For this reason, the minimum OAD setting was manually set to 15% from 22% when OAT was -37°C.

No physical measuring devices were noted on the AHU. Upgrades to the AHU should include adding thermometers that can be viewed by operations staff and compared to temperature sensors that are monitored by the building management system. The existing supply air temp (SAT), return air temperature (RAT) and mixed air temp (MAT) sensors should be replaced as part of upgrading the BMS.

2.4.1 – Recommissioning Notes AHU-1

The outdoor air temperature (OAT) sensor was significantly out of calibration. The $OAT_{Weather\ Network}$ = -36°C when the BMS indicated that the sensor was OAT_{Sensor} = -23.3°C. This level of error in temperature readings will cause significant issues in program logic. Whatever option is implemented regarding the new control system, a properly calibrated outdoor air temperature sensor is very important to ensure that the system functions optimally.

The outside air damper (OAD) appeared to be fully closed (0%) when set at 15% which is minimum damper position setting. Tested the dampers at 0% and witnessed no air flow, 5% with no noticeable air flow, 10% minimal outdoor air flow, 15% which provided sufficient outdoor air flow. When tested at 20%, the outdoor air increased significantly from 15% and dropped the mixed air temperature several degrees with outdoor air temperatures at -36°C.

Minimum position was manually set back to 15% based on this observation. Given the cold outside air temperatures in Dawson, 15% was deemed adequate to maintain a healthy environment. The automatic damper position defaulted to 22% but was observed to greatly increase the position of the heating valve required to maintain the SAT. This minimum damper position may be the result of the faulty outdoor air temperature sensor reading -23.3°C when the actual outdoor air temperature was -36°C (feels like -38°C). Building operations staff reduced it to 15% due to cold air complaints during extreme cold temperatures. The OAD minimum position should be put back into AUTO setting if condensation is witnessed on windows and from spring to fall to ensure high levels of ventilation when temperature issues do not occur. The minimum damper position using the current configuration should not be reduced below 15% to ensure adequate ventilation during the most extreme cold weather.

- Changed AHU1_Mixing_Dampers value to 50% to test automation sequences and observed SAT and MAT drop as expected with heating valve opening. The boiler also kicked on at the same moment, but that may have been a coincidence.
- The relief air dampers were checked and observed to be fully closed.
- SAT_{Sensor} = 22.9°C , $SAT_{Measured}$ = 19.7°C – Sensor is slightly out of calibration but will be replaced with new control system.
- The supply air temperature setpoint is met well by the automation

- The Heating Valve responded as expected when tested.
- MAT_{Sensor} = 20.2°C , $MAT_{Measured}$ = 19.4°C – Sensor is working well but will be replaced with new control system.
- The mixed air temperature setpoint is met well by the automation.
- RAT_{Sensor} = 21°C , $RAT_{Measured}$ = 19.4°C, RAT_{Gauge} = 70F (21.11°C) – Sensor matches gauge and will be replaced with new control system.

3 – Biomass heating

Item 5.8,

At this time, fire smarting is being completed around West Dawson and this wood is being burned on site and wasted. This wood would be better utilized as a heating source for buildings within Dawson City.

Since there is a lot of capacity to provide wood chips in Dawson City due to the large biomass boiler already in place at the Water Treatment plant, a biomass boiler may be considered for installation as primary heat source for the Administration Building, Public Works Building, and for potentially multiple Chief Isaac owned properties in the vicinity.

ECM-13 of the Energy Audit recommends implementing a 120kW biomass boiler specifically for the Administration Building as top recommendation, however this sized boiler will be insufficient if multiple buildings are heated using biomass. Further, it is advisable to utilize multiple biomass boilers for this project so that they can be activated during colder weather and biomass can still be utilized if a single boiler requires maintenance.

Of important note, permafrost gets worse within Dawson City at the north end of town. Since the buildings that would benefit from biomass as discussed here are in the north end of town, permafrost concerns should be considered as part of the design and installation.

During the site visit, FPMBC investigated City property to determine where a biomass boiler could best be located. Due to the importance of access and egress from the Firehall, the most plausible option on City property is to possibly convert the existing woodshop into a biomass boiler facility. Even this option has complications however with regards to efficient chip deliveries regarding access and egress and thus the neighboring Chief Isaac property was considered.

FPMBC spoke with Gina Nagano past Chair of Chief Isaac Group of Companies. Ms. Nagano served 6 years on the board and is knowledgeable of the location. She indicated that Chief Isaac would be keen to discuss utilizing biomass at their office that is next door to the Firehall/Admin Building as well as in the Tr'ondëk Hwëch'in daycare which is across the street (behind the admin building). If the City has Chief Isaac/Tr'ondëk Hwëch'in First Nation as a partner, it should reduce the cost and complexity of implementing biomass for the Admin and Public Works Buildings. To size a biomass installation properly for such an application, it will be important to know the heat loads of Chief Isaac buildings and the wood shop if this building is also to be heated using biomass.

To create a biomass district/cluster heating system for use between Chief Isaac and the City, it will be important for the City of Dawson to have some type of heat purchase agreement, MOU or maintenance agreement if a biomass plant is to be constructed on Chief Isaac property for sharing between Chief Isaac and the City of Dawson at the Admin Building and Public Works building.

The only other option that appears possible is to construct a small biomass building in some of the parking spaces near the road on the north side of the Fire Hall/Admin building. This is an option if this building and chip delivery does not interfere with fire truck operation. Given the limited options for constructing a biomass facility on City property as well as the cost benefits of partnering with the First Nation, constructing it on the adjacent Chief Isaac property holds promise.

Figure 3: The area in front of the Firehall must remain clear so that fire trucks can easily exit and enter the hall. This leaves little space for implementing a biomass facility on City property. The exception may be to remove several parking spaces along the fence on the north side of the building (directly in front of the Museum entrance). The adjacent property owned by Chief Isaac holds promise for housing a biomass district heating plant for multiple buildings in the area.

The City of Dawson may wish to simply purchase heat from Chief Isaac, or they may take an ownership through a partnership of some kind. In terms of acquiring funding and reducing project costs, a partnership with Chief Isaac is likely the best option for the City.

In terms of operational costs, the cost of a gigajoule of energy produced from burning oil @ $1.05/L in an 85% efficient furnace is $32.24/GJ. The cost of heat provided by biomass is approximately $10/GJ[1] at $150/ton for dry wood chips. Lower quality (wetter) wood chips will increase the cost per GJ of heat and will increase the amount of maintenance that will be required to operate the biomass boiler(s). The cost of heat currently being paid for biomass heat in Dawson City is $28/GJ[11].

Figure 4: A google map of the City Fire Hall/Admin Building, City Public Works Building, City Woodshop, Chief Isaac Office, Tr'ondëk Hwëch'in Daycare and Chief Isaac wood working shop. The most likely location for a biomass facility is highlighted in red. The buildings that have potential for biomass heating have orange and yellow lines running to them. A detailed design would be required to accomplish this work. An engineering/energy assessment and optimally recommissioning of other buildings to be connected to the biomass must be conducted prior to detailed design to ensure that they are using energy efficiently and to prevent oversizing the biomass system.

[1] The cost of biomass heating depends mostly upon the moisture content of chips and cost of supplied wood per ton. There will also be losses through the distribution system.

[11] See Appendix 2 regarding costs provided to the City of Dawson. These costs will likely decrease with improved chip quality due to increased demand and infrastructure, participation from Chief Isaac/ Tr'ondëk Hwëchin and greater uptake of biomass in the Dawson area. Having a reliable demand for wood chips will help to improve the quality and supply.

By implementing biomass heating in the Administration building, the existing or replacement boilers will be required when the biomass boiler is unable to meet demand or if the biomass system fails. Since the building is already setup to utilize radiant hot water in unit heaters, radiant wall heaters and within the AHU, the Admin Building is an ideal candidate for the implementation of biomass heating.

Implementing biomass heating in this location would greatly reduce greenhouse gases, reduce the cost of heating fuel[12], provide local employment to Dawson citizens, and significantly increase the life expectancy of the new or existing oil boilers. If propane boilers replace the existing oil boilers, they would be able to be modulated more accurately to save further energy while also reducing greenhouse gases.

A trench will need to be created to run insulated hot water lines (supply and return) from the biomass building to the boiler room of the Firehall/Admin Building. The lines would tie into the building and connect with the existing hot water circulation system via a heat exchanger. The tie in point would be prior to the return water temperature sensor of the system. It is important that the heating loop used for the biomass system is a separate loop than what is utilized within the Administration building.

The biomass lines will likely run through the Fire Hall to the south side of the building to connect to the Public Works building. A small area will need to be excavated next to the building to run the biomass lines (~ 2-inch insulated piping) between the two buildings. A detailed design of such a facility and connection to Firehall would be required. The hot water biomass lines could potentially run through the firehall and trench to the Public Works building, or a more expensive option would be to trench the hot water lines directly to the Public Works building. Since permafrost is an issue in this area, avoiding underground trenching of hot water lines by running connection lines through buildings will not only reduce costs, but will reduce complications from permafrost melting issues while bleeding heat from lines into buildings rather than into the ground, thus increasing system efficiency.

3.1 – Biomass Heating Options

Item 5.9

Since the building is already heated by the circulation of hot water, the addition of a biomass boiler connection to the building would utilize the existing heating equipment. The AHU, unit heaters, and radiant wall heaters would all utilize the heat produced from a biomass system, however there will be times that the boilers will function to provide supplemental heat and as backup.

The boiler loop within the Administration building is a single loop that directly connects the boilers to the heating equipment. Because of this, the connection of a biomass heat plant to the Administration

[12] This option is particularly useful for reducing the high costs of and will help reduce greenhouse gases generated from burning oil. Wood chips are also significantly cheaper as a fuel source ($10/GJ @ $150/tonne in Haines Junction and Whitehorse area) than oil ($32.24/GJ @ $1.05/L consumed by 85% equipment) and electricity ($55.56 @ $0.20/kWh pure electric heating) while providing employment to locals and Tr'ondëk Hwëch'in citizens. The biomass facility in Dawson is currently paying $28/GJ for wood chips. It is likely that these chips are not as well seasoned or of as high quality as in Haines Junction. This cost is predicted to drop with improved infrastructure, experience and demand.

building will require the implementation of a heat exchanger loop that connects to the existing hot water loop since the biomass loop will be a glycol-based loop.

With regards to the existing oil boilers, they are rather large and thus the introduction of a biomass system will cause the oil boilers to fire whenever the water temperature setpoint is not being reached by the biomass system. This has the potential to make the boilers short-cycle which will significantly impact their life. A strategy to combat this is to utilize the control system to monitor all the zones in the building as well as the boiler water temperature and boiler water temperature setpoint. Once the water temperature setpoint cannot be reached by the biomass system AND several zones are at or below their setpoint, the controls will know that the biomass system is not providing sufficient heat. When this occurs the control system would temporarily raise the hot water setpoint by at least 10°C to a maximum of ~92°C so that the oil boilers activate for as long as possible to raise the system and building temperature. This would prevent boiler short-cycling while still allowing the biomass system to provide as much heat as possible. Once the temporary setpoint is reached by the system, the system would ideally default back to the previous hot water setpoint as determined by the reset schedule (outdoor air temperature).

If high efficiency propane boilers replace the existing oil boilers, the above scenario is not necessary because propane boilers are easier to modulate in temperature and will potentially allow for heating the building using lower water temperatures during the milder temperatures of the year in conjunction with the biomass system. If propane boilers are installed, the utility of replacing air conditioning with a heat pump is reduced.

4 – Building Envelope and related ECMs

FPMBC was provided with a word file providing ECMs that were being considered along with funding information for comment. Below is the section of that document relevant to this project with comments for each item in a separate section.

City of Dawson (2 buildings, up to $200,000/building) *(Administration &Public Works buildings)*	
Energy Upgrade Description	**Estimated Cost**
#1. City of Dawson Administration Building	*10th Feb. 2021*
Door Seals & Sweeps (ECM 1)	$2,250
Interior Lighting Upgrades (incl. EXIT signs to LED) (ECM 3)	$38,730
Sensors & Controls (ECM 2, 4, 9, 10, 14) $9,500 + $6,200 + $3,500 + $64,480 +$4,500	$88,180
Self-Sensing Pumps (ECM 6)	$9,600
Recommissioning (ECM 8)	$19,950
Baseline Oil Boiler Upgrade (ECM 15)	$19,600
Wall Insulation Upgrade (ECM 16) Audit estimate	$45,500
Roof Insulation (ECM 17)	$4,550
Magnetite storm windows ($27.24 - $35.30/sqft) (ECM 11)	$18,200
Admin. Bldg. sub-total #1	**$246,560**

Figure 5: Table of proposed ECMs for funding.

4.1 – Door Seals and Sweeps - ECM-1

Item 5.11

Door seals and sweeps improvement is a low-cost ECM that will reduce the heat loss through the bay doors of the Fire Hall as well as the main entrance by preventing heat migration from the interior to the exterior. Installing these sweeps is recommended. The thermal imaging report indicates the bay doors that have the most air leakage.

Figure 6: The middle rear bay door appears to have light shining through it at the bottom. The thermal image on both the interior and exterior indicate that a significant amount of heat is escaping through this door.

4.1.1 – Insulate the bay doors and metal exit doors to reduce heat loss

Item 5.12

This option was not indicated in the Energy Audit report, however after completing a thermal imaging inspection, most heat loss through the building envelope is occurring through the windows and bay doors. A cost-effective option to reduce this heat loss is to insulate the bay doors.

A product option to consider: https://www.curtain-and-divider.com/roll-up-dock-door-curtains/

Pre-cut insulated panels for bay doors are another option: https://www.homedepot.com/p/Cellofoam-Garage-Door-Insulation-Kit-8-Pieces-Garage-Door-Insulation-Kit-8-pcs/203630159

Likely the most cost-effective option is to simply cut some 1.5" – 2" rigid to size so that the pieces don't impede door movement at the hinges and adhere them to the panel portion of the bay doors using foam adhesive. The foam pieces should be combined with this reflective door cover https://www.smartgarage.ca/insulated-roll-up-garage-doors/ or an aluminum or fire resistant, thermally reflective film cover to provide the longest life expectancy and energy efficient benefits.

This same strategy can be utilized to reduce heat loss through metal exit doors. It is important to adhere the rigid to a clean and dry door and ensure that the rigid is covered with aluminum or a fire-resistant material that can handle the abuse that a door typically endures.

4.2 –Interior Lighting Upgrades and EXIT signs to LED - ECM-3

Item: 5.13

The Energy Audit report recommends upgrading all lighting to LED. It also recommends the installation of dimmer switches and timers. Given the dark mornings and late afternoons in the Dawson winter (October to March), the lights within the building will likely be on as long as the zones are occupied due to low natural lighting levels. Also, occupancy sensors are not recommended in offices that have an occupant working at a desk for long periods because they shut lights off when there is no movement.

From March until October, lighting within the offices can be manually implemented if the occupant doesn't find sufficient natural lighting available via windows. It is likely that dimmer switches and occupancy sensors will add to the project costs while adding minimal energy benefit, and they will likely not be well utilized. The exception is installing an occupancy switch in the washrooms.

Replacing all existing lighting with LED is recommended, but occupancy sensors and dimmer switchers are not likely worth the extra cost and are left to the discretion of the City. When replacing outdoor lighting, it is recommended that the replacement lighting is Dark Sky compliant to reduce light pollution levels.

4.3 – Sensors and Controls (ECM 2,4,9,10)

Item 5.14

The controls system at the Administration Building is antiquated and malfunctioning. It should be replaced with a modern control system. Within the Energy Audit report, the recommended functionality of a modern controls system is broken down into multiple ECMs using individual components. The recommended ECMs from the Energy Audit provide the ability to:

1) Monitor zone temperatures and provide occupancy scheduling to individual zones (ECM-2: Sensor Suite Thermostats)
2) Monitor and control the boiler and circulation pump according to outdoor air temperatures and demands of the system (ECM-4: Boiler and Circulation Pump Controls)
3) Provide sufficient ventilation without significantly increasing energy usage. Demand control ventilation via a controller and CO_2sensor (ECM-9: Demand Control Ventilation) is the recommended path in the Energy Audit Report.
4) Installing a Building Management System (BMS) to monitor and control all operations within the building (ECM-10: BMS System).
5) Improving the Delta T (heat transfer efficiency) of the heating coil within AHU-1 via the installation of an Energy Valve (ECM-14: Energy Valve)

Note that all of these individual components work to satisfy the functionality of a properly installed, programmed and commissioned modern control system with graphical interface. The successful implementation of these devices will depend upon their ability to be monitored and controlled by the

new BMS. Having individual components installed as part of an un-integrated system creates the high likelihood of certain components competing with each other and causing control issues.

4.3.1 - ECM-2: Sensor Suite Thermostat

Item 5.15

ECM-2 is estimated to cost $9,500. The solution as presented in ECM-2 looks to be economic and suitable for the application. This solution appears to allow occupants to adjust settings within the zone as appropriate while also allowing the building operators to control the zones. This solution should be simple to implement, but there may be some cost savings possible.

A typical BMS within a new building as per ECM-10 utilizes simpler thermostats[13] that are all wired directly to a controller, and that controller(s) communicates with the BMS. Given the complications and costs of wiring all 20 thermostats to a controller or multiple controllers, using the wireless thermostats and router as proposed is a simple solution.

The City may wish to consider wiring the upstairs thermostats to a compatible controller to the implemented BMS[14] if the office has a drop ceiling[15] and the City has electricians on staff. It may be advisable to wire the upstairs thermostats to a controller and utilize the wireless thermostats on the main floor to reduce the costs of thermostats and ongoing subscription costs. Since most of the 20 thermostats are upstairs, this can potentially cut the costs of this ECM significantly to improve the payback period. This is possible if the BMS/Control system installed is capable of using both wired thermostats connected to a controller and the wireless thermostats and routing controller proposed.

The ongoing subscription cost of the wireless thermostats is $480 per year for 20 thermostats which is significantly less than paying electricians/controls contractor to run wires to all the thermostats and connect them to a controller. This is likely why this option was proposed, however if much of the installation costs can be absorbed by the City, that changes the payback and options possible. Wired thermostats as installed by a controls company may be cheaper at around the 15-year life expectancy mark, but it may be worth using City staff to run thermostat wires in certain zones if it is easy to run these wires and save on the costs of thermostats for wired zones. Also wired thermostats tend to function and report better than wireless thermostats.

4.3.2 - ECM-4: Boiler and Circulation Pump Controls

Item 5.17, Item 5.18

The cost to implement ECM-4 is estimated at $6,200.

[13] The wired thermostats are assumed to be significantly cheaper than $450 each.
[14] If wired thermostats and a controller cannot work with the implemented BMS, then it is advisable to simply utilize the wireless thermostats throughout.
[15] A drop ceiling would making wiring the easiest, but it may be possible to run wires in an existing raceway etc.

Currently the boilers have a hot water setpoint that is the same whether the outside air temperature is 10°C or -40°C. This wastes a lot of energy which would be saved by implementing a boiler reset schedule. This can be accomplished via two methods:

1) Via programming of a modern control system with supply water temperature and return water temperature sensors via the BMS proposed in ECM-10.
2) Via a boiler and circulation pump control device as described in this ECM. Note however that the boilers and building receive flow via the circulation pumps[16] and thus the pumps must run continuously to provide heating to the building, contrary to the assumption in the Energy Audit report.

Replacing the existing circulation pumps with self-sensing pumps as per ECM-6 is recommended, but they must always run during periods of heating for the building to have access to the heat that the boilers produce.

The boilers require thermostats for monitoring supply and return water temperatures as none are currently installed.

Utilizing the BMS with sensors (ECM-10) is advantageous as it allows for more precise control and integration with the biomass system as long as it is programmed and commissioned correctly. This option is recommended since ECM-10 is budgeted for.

A device that accomplishes this function is unlikely to interface with the BMS or be adjustable by the operator according to the dynamics of the building. Without a BMS, this type of device is the best option for boiler control which is likely why it was recommended in the Energy Audit.

4.3.3 - ECM-9: Demand Control Ventilation

Item 5.19

The cost to implement ECM-9 is estimated at $3,500. This ECM is essentially to install a CO_2 sensor and programming to the control system of ECM-10 that will allow the control system to provide outdoor air according to the reading of the sensor. This method of accomplishing the functionality of ECM-9 is recommended.

The costs predicted for this ECM are based on assumptions that were disproven during recommissioning. The Energy Audit is incorrect regarding the nonexistence of motorized dampers and their current functionality. The motorized dampers already exist and are utilized by the simple control system that is currently utilized. The Energy Audit report indicates that the minimum OAD position is 25%, when it reality it has been reduced to 15% to ensure occupant comfort and energy savings in the coldest parts of winter. It also states that the dampers are manually adjusted to do cooling, which is incorrect because they automatically open to provide free cooling using the existing control system. The costing data for the ECM includes the installation of motorized dampers (already exist), $C0_2$ sensor, and

[16] As confirmed via Facetime video call on April 22, 2021 with Owen Kemp-Griffin.

electronic/wiring. Wiring already exists to dampers and AHU temperature sensors but not to a CO_2 sensor.

Installing a CO_2 sensor to monitor and control the OAD should also include the ability of the operator to manually set the damper minimum position, test the dampers, recalibrate the CO_2 sensor etc. It is unknown if the installation of the system as described will allow for a free cooling algorithm to be utilized for cooling the building at night during the summer or during the day. Since free cooling is an option on most nights and during many days of the summer, this is an important consideration that should be implemented.

Essentially this ECM is the installation of a sensor which can fall out of calibration and cause the building to be overventilated or under-ventilated according to the sensor output. The building operator should still have the ability to set a minimum damper position variable and override the sensor within the new control system.

The implementation of this ECM is recommended.

4.3.4 - ECM-10: BMS System

The cost to implement ECM-10 is estimated at $64,480. The implementation of this ECM is highly recommended as it allows the building operators to monitor and control equipment within the facility as well as troubleshoot systems and track the performance of equipment. Implementing this ECM correctly also negates the need to install a device to implement ECM-4 Boiler and Pump Control and a device for ECM-14 Energy Valve as this functionality will be built into ECM-10. This ECM also allows for the implementation of ECM-9 Demand Control Ventilation.

A good BMS also helps manage the boilers with regards to integrating the biomass system by having the ability to be programmed more efficiently for operation. Without a BMS, a simple boiler controller (ECM-4) is likely to activate the boilers whenever the hot water temperature is below the setpoint. This will not only activate the boiler more often the necessary, but it is likely to make the boiler short-cycle and thus significantly reduce the boiler lifespan.

Note that adding a heat pump to the system to replace the air conditioning as discussed in Section 2.3 will necessitate a more advanced controls system.

Installing a propane boiler system will allow for better temperature modulation through the system and will optimally utilize a more advanced control system in cooperation with the propane boiler controls. Figure 12 on page 37 of the Energy Audit report illustrates the additional potential savings possible from implementing a condensing propane boiler with outdoor reset.

Given the advantages of implementing ECM-10 correctly, it is advisable to seek a quote for implementing a control system with graphical interface that can accomplish the tasks of section 4.3 (monitoring and control of 20 zones, occupancy setpoints, operator adjustable boiler reset, CO_2 monitoring, AHU-1 heating valve control for Delta T optimization via the installation of either the Energy Valve (ECM-14) or some programming and a supply water temperature sensor and return water temperature sensor for the heating coil.

Ideally a BMS should also be capable of trending data, providing a graphical interface of each zone, remote monitoring by operators as requested, alarms to inform operators of equipment failure and monitoring and totalizing equipment runtimes[17].

Below is a list of points monitored by the existing control system[18]. Points that have control wires ran to them are indicated. These wires can be reused by the new controller, however the sensors should be replaced with new. The points associated with AHU1 will come from a controller located in the mechanical room that houses AHU1 and thus a controller bus to the main controller in the boiler room already exists and can likely be used by the new control system. Controls for the boiler and biomass interface can be ran to the main controller located in the boiler room.

Point Name	Point Type	Existing Wiring
ALARM_RESET	Digital Output	no
AHU1_FAN_STATUS	Digital Input	yes (assumed)
SUPPLY_AIR_SET_POINT	Analog software	no
AHU1_SUPPLY_AIR_TEMP	Analog input	yes
AHU1_HEATING_VALVE	Analog output	yes
MIX_AIR_SET_POINT	analog software	no
AHU1_MIX_AIR_TEMP	Analog input	yes
AHU1_RETURN_AIR_TEMP	Analog input	yes
AHU1_OUTSIDE_AIR_TEMP	Analog input	yes
DAMPER_MIN_POSITION	Analog software	no
AHU1_MIXING_DAMPERS	Analog output	yes
AHU1_EXHAUST_DAMPER	Analog output	yes
AHU1_COOLING_STG1	Digital output	yes[19]
AHU_COOLING_STG2	Digital output	yes

[17] By totalizing boiler runtimes, the amount of oil/propane consumed can be determined and compared against the quantities of oil/propane delivered.
[18] Point table compiled from photos of the interface taken by Owen Kemp-Griffin.
[19] As of April 23, 2021 there appears to be an issue with Stage 1 cooling. This may be a faulty relay or potentially an issue with the wiring.

AHU1_FILTER	Digital Input (assumed)	yes - assumed but could be a timed filter alarm

Figure 7: Table of control points within the existing automation system.

4.3.5 - ECM-14: Energy Valve

Item 5.20

The cost of ECM-14 is estimated at $4,500. This ECM would replace the existing hot water valve in AHU-1 with a "smart valve". This ECM intends to increase the heat transfer efficiency of the heating coil within AHU-1 by monitoring the supply water temperature to the heating coil and return water temperature after the heating coil. In doing this, the valve position can be modulated to slow the flow rate through the coil to transfer more heat to the air stream.

The operation of this device would typically be calculated by a modern control system that is programmed using a PID control algorithm. The installation of this device is intended to simplify the control system, but it is unknown how well this device would work to satisfy the supply air temperature. It is assumed that this device receives the supply air temperature setpoint and controls itself to meet that setpoint while also working to maximize the Delta T across the coil. It is assumed that this device was recommended as an ECM because ECM-10 BMS system was not recommended.

Note that the supply and return water temperatures measured by this device should be monitored and visible on the BMS control system. If this device is implemented, they may not be able to interface with the controls.

It is likely that this device will require flow input data from the variable flow pumps or it is likely that these devices will counteract each other. Ie. the variable speed pump may slow down to reduce pressure within the system and the valve may have to open more to counteract that or visa versa. This can lead to a problematic feedback loop that can't be controlled by the BMS because these are separate devices/systems. Devices like this must be monitored/controlled by the BMS or they can cause issues. If these devices are installed without a BMS, it is likely that they will fight each other, and it will be nearly impossible to troubleshoot because there will not be an interface to monitor the entire system.

The implementation of the functionality of this device is recommended. Ideally that would be accomplished using the new control system with a couple of new water temperature sensors installed to the supply and return lines. Installing these sensors will be relatively simple if a new controller is installed in the mechanical room because of the existence of the controller that is wired to the current main controller. This wiring is assumed to be reusable.

If this Energy Valve device is installed rather than a couple of sensors with a control algorithm, the contractor should confirm that the supply water temperature and return water temperature can be monitored (and hopefully trended) by the BMS implemented by ECM-10. It is recommended that this functionality is handled by the BMS using two new temperature input sensors with a control algorithm.

4.4 – Self Sensing Pump ECM-6

Item 5.21

The cost of ECM-6 is estimated at $9,600. This ECM would replace the existing circulation pumps with pumps that would sense the pressure within the system and adjust their speed accordingly. This will save electrical energy for pumping because the pump will not have to work as hard when the building is under less heating load due to radiant valves being closed. When valves are closed due to a zone being satisfied, the pumps should slow down and save electrical energy.

As mentioned above in section 4.3.5, self sensing pumps combined with an Energy Valve that modulates to maximize Delta T across a heating coil may not work well together. Also, if Self Sensing Pumps replace the existing circulation pumps, they should not be connected to boiler control shut offs as per section 4.3.2 Boiler and Circulation Pump Controls because these pumps are a single loop through the building and must run constantly to provide heat to the facility. These pumps can be shut down during summer when the boilers are no longer distributing heat.

Replacing the existing circulation pumps with self sensing pumps is recommended. Their operation in cooperation with an Energy Valve should be reviewed by the controls contractor prior to implementing the Energy Valve along with Self Sensing pumps.

4.5 – Baseline Boiler Upgrade – ECM-15

Item 5.22, 5.9

The cost of ECM-15 is estimated at $19,600. This cost is assumed to replace 2 – 169kW oil boilers (with 4 years of remaining life expectancy) with 2 – 144kW near condensing oil boilers (with 25-year life expectancy) as per the Energy Audit report.

As discussed in section 2, the decision to replace oil boilers with high efficiency propane boilers should be investigated prior to moving forward with this ECM. Switching to propane not only reduces fuel costs, but it allows for greater efficiencies and GHG reductions while likely reducing insurance and the costs of an oil cleanup due to the reduced risk to the insurance provider. High efficiency propane boilers are also much smaller in physical size than the existing oil boilers, which should free up space within the mechanical room. It is assumed that 3 - ~112kW high efficiency propane boilers could replace the existing oil boilers.

Figure 8: High efficiency propane boilers (IBC SL 80-399 TI Condensing Boilers) used in the Carcross Learning Centre are 95.7% efficient and have a CSA rated output of 22.6kW – 112kW (77 – 382 MBH) per boiler. Based on the current boilers at the Administration Building, it is assumed that 3 of these propane boilers would work well with a biomass system or as stand alone. Since these boilers can be modulated significantly, their implementation would reduce the usability of a heat pump in replacement of the existing air conditioning equipment. They would also work much better than oil boilers for supplementing the performance of a biomass system.

Note that if the existing oil boilers are changed out, they could potentially be utilized as backup heating for the Public Works Building as indicated within that report. They may even be considered as backup heating to the biomass system by connecting them directly to the biomass loop. This would be for extreme circumstances and would be useful in the event of a biomass boiler shutdown and situation in which buildings on the district energy system require extra heat.

Another option is to leave these boilers within the Administration Building as backup heating to a biomass heating system, as discussed in Section 3. Using the existing oil boilers as backup heating may

extend their life significantly past the expected 4 years as indicated in the Energy Auding report. Since funding is available now and this work can be coordinated as a large project, it is recommended that these boilers are changed out now.

4.6 – Wall Insulation Upgrade – ECM-16

Item 5.23

The cost of ECM-16 is estimated at $45,500. The Energy Audit report indicates that the existing exterior walls are installed at RSI 4.64 (R-26.35). The proposed upgrades are to install 50mm of Rigid XPS Insulation to add an additional RSI of 1.72 (R-9.77), for a total wall performance of RSI 6.36 (R-36.12).

A thermal graphic inspection of the Administration Building was completed on December 15, 2020 and found that the building envelope is in good shape with the exception of two obvious flaws as noted in the report. As indicated in the Energy Audit report, the costs to upgrade the building envelope are high with a very long payback period. Further, the implementation of this ECM would require a great deal of labor and would affect the aesthetics of a building envelop that is aesthetically pleasing and in apparent good shape.

The thermal investigation also showed how most of the heat loss through the building envelope is occurring through the bay doors and office windows. Thus, it is advisable to improve the energy performance of those components as discussed in Section 4.1.1 regarding the bay doors and exit doors and Section 4.8 regarding the windows.

Upgrading the wall insulation is not recommended.

4.7 – Roof Insulation – ECM-17

Item 5.24

The cost of ECM-17 is estimated at $4,550. The Energy Audit report indicates that the existing roof insulation is comprised of batts that are 300mm thick with an RSI 7.50 (R-42.59). The proposed upgrades are to install an additional 102mm of cellulose insulation to add an additional RSI of 2.6 (R-14.76), for a total insulation performance of RSI 10.1 (R-57.35). The effective RSI-value of the roof after the upgrade is expected to be 9.93 (R-56.39).

This upgrade has a low installed cost and a modeled payback period of just over 2 years. This ECM is recommended for implementation. Note that care should be taken not to block or obstruct any venting within the attic space as part of installation.

4.8 – Magnetite Storm Windows – ECM - 11

Item 5.25

The cost of ECM-11 is estimated at $18,200. The Magnetite windows appear to be a good option to replacing the windows and will help to reduce the heat loss via the glass. This will improve the comfort of office staff while saving energy. These panels are cheaper to implement than replacing the existing windows with triple pane and will help reduce heat loss through the lowest performing parts of the

building envelope. Additionally, in the accompanying thermal imaging report, windows throughout the Administration Building appeared to be installed well, thus replacing them is not as attractive as upgrading the performance of the existing windows.

If occupants will be opening windows for cooling, care will need to be taken to ensure that the Magnetite panels for operable windows are stored safely so that they do not crack or get scratched when removed from the windows during summer months. As indicated in section 2.2.1, the CAO currently addresses her office overheating by opening the window, even during winter. This situation will likely make the Magnetite window useless.

Installing Magnetite Storm Windows for the Administration Building is recommended.

5 – Recommendations for the City of Dawson to consider

The City should decide which recommendations they wish to pursue and discuss this with the Energy Solutions Centre.

5.1: Determine if oil will remain as a fuel source or if propane shall be used prior to selecting heating equipment

Reference: Section 2

The Energy Audit report assumes that oil shall remain as a heat source in the building despite several advantages of implementing propane. A significant drawback of propane in Dawson's extreme climate is that it has the potential to stop flowing when outdoor air temperatures are colder than -42°C. Tank heating equipment such as an electric heating blanket exists that can prevent this from happening. A greater issue may be a lack of infrastructure in place and the availability of being able to receive reliable propane deliveries. All of these should be considered prior to making the decision to change to propane.

The decision to remain with oil as a backup heat source to biomass should be made prior to moving forward with any equipment upgrades or renovations.

Recommend cost out utilizing propane and changing over infrastructure to propane versus the costs of replacing the oil tank, oil insurance costs etc. prior to moving forward with oil burning equipment upgrades. This step is not required but recommended as significant cost savings may be found from switching as part of this project. Be sure to include propane warming equipment in the estimates.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.2: Replace the oil tank if oil continues to be used as primary or secondary fuel

Reference: Section 2

The oil tank for this facility is due for replacement. Recommend plan to replace the oil storage tanks along with oil-based heating equipment if oil remains as a primary fuel source and include this expense with project costs as it is a necessary expense.

Response (Project Manager, CAO, Energy Solutions Centre):

Signed: _____ Date: _____

5.3: Replace zone valves, install strainer, drain system and replace glycol as part of project

The installed zone valves can remain until their end of life, however it is recommended that during boiler upgrades and installation of the biomass heating loop, all radiant control valves be replaced with **Normally Open** control valves and the radiant system be drained to replace the glycol in the system. A strainer for the glycol system should also be added or replaced if it does not currently exist.

Response (Project Manager, CAO, Energy Solutions Centre):

Signed: _____ Date: _____

5.4: Test AC relays via the control system and replace as necessary for this summer

Reference: Section 2.3

In the summer, the boilers are manually shut down and air conditioning must currently be manually activated via the control system. The air conditioning must be run manually because the programming doesn't work despite the automation system having cooling points within the program. Owen has indicated that stage 2 of the cooling is controllable, but not stage 1 at this point. The fact that stage 2 can be controlled via the automation system indicates that there are relays wired to the automation system to activate the AC stages.

Recommend test the relays and replace as necessary. If possible, reprogram the cooling algorithm with the following logic:

> If RAT > 24°C AND OAT > 15°C then COOLING = ON
>
> ELSE COOLING = OFF

NOTE that the OAT sensor is currently mis calibrated and must be recalibrated for the temperatures with this logic to work correctly.

If the automation is not able to be reprogrammed, a simple thermostat within the return air duct can be rigged to activate a single stage of cooling when the RAT > ~24°C. This thermostat should be adjustable so that the operators can disable cooling on weekends or adjust the cooling setpoint manually during summer. Note that the activation of the AC unit should be tied to the operational status of AHU1. If a thermostat is used within the ductwork and the AHU is OFF, it is likely that the AC will activate when the fan is not running on hot weekends or after hours. This would likely damage the AC unit and should be avoided. The contractor should ensure that AHU1 is running in order for the AC unit to activate.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.5: Replace AC units with a heat pump(s) to provide cooling and some heating

Reference: Section 2.3

The AC equipment was installed in 2000 along with the rest of the HVAC equipment[20] and is nearing end of life. Installing a heat pump to replace the AC equipment within the building would allow for cooling in the summer as well as GHG free heating in the summer and shoulder seasons.

Recommend replace the AC units with Heat Pump(s) as part of the tender. Detailed designer to provide pricing for replacing AC units vs. heat pumps. The energy benefit of heating with heat pump during summer and shoulder seasons should be considered. Note that if high efficiency propane boilers are installed, the benefits of using a heat pump during shoulder season are slightly reduced.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.6: Test and replace all components of AHU in order to run in AUTO

Reference: Section 2.4

No physical measuring devices were noted on the AHU. Recommend install thermometers in the air streams and on supply water and return water lines next to sensors of AHU1 (same as ECM-14) so that

[20] According to Owen Kemp-Griffin, building operator.

these values can be viewed by operations staff and compared to temperature sensors that are monitored by the building management system.

Recommend replace the existing supply air temp (SAT), return air temperature (RAT) and mixed air temp (MAT) sensors as part of upgrading the BMS. Replacing the existing damper actuators and heating valve actuator are also recommended for replacement if they are original to the system. Controls technicians to test all relays and replace as necessary to operate the supply air fain and return air fan in AUTO.

Response (Project Manager, CAO, Energy Solutions Centre):

Signed: _____ Date: _____

5.7: Perform testing and air balancing of all conditioned zones serviced by AHU1 as part of controls upgrade

The performance of AHU-1 will change as a result of this project. The air balancing during the initial installation is likely to have shifted since 2000 and may not have been completed optimally at that time.

Assessing and testing the air flow to each zone should be completed once all upgrades to the controls and mechanical systems are complete.

Response (Project Manager, Energy Solutions Centre, CAO):

Signed: _____ Date: _____

5.8: Contact Chief Isaac group to discuss a biomass facility for the Admin Building, Public Works Building, Wood Shop and Chief Isaac buildings

Reference: Section 3

Chief Isaac would be keen to discuss utilizing biomass at their office that is next door to the Firehall/Admin Building, at their adjacent wood shop, as well as in their daycare which is across the street (behind the admin building). If the City has Chief Isaac as a partner, it should reduce the cost and complexity of implementing biomass for the Admin and Public Works Buildings.

To size a biomass installation properly for such an application it will be important to know the heat loads of Chief Isaac buildings and the wood shop if this building is also to be heated using biomass. FPMBC would be keen to help assess the wood shop as well as the Chief Isaac buildings.

Recommend reach out to Gina Nagano, Former Chair of Chief Isaac group of companies to discuss an agreement for heat purchase, MOU or joint venture regarding a biomass district heating system. Her phone number is 867-334-7609 and email is gina.nagano@gmail.com.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.9: Be aware of the advantages of propane boilers vs. oil boilers with regards to implementing biomass heating

Reference: Section 3.1, Section 4.5

Oil boilers have a limited temperature range and are rather large in size which creates the potential to short-cycle. Short cycling will significantly impact their life.

If high efficiency propane boilers replace the existing oil boilers, they are programmed to automatically modulate in temperature and will allow for heating the building using lower water temperatures during the milder temperatures of the year in conjunction with the biomass system. If propane boilers are installed, the utility of replacing air conditioning with a heat pump is reduced because of improved boiler efficiency.

Response (Project Manager, Energy Solutions Centre, CAO):

Signed: _____ Date: _____

5.10: Determine the operational state of the boiler and generator in the City owned portable trailer for potential use as backup heating and power to the biomass system

There is a portable trailer located next to the Fire Hall that is owned by the City. The trailer contains an electrical generator that is rated at 53.6KVA on a single phase and 100KVA on three phases. The trailer also contains a 646MBH (189.3kW) boiler. If this boiler still works, it could be connected to the future biomass system to provide backup heating to the public works building and potentially the workshop or another part of the district heating system. The electrical generator could also be hooked up to the biomass system to provide backup power to the biomass system in the event of a prolonged outage. The operational condition of this equipment is unknown, but apparently this trailer was constructed to provide emergency power and heating to a facility.

Recommend check records and/or test this equipment to determine if it can be used with the future biomass district heating system to reduce the project cost for the City.

Response (Project Manager, Energy Solutions Centre, CAO):

Signed: _____ Date: _____

5.11: Door Seals and Sweeps ECM-1

Reference: Section 4.1

Door seals and sweeps improvement is a low-cost ECM that will reduce the heat loss through the bay doors by preventing heat migration from the interior to the exterior. Installing these sweeps is recommended.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.12: Install insulation panels or insulative blanket on bay doors and metal exit doors

Reference: Section 4.1.1

Recommend implement one of the options provided regarding insulating the bay doors and metal exit doors. This will have a much lower capital cost and higher energy savings than upgrading the building envelope.

Response (Project Manager, CAO, Energy Solutions Centre):

Signed: _____ Date: _____

5.13: ECM-3 Upgrade to LED lighting

Reference: Section 4.2

Recommend install an occupancy sensor in the washrooms and upgrade all lighting to LED. Recommend replacement outdoor lighting is Dark Sky compliant to reduce light pollution levels.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.14: Get estimates for a modern control system (from several venders) that uses sensors and programming rather than hardware components – ECM-10

Reference: Section 4.3

The Energy Audit recommends splitting the functionality of a modern control system (ECM-10) into multiple ECMs that have the potential to conflict with each other. Multiple devices that have a mind of their own are recommended within the Energy Audit rather than a centralized control system that accomplishes the same functionality using sensors and common HVAC programming.

Recommend utilizing a centralized control system to accomplish the functionality of ECM-2, ECM-4, ECM-9 and ECM-14 as part of ECM-10. The wireless thermostats and router of ECM-2 will likely be required in much of the facility.

Note that since there is already a controller in the mechanical room of AHU-1, a new controller to control AHU-1 can easily be installed to accomplish ECM-9 and ECM-14 using sensors and programming. ECM-4 functionality can be wired directly into the new main controller using a few feet of wire and 2 sensors that will replace the existing controller in the boiler room.

Given the advantages of implementing ECM-10 correctly, it is recommended that the City seek estimates for implementing a control system with:

1) Graphical interface that can accomplish the tasks of section 4.3 including provide a graphical interface of each zone, boiler operation, cooling equipment operation, AHU-1 operation, biomass system integration
2) Monitoring and control of 20 zones using either wireless or wired thermostats
3) Occupancy/unoccupancy setpoints
4) Operator adjustable boiler reset
5) CO_2 monitoring with OAD control
6) AHU-1 heating valve control for Delta T optimization via the installation of either the Energy Valve (ECM-14) or some programming and a supply water temperature sensor and return water temperature sensor for the heating coil.
7) Ideally the BMS should trend data
8) Remote monitoring by operators via web-based interface
9) Alarms to inform operators of equipment failure
10) Optimally monitoring and totalizing boiler runtimes to calculate fossil fuel consumption

It is assumed that utilizing the BMS of ECM-10 as a single system will improve efficiency, reduce component costs of individual ECMs, simplify the system operation and monitoring, and likely reduce the total costs of the control system.

Response (Project Manager, CAO, Energy Solutions Centre):

Signed: _____ Date: _____

5.15: Install occupant-adjustable thermostats that are monitored by the BMS and allow for occupancy scheduling - ECM-2

Reference: Section 4.3.1

As part of BMS upgrades, recommend replace manual thermostats with occupant-adjustable thermostats that are monitored and controlled by the BMS. The thermostat should allow for occupancy scheduling. Zones that may be occupied after hours such as the Council Chambers should optimally have an occupancy sensor built into the thermostat (smart thermostat) or zone override button that keeps the zone at occupied temperatures after hours as required.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.16: Determine if wires can be ran to control thermostats upstairs or in fire hall - ECM-2

Reference: Section 4.3.1

Does the City have electricians on staff who can easily run wires to thermostats or the ability to run wires from the location of existing thermostats to a wired controller? If so, recommend wire these thermostats to a controller location for the controls contractor to install. This will reduce installation costs and ongoing subscription fees.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.17: Implement an operator adjustable boiler reset schedule (ECM-4) using the control system as part of ECM-10

Reference: Section 4.3.2

Recommend have the controls contractor run a sensor to the supply water line and return water line near the boiler to monitor these temperatures and create an operator adjustable boiler reset schedule based on outside air temperature. This allows the operator to optimize the water temperature according to building dynamics. This option is more adjustable than implementing a device, which is typically not monitorable or controllable by the operator.

Using the BMS to create the reset schedule is also beneficial with regards to efficiency regarding the implementation of a biomass system.

The BMS should only shut down the circulation pumps (self sensing as per ECM-6) according to outdoor air temperatures. Ie. when OAT > ~15°C. The shut down temperature will also depend on the implementation of a heat pump or not. If a heat pump is implemented, the shut down temperature for the boilers will be a colder temperature of approximately 0°C.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.18: Install thermometers to monitor boiler water temperatures for comparing to sensors

Reference: Section 2.1, Section 4.3.2

The boilers require thermometers for monitoring supply and return water temperatures as none are currently installed. These should be installed near the supply water sensor and return water sensor locations.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.19: Implement demand control ventilation via CO_2 sensor – ECM-9

Reference: Section 4.3.3

Recommend install a CO_2 sensor for demand control ventilation while including the ability of the operator to manually set the damper minimum position, test the dampers and recalibrate the CO_2 sensor.

The implementation of this ECM is recommended with a reduced minimum damper position of ~5% and CO_2 threshold of ~850ppm to modulate the damper open up to ~25%.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.20: Implement Delta T control via the BMS ECM-14

Reference: Section 4.3.5

The implementation of the functionality described by ECM-14 Energy Valve is recommended via the new control system using new water temperature sensors installed to the supply and return hot water lines. Installing these sensors will be relatively simple when a new controller is installed in the mechanical room because of the existence of the controller that is wired to the current main controller.

If the Energy Valve device is installed rather than a couple of sensors with a control algorithm, it is recommended that the contractor confirm that the supply water temperature and return water temperature measured by this device can be monitored (and hopefully trended) by the BMS implemented by ECM-10.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.21: Replace circulation pumps with self sensing pumps – ECM-6

Reference: Section 4.4

Replacing the existing circulation pumps with self sensing pumps is recommended. If an energy valve device is utilized rather than a BMS controlled algorithm, the self sensing pump operation in cooperation with an Energy Valve should be reviewed by the control system contractor prior to implementation to ensure that the Energy Valve and Self Sensing Pumps don't fight each other.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.22: Replace oil boilers with new propane or oil - ECM-15

Reference: Section 4.5

Since funding is available now and this work can be coordinated as a large project, it is recommended that these boilers are changed out now despite using the existing oil boilers as backup heating may extend their life significantly past the expected 4 years. Changing these old boilers for new, more efficient boilers of either propane or oil will also help to reduce GHGs whenever they operate.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.23: Building Envelope insulation upgrade ECM-16 - Not Recommended

Reference: Section 4.6

A thermal graphic inspection of the Administration Building found that the building envelope is in good shape with the exception of two obvious flaws as noted in the report. As indicated in the Energy Audit report, the costs to upgrade the building envelope are high with a very long payback period. Further, the implementation of this ECM would require a great deal of labor and would affect the aesthetics of a building envelop that is aesthetically pleasing and in good shape. Unless the City has plans to change or upgrade the building exterior, upgrading the building envelope is not recommended.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.24: Upgrade roof insulation ECM-17

Reference: Section 4.7

This upgrade has a low installed cost and a modeled payback period of just over 2 years. This ECM is recommended for implementation. Note that care should be taken not to block or obstruct any venting within the attic space as part of installation.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.25: Magnetite window covers

Reference: Section 4.8

Installing Magnetite Storm Windows for the Administration Building is recommended.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.26: Commission the biomass system as well as backup heating equipment once all projects are complete

Ensuring that the new biomass equipment functions optimally and in cooperation with the boiler equipment will be important to ensure long term energy savings and equipment life expectancy. This should be done by a third party with control systems expertise if the control system for the biomass system interfaces with the buildings in a complex manner.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.19: Implement "Energy Star Portfolio Manager" or other application to track facility energy usage

The City of Dawson would likely benefit from implementing "Energy Star Portfolio Manager" because the electrical, oil and propane bills for each facility managed by the City would be entered into the application as they arrive and then can be easily tracked. Since the expenses will be reduced for buildings that undergo improvements, it is wise to track and compare these expenses to previous years.

By implementing "Energy Star Portfolio Manager" or a similar program, it will be easier for staff to observe/verify energy saving measures that are implemented in buildings and throughout the community over time and would lead to higher productivity with regards to tracking the costs of facilities.

The Energy Branch is in the process of setting up an Energy Benchmarking initiative that utilizes "Energy Star Portfolio Manager" for buildings such as this. It is recommended that the City of Dawson add the Administration building to the list of buildings the Energy Branch will contact for this initiative.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

Appendix A: Recommissioning Email

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: March 11, 2021 11:46 AM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: Recommissioning Reports
Hi Shane

Just to re-iterate the paragraph below, we would like your report to have a significant focus on the ECMs that are outlined in the table attached as these are directly what our TPA is based upon.

Any suggestions you have on the implementation of these ECM's, alternative options, design considerations, cautions, past successes in other communities etc are all of great interest

Cheers

Brodie

Has the City moved forward with implementing or procuring ECMs (energy conservation measures) from the Energy Audit Reports? Do you want my recommendations to include these ECMs or simply to comment on them? If so I will simply copy and paste the information into the Recommendations Section. The City can then decide which recommendations they wish to pursue.

Our funding agreement with YG is completely based on the remaining recommendations from the report that we have deemed appropriate as well as some extra measures that I have been researching. All funding estimates have also been taken from the audit report. Please see the attached table and please comment on these ECMs as this is what YG has agreed to fund at this time.

Our BM staff have begun with the switching of fluorescent tubes to LED substitutes across both facilities. We have been waiting to receive your report before moving on anything else

From: Project Manager
Sent: Wednesday, March 10, 2021 4:49 PM
To: 'Shane Wolffe' <shane@futureproofmybuilding.com>
Cc: CAO Dawson <cao@cityofdawson.ca>
Subject: RE: Recommissioning Reports
Hi Shane

Comments in red

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Tuesday, March 9, 2021 7:42 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Cc: CAO Dawson <cao@cityofdawson.ca>
Subject: RE: Recommissioning Reports
Hi Brodie,

I'm working on the report and I have a few questions that I have added to this email as I have been progressing. Please respond to each question individually in RED so that I can keep track of answers. If you have comments please also indicate them in red.

First of all, I spoke with Gina Nagano who is the Chair of Chief Isaac group of companies. She indicated that Chief Isaac would be keen to discuss utilizing biomass at their facility that is next door to the Admin Building as well as in their daycare which is across the street (behind the admin building). If the City has Chief Isaac as a partner it should reduce the cost and complexity of implementing biomass for the Admin and Public Works Buildings. To size a biomass installation properly for such an application it will be important to know the heat loads of these buildings as well and for the City of Dawson to have some type of heat purchase agreement, MOU or maintenance agreement if a biomass plant is to be constructed on Chief Isaac property for sharing between Chief Isaac and the City of Dawson at the Admin Building and Public Works building. Given the limited options for constructing a biomass facility on City property, constructing it on the adjacent Chief Isaac property holds promise. You may want to grease some wheels with the City to see what their appetite for this type of arrangement is. In the report I will indicate other potential locations for the biomass facility. Note also that the City may wish to simply purchase heat from Chief Isaac or they may take an ownership through a partnership of some kind. I am quite certain that a partnership with them is the best option for the City in terms of finding funding and reducing project costs. In terms of operational costs, the cost of a gigajoule of energy produced from burning oil @ $1.02/L in an 85% efficient furnace is $31.32/GJ. The cost of heat provided by biomass is approximately $10/GJ[1] at $150/ton. Biomass heating costs about 1/3 as much as burning oil and the price of oil is likely to climb, plus the biomass can be sourced locally. I definitely like the idea but assume it will be outside the scope of the Community IEEP funding. This will likely have to be a completely separate project.

The Energy Audit report ECM-2 indicates using a Smart Thermostat which is adequate to control a regular furnace but will not likely work for some of the biomass heated options I am proposing. This is a fairly simple means of control that is lower cost than an advanced control system but has limited functionality. If the City goes with more than a furnace, I don't see this as an option. This ECM has been omitted from our funding agreement. From what I understand (and please correct me if I am wrong) the City would like to be able to remotely monitor their buildings and equipment? A more advanced control system is required to do this but it will come at a higher cost than what is recommended in the Energy Audit. Since the Public Works and Admin Building are next to each other, are both intended to utilize biomass heating and will be tendered at approximately the same time, it makes sense that both buildings would utilize the same control system. This should reduce the costs of installation and will allow the City to monitor the buildings remotely while improving their energy efficiency via better controllability. Please let me know if this is the desired outcome? I will comment on the recommendations from the Energy Audit report with regards to this as I am providing a couple of options in the report. Remote monitoring is not really as much as a priority as a general upgrade to the controllability of our HVAC systems across the two buildings that allow for an Occupied/Unoccupied settings. This is currently managed via programmable thermostat setbacks in the PW building and via

[1] The cost of biomass heating depends upon the moisture content of chips and cost of supplied wood per ton.

manually shutting down the system by BM staff for the Admin building. A modular/scalable system that can be added to if/when a biomass system is introduced to heat both buildings would be advantageous (such as a Canadian version of Autani)

Has the City moved forward with implementing or procuring ECMs (energy conservation measures) from the Energy Audit Reports? Do you want my recommendations to include these ECMs or simply to comment on them? If so I will simply copy and paste the information into the Recommendations Section. The City can then decide which recommendations they wish to pursue.

Our funding agreement with YG is completely based on the remaining recommendations from the report that we have deemed appropriate as well as some extra measures that I have been researching. All funding estimates have also been taken from the audit report. Please see the attached table and please comment on these ECMs as this is what YG has agreed to fund at this time.

Our BM staff have begun with the switching of fluorescent tubes to LED substitutes across both facilities. We have been waiting to receive your report before moving on anything else

What does the City pay for a liter of fuel oil? The Energy Audit indicates $1.02/L but this is less than the City of Whitehorse pays so I am a bit skeptical.

The City is on 'Contract Pricing' with North 60 that is quite dynamic and changes monthly. I have pulled the following from our invoices for filling the tank at the Arena for 2020:

JAN – 1.09040
FEB – 1.09040
MAR – 0.97240
APR - 0.71340
MAY – 0.65040
OCT – 0.72940
NOV – 0.80140
DEC – 0.84640
Carbon tax of appox 9.5% is added to this pricing.

Note that Arena is closed and doesn't require heat through the summer

How old are the oil tanks used at the Public Works building and Admin Building? The Energy Audits do not consider replacing oil as a heating source with propane despite the GHG reductions possible as well as the environmental costs of using oil (remediation, replacement tank costs, spill costs etc.). If the oil tanks are nearing their end of useful life, it gives more power to the argument of implementing biomass and eventually replacing the oil infrastructure with propane (if the tanks still have a few years of useful life left). Also if the tank at the Public Works building is nearing end of life and an oil furnace and replacement oil based unit heaters are installed, then the City must continue to use oil until the new equipment wears out. If there is a desire to change to propane, the decision to do so should be made now! Propane boilers to backup the biomass are preferable because they have much better temperature modulation and higher efficiency.

Oil tanks at the Admin building are at the end of useful life and will be upgraded along with the boilers. The PW building has the tanks stored within the building and probably could also be replaced but had no noted deficiencies during our last facility condition assessment (apart from having no secondary containment)

I was under the impression that propane was not a viable heat source here due to the propane turning gelatinous and consequently boilers failing during the coldest months. I am also unsure of the infrastructure in place and the availability of being able to receive reliable propane deliveries.

Thanks,

Shane Wolffe P.Eng, LEED AP BD+C, CEA, Level 1 Thermographer
Principal Engineer
Cell:(306)261-8846
Future Proofing the North from Whitehorse, Yukon

Appendix B: Propane and Biomass Costs Email

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: May 7, 2021 4:33 PM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Yes, there is a bit of friction between the 2 for sure in regards to how efficiently/inefficiently the boiler is run.

Talking to Louise today, they supplied what they thought would be 10,000GJ of wood for the biomass but it only produced 3000-4000GJ

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Friday, May 7, 2021 4:24 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Just to clarify…. so the saw mill simply provides chips and YG monitors the heat use of the system and pays accordingly?

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: May 7, 2021 4:21 PM

To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Yes it is for heat purchase

YG still runs the biomass since the City never took ownership of the Waste Water Treatment Plant that it is attached to

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Friday, May 7, 2021 4:14 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Hi Brodie,

Did they mention how they are measuring the cost per GJ? Does YG have a heat purchase agreement with them? That's what I am assuming based on being paid per GJ rather than per ton of wood.

This quote will have the same meaning to the City of Dawson if you have a heat purchase agreement as opposed to a wood purchase agreement. Whoever owns and maintains the boilers will be an important consideration regarding that. I would assume that if the boilers are owned and operated by an entity other than the City or Chief Isaac/Tr'ondëk Hwëch'in then they will charge a premium to own and operate those boilers which explains the significantly higher cost of heat than I indicated in the report.

Do you know how much they are charging per ton of wood if the City of Dawson runs the biomass system? According to the information I was given, the City of Whitehorse and Village of Haines Junction are paying $150/ton of wood which equates to ~$10/GJ. Using simple math, that means that the City of Dawson would be paying $420/ton of chips, which is significantly more. That definitely affects the economics of utilizing biomass for heating unless the City is also paying for a 3rd party to own and operate the boiler system.

I can put that quote into the report, however please confirm if that quote is related to a heat purchase agreement or a wood purchase agreement.

Thanks and have a great weekend.

Shane

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: May 7, 2021 11:26 AM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Hi Shane

Just got back from a visit to the lumber mill that supplies the YG biomass system in town

Their current contract that was recently renewed has them being paid $28/GJ

Can you please update your report(s) to reflect this actual cost

Thanks

Brodie

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Thursday, April 29, 2021 6:35 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Subject: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Hi Brodie,

Please find attached version 2 of the draft reports for the Admin Building and Public Works building. As requested, I have updated the reports with the propane costs based on the estimate you received on April 27. I also found that replacing the furnace in the Public Works building with another furnace of equal efficiency makes no real sense.

We can discuss on the phone tomorrow.

Let me know if you have questions or concerns.

Thanks,

Shane Wolffe P.Eng, LEED AP BD+C, CEA, Level 1 Thermographer
Principal Engineer
Cell:(306)261-8846
Future Proofing the North from Whitehorse, Yukon
FutureproofMyBuilding.com

2180 2nd Ave
Whitehorse, YT Y1A 5N6
Tel: 306.261.8846
www.FutureProofMyBuilding.com

Client: City of Dawson

Public Works Building

Recommissioning and Engineering Assessment Report

Prepared by:

Shane Wolffe P.Eng, LEED AP BD+C, CEA
APEY Member No. 2428

Issued to Brodie Klemm

City of Dawson Project Manager

ProjectManager@cityofdawson.ca (867)993-7405

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Executive Summary

This report is a record of recommissioning and assessment activities of the City of Dawson Public Works Building located in Dawson City, Yukon. It explains components of the facility that were investigated during this project and provides guidance to building operators and project managers with regards to how to proceed with energy saving and greenhouse gas reducing projects. This project was initiated to aid proponents in bidding and provide a detailed scope of work as well as to comment on proposed ECMs from the Energy Audit Report.

Section 5 of this report defines the options available to the City of Dawson and should be fully considered prior to moving forward with implementing ECMs that may later have minor usage.

Proponents to the Request for Proposals should read this report and become familiar with it to assist with preparing their submission. Section 5 lays out the action items/criteria of the project that are being completed and bid on. The proponents are instructed to reference each item in section 5 individually as each item will be individually assessed according to the item reference number. This is intended to assist proponents with organizing their submissions and for the owner with regards to scoring proposals.[1]

At the request of the building owner this project focused on the future state of the building rather than its current state. Recommissioning activities took place during the winter.

Operators should familiarize themselves with recommissioning and energy auditing reports to assist with operating the building. Project managers should make themselves familiar with energy auditing and recommissioning reports prior to contracting services or making alterations to a building that has been recommissioned or energy audited to make the best usage of their time and resources. Energy Audit reports are a surface level investigation while recommissioning projects dig into the details of how a building is operating.

Operators should endeavour to continuously commission equipment through the life of a building.

Top recommendations to be implement as part of this project include:

1. Implement ECM-1 Seals and Sweeps
2. Implement ECM-4 LED Lighting Upgrades without occupancy sensors or dimmer switches
3. Implement ECM-3 Furnace Upgrade
4. Implement ECM-6 Insulation Upgrade to roof
5. Contact Chief Isaac concerning a shared biomass district heating system for multiple City and Chief Isaac buildings in the area to reduce biomass system costs and complexity.

ECMs not recommended are:

1. Airius fans not recommended (install regular fan(s))
2. Air Curtains not recommended
3. Insulation upgrade to walls not recommended

[1] This report has a different layout than I expected because of the multiple options available to the City. Once the City selects which criteria to utilize, I will remove the components that are not applicable from section 5.

The City of Dawson will need to consider the implications of implementing "ECM-5 Unit Heater Upgrade" as this equipment will have minimal usage in the future if a biomass system is implemented. If the unit heaters are upgraded as per ECM-5, they will likely last for a long time but may be taking up budget that could be used on the biomass system.

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1 - Introduction

Future Proof My Building Consulting Ltd. (FPMBC) was contracted by the City of Dawson to carry out recommissioning activities at the Dawson Public Works Building in Dawson, YT to identify sources of excessive energy usage in the facility and provide recommendations for the correction of mechanical, electrical and control systems that can save energy in the facility and reduce greenhouse gas (GHG) emissions. The project is intended to help clarify and facilitate the successful implementation of energy conservation measures (ECMs) noted in the Energy Audit Report issued by 3D Energy Limited on April 16, 2020. The inspection appears to have been conducted in January or February of 2019.

Site visits by FPMBC were carried out on December 14 and 18th to assess equipment and the building in general and test controls, mechanical and electrical systems within the building. During the week of site visits to Dawson facilities, outdoor air temperatures were between -22°C and -34°C.

This report highlights issues identified and opportunities to save energy within the facility and shall help inform proponents of issues that must be addressed as part of energy efficiency upgrades to the building. Consultation with building operators, engineers, technicians, design consultants and contractors will likely be necessary to address the issues and opportunities identified within this report. This report in whole or in part can be issued to the appropriate parties to request resolutions, provide guidance with detailed designs, provide answers to inquiries or for the sake of providing clarification.

1.1 - Definitions, Acronyms etc.

ESC – Energy Solutions Centre

FPMBC – Future Proof My Building Consulting Ltd.

AHU – Air Handling Unit

AH – Air Handler also referred to as RTU and AHU

BMS - Building Management System – the computer/software that displays the graphics and allows a building operator to control components within the building. The BMS is essentially a SCADA system that displays trends, graphics and monitors the control system to visually describe the state of equipment within a building.

City – Referring to the City of Dawson

CU – Cooling Unit

Cx – short for commissioning

DMP/DMPR – Damper – a device that opens and closes to allow air flow or restrict airflow.

EAD – Exhaust Air Dampers – dampers that exhaust return air to the exterior

EF – Exhaust Fan – a fan that removes exhaust air from a zone

FC or FCU – Fan Coil Unit

HAND – Industry term for "Manual" mode or "ON"

HOA – Hand/OFF/AUTO – a switch that puts equipment in HAND (manual ON), OFF or Automatic as determined by the control system

HtgVlv – Heating Valve – A valve that opens in order to allow hot water to flow through it into a heating coil or radiating device.

HWST - Hot water supply temperature. The temperature of the water that is provided to the building by the boilers.

HWRT – Hot water return temperature. The temperature of the water that returns to the boilers after being used by equipment in the building.

IPP – Independent Power Producers Program – A program administered by the Energy Solutions Centre that allows for selling renewable energy to the grid.

MAD – Mixed Air Dampers – dampers that mix return air with outdoor air

MCC – Motor Control Centre – A switch that allows for turning large equipment such as fans and pumps ON/OFF in HAND/AUTO.

Night Setback – An algorithm that holds a zone at a temperature several degrees below the regular occupancy temperature. A night setback during heating season is typically 17°C or 18°C. Also called an "unoccupied mode." In the Yukon, summer temperatures do not typically require a setback temperature due to cool nights.

OAD – Outside Air Dampers – dampers that open to allow fresh air into an AHU.

OAT – Outside Air Temperature

PID – Proportional Integral Derivative – A mathematically derived equation that controls the behaviour of equipment. A good PID loop is a program that makes equipment find a steady state of operation without oscillating between overshooting and undershooting the desired output.

RCx – short for recommissioning. Recommissioning is a re-optimization process for existing buildings. It ensures building equipment and systems are operating optimally to meet current occupant needs. It provides a rigorous investigation approach to identify problems and integration issues.
The RCx primary focus is on identifying "low cost/no cost" operational improvements given the building's current usage to obtain comfort and energy savings. [2]

[2] https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/pdf/fichier.php/codectec/En/2008-167/NRCan_RCx_Guide.pdf

Reset Schedule – an algorithm within the control system that automatically modulates the output temperatures of a boiler according to the OAT. A good reset schedule should be operator adjustable so that the operator can adjust the boiler water temperature at a given OAT according to the dynamics of a building. Warmer OATs allow for cooler boiler water and colder OATs require hotter boiler water to meet the demands of a building. In buildings without a reset schedule, the same temperature water is used whether it's -40°C or 15°C.

RTU – Roof Top Unit – supplies large amounts of tempered air to a building.

SAF – Supply Air Fan – The fan within the air handling unit that pushes air through the zone/ductwork/system as it pulls return air back and mixes it with outside air.

SAT – Supply Air Temperature – typically from an air handling unit

SATSP – Supply Air Temperature Setpoint - the temperature that the AHU should be providing

SHGC - Solar Heat Gain Coefficient – a measure of how well solar gains are transmitted through glass to allow heat to be captured by the glass. SHGC = 1 means that all light frequencies pass through and cause heating. SHGC = 0 means that all visible light is reflected. No window will ever reach SHGC of 1 or 0.

Shoulder Season – typically fall and spring in which heating is required at night or on cloudy days and cooling is required during the heat of the day. The shoulder season is typically when HVAC systems can overheat or cool a building and use excessive amounts of energy unnecessarily. In Yukon the shoulder season can also refer to summer operating conditions.

SWT – Supply Water Temperature – the temperature of water that is being delivered from the boilers to heating equipment

TStat – Thermostat – A device that measures temperature in a zone.

Trends – Trends are graphs of the status of a point as measured or set by a control system. Having the status of points displayed graphically allows an operator or energy manager to understand how well equipment is operating. This assists with determining options that can save energy in buildings and allows for experimentation with regards to scheduling etc.

UPS – Uninterrupted Power Supply – A battery bank that is attached to electrical equipment to prevent the equipment from shutting down or experiencing power failure/power quality issues.

VAV – Variable Air Volume box – A device that mixes and tempers air for delivery to a zone at a setpoint temperature

VFD – Variable Frequency Drive – A device that changes the frequency of power that is delivered to a motor in order to control the speed of the motor. Running a motor with a VFD provides significant efficiencies with regards to electrical energy used if the motor isn't running at full speed. VFDs can also introduce harmonics and slightly alter the power factor of a circuit.

1.2 - General Notes regarding building history and findings[3]

The Dawson Public Works building is a 354m^2 one and a half story maintenance shop with offices upstairs located in Dawson, Yukon. The facility was constructed circa 2000.

The facility has two main workshop bays, a washroom, storage rooms, and a half story (second floor) with office spaces. The main entrance to the building in on the west side with a secondary entrance on the south side of the building. There are also three large overhead doors, one on the south side and two on the north side.

Based on the heating oil consumption records for 2017-2019, the facility uses an annual average of 14,073L of fuel oil per year at $1.02/L. That is an annual fuel cost of $14,354.46. The cost of a gigajoule of energy produced from burning oil in an 85% efficient furnace @$1.02/L is $31.32/GJ. The cost of heat provided by biomass is approximately $10/GJ[4] at $150/ton of dry chips. The biomass system currently operating in Dawson is paying the sawmill $28/GJ to provide chips to the Yukon Government operated facility[5].

The state of the oil tank is unknown at this time but should be considered as part of the replacement equipment if it is original.

Based on the electricity consumption records for 2017-2019, the facility uses an annual average of 25,993 kWh of electricity per year with a peak demand of 14.1 kW. This usage puts the facility in Block 4 of the new Yukon Energy rate schedule (2020) with a cost of $0.20/kWh and a demand charge of $10.85/kW.

The heating and plumbing equipment in the facility currently consists of:

- Heating oil indirect-fired forced-air convective Furnace (F) which mixes return air with fresh outdoor air, then filters, conditions, and supplies the heated air to upstairs offices.
- Ceiling mounted heating oil unit heaters (UH) which heat the bay and storage areas.
- Electric resistance personal space heater (SH).
- Electric storage type Domestic Hot Water (DHW) heater.

Currently the Public Works building is primarily heated from the combustion of oil using aged equipment. To significantly reduce the GHGs consumed by the building, implementing biomass heating in the Public Works Building as well as at the Admin Building/Firehall is recommended. The Energy Audit does not recommend upgrading the Public Works facility to utilize biomass heating along with the

[3] Many of the statistics from this report have been referenced from the Energy Audit report.
[4] The cost of biomass heating depends upon the moisture content of chips and cost of supplied wood per ton.
[5] The chip quality and dryness will directly affect the performance and efficiency of the biomass system and thus it is recommended to procure dry, seasoned chips. If Chief Isaac or Tr'ondëk Hwëchin have a stake in the biomass system, they will likely participate in the acquisition of wood chips at a more competitive rate while investing in infrastructure to improve chip quality.

Firehall/Admin Building, however given the GHG saving potential, remoteness of Dawson City and operational cost savings, biomass heating should be strongly considered despite initial costs of implementation[6].

There are multiple potential options for implementing biomass heating in the building. Section 3 of this report will discuss potential options for constructing a biomass district heating plant that can be utilized by the City of Dawson as well as potentially Chief Isaac.

2.0 – Heating Equipment

Item 5.1, 5.2,

Heating within the Public Works building is currently accomplished by heating air and distributing that hot air within the building. Since this building regularly has the bay doors open and closed at least once a day to move equipment in and out, this is an extremely inefficient means of heating the building. A better strategy is to heat a mass, such as fluid, and allow the heated mass to radiate its heat to the surroundings. In doing this, heat is less prone to escaping when a bay door or employee entrance is opened. By circulating this fluid to areas in which it is useful, this strategy is even more effective.

Oil heating is currently the primary source of heating within the Public Works building. According to Brodie Klem "*The PW building has the tanks stored within the building and probably could also be replaced but had no noted deficiencies during our last facility condition assessment (apart from having no secondary containment).*"

The City of Dawson should decide if oil will continue to be the backup source of heat once a biomass system is installed. If the oil tank will need to be replaced soon, it may be advisable to change over all equipment within the Public Works building to propane now since propane equipment is more efficient, allows for better temperature modulation, creates less GHGs, and has less risk and environmental concern attached to it. The cost alone to replace an oil tank and infrastructure with propane infrastructure may be offset by the cost of cleanup from an oil spill or leaking tank.

In terms of economics, propane typically outperforms oil in terms of cost per heat delivered and has the benefit of reduced GHG emissions. The cost of propane to the City of Dawson was quoted at $0.9141/L on April 27, 2021 which is 208% higher than the $0.44/L that the City of Whitehorse paid in 2019. This equates to a cost of $37.59/GJ of heat delivered when utilized in a 95% efficiency boiler. The cost of a gigajoule of energy delivered from burning oil @ $1.05/L in an 85% efficient furnace (maximum efficiency) is $32.24/GJ.

Regarding expected propane consumption if a biomass boiler is added, the following can be inferred. The Public Works Building used an annual average of 14,073L (539GJ) of heating oil from 2017 to 2019. The Energy Audit assumes that the furnace and unit heaters within the building operate significantly below the measured ~86% efficiency of the furnace and assumed 85% efficiency of the unit heaters

[6] Note that funding to implement GHG saving technologies is widely available at the moment and should be leveraged as much as possible to reduce ongoing operational expenses.

which has been achieved thanks to yearly maintenance. Approximately 458GJ of the 539GJ of delivered energy was used for heating by the oil boilers. **458GJ worth of propane used in a 95% efficient boiler(s) is 18,900L per year** if no other energy conservation measures are taken. Since the building will use significantly less energy from ECMs and be approximately 80% heated by biomass, it is reasonable to assume between 1890L to 7,560L of propane per year (10% to 40% of current energy demand) once biomass is installed and other ECMs are implemented. The 40% figure is in case the biomass is down for a period in the winter. 1890L @ $0.9141 = $1,728/year to 7,560L @ $0.9141 = $6,910. The high end of propane usage is pure propane 18,900L @ $0.9141 = $17,276 per year.

A significant drawback of propane in Dawson's extreme climate is that it has the potential to stop flowing when outdoor air temperatures are colder than -42°C. There is equipment that is designed to mitigate the chances of propane coagulating such as a tank warming electric blanket. A greater issue may be a lack of infrastructure in place and the availability of being able to receive reliable propane deliveries. All of these should be considered prior to making the decision to change to propane.

According to the Superior Propane website[7], 500Gal (2000L) and 1000Gal (4000L) tanks are available. The number of deliveries the City intends in a year will determine the tanks chosen vs. cost per tank. For fewer deliveries and potentially a better cost per liter, select larger tanks. If there is a delivery charge it should be considered as part of the ongoing costs since a delivery to Dawson will likely be expensive and thus the City will want to limit deliveries as much as possible. It is likely that the high cost per liter factors delivery into the cost.

The decision to remain with oil as a backup heat source to biomass should be made prior to moving forward with any equipment upgrades or renovations. If oil remains as a backup heat source, the decision to implement backup oil boilers to the biomass heating system may be advisable, dependent upon the equipment options selected.

This report will assume that oil will remain the primary backup heat source to biomass.

2.1 – Furnace

Item 5.3

The heating oil furnace is located in the maintenance room and provides conditioned air for heating to the second-floor offices via in-floor registers. The furnace is activated by a simple programmable thermostat that is located in the Super Intendent's office. According to Table 4 of the Energy Audit report, the estimated total ventilation rate according to ASHRAE 62.1 is 48L/s (95cfm) with minimum outdoor air is 36L/s (76cfm).

According to the nameplate sticker, the furnace has a Capacity of 29.6kW (101,000BTUH) with an original seasonal efficiency of 83% and an estimated seasonal efficiency of 60%. According to the maintenance sticker, the furnace is currently performing at 86%. This furnace is near the end of its useful life and should be replaced.

[7] https://www.superiorpropane.com/tank-sizes

Figure : A compilation of images of the furnace. Left Image: Front view showing the motor and controls. Right Image: Side view of the furnace showing return air ducting with outside air ducting connected. Inset: Thermostats that control the furnace located in the superintendent office.

2.1.1 – Furnace Replacement Options – Furnace Upgrade

ECM-3 Furnace Upgrade within the Energy Audit report recommends the installation of a near-condensing furnace with an AFUE of 95%. This option is likely the lowest capital cost option, however it still utilizes oil as the only fuel source and gets no real efficiency boost because of the actual performance of the furnace being maintained. According to the service sticker on the furnace dated April 1, 2020 the furnace is performing with an efficiency of 86%. If oil remains as the only fuel source, the GHG reductions of this option are essentially nil. The only real reductions from this option will be based on occupancy if a smart thermostat is utilized. This option will provide minimal to no reduction of oil consumption within the building.

ECM-2 from the Energy Audit recommends installing a Smart Thermostat to control this zone to replace the existing programmable thermostat. The cost to install the Smart Thermostat with occupancy sensors is nearly $600. While this will reduce the amount that the zone is heated, it will likely take quite a while for the Smart Thermostat to pay back. The City may wish to continue to use the existing programmable

thermostat or replace it with a Smart Thermostat. The effectiveness of the Smart Thermostat is directly related to how well the programmable thermostat is programmed regarding an occupancy schedule. A Smart Thermostat will take the guess work out of managing the thermostat for holidays or times when staff are away.

This ECM has minimal chance for efficiency improvement despite being the lowest capital cost option to implement. This option is only recommended if a biomass system isn't installed. The office zone is a small component of the overall building load, and thus an expensive installation of the other options may be a deterrent to them. A complex and expensive control system is not required for this option. The City may wish to consider implementing a higher efficiency propane furnace if the building were to change over to propane, however if a propane boiler(s) is added to the building, this option is not recommended.

2.1.2 – Furnace Replacement Options – Furnace Upgrade with biomass coil

An option that allows for the usage of biomass heating for the majority of the year involves installing the near-condensing furnace from ECM-3 along with a heating coil installed in the supply air plenum of the furnace along with a supply air temperature sensor and controlled valve.

With this option, the furnace would be installed with the blower motor set to activate when the furnace calls for heat. Upon a call for heat, the control valve will open and the blower motor will engage to remove heat from the biomass-heated coil for distribution to the second floor. If the supply air temperature sensor registers a minimum air temperature of ~30°C, the furnace burner will stay off[8]. If the biomass system is at capacity and unable to meet the supply air temperature setpoint, the furnace burner will be activated to provide additional heat. This option allows for backup oil heating as required but depends largely on the biomass system providing heat.

This option is preferable if oil continues to be the backup source of heating within the Public Works Building because it allows for biomass heating at most times with the oil furnace as backup when required. The backup furnace uses oil heating efficiently, so energy will be saved from the existing furnace with biomass operating or not. Selecting the proper furnace and commissioning the furnace correctly will be important as some models may require special configuration to activate the blower motor without also activating the oil burners. Programming the controller to monitor the supply air temperature sensor and activate the burner if below a specific setpoint will be necessary to make this option function.

This option requires a complex control system which will add to the cost of implementing this option above option 2.1.1. Given the small load of this zone, the increased costs of installing a more complex control system make this option less appealing than 2.1.1 in terms of cost despite the GHG savings that this option would provide.

[8] Thermal imaging investigation found that the distribution temperature of the furnace is currently 35˚C to 40˚C.

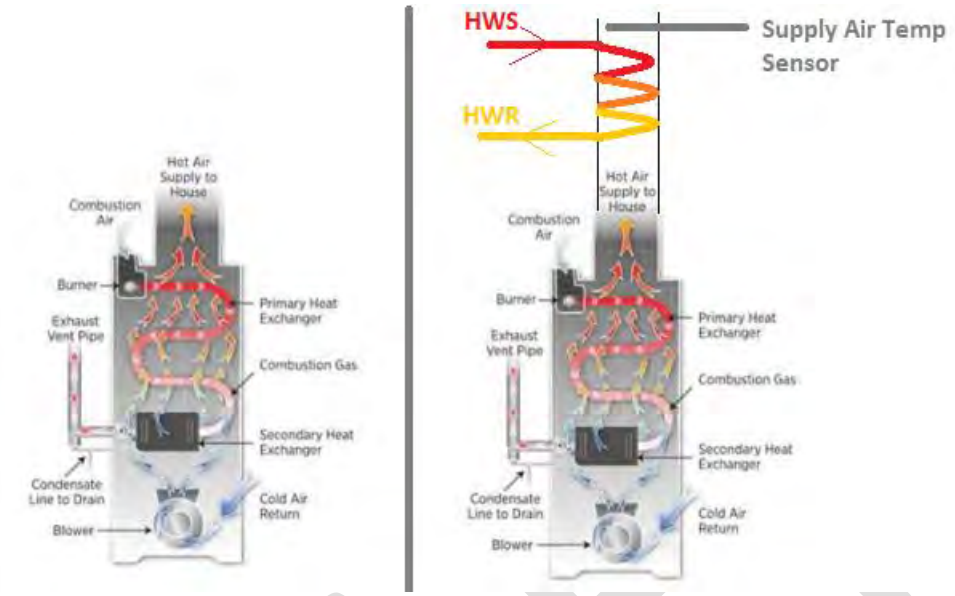


Figure : Left: The working principles of a near-condensing furnace are shown (2.1.1). Right: The near-condensing furnace is paired with a hot water coil that is fed from a biomass heating plant (2.1.2). A more advanced control system will be required to operate 2.1.2.

2.1.3 – Furnace Replacement Options – HRV with biomass coil and backup boiler

Another option that provides up to 85% heat recovery and potentially higher, involves the replacement of the furnace with a heat recovery ventilator (HRV) or a LifeBreath Furnace. This scenario is very similar to 2.1.2, however the HRV would be sized to provide the required ventilation rate to the upstairs offices. This option would best be accompanied by a building envelope upgrade to the roof as per section 4.7 to reduce the heating load.[9]

The supply air duct after the HRV would have a heating coil similar to the furnace in 2.1.2 that would have a monitored supply air temperature. The coil would need to be sized in order to provide as close to the furnace heating capacity as possible in cooperation with radiant heating (if implemented). Installing an HRV in the furnace room is expected to take up much less space within the room then a furnace because ducting could be reduced in size. This would provide more room for storage, which the room is already used for.

Alternatively, if recommendation 3.1.3 is implemented using a hot water circulation system, a LifeBreath Furnace[10] can be implemented to utilize hot water from biomass or an oil boiler.

[9] A wall upgrade will provide minimal energy benefit for the capital cost involved and is not recommended, however a substantial upgrade to the roof insulation is recommended.
[10] This model of LifeBreath Furnace can meet half of the current heating provided by the existing furnace (29.6kW = 8 ton) and airflow provided by the existing furnace: https://www.lifebreath.com/product/clean-air-furnace-6/ If the heat load is reduced by improving the roof and radiant ceiling tiles are used, this device is an option.

If the exhaust from the HRV can be vented to the workshop, then even higher efficiency is possible. Since an HRV would pull exhaust air from an office kitchen and likely the hallway, there is minimal concern for contamination and codes should allow for it to be exhausted within a workshop, however this will require a code review as part of detailed design. If the HRV pulls exhaust air from the bathroom, the exhaust must be vented to the outdoors.

The offices may require a secondary source of heating such as radiant heating from the biomass system or small electric baseboards. If biomass heating is installed to heat the vehicle bay, extending the biomass lines to provide radiant heat via ceiling tiles will require minimal disruption to the space and will allow for ventilation equipment to be shut down at night while allowing the space to continue to be heated.[11] Alternatively, radiant floor or wall heating may be implemented. Installing radiant heating will come at additional costs which makes this option less desirable from a first cost perspective but has reduced operational costs and allows for more efficient use of the biomass heating system.

If this option is implemented, it will also be important to have a backup boiler of some kind in case the biomass system fails outright or cannot meet the demand during extreme conditions. If only the office requires a backup boiler, a small electric boiler capable of providing the current heating capacity of up to 29.6kW[12] of heating would suffice. Panel A within the furnace room is a 240V 225A panel with spare slots for easy install.

If hot water-based unit heaters are implemented instead of a Modine Oil-Fired Unit Heater from ECM-5 as discussed in Section 3.1.3 then a larger oil-based (or propane if backup heat sources are changed) backup boiler will be necessary[13]. Note also that if the existing unit heaters remain in place as backup, the vehicle bay may also implement fan coil heaters along with radiant heating as discussed in section 3.1.2.

This option would improve efficiency but at an added capital cost. If this option utilizes the LifeBreath furnace and radiant panels, it is likely less complex to implement than 2.1.2. To implement this option an advanced control system, radiant heating and a backup boiler will be required. If a backup boiler is installed, this option has good potential as it has the highest efficiency of the furnace options of section 2.1.

2.2 – Unit Heaters

Currently the vehicle bay is heated by two large oil-fired unit heaters that have a heating capacity of 67.4kW each. These units are located in the middle of the facility and provide heat near the ceiling by heating the air and blowing it towards the ground. According to Table 4 of the Energy Audit, these unit heaters are expected to provide a minimum ventilation rate of 108L/s for Bay Area 1 and 142L/s for Bay Area 2.

[11] A more advanced control system will be required to accomplish this than a simple thermostat.
[12] This will be smaller if a roof insulation upgrade is implemented and radiant heating is utilized upstairs.
[13] As discussed in 3.1.3, the boilers from the Fire Hall/Admin Building could potentially be used as backup to the biomass system.

Unit heater 1 is facing the south bay door and unit heater 2 is facing the north bay doors. The thermostat that controls unit heater 1 is located across from the furnace room. The thermostat for unit heater 2 is on the column near the north wall.

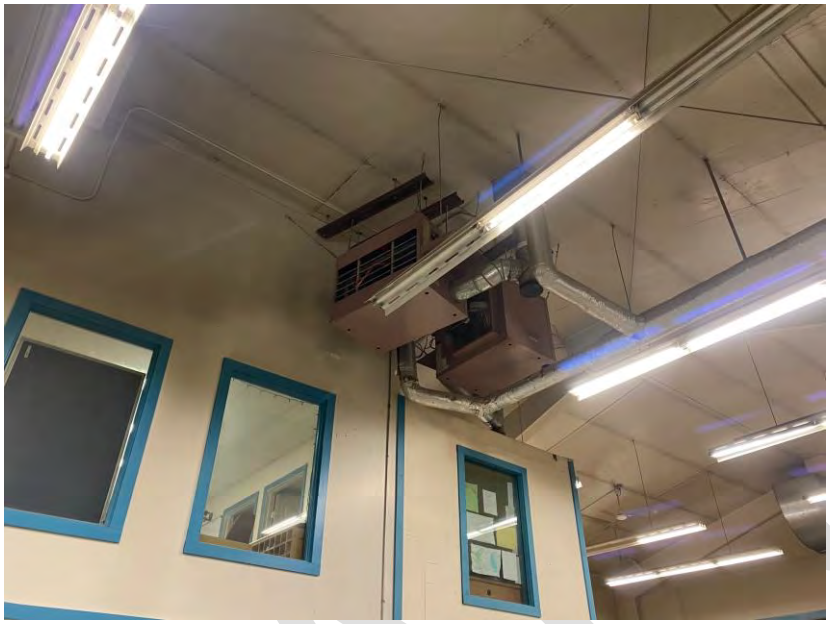


Figure : The unit heaters that heat the vehicle bay are located at roof level and thus much of the heat that they produce is lost through the roof without reaching the floor level where the heat is required. Left unit is UH-1, right unit is UH-2.

Heating the air, especially air near the roof is inefficient in this application because the heated air is easily lost when a bay door opens and because the roof has minimal insulation values at this time. Heating a mass that can radiate heat to objects within the workshop/vehicle bay is a much more efficient means of maintaining heat within the space because more heat remains even when the bay doors open. This is discussed in more detail in section 3.1.1.

2.2.1 – ECM-5 Near Condensing Unit Heaters

Item 5.5

The unit heaters within the Public Works building are nearing their end of life and must be replaced in some capacity for the vehicle bay to remain usable in the winter over the long term. According to the cost breakdown document provided by Brodie Klem, replacing the existing unit heaters with more efficient units is expected to cost $7,774. This option is likely the easiest to implement as there is no detailed design involved. For the sake of simplicity, this option is recommended at this time unless money from this funding can be utilized to implement heating elements of a future biomass project and backup boiler system.

If biomass heating is to be installed in the future, and costs on that installation are intended to be reduced and combined with this project, then options 3.1.2 and 3.1.3 should be considered because the

costs of installing hot water-based unit heaters is less than installing the Reznor Unit Heaters from ECM-5. That option however requires the installation of a backup boiler(s) and will require a detailed mechanical design. Given the stage that this project is at, it is likely best to implement ECM-5 as planned and implement 3.1.2 when a district heating system using biomass is planned.

If a district heating system using biomass as per 3.1.2 is installed, the oil-based unit heaters can act as backup by simply having their thermostats set to a setpoint 5°C to 10°C less than the setpoint of the biomass system.

3 – Biomass heating

At this time, fire smarting is being completed around West Dawson and this wood is being burned on site and wasted. This wood would be better utilized as a heating source for buildings within Dawson City.

Since there is a lot of capacity to provide wood chips in Dawson City due to the large biomass boiler already in place, a biomass boiler may be considered for installation as primary heat source for the Public Works Building, Firehall/City Hall and for potentially multiple Chief Isaac/Tr'ondëk Hwëch'in owned properties in the vicinity.

During the site visit, FPMBC investigated City property to determine where a biomass boiler could best be located. Due to the importance of access and egress from the Firehall, the most plausible option on City property is to possibly convert the existing woodshop into a biomass boiler facility. Even this option has complications however with regards to efficient chip deliveries regarding access and egress and thus the neighboring Chief Isaac property was considered.

FPMBC spoke with Ms. Gina Nagano who is the Former Chair of Chief Isaac group of companies. She indicated that Chief Isaac would be keen to discuss utilizing biomass at their office that is next door to the Firehall/Admin Building as well as in the Tr'ondëk Hwëch'in daycare which is across the street (behind the admin building). If the City has Chief Isaac as a partner, it should reduce the cost and complexity of implementing biomass for the Admin and Public Works Buildings. To size a biomass installation properly for such an application, it will be important to know the heat loads of Chief Isaac buildings and the wood shop if this building is also to be heated using biomass.

To create a biomass district/cluster heating system for use between Chief Isaac/Tr'ondëk Hwëch'in and the City, it will be important for the City of Dawson to have some type of heat purchase agreement, MOU or maintenance agreement if a biomass plant is to be constructed on Chief Isaac property for sharing between Chief Isaac/Tr'ondëk Hwëch'in and the City of Dawson at the Admin Building and Public Works building.

The only other option that appears possible is to construct a small biomass building in some of the parking spaces near the road on the north side of the Fire Hall/Admin building. This is an option if this building and chip delivery does not interfere with fire truck operation. Given the limited options for constructing a biomass facility on City property as well as the cost benefits of partnering with the First Nation, constructing it on the adjacent Chief Isaac property holds promise.

Figure : The area in front of the Firehall must remain clear so that fire trucks can easily exit and enter the hall. This leaves little space for implementing a biomass facility on City property. The exception may be to remove several parking spaces along the fence on the north side of the building (directly in front of the Museum entrance). The adjacent property owned by Chief Isaac holds promise for housing a biomass district heating plant for multiple buildings in the area.

The City of Dawson may wish to simply purchase heat from Chief Isaac/Tr'ondëk Hwëch'in, or they may take an ownership through a partnership of some kind. In terms of acquiring funding and reducing project costs, a partnership with Chief Isaac/Tr'ondëk Hwëch'in is likely the best option for the City.

In terms of operational costs, the cost of a gigajoule of energy produced from burning oil @ $1.02/L in an 85% efficient furnace is $31.32/GJ. The cost of heat provided by biomass is approximately $10/GJ[1] at $150/ton for dry wood chips. Lower quality (wetter) wood chips will increase the cost per GJ of heat and will increase the amount of maintenance that will be required to operate the biomass boiler(s). The cost of heat currently being paid for biomass heat in Dawson City is $28/GJ[14].

[1] The cost of biomass heating depends mostly upon the moisture content of chips and cost of supplied wood per ton. There will also be small losses through the distribution system.

[14] See Appendix 2 regarding costs provided to the City of Dawson. These costs will likely decrease with improved chip quality due to increased demand and infrastructure, participation from Chief Isaac/ Tr'ondëk Hwëchin and greater uptake of biomass in the Dawson area. Having a reliable demand for wood chips will help to improve the quality and supply.

Figure : A google map of the City Fire Hall/Admin Building, City Public Works Building, City Woodshop, Chief Isaac Office, Tr'ondëk Hwëch'in Daycare and Chief Isaac wood working shop. The most likely location for a biomass facility is highlighted in red. The buildings that have potential for biomass heating have orange and yellow lines running to them. A detailed design would be required to accomplish this work. An energy assessment of other buildings to be connected to the biomass must be conducted prior to detailed design to ensure that they are using energy efficiently and to prevent oversizing the biomass system.

By implementing biomass heating in the Public Works building, the replacement or remaining unit heaters will function as backup heating[15] in the event that it is required when the biomass boiler is unable to meet demand or if the biomass system fails. Implementing biomass heating in this location would greatly reduce greenhouse gases, reduce the cost of heating fuel[16], provide local employment to Dawson citizens, and significantly increase the life expectancy of the new or existing oil unit heaters.

[15] Some heating equipment may need to be removed due to it no longer meeting building codes.

[16] This option is particularly useful for reducing the high costs of and will help reduce greenhouse gases generated from burning oil. Wood chips are also significantly cheaper as a fuel source ($10/GJ @ $150/tonne in Haines Junction and Whitehorse market) than oil ($31.32/GJ @ $1.02/L consumed by 85% equipment) and electricity ($55.56 @ $0.20/kWh pure electric heating) while providing employment to locals and Tr'ondëk Hwëch'in citizens. The biomass facility in Dawson is currently paying $28/GJ for wood chips. It is likely that these chips are not as well seasoned or of as high quality as in Haines Junction. This cost is predicted to drop with improved infrastructure, experience and demand.

Note that the life expectancy of the replacement unit heaters (Reznor) is 13 years if they are the primary heating source. This should be much longer if they are only used intermittently.

A trench will need to be created to run insulated hot water lines (supply and return) from the biomass building to the boiler room of the Firehall/Admin Building. The lines would tie into the building and connect with the existing hot water circulation system. The tie in point would be prior to the return water temperature sensor of the system.

The biomass lines will likely run through the Fire Hall to the south side of the building to connect to the Public Works building. A small area will need to be excavated next to the building to run the biomass lines (~ 2-inch insulated piping) between the two buildings. A detailed design of such a facility and connection to Firehall would be required. The hot water biomass lines could potentially run through the firehall and trench to the Public Works building, or a more expensive option would be to trench the hot water lines directly to the Public Works building.

Since the Public Works building is kept at a low temperature regularly, the building itself could potentially serve as a "heat dump" to the biomass plant at times when the plant is producing more heat than the rest of the buildings can utilize. Since biomass boilers are typically undersized to meet approximately 70%-80% of the district heating load in order to run continuously all winter, dumping heat into the Public Works building may be a way to size the system for meeting higher than 80% of the heating load. If this was done, it would likely involve the biomass boiler system controls also controlling the biomass components within the Public Works building.

3.1 – Biomass Heating Options

Currently the vehicle bay is heated by two large oil-fired unit heaters that have a heating capacity of 67.4kW each. These units are located in the middle of the facility and provide heat near the ceiling by heating the air. Since heat rises, a good percentage of this heat does not reach the ground floor and escapes via the minimally insulated roof or when a bay door is opened. According to the Energy Audit, the roof currently has an insulation value of RSI 4.047 (R- 22.98).

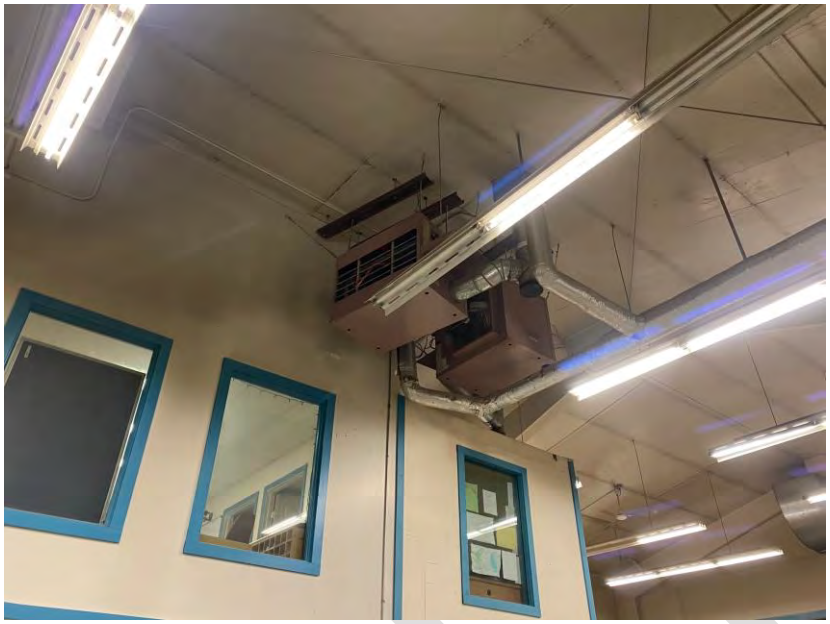


Figure : The unit heaters that heat the vehicle bay are located at roof level and thus much of the heat that they produce is lost to the roof without reaching the floor level where the heat is required.

Heating the air, especially air near the roof is inefficient in this application because the heated air is easily lost when a bay door opens. Heating a mass that can radiate heat to objects within the workshop/vehicle bay is a much more efficient means of maintaining heat within the space because the heat remains even when the bay doors open.

There are multiple ways in which biomass heating can be implemented within the Public Works Building. Each option will involve running hot water lines to equipment within the facility. Below is a breakdown of potential options to consider.

3.1.1 – Install Ground Level Radiant Heating

Item 5.7

Ideally heat should be distributed as close to the working area as possible. One possible solution is to run radiant hot water lines (supply and return) through wall fin radiators or panels located near ground level. To accomplish this, the shelving units along the walls that would need to be moved slightly away from the wall. Having the source of heat behind the shelves may not be desirable as it appears that multiple vehicle fluids are stored on the shelves. These fluids and other equipment on the shelves will absorb the heat from any radiant equipment installed behind the shelves. This along with the shelves being relocated and the labor involved in moving these shelves may be deterrents to implementing this solution at ground level.

Alternatively, a radiant heat pipe or wall finned heaters may be installed just above the shelving units along the wall. Both options would utilize the biomass-heated water as a thermal mass that would

radiate heat to the nearby equipment and space. Heating equipment and the vehicle bay in this way will allow for more heat to remain in the space whenever the bay door is opened and utilize less electricity to deliver the heat. The system could be controlled by a simple thermostat which would control a Normally Open valve to allow flow through the system.

Ideally, the thermostat for any biomass heating within the Public Works Building would be tied into the biomass control system and would allow the system to "dump" excess heat into the Public Works building as needed to optimize operation of the biomass plant.

When the radiant wall equipment is installed, ideally an insulative layer will be added to the exterior wall directly behind the radiant equipment so that heat from the equipment does not short circuit to the outdoors. Screwing a plywood strip to the wall studs, gluing a 2" – 3" rigid insulation strip to the plywood, and screwing another plywood strip to the other side of the rigid would create a solid, insulated surface to attach radiant equipment to. Since the exterior wall is not well insulated, preventing heat from conducting from the radiant equipment to the outdoors will be important.

The main benefit of this option along with option 3.1.2 is that this system will function independently from the oil-based system and thus the existing unit heaters can remain in the space to provide backup heating to this system. Since the life of the existing oil-based heaters is unknown, using this biomass-based system as primary heating may allow for them to remain in operation for some time. Alternatively, the City may wish to replace the existing unit heaters with the devices indicated in ECM-5 for the cost of $7,774 as budgeted and allow those devices to remain as backup for a very long time. The other option is 3.1.3 which will require a detailed design to implement in the short term.

Since the City may not be able to implement biomass heating within the next year, replacing the old unit heaters with fully funded ones is likely the best option unless 3.1.3 is implemented.

Figure : Radiant heating lines near ground level behind the shelving units are shown in red.

Alternatively, a thermostatically controlled radiant pipe or wall fin system may be installed above the shelving units as illustrated in grey and red. By using hot water as a mass to heat air (orange), only a pump is required to circulate this heat which saves electrical energy and maintains heat within the building. The heat pipe or wall finned heater should be reflected downward towards the shop floor. Installing a ceiling fan will push the air downward and allow for better convection.

3.1.2 – Radiant Heat and Unit Heaters

Item 5.7

In addition to, or alternative to installing radiant heating using biomass heated hot water, unit heaters could be added to increase the heat distribution within the building. This would be done if insufficient heat can be transferred to the space using only radiant heating. By adding unit heaters, more heat can

be dumped into the Public Works building and potentially allow the biomass boiler system to operate with higher efficiency while preventing the usage of oil heating in the shop area.

As with 3.1.1, implementing this solution would allow for the existing unit heaters to remain in place or for new oil-based unit heaters to provide backup heat. With this option implemented it is unlikely that the oil unit heaters will be required unless there is an issue with the biomass system or during extreme weather. The existing thermostats within the building could still be utilized for this equipment. This would involve setting the setpoint to be at least 5°C less than the setpoint of the biomass system.

Since this building is typically utilized at a low temperature, it can work well as a buffer that allows heat from the biomass system to be redirected to other buildings within the system as needed or as heat storage/dump as required. Utilizing the building in this way would require the biomass-based equipment to be controlled from/interface with the biomass control system.

Figure : Radiant wall heating from the biomass system could be run extensively within the public works building in combination with unit heaters that utilize the hot water loop. The unit heaters would ideally be controlled via a secondary thermostat that allows them to boost heat within the space as required when the radiant lines cannot keep up. Insulated hot water lines are shown in grey. Note that the hot water lines from this system could be tied into to provide heat to the second floor via radiant ceiling panels for option 2.1.3.

3.1.3 – Install water-based unit heaters with backup boiler

Item 5.8, Item 5.9

The system in 3.1.2 above could be installed by replacing the old oil unit heaters with hot water unit heaters. In this scenario, the new hydronic unit heaters could remain in the location of the oil-based unit heaters, be placed according to figure __ above, or as designed.

To accomplish this, oil (or potentially propane) boilers capable of meeting the combined load of the existing unit heaters (67.4kW * 2 = 134.8kW) would be required to be installed[17]. In doing this, the building would be heated with hot water and could begin utilizing radiant heating once the equipment is installed. This option would reduce the amount of equipment that would eventually be installed within the building but may be an issue from a funding perspective as a detailed design would be required. This report would be an important resource to anyone who would complete a detailed design.

Of important note, the boilers within the Fire Hall/Admin Building have a gross output of 483MBH (141.6kW) each according to their nameplate stickers[18]. A single boiler operating would cover the load of the bay which will be less than 134.8kW once other measures are taken. The Energy Audit lists the condition of these boilers as "good" and they may have many years of functionality remaining in them. If these boilers are to be replaced within the Fire Hall/Admin Building, they could potentially be installed as backup boilers to a hydronic system that is primarily heated with biomass. Installing one of these boilers in the furnace room and storing the other is an option that could be implemented if the work between the Firehall/Admin Building and Public Works Building is coordinated. The existing unit heaters could remain in service until hydronic unit heaters and radiant equipment is installed and connected to the backup boiler. This could be set to function immediately or wait until the system is connected to the biomass system.

Alternatively, there is a portable trailer located next to the Fire Hall that is owned by the City. The trailer contains an electrical generator that is rated at 53.6KVA on a single phase and 100KVA on three phases. The trailer also contains a 646MBH (189.3kW) boiler. If this boiler still works, it could be connected to the future biomass system to provide backup heating to the public works building and potentially the workshop or another part of the district heating system. The operational condition of this equipment is unknown, but apparently this trailer was constructed to provide emergency power and heating to a facility.

The advantage of this hydronic option is that hot water unit heaters are significantly cheaper than oil burning unit heaters. This option also allows for the HRV design for the upstairs as discussed in 2.1.3. This option is more expensive than 3.1.1 and 3.1.2 at this time because a detailed design and boiler installation will be required, however if the Firehall boilers are installed in this location or connected to a new hydronic system via the trailer, the cost may be very similar if not less than replacing the oil unit heaters with other oil unit heaters and then installing a separate hydronic system for biomass. If biomass for this building was considered and funded as part of the Energy Audit scope, this option would likely be in the same ballpark in terms of costs.

If biomass is to be installed for the Admin Building and Public Works building in the future, and the boilers from the Fire Hall/Admin Building are being changed out, this option should be considered now

[17] Upgrading the roof insulation as per recommendation ___ will reduce the heat load of the shop. Installing radiant heating will also allow for smaller unit heaters.
[18] The Energy Audit indicates that they have a heat capacity of 169.14kW which contradicts the nameplate sticker.

to save the $7,774 expense of replacing the old oil unit heaters with new oil unit heaters which are unlikely to be used often.

4 – Building Envelope and related ECMs

FPMBC was provided with a word file providing ECMs that were being considered along with funding information for comment. Below is the section of that document relevant to this project with comments for each item in a separate section.

#2. Dawson Public Works (Gerties)	
Door Seals & Sweeps (ECM 1)	$1,708
Interior Lighting Upgrades + EXIT signs to LED (ECM 4)	$6,457
Furnace Upgrade (ECM 3)	$4,171
Unit Heater Upgrade (ECM 5)	$7,774
Airius Air Pear (ceiling fan replacement) (ECM 7*)	$1,335
3 x Air Curtain (ECM 8*)	$51,756
Control Optimization / Recommissioning? (new ECM 9*)	$10,950
Insulation Upgrade (ECM 6) Audit estimate	$45,120
Magnetite storm windows ($27.24 - $35.30/sqft)	$2,200
Public Works bldg. sub-total #2	**$131,471**

Figure : Table of proposed ECMs for funding.

4.1 – Door Seals and Sweeps - ECM-1

Item 5.10

Door seals and sweeps improvement is a low-cost ECM that will reduce the heat loss through the bay doors by preventing heat migration from the interior to the exterior. Installing these sweeps is recommended.

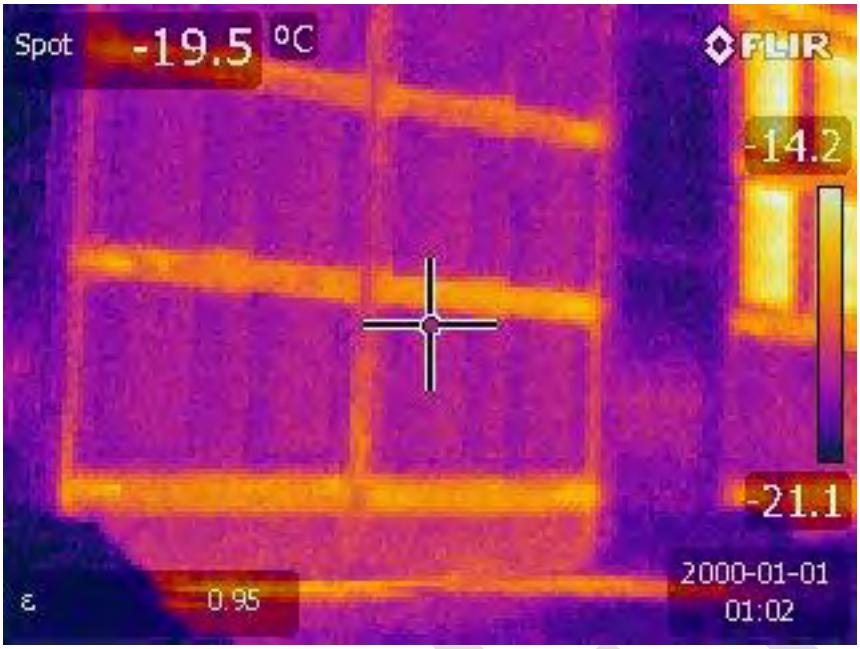


Figure : The north bay door. It appears that heat is escaping from this bay door because of a poor seal. It is possible but unlikely that the door had recently opened leaving a heat imprint. It is unknown when the door was opened prior to taking this image.

4.1.1 – Install "Arctic Entry" to upstairs

Item 5.11

Next to the stairway to the upper offices is an open section of wall that is connected to the vehicle bay. Whenever the north bay door is opened, this cold air rushes into the vehicle bay but is also allowed to blow up the stairs into the offices. This open area also allows vehicle exhaust or other odors produced in the workshop to migrate up to the offices.

Framing this area and installing a regular or transparent door would reduce cold air and fumes from the vehicle bay from entering the second-floor office space while also allowing direct access to the shop via the offices.

This area is currently heated by air circulating in the shop. The base of the stairs may get cold and require a radiant panel once the biomass system is installed, if this is pursued.

Figure : The open corridor to the upstairs that connects to the vehicle bay can be framed with a door installed to prevent cold air and fumes from migrating upstairs.

4.1.2 – Insulate the bay doors and metal exit doors to reduce heat loss

Item 5.20

This option was not indicated in the Energy Audit report, however after completing a thermal imaging inspection, a lot of heat loss was observed through the bay doors and metal exit doors. A cost-effective option to reduce this heat loss is to insulate the bay doors.

A product option to consider: https://www.curtain-and-divider.com/roll-up-dock-door-curtains/

Pre-cut insulated panels for bay doors are another option: https://www.homedepot.com/p/Cellofoam-Garage-Door-Insulation-Kit-8-Pieces-Garage-Door-Insulation-Kit-8-pcs/203630159

Likely the most cost-effective option is to simply cut some 1.5" – 2" rigid to size so that the pieces don't impede door movement at the hinges and adhere them to the panel portion of the bay doors using foam adhesive. The foam pieces should be combined with this reflective door cover https://www.smartgarage.ca/insulated-roll-up-garage-doors/ or an aluminum or fire resistant, thermally reflective film cover to provide the longest life expectancy and energy efficient benefits.

This same strategy can be utilized to reduce heat loss through metal exit doors. It is important to adhere the rigid to a clean and dry door and ensure that the rigid is covered with aluminum or a fire-resistant material that can handle the abuse that a door typically endures.

4.2 –Interior Lighting Upgrades and EXIT signs to LED - ECM-4

Item 5.12

The Energy Audit report recommends upgrading all lighting to LED. It also recommends the installation of dimmer switches and timers. Given the dark mornings and late afternoons in the Dawson winter (October to March), the lights within the building will likely be on as long as the zones are occupied due to low natural lighting levels. Also, occupancy sensors are not recommended in offices that have an occupant working at a desk for long periods because they shut lights off when there is no movement.

From March until October, lighting within the offices can be manually implemented if the occupant doesn't find sufficient natural lighting available via windows. It is likely that dimmer switches and occupancy sensors will add to the project costs while adding minimal energy benefit, and they will likely not be well utilized. The exception is installing an occupancy switch in the washroom.

Replacing all existing lighting with LED is recommended, but occupancy sensors and dimmer switchers are not likely worth the extra cost and are left to the discretion of the City. When replacing outdoor lighting, it is recommended that the replacement lighting is Dark Sky compliant to reduce light pollution levels.

4.3 – Furnace Upgrade ECM-3

Item 5.4, Item 5.3

Section 2 of this report focuses on the options available for furnace upgrades. Given the small load of the upstairs zone and the minimal cost to upgrade the furnace, it is recommended that the furnace upgrade proceed as planned as per section 2.1.1 to reduce the project complication and cost unless a propane boiler is added to the building as backup to the biomass. If this occurs, the option from 2.1.3 is recommended.

Implementing "ECM-2 Smart Thermostat" is up to the discretion of the City. Since the existing thermostat is programmed to reduce temperatures during unoccupied periods, ECM-2 is not likely to produce much energy savings unless the upstairs offices are rarely occupied during occupied hours and occupants are willing to wait a couple of minutes to bring the temperature up from approximately 18°C to 22°C when they enter the upstairs.

4.4 – Unit Heater Upgrade - ECM-5

Item 5.5

Upgrading the unit heaters is discussed in section 2.2 and 3.1. The simplest solution at this point is to upgrade the existing unit heaters as per ECM-5, however this installs equipment which will rarely be

utilized once biomass is installed and thus the City should consider the information in Section 3.1 prior to moving forward with ECM-5.

4.5 – Airius Air Pear (ceiling fan replacement) – ECM-7

Item 5.13

The Airius fans are intended to move warm air from the ceiling space to the floor for the cost of $1,335. The Airius website[19] claims that a savings of up to 23.2% is possible from a 33-foot-tall ceiling with a delta T of 10.8°F. This would be accomplished by moving the air from near the ceiling to ground level. This is the same function as a common ceiling fan. Since the ceiling height is low, a common fan costing less than $200 should have no problem distributing the air in the same way. The motor efficiency from the Airius to a common fan will be play into the savings possible, however the motor efficiency difference is expected to be minimal and thus the payback period for implementing the Airius fan is very long.

This product appears to be more applicable for higher roofs as the amount of pressure required to direct the airflow down to ground level would be much higher. Having an overly strong air current in such a low ceiling space would blow dust and debris around making working in the shop difficult. A minimal fan pressure is required to move air from the ceiling to the floor in this application.

Also, installing radiant heating as per Section 3.1 as well as insulating the roof as per 4.7 are intended to help reduce stratification within the space, minimizing the need for expensive fans.

Installing the Airius fans instead of a common ceiling fan is not recommended.

4.6 - Air Curtains – ECM – 8

Item 5.14

The installation of air curtains is intended to prevent cold air from infiltrating the vehicle bay and removing heated air from the space. The reason that air curtains seem like a good idea is because the building is currently heated with air from unit heaters. This heated air is prone to escaping multiple times per day, whenever the bay doors are opened.

If air curtains are installed a portion of heated air will still escape and there are factors to consider regarding air curtains. These devices will increase electrical energy usage while blowing dust, snow and debris from the maintenance equipment as they enter and exit the building. This will likely create dust clouds and contamination within the Public Works building which will make it more difficult to work within the building. Notice on the air curtain website[20] how all the warehouses are clean.

Installing the three air curtains has a budget of $51,756. This is a very expensive ECM with minimal payback and potential drawbacks considering that the annual fuel cost is on average $11,791 according to the Energy Audit report. It is advisable to spend that money instead on building a system that

[19] https://www.airiusfans.com/
[20] http://www.aircurtain.ca/

maintains heat within the building more efficiently (using as much radiant heating and thermal mass as possible) as discussed in section 3.1 and on insulating the roof to reduce the amount of heat that is lost 24/7/~300.

4.7 – Insulation Upgrade – ECM – 6

Item 5.15, Item 5.16

As shown in the accompanying "Dawson Public Works Thermal Imaging Report" and as discussed in section 2.7.2 of the Energy Audit, the roof of the Public Works building is poorly insulated and prone to significant heat loss. Since the heating equipment is also located near the roof, much of the heat produced in the vehicle bay sits near the roof and escapes via the roof causing ice damning and high energy consumption. According to the Energy Audit Table 11, the roof of the Public Works building only has an RSI of 4.047 (R-22.98). Ideally a roof in the Yukon should not perform below R-40 for a large commercial building.

According to Table 33 in the Energy Audit, the proposed improvement to the roof is only an additional 50mm (~2 inches) of additional Polystyrene (rigid) for an added RSI increase of 1.724 (R - 9.79). Given the cost to remove the metal siding and minimal energy savings of adding 2" of rigid, this renovation only makes sense if more than 2" of rigid is added. This is possible because the roof is believed to be made of polystyrene[21] which allows for additional insulation to be added without worry of creating a second vapor barrier.

Improvements to the roof insulation of at least 4" to 6" of additional rigid is recommended. Adding 4" would increase the roof insulation to ~ R- 44. Adding 5.5" of rigid would increase the roof insulation to ~ R- 60. This could be accomplished by installing 2 x 6 cross members parallel and attached to the existing roof trusses to hold the new rigid insulation and attach metal roofing or plywood for shingles. These members would be installed at the edge of each piece of rigid and would be cut to have approximately a ¼" gap between the insulation layer and plywood or metal roofing. If solar is intended for this facility, adding a ¾" plywood layer over the insulation layer is a good idea because it will allow for more strength while providing attachment points for anchoring a solar system.

Improving the insulation values on the roof are significantly less labour intensive than improvements to the building envelope because the building envelop is much larger and has electrical conduit, lights, windows, doors etc. to work around.

As shown in the Thermal Imaging report, adding a 2" layer of insulation to the underside of the roof (plywood) above the offices will increase the thermal performance and reduce heat loss within the office spaces. If 4" is added to the roof via the exterior, and 2" is added to the roof above the office spaces from the interior, there will be a significant energy reduction via reduced heat loss.

Table 34 of the Energy Audit report also recommends adding a 50mm layer of polystyrene to the wall assembly. Adding additional insulation to the wall assembly will effectively create a secondary vapor

[21] According to the Energy Audit report.

barrier and is highly undesirable. Adding only 2" of rigid to the wall assembly is significantly more complex than adding insulation to the roof and has minimal energy benefit. Thus, a wall assembly insulation upgrade is not recommended unless the City wishes to also upgrade the exterior aesthetics of the Public Works building as part of the insulation installation.

Note that any insulation improvements will reduce the heat loads and thus the sizing of biomass heating equipment and even oil burning equipment can potentially be reduced.

4.8 – Magnetite Storm Windows – ECM - 11

Item 5.17

The Magnetite windows appear to be a good option to replacing the windows and will help to reduce the heat loss via the glass. These panels have a high cost of $2,200 and will have a minimal energy payback since they are assumed to be implemented in the upstairs offices which are a low energy use zone compared to the vehicle bay. If the occupants presently find the windows to be drafty and uncomfortable, then this option is recommended.

Since cooling in the building will be accomplished via opening windows during summer, care will need to be taken to ensure that the Magnetite panels for operable windows are stored safely so that they do not crack or get scratched when removed from the windows during summer months.

In the accompanying thermal imaging report, only one window was observed to have heat loss around the frame. This window should be insulated around the frame by removing the window trim and using expanding foam.

5 – Recommendations for the City of Dawson to consider

The City should decide which recommendations they wish to pursue and discuss this with the Energy Solutions Centre.

5.1 – Assess the condition of the oil tank to determine if it is due for replacement

Reference: Section 2

The oil tank for this facility is stored within the building and is likely due for replacement in the near future. This tank has no secondary containment and the state of it is currently unknown.

Recommend have the oil tank(s) assessed regarding replacement prior to deciding to continue with oil. Plan to replace the oil storage tanks along with oil-based heating equipment if oil remains as a primary fuel source and the tank is due for replacement. Have this expense included with project costs as it is a necessary expense. Note that using oil as backup heating to biomass is required if the option discussed in section 3.1.3 utilizes the boilers that are being replaced from the Fire Hall/Admin Building.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.2 - Determine if oil will remain as a fuel source or if propane shall be used prior to selecting heating equipment

Reference: Section 2

The Energy Audit report assumes that oil shall remain as a heat source in the building despite several advantages of implementing propane. A significant drawback of propane in Dawson's extreme climate is that it has the potential to stop flowing when outdoor air temperatures are colder than -42°C. Tank heating equipment such as an electric heating blanket exists that can prevent this from happening. A greater issue may be a lack of infrastructure in place and the availability of being able to receive reliable propane deliveries. All of these should be considered prior to making the decision to change to propane.

The decision to remain with oil as a backup heat source to biomass should be made prior to moving forward with any equipment upgrades or renovations. Note that using oil as backup heating to biomass is required if the option discussed in section 3.1.3 utilizes the boilers that are being replaced from the Fire Hall/Admin Building.

Recommend cost out utilizing propane and changing over infrastructure to propane versus the costs of replacing the oil tank, oil insurance costs etc. prior to moving forward with oil burning equipment upgrades. This step is not required but recommended as you may find significant cost savings from switching as part of this project. Be sure to include propane warming equipment in the estimates.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.3 – Decide regarding implementation of ECM-2 Smart Thermostat

Reference: Section 4.3, Section 2.1

ECM-2 from the Energy Audit recommends installing a Smart Thermostat to control this zone to replace the existing programmable thermostat. The cost to install the Smart Thermostat with occupancy sensors is nearly $600. While this will reduce the amount that the zone is heated, it will likely take quite a while for the Smart Thermostat to pay back. The City may wish to continue to use the existing programmable thermostat or replace it with a Smart Thermostat.

Recommend continue to utilize the programmable thermostat. Ensure that unoccupied settings are approximately 15°C or less during times when the offices are not in use.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.4 – Upgrade furnace as per ECM-3

Reference: Section 2.1, Section 4.3

Since this zone is a small component of the overall building load, ECM-3 is recommended as it will have the lowest capital cost to implement. A complex and expensive control system is not required for this option. The City may wish to consider implementing a higher efficiency propane furnace if the building changes over to propane.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.5 – Implement ECM-5 unless there is desire to implement 3.1.3

Reference: Section 2.2.1, Section 3.1, Section 4.4

According to the cost breakdown document provided by Brodie Klem, replacing the existing unit heaters with more efficient units is expected to cost $7,774. This option is likely the easiest to implement as there is no detailed design involved. For the sake of simplicity, this option is recommended at this time unless money from this funding can be utilized to implement the heating components that would work with a future biomass project and backup boilers.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.6 – Contact Chief Isaac group to discuss a biomass facility for the Fire Hall/Admin Building, Public Works Building, Wood Shop and Chief Isaac buildings

Reference: Section 3

Chief Isaac would be keen to discuss utilizing biomass at their office that is next door to the Firehall/Admin Building, at their adjacent wood shop, as well as in their daycare which is across the street (behind the admin building). If the City has Chief Isaac as a partner, it should reduce the cost and complexity of implementing biomass for the Admin and Public Works Buildings.

To size a biomass installation properly for such an application it will be important to know the heat loads of Chief Isaac buildings and the wood shop if this building is also to be heated using biomass. FPMBC would be keen to help assess the wood shop as well as the Chief Isaac buildings.

Recommend reach out to Gina Nagano, Chair of Chief Isaac group of companies to discuss an agreement for heat purchase, MOU or joint venture regarding a biomass district heating system. Her phone number is 867-334-7609 and email is gina.nagano@gmail.com.
Response (Project Manager, CAO):

Signed: _____ Date: _____

5.7 – Install Radiant Heating in the Vehicle Bays to utilize biomass heating and potentially backup boiler heat

Reference: Section 3.1.1, Section 3.2

Recommend install radiant heating extensively within the vehicle bay to allow for better heat delivery and heat retention within the vehicle bay. The most practical way to accomplish this is illustrated in figure __ in Section 3.2 by locating the radiant heating above the shelving units and doors. Installing an insulated panel between the radiant equipment and exterior walls is recommended to prevent heat from short circuiting to the outdoors.

If the biomass heating equipment functions separately from the oil unit heaters, then the setpoint of the oil unit heaters should be set to a minimum temperature for the space (~5°C) so that they only activate if the biomass system fails or cannot keep up with heating demand. Alternatively all heating equipment within the vehicle bay can be connected to the biomass controls once they are implemented.

Response (Project Manager, Energy Solutions Centre, CAO):

Signed: _____ Date: _____

5.8 – If a hydronic heating system is implemented, consider using the old Fire Hall boilers as backup to biomass

Reference: Section 3.1.3

The boilers within the Fire Hall/Admin Building have a gross output of 483MBH (141.6kW) each according to their nameplate stickers[22]. A single boiler operating would cover the load of the bay which will be less than 134.8kW once other measures are taken. The Energy Audit lists the condition of these

[22] The Energy Audit indicates that they have a heat capacity of 169.14kW which contradicts the nameplate sticker.

boilers as "good" and they may have many years of functionality remaining in them. If these boilers are to be replaced within the Fire Hall/Admin Building, they could potentially be installed as backup boilers to a hydronic system that is primarily heated with biomass. This would greatly reduce the costs of implementing a hydronic heating system and would save money on the overall upgrades by not installing multiple heating systems.

Installing one of these boilers in the furnace room and storing the other is an option that could be implemented if the work between the Firehall/Admin Building and Public Works Building is coordinated. The existing unit heaters could remain in service until hydronic unit heaters and radiant equipment is installed and connected to the backup boiler. This could be set to function immediately or wait until the system is connected to the biomass system.

Recommend investigate this option if a biomass system is to be implemented. FPMBC can potentially complete this work or recommend a consultant with experience in this area[23].

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.9 – Determine the operational state of the boiler and generator in the City owned portable trailer for potential use as backup heating and power to the biomass system

Reference: Section 3.1.3

There is a portable trailer located next to the Fire Hall that is owned by the City. The trailer contains an electrical generator that is rated at 53.6KVA on a single phase and 100KVA on three phases. The trailer also contains a 646MBH (189.3kW) boiler. If this boiler still works, it could be connected to the future biomass system to provide backup heating to the public works building and potentially the workshop or another part of the district heating system. The electrical generator could also be hooked up to the biomass system to provide backup power in the event of a prolonged outage. The operational condition of this equipment is unknown, but apparently this trailer was constructed to provide emergency power and heating to a facility.

Recommend check records and/or test this equipment to determine if it can be used with the future biomass district heating system to reduce the project cost for the City.

Response (Project Manager, Energy Solutions Centre, CAO):

[23] If FPMBC wins an RFP that was recently submitting I will be hiring a mechanical engineer who could do the design and costing analysis.

Signed: _____ Date: _____

5.10 – Door Seals and Sweeps ECM-1

Reference: Section 4.1

Door seals and sweeps improvement is a low-cost ECM that will reduce the heat loss through the bay doors by preventing heat migration from the interior to the exterior. Installing these sweeps is recommended.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.11 – Install an "Arctic Entrance" to prevent cold air and fumes from migrating upstairs

Reference: Section 4.1.1

Recommend frame the open area that connects the shop to the stairwell. Framing this area and installing a regular or transparent door would reduce cold air and fumes from the vehicle bay from entering the second-floor office space while also allowing direct access to the shop via the offices. The base of the stairs may get cold and require a radiant panel once the biomass system is installed if this is pursued.

The costing for this item may be separate or included with ECM-1.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.12 – ECM-4 Upgrade to LED lighting

Reference: Section 4.2

Recommend install an occupancy sensor in the washroom and upgrade all lighting to LED. Recommend

replacement outdoor lighting is Dark Sky compliant to reduce light pollution levels.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.13 – Install a ceiling fan to reduce stratification

Reference: Section 4.5

The Airius fans are intended to move warm air from the ceiling space to the floor for the cost of $1,335. This is the same function as a common ceiling fan. A minimal fan pressure is required to move air from the ceiling to the floor in this application because the roof is not that high. Installing the Airius fans instead of common ceiling fans is not recommended to reduce the ECM cost.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.14 – Air Curtains not recommended

Reference: Section 4.6

The installation of air curtains is intended to prevent cold air from infiltrating the vehicle bay and removing heated air from the space. If air curtains are installed a portion of heated air will still escape and there are factors to consider regarding air curtains. These devices will increase electrical energy usage while blowing dust, snow and debris from the maintenance equipment as they enter and exit the building. This will likely create dust clouds and contamination within the Public Works building which will make it more difficult to work within the building.

Installing the three air curtains has a budget of $51,756. This is a very expensive ECM with minimal payback and potential drawbacks considering that the annual fuel cost is on average $11,791 according to the Energy Audit report.

Installing the air curtains is at the discretion of the City but is not recommended.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.15 – Upgrade roof insulation

Reference: Section 4.7

Improvements to the roof insulation of at least 4" to 5.5" of additional rigid is recommended. If solar is intended for this facility, adding a ¾" plywood layer over the insulation layer is a good idea because it will allow for more strength while providing attachment points for anchoring a solar system.

Improving the insulation values on the roof are significantly less labour intensive than improvements to the building envelope because the building envelop is much larger and has electrical conduit, lights, windows, doors etc. to work around.

Adding a 2" layer of insulation to the underside of the roof above the offices is recommended. It will increase the thermal performance and reduce heat loss within the office spaces. This work could be done with City staff to save costs.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.16 – Envelope insulation upgrade not recommended

Reference: Section 4.7

Adding rigid to the wall assembly is significantly more complex than adding insulation to the roof and 2" has minimal energy benefit. Thus, a wall assembly insulation upgrade is not recommended unless the City wishes to also upgrade the exterior aesthetics of the Public Works building as part of the insulation installation.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.17 – Magnetite window covers

Reference: Section 4.8

The Magnetite windows appear to be a good option to replacing the windows and will help to reduce the heat loss via the glass. These panels have a high cost of $2,200 and will have a minimal energy payback since they are assumed to be implemented in the upstairs offices which are a low energy use zone compared to the vehicle bay. If the occupants presently find the windows to be drafty and uncomfortable, then this option is recommended.

Recommend insulate the frame around the problem window identified in the Thermal Imaging report.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.18 – Commission the biomass system as well as backup oil-based equipment once all projects are complete

Ensuring that the new biomass equipment functions optimally and in cooperation with the oil-based equipment will be important to ensure long term energy savings. This should be done by a third party with control systems expertise if the control system for the biomass system interfaces with the buildings in a complex manner.

Response (Project Manager, CAO):

Signed: _____ Date: _____

5.19 - Implement "Energy Star Portfolio Manager" or other application to track facility energy usage

The City of Whitehorse uses a web-based application called "Energy Tracker" to catalogue and keep track of its various buildings and the energy usage of these buildings. The City of Dawson would likely benefit from implementing this or a similar application such as "Energy Star Portfolio Manager" because the electrical, oil and propane bills for each facility managed by the City would be entered into the application as they arrive and then can be easily tracked. Since the expenses will be reduced for buildings that undergo improvements, it is wise to track and compare these expenses to previous years.

By implementing "Energy Star Portfolio Manager" or a similar program, it will be easier for staff to observe/verify energy saving measures that are implemented in buildings and throughout the community over time and would lead to higher productivity with regards to tracking the costs of facilities.

The Energy Branch is in the process of setting up an Energy Benchmarking initiative that utilizes "Energy Star Portfolio Manager" for buildings such as this. It is recommended that the City of Dawson add the Public Works building to the list of buildings the Energy Branch will contact for this initiative.

Response (Project Manager, Energy Solutions Centre):

Signed: _____ Date: _____

5.20: Install insulation panels or insulative blanket on bay doors and metal exit doors

Reference: Section 4.1.2

Recommend implement one of the options provided regarding insulating the bay doors and metal exit doors. This will have a much lower capital cost and higher energy savings than upgrading the building envelope.

Response (Project Manager, CAO, Energy Solutions Centre):

Signed: _____ Date: _____

Appendix A: Recommissioning Email

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: March 11, 2021 11:46 AM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: Recommissioning Reports
Hi Shane

Just to re-iterate the paragraph below, we would like your report to have a significant focus on the ECMs that are outlined in the table attached as these are directly what our TPA is based upon.

Any suggestions you have on the implementation of these ECM's, alternative options, design considerations, cautions, past successes in other communities etc are all of great interest

Cheers

Brodie

Has the City moved forward with implementing or procuring ECMs (energy conservation measures) from the Energy Audit Reports? Do you want my recommendations to include these ECMs or simply to comment on them? If so I will simply copy and paste the information into the Recommendations Section. The City can then decide which recommendations they wish to pursue.

Our funding agreement with YG is completely based on the remaining recommendations from the report that we have deemed appropriate as well as some extra measures that I have been researching. All funding estimates have also been taken from the audit report. Please see the attached table and please comment on these ECMs as this is what YG has agreed to fund at this time.

Our BM staff have begun with the switching of fluorescent tubes to LED substitutes across both facilities. We have been waiting to receive your report before moving on anything else

From: Project Manager
Sent: Wednesday, March 10, 2021 4:49 PM
To: 'Shane Wolffe' <shane@futureproofmybuilding.com>
Cc: CAO Dawson <cao@cityofdawson.ca>
Subject: RE: Recommissioning Reports
Hi Shane

Comments in red

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Tuesday, March 9, 2021 7:42 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Cc: CAO Dawson <cao@cityofdawson.ca>
Subject: RE: Recommissioning Reports
Hi Brodie,

I'm working on the report and I have a few questions that I have added to this email as I have been progressing. Please respond to each question individually in RED so that I can keep track of answers. If you have comments please also indicate them in red.

First of all, I spoke with Gina Nagano who is the Chair of Chief Isaac group of companies. She indicated that Chief Isaac would be keen to discuss utilizing biomass at their facility that is next door to the Admin Building as well as in their daycare which is across the street (behind the admin building). If the City has Chief Isaac as a partner it should reduce the cost and complexity of implementing biomass for the Admin and Public Works Buildings. To size a biomass installation properly for such an application it will be important to know the heat loads of these buildings as well and for the City of Dawson to have some type of heat purchase agreement, MOU or maintenance agreement if a biomass plant is to be constructed on Chief Isaac property for sharing between Chief Isaac and the City of Dawson at the Admin Building and Public Works building. Given the limited options for constructing a biomass facility on City property, constructing it on the adjacent Chief Isaac property holds promise. You may want to grease some wheels with the City to see what their appetite for this type of arrangement is. In the report I will indicate other potential locations for the biomass facility. Note also that the City may wish to simply purchase heat from Chief Isaac or they may take an ownership through a partnership of some kind. I am quite certain that a partnership with them is the best option for the City in terms of finding funding and reducing project costs. In terms of operational costs, the cost of a gigajoule of energy produced from burning oil @ $1.02/L in an 85% efficient furnace is $31.32/GJ. The cost of heat provided by biomass is approximately $10/GJ[1] at $150/ton. Biomass heating costs about 1/3 as much as burning oil and the price of oil is likely to climb, plus the biomass can be sourced locally. I definitely like the idea

[1] The cost of biomass heating depends upon the moisture content of chips and cost of supplied wood per ton.

but assume it will be outside the scope of the Community IEEP funding. This will likely have to be a completely separate project.

The Energy Audit report ECM-2 indicates using a Smart Thermostat which is adequate to control a regular furnace but will not likely work for some of the biomass heated options I am proposing. This is a fairly simple means of control that is lower cost than an advanced control system but has limited functionality. If the City goes with more than a furnace, I don't see this as an option. This ECM has been omitted from our funding agreement. From what I understand (and please correct me if I am wrong) the City would like to be able to remotely monitor their buildings and equipment? A more advanced control system is required to do this but it will come at a higher cost than what is recommended in the Energy Audit. Since the Public Works and Admin Building are next to each other, are both intended to utilize biomass heating and will be tendered at approximately the same time, it makes sense that both buildings would utilize the same control system. This should reduce the costs of installation and will allow the City to monitor the buildings remotely while improving their energy efficiency via better controllability. Please let me know if this is the desired outcome? I will comment on the recommendations from the Energy Audit report with regards to this as I am providing a couple of options in the report. Remote monitoring is not really as much as a priority as a general upgrade to the controllability of our HVAC systems across the two buildings that allow for an Occupied/Unoccupied settings. This is currently managed via programmable thermostat setbacks in the PW building and via manually shutting down the system by BM staff for the Admin building. A modular/scalable system that can be added to if/when a biomass system is introduced to heat both buildings would be advantageous (such as a Canadian version of Autani)

Has the City moved forward with implementing or procuring ECMs (energy conservation measures) from the Energy Audit Reports? Do you want my recommendations to include these ECMs or simply to comment on them? If so I will simply copy and paste the information into the Recommendations Section. The City can then decide which recommendations they wish to pursue.

Our funding agreement with YG is completely based on the remaining recommendations from the report that we have deemed appropriate as well as some extra measures that I have been researching. All funding estimates have also been taken from the audit report. Please see the attached table and please comment on these ECMs as this is what YG has agreed to fund at this time.

Our BM staff have begun with the switching of fluorescent tubes to LED substitutes across both facilities. We have been waiting to receive your report before moving on anything else

What does the City pay for a liter of fuel oil? The Energy Audit indicates $1.02/L but this is less than the City of Whitehorse pays so I am a bit skeptical.

The City is on 'Contract Pricing' with North 60 that is quite dynamic and changes monthly. I have pulled the following from our invoices for filling the tank at the Arena for 2020:

JAN – 1.09040
FEB – 1.09040

MAR – 0.97240
APR - 0.71340
MAY – 0.65040
OCT – 0.72940
NOV – 0.80140
DEC – 0.84640
Carbon tax of appox 9.5% is added to this pricing.

Note that Arena is closed and doesn't require heat through the summer

How old are the oil tanks used at the Public Works building and Admin Building? The Energy Audits do not consider replacing oil as a heating source with propane despite the GHG reductions possible as well as the environmental costs of using oil (remediation, replacement tank costs, spill costs etc.). If the oil tanks are nearing their end of useful life, it gives more power to the argument of implementing biomass and eventually replacing the oil infrastructure with propane (if the tanks still have a few years of useful life left). Also if the tank at the Public Works building is nearing end of life and an oil furnace and replacement oil based unit heaters are installed, then the City must continue to use oil until the new equipment wears out. If there is a desire to change to propane, the decision to do so should be made now! Propane boilers to backup the biomass are preferable because they have much better temperature modulation and higher efficiency.

Oil tanks at the Admin building are at the end of useful life and will be upgraded along with the boilers. The PW building has the tanks stored within the building and probably could also be replaced but had no noted deficiencies during our last facility condition assessment (apart from having no secondary containment)

I was under the impression that propane was not a viable heat source here due to the propane turning gelatinous and consequently boilers failing during the coldest months. I am also unsure of the infrastructure in place and the availability of being able to receive reliable propane deliveries.

Thanks,

Shane Wolffe P.Eng, LEED AP BD+C, CEA, Level 1 Thermographer
Principal Engineer
Cell:(306)261-8846
Future Proofing the North from Whitehorse, Yukon

Appendix B: Propane and Biomass Costs Email

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: May 7, 2021 4:33 PM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Yes, there is a bit of friction between the 2 for sure in regards to how efficiently/inefficiently the boiler is run.

Talking to Louise today, they supplied what they thought would be 10,000GJ of wood for the biomass but it only produced 3000-4000GJ

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Friday, May 7, 2021 4:24 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Just to clarify…. so the saw mill simply provides chips and YG monitors the heat use of the system and pays accordingly?

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: May 7, 2021 4:21 PM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Yes it is for heat purchase

YG still runs the biomass since the City never took ownership of the Waste Water Treatment Plant that it is attached to

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Friday, May 7, 2021 4:14 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Hi Brodie,

Did they mention how they are measuring the cost per GJ? Does YG have a heat purchase agreement with them? That's what I am assuming based on being paid per GJ rather than per ton of wood.

This quote will have the same meaning to the City of Dawson if you have a heat purchase agreement as opposed to a wood purchase agreement. Whoever owns and maintains the boilers will be an important consideration regarding that. I would assume that if the boilers are owned and operated by an entity other than the City or Chief Isaac/Tr'ondëk Hwëch'in then they will charge a premium to own and operate those boilers which explains the significantly higher cost of heat than I indicated in the report.

Do you know how much they are charging per ton of wood if the City of Dawson runs the biomass system? According to the information I was given, the City of Whitehorse and Village of Haines Junction are paying $150/ton of wood which equates to ~$10/GJ. Using simple math, that means that the City of Dawson would be paying $420/ton of chips, which is significantly more. That definitely affects the economics of utilizing biomass for heating unless the City is also paying for a 3rd party to own and operate the boiler system.

I can put that quote into the report, however please confirm if that quote is related to a heat purchase agreement or a wood purchase agreement.

Thanks and have a great weekend.

Shane

From: Project Manager <ProjectManager@cityofdawson.ca>
Sent: May 7, 2021 11:26 AM
To: Shane Wolffe <shane@futureproofmybuilding.com>
Subject: RE: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Hi Shane

Just got back from a visit to the lumber mill that supplies the YG biomass system in town

Their current contract that was recently renewed has them being paid $28/GJ

Can you please update your report(s) to reflect this actual cost

Thanks

Brodie

From: Shane Wolffe <shane@futureproofmybuilding.com>
Sent: Thursday, April 29, 2021 6:35 PM
To: Project Manager <ProjectManager@cityofdawson.ca>
Subject: City of Dawson Recommissioning Reports V2 with Propane costs and updates

Hi Brodie,

Please find attached version 2 of the draft reports for the Admin Building and Public Works building. As requested, I have updated the reports with the propane costs based on the estimate you received on April 27. I also found that replacing the furnace in the Public Works building with another furnace of equal efficiency makes no real sense.

We can discuss on the phone tomorrow.

Let me know if you have questions or concerns.

Thanks,

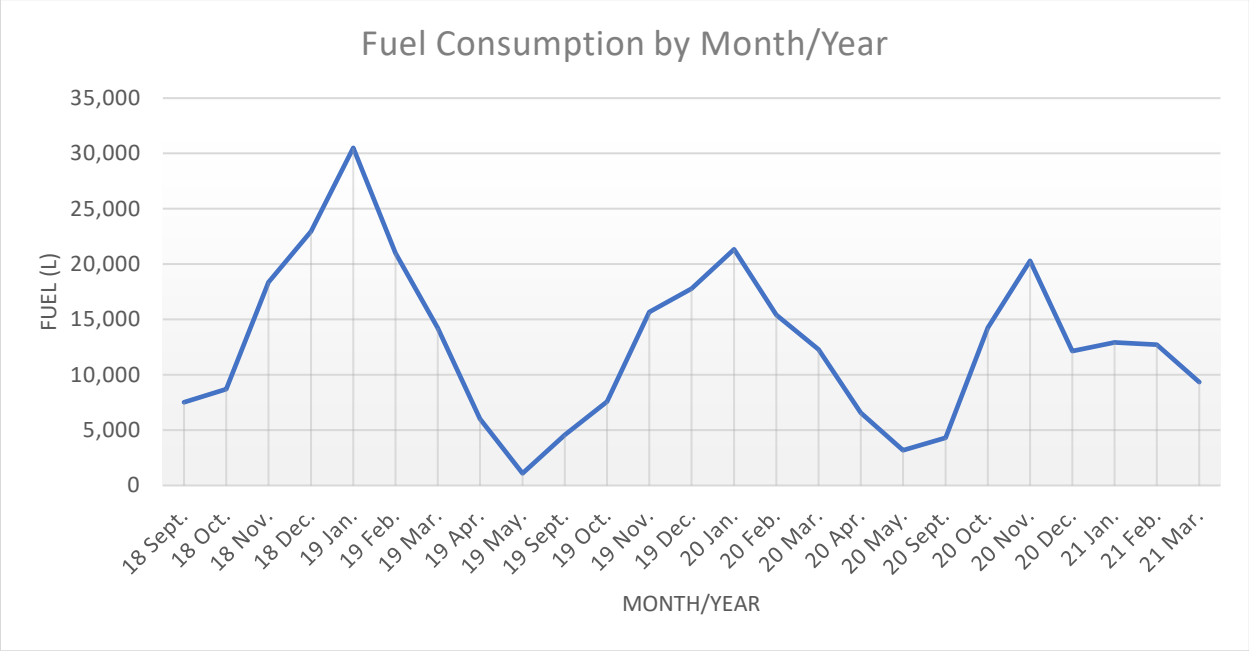
Shane Wolffe P.Eng, LEED AP BD+C, CEA, Level 1 Thermographer
Principal Engineer
Cell:(306)261-8846
Future Proofing the North from Whitehorse, Yukon
FutureproofMyBuilding.com

AFMRC Fuel consumption analysis

By Owen Kemp-Griffin and James Meagher

Fuel Consumption

Here is the overall graph of fuel use by month per heating season (there are some estimations as fuel deliveries are not consistent). Fuel data was obtained directly from North 60° delivery logs.



Here is a table for month to month comparisons of fuel consumed

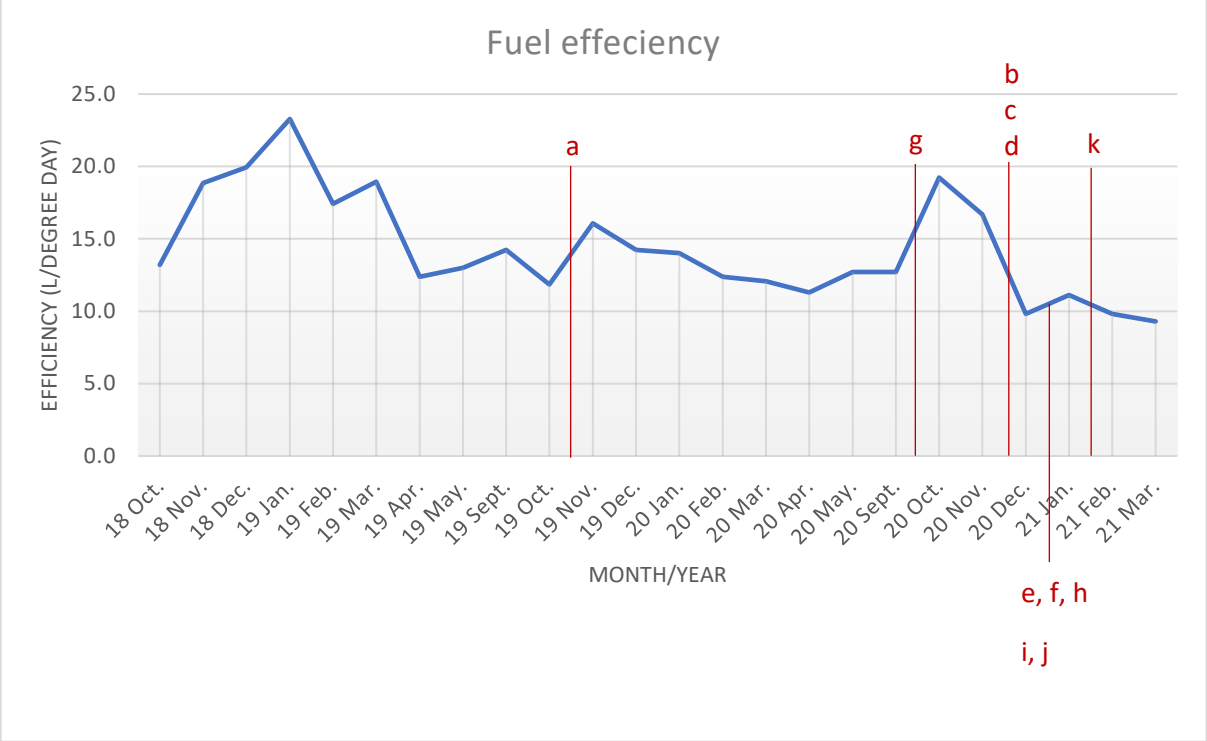
Month	2018	2019	2020	2021
January		30,506	21,337	12,927
February		21,005	15,403	12,716
March		14,224	12,299	9,326
April		6,021	6,555	
May		1,095	3,177	
September	7,516	4,563	4,296	
October	8,717	7,583	14,268	
November	18,369	15,686	20,295	
December	22,949	17,771	12,135	
Total	**57,551**	**118,453**	**109,765**	**25,642**

Accounting for weather variations

In this case, heating degree days are used to account for weather variations when comparing fuel consumption. Degree days are sourced from “climate.weather.gc.ca” where they explain how it works.

The degree day is used to determine a “Fuel efficiency”, the amount of fuel burned per degree day (liters per degree day). Similar to vehicles calculating efficiencies with L/100km.

Here is the overall graph for fuel efficiency by month per heating season



Operational improvements:

a) Significantly reduced the use of the heating system for the skating rink (2019-November)
b) Shutoff baseboards in the rink section of the Arena (2020-December)
c) Curling rink schedule update (2020-December)
d) Optimized scheduling for holidays (2020-December)
e) Limited use of exhaust fans while building is unoccupied (2021-January)
f) Removing nightly building air exchange (2021-January)

Building improvements:

g) Banking and insulating of outside east wall (2020-October)
h) Insulation of upper NW wall (2021-January)
i) Sealing holes and cracks in building from heaving (2021-January)
j) Curling rink vent sealed (2021-January)
k) New winter diffusers for both boilers (2021-February)

Here is a table for month to month fuel efficiency comparisons with yearly averages.

Month	2018	2019	2020	2021
January		23.3	14.0	11.1
February		17.4	12.4	9.8
March		18.9	12.1	9.3
April		12.4	11.3	
May		13.0	12.7	
September		14.2	12.7	
October	13.2	11.9	19.2	
November	18.8	16.1	16.7	
December	19.9	14.2	9.8	
Year Average	**17**	**16**	**13**	**10**

Taking December as an example. In 2018, the Arena burned 19.9 Liters/Degree day, in 2019 was 14.2 Liters/Degree day, and in 2020 was 9.8 Liters/Degree day

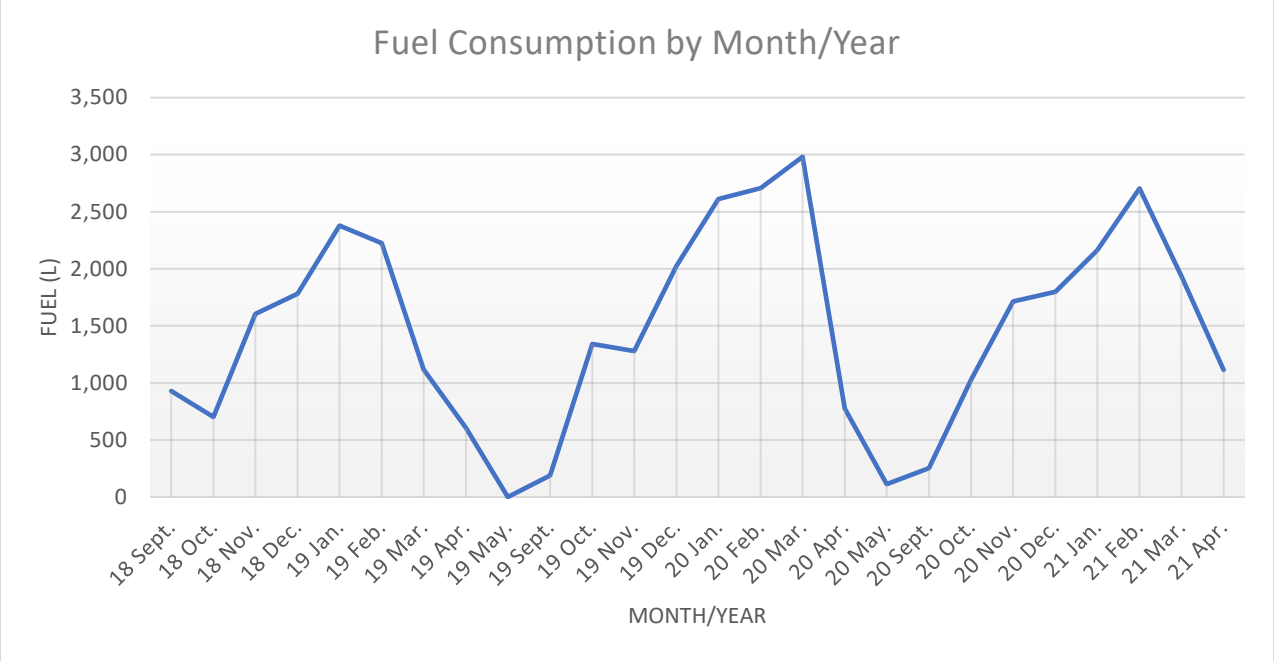
Potential reasons for high fuel consumption in October and November 2020

- Only one boiler was available for heat production (2020-October to mid November)
- The Arena opened two weeks earlier than usual (2020-October)
- Some of the September fuel use was likely put into the October bill due to the timing of deliveries (October 2020)
- The fuel tank cannot go below 6,000L out of a 10,000L tank. This means that summer fuel (less efficient) is burnt in place of winter fuel (more efficient) when temperatures start to drop. (October (2020)

PW Shop/Garage consumption analysis

Fuel Consumption

Here is the overall graph of fuel use by month per heating season (there are some estimations as fuel deliveries are not consistent). Fuel data was obtained directly from North 60° delivery logs.

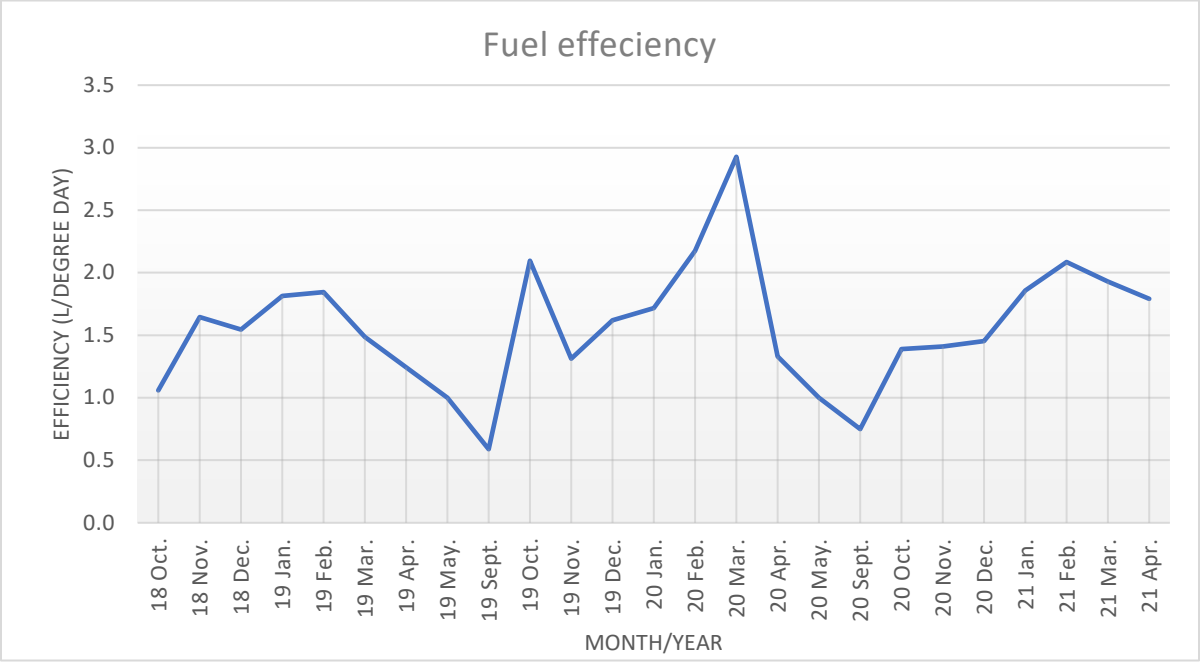


Here is a table for month to month comparisons of fuel consumed

Month	2018	2019	2020	2021
January		2,379	2,613	2,162
February		2,226	2,707	2,704
March		1,117	2,982	1,936
April		605	773	1,115
May		n/a	112	
September	930	189	253	
October	700	1,340	1,031	
November	1,604	1,280	1,714	
December	1,781	2,024	1,798	
Total	**5,014**	**11,160**	**13,983**	**7,917**

Efficiency

Here is the overall graph for fuel efficiency by month per heating season



Building improvements:

a) Window plastic install on all windows

Here is a table for month to month fuel efficiency comparisons with yearly averages.

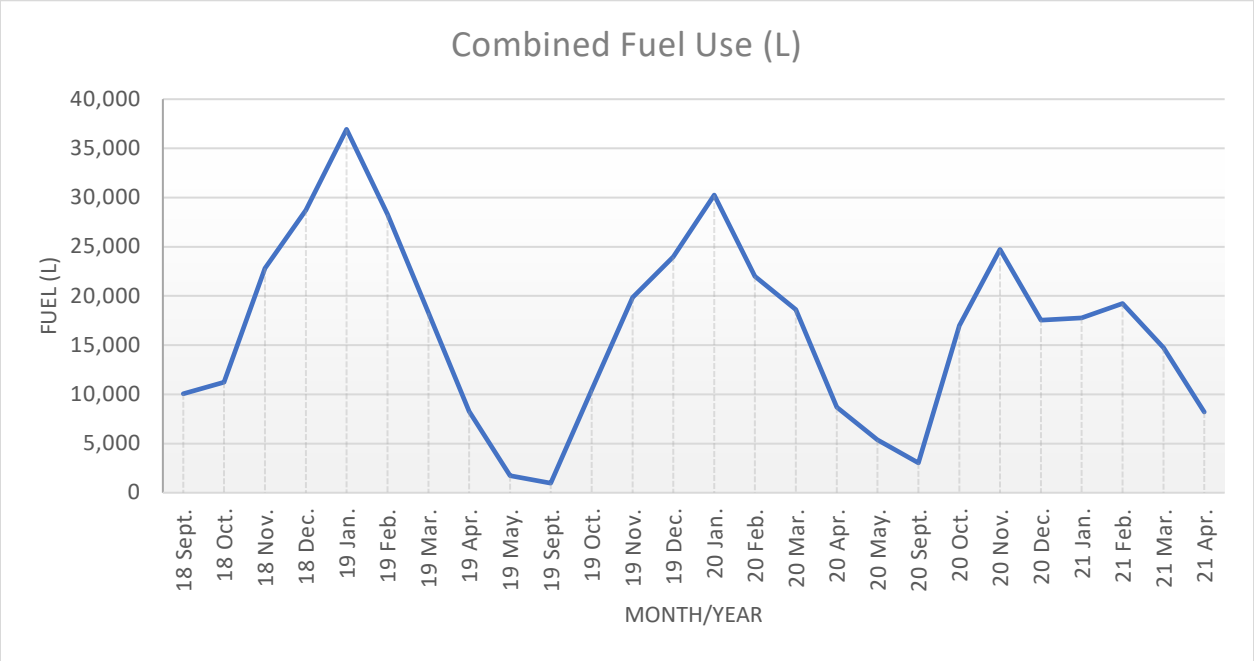
Month	2018	2019	2020	2021
January		1.8	1.7	1.9
February		1.8	2.2	2.1
March		1.5	2.9	1.9
April		1.2	1.3	1.8
May		1.0	1.0	
September		0.6	0.7	
October	1.1	2.1	1.4	
November	1.6	1.3	1.4	
December	1.5	1.6	1.5	

City Buildings Fuel consumption analysis

AFMRC, PW shop, City Hall

Fuel Consumption

Here is the overall graph of fuel use by month per heating season (there are some estimations as fuel deliveries are not consistent). Fuel data was obtained directly from North 60° delivery logs.



Here is a table for month to month comparisons of fuel consumed

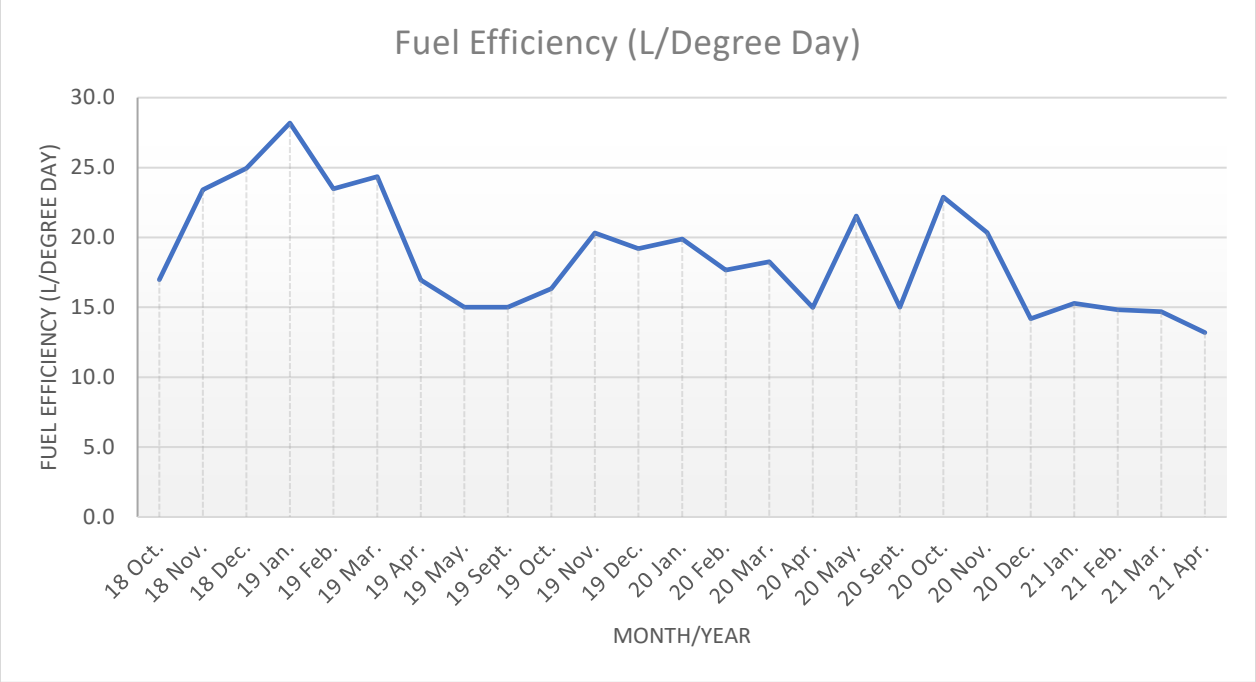
Month	2018	2019	2020	2021
January		36,937	30,265	17,783
February		28,298	22,005	19,230
March		18,282	18,609	14,732
April		8,256	8,696	8,219
May		1,732	5,385	
September	10,054	973	3,045	
October	11,216	10,449	16,979	
November	22,825	19,842	24,745	
December	28,715	23,973	17,550	
Total	**72,809**	**148,742**	**147,278**	**59,965**

Accounting for weather variations

In this case, heating degree days are used to account for weather variations when comparing fuel consumption. Degree days are sourced from “climate.weather.gc.ca” where they explain how it works.

The degree day is used to determine a “Fuel efficiency”, the amount of fuel burned per degree day (liters per degree day). Similar to vehicles calculating efficiencies with L/100km.

Here is the overall graph for fuel efficiency by month per heating season



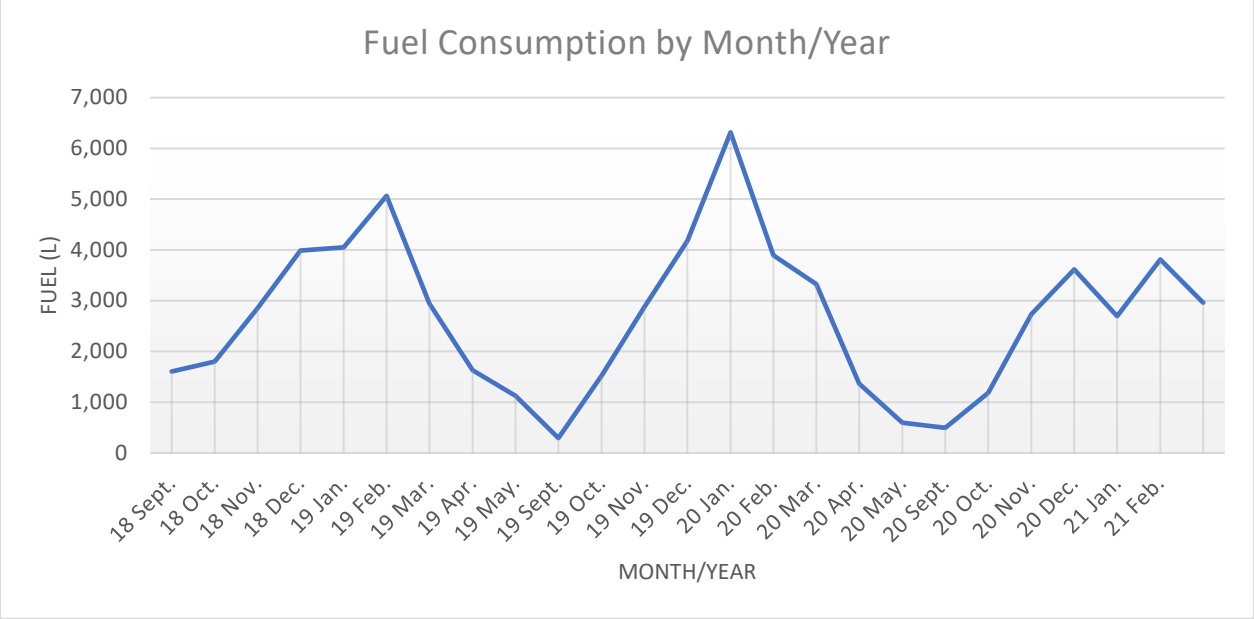
Here is a table for month to month fuel efficiency comparisons with yearly averages.

Month	2018	2019	2020	2021
January		28.2	19.9	15.3
February		23.5	17.7	14.8
March		24.3	18.3	14.7
April		17.0	15.0	13.2
May		15.0	21.5	
September		15.0	15.0	
October	17.0	16.3	22.9	
November	23.4	20.3	20.3	
December	24.9	19.2	14.2	
Year Average	**21.8**	**19.9**	**18.3**	**14.5**

City Hall Fuel consumption analysis

Fuel Consumption

Here is the overall graph of fuel use by month per heating season (there are some estimations as fuel deliveries are not consistent). Fuel data was obtained directly from North 60° delivery logs.

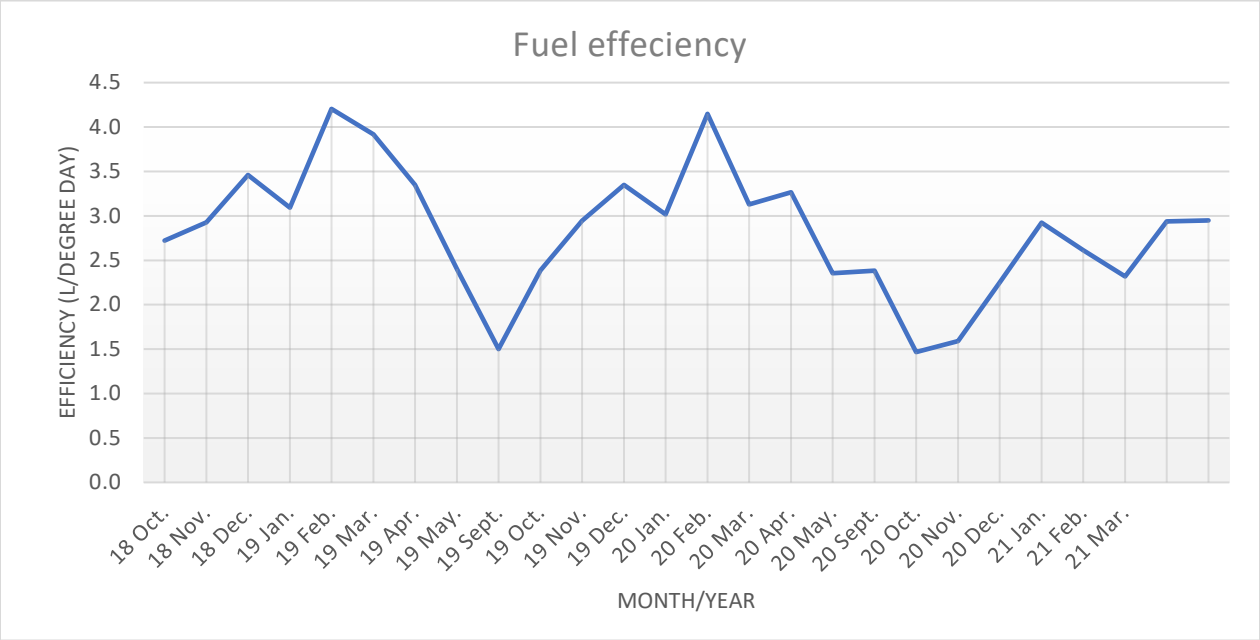


Here is a table for month to month comparisons of fuel consumed

Month	2018	2019	2020	2021
January		4,052	6,315	2,695
February		5,068	3,895	3,811
March		2,941	3,328	2,957
April		1,630	1,368	1,511
May		1,127	596	
September	1,607	294	496	
October	1,798	1,526	1,180	
November	2,853	2,876	2,736	
December	3,985	4,179	3,617	
Total	**10,244 (L)**	**23,693 (L)**	**23,530 (L)**	**10,974 (L)**

Efficiency

Here is the overall graph for fuel efficiency by month per heating season



Operational improvements:

a) Reduced the minimum outside air damper position to 15% (from 25%), this did not significantly impact the air quality
b) The AHU was shut off during weekends while building was unoccupied

Building improvements:

a) Window plastic install on all windows
b) Sealed doors/bay doors

Here is a table for month to month fuel efficiency comparisons with yearly averages.

Month	2018	2019	2020	2021
January		3.1	4.1	2.3
February		4.2	3.1	2.9
March		3.9	3.3	2.9
April		3.3	2.4	2.4
May		2.4	2.4	
September		1.5	1.5	
October	2.7	2.4	1.6	
November	2.9	2.9	2.2	
December	3.5	3.3	2.9	
Year Average	**3.0 (L/DD)**	**3.0 (L/DD)**	**2.6 (L/DD)**	**2.7 (L/DD)**

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Municipal/Domestic Solid Waste • Biomedical Waste • Pharmaceuticals • Illicit Drugs • Hazardous Waste
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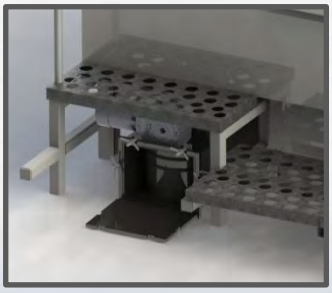

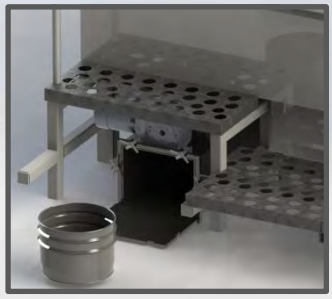

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Exceptionally Clean Emissions

No Pre-Treatment Required

Auto Gasification is Terragon's patented technology. MAGS thermally breaks down waste into biochar and syngas. The syngas is then used as fuel to make the process self-sustaining.

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- 120 kW energy generation (hot water or space heating)
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- Sequesters carbon from waste to reduce CO_2 emissions

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MAGS™

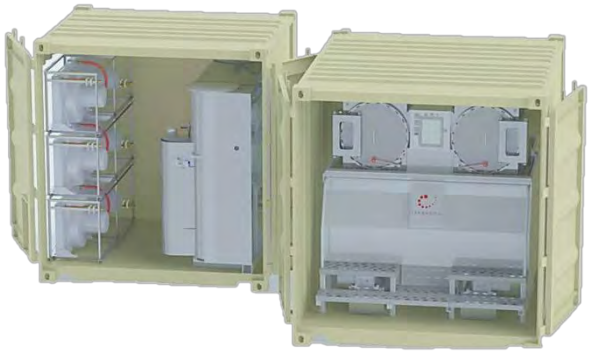
Enabling the Recovery of Energy from Waste

TECHNICAL SPECIFICATIONS

Total Weight	**5,400 kg** (11,905 lbs)
Footprint (default)	**2.5m x 3.5m** (8.2 ft x 11.4 ft)
Height	**2.1 m** (6.9 ft)
OPERATING CONDITIONS	
Nominal Solid Waste Throughput	The throughput depends on the bulk density of the waste being treated. Waste loading results in the treatment of **17 kg/hr** (37 lbs./hr) up to **50 kg/hr** (110 lbs./hr) depending on the waste composition. See details in MAGS operating specifications sheet.
Sludge Oil Throughput	**15-20 L/hr** (4 – 5.25 USGal/hr)
Operating Temperature in Gasifier	**600°C** (1112°F)
Operating Temperature in Combustion Chamber	**1100°C** (2012°F)
Types of Waste Streams	Although **MAGS** can accept a variety of waste mixtures, it is ideally suited for the treatment of combustible wastes, including but not limited to: paper/cardboard, plastics, food, wood, rags, oils, solvents, sludge, etc.
UTILITIES / CONSUMABLES	
Electrical Consumption	22 kW (400V/50Hz; 440V/60Hz; 460V/60Hz)
Type of Fuel	Light oil #1 or #2 (diesel), NATO F76 fuel, natural gas, other fuels also possible.
Fuel Consumption	**11.5 L/hr** (3 gal/hr) for heat-up, which takes a maximum of 1.5 hours. Some additional fuel may be required, depending on waste composition and waste loading frequency.
Caustic	**60 mL/kg solid waste** (0.9 fl.oz/lb) NaOH, caustic soda 10% solution.
EMISSIONS	
Gaseous	Total flow approximately **200 SCFM** (5.6m^3/min) at less than **65°C** (149°F). MAGS will comply with all applicable air emission regulations.
Condensed Water	About **3 – 8.5 L/hr** (0.8 – 2.2 gal/hr) depending on application and waste composition.
Bio-char	**95%** solid waste volume reduction
Audible	Less than **75** dBA within 5 feet
Surface Temperatures	Less than **45 °C** (113°F)
ENERGY RECOVERY	
Energy Recovery Output	Between **100 kW – 130 kW** depending on application and waste composition

*Specifications are based on measured values for an average waste stream and may vary according to waste input.

MAGS hot and cold skids can be reconfigured or separated according to spatial limitations. Systems are available in a single 20 ft ISO container or Tricons for outdoor installation, easy mobility and rapid deployment



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May 2018

Report to Council

[x] For Council Decision [ ] For Council Direction [ ] For Council Information

[ ] In Camera

AGENDA ITEM:	Block Q	
PREPARED BY:	Cory Bellmore, CAO	**ATTACHMENTS:** 1. *Block Q Ladue Estate Planning Study – Stantec Consulting and Vector Research* 2. *Block Q Ladue Estate Planning Study Overview – Engagement Summary* 3. *City of Dawson – Letter to Gold Rush Campground Re: Notice of termination of lease agreement.* 4. *Correspondence Received regarding the Gold Rush Campground* 5. *Petition to Preserve the Gold Rush Campground*
DATE:	June 4, 2021	
RELEVANT BYLAWS / POLICY / LEGISLATION:		

RECOMMENDATION

That Committee of the whole consider the information and reports as presented and provide direction to administration on the future of Lots 1-20 Block Q Ladue.

ISSUE / PURPOSE

A decision is required on the future use of lots 1-20 Block Q Ladue Estate (currently the site of the Gold Rush Campground)

BACKGOUND SUMMARY

The City of Dawson gave notice to terminate the current lease with Gold Rush Campground Ltd of lots 1- 20 Block Q Ladue Estate via council resolution:

C20-07-16 Moved by Mayor Potoroka, seconded by Councillor Shore that Council give Goldrush Campground Ltd. two-years' notice of termination of our lease agreement.
Motion Carried 4-1
Called for a recorded vote:
For: Mayor Potoroka, Councillor Shore, Councillor Ayoub and Councillor Kendrick
Against: Councillor Johnson

Directly following this lease termination, in 2019 council requested the completion of a land planning study for Lots 1 to 20, Block Q, Ladue Estate to consider both economic and social factors, including opportunity costs to assist in the determination of the highest and best use for this block of City owned property.

Over the last several years, planning studies commissioned by the City of Dawson have cited the importance of understanding the potential development options and highest and best use of Lots 1-20 Block Q Ladue Estate. Most recently the North End Planning exercise, Recreation Master Plan and Recreation Pre-design report as well as community feedback have indicated three potential options for this parcel of land. Council directed administration to move forward with a RFQ to complete the planning study to include both an economic and social analysis of these 3 options including Recreation Centre location, Residential Building lots and a location for a new Recreation Centre.

In July of 2020 a contract was awarded to Stantec and Vector Research for the Lots 1-20 Block Q Land Planning Study.

Stantec and Vector Research presented to Council the Planning Study and Engagement summary reports on March 10, 2021. A copy of the final report and engagement summary is attached.

The recommendation provided by the consultants is that residential use be considered the most suitable use for the Block Q site.

ANALYSIS / DISCUSSION

The use of this site has generated a lot of community discussion and a lot of feedback has been received. Although all the attached documents have already been received by council in various committee and council meetings, it is all included again in this package including both the Stantec Final Report and Engagement Summary as well as additional correspondence received by the public.

Council has now received the reports and feedback as requested and a decision is required to move forward.

APPROVAL		
NAME:	Cory Bellmore, CAO	**SIGNATURE:** 
DATE:	June 4, 2021	

CITY OF DAWSON

FLAG PROTOCOL POLICY

PURPOSE: To establish the process for ensuring proper protocol for Canadian, Territorial, City, and First Nation and Other flags is followed by the City of Dawson.

FLAG PROTOCOL POLICY

Policy Statement

The National Flag of Canada and the flag of the Yukon, City, and Tr'ondëk Hwëch'in are symbols of honour and pride. This policy sets guidelines for the City of Dawson to ensure we treat flags we display with respect and follow customs and etiquette recommended by other orders of government.

Displaying Flags

Flags should always be shown, represented, or used in a dignified manner. They should not be used as a table or seat cover, to mask boxes or other items or to cover a statue, monument or plaque for an unveiling ceremony.

City, territorial, Canadian, and special occasion flags are flown or displayed at city hall and during special events. Care should be taken that the following practice is followed:

(1) The National Flag of Canada takes precedence over all other flags. No other flag should be flown at a higher height than the National Flag. It should be raised first and lowered last unless all are being raised and lowered simultaneously.

(2) When the National Flag is flown with one other flag it should be on the left of an observer facing the flags.

(3) When three flags are displayed, the National Flag should be at the centre.

(4) When there are more than three flags in a group, the National Flag should be flown on the left of an observer facing the flags.

Flags Flown at Half-Mast for Mourning

To half-mast the flag as a sign of mourning, the flag is brought to the half-mast position by first raising it to the top of the mast and then immediately lowering it slowly to the half-mast position.

The Canadian Department of Heritage provides direction as to occasions when the National Flag is to be flown at half-mast.

The Yukon Premier approves occasions when all Yukon Flags will fly at half-mast apart from those occasions dictated by national protocol.

A list of occasions and annual dates when flags are flown at half mast is included in Schedule A.

Special Occasion Flags

The City of Dawson may fly special occasion flags to celebrate a particular date or event of significance to the City. The Mayor will decide which flags will be flown for special occasions.

Community groups and organizations may request their flag be flown to raise public awareness of an initiative or event. When this type of flag is flown, it replaces the City of Dawson flag from the group of flags flown at City Hall.

Disposal of Flags

When a flag becomes tattered or faded and is no longer in a suitable condition for use, it should be destroyed in a dignified way by burning it privately.

Responsibilities and Procedures

1. Flags on the four flagpoles at City Hall are raised and lowered by the Fire Chief, Fire Department personnel, or the CAO.
2. The CAO, based on information received from the Executive Council Office of the Government of Yukon, will advise on occasions on which the flags are to be flown at half-mast.
3. Flags flown for special occasions, groups or events will be flown on the flagpole reserved for the City flag. At no time will the National Flag be replaced

by a special occasion flag.

4. The City of Dawson will:

- maintain a supply of Canadian, territorial, City and other flags for useby departments or community groups.
- respond to requests from community groups to fly their flags duringspecial events and will advise the Fire Department of the details.
- arrange for replacement and disposal of flags which are faded, tatteredor soiled and unfit for service.

5. The Mayor will have the authority to make a decision on any flag protocol not covered in the policy.

Schedule A Flag

Policy Schedule

Flags will be flown at half-mast on the following days:

April 28	National Day of Mourning for Persons Killed or Injured in the Workplace. Flags are half-masted from sunrise to sunset.
November 11	Remembrance Day. Flags are half-masted from 11:00 am to sunset.
December 6	National Day of Remembrance and Action on Violence Against Women. Flags are half-masted from sunrise to sunset.

Occasions for half-masting flags:

Flags will be flown at half-mast after the passing of people who hold the following positions:

- Commissioner of the Yukon (current and former)
- Premier of the Yukon (current and former)
- Klondike MLA (current and former)
- Yukon MP (current and former)
- Yukon Senator (current and former)
- Tr'ondëk Hwëch'in Chief (current and former)
- Tr'ondëk Hwëch'in Council member (current and former)
- City of Dawson Mayor (current and former)
- City of Dawson Council member (current and former)

Committee Minutes

THURSDAY 6th MAY 2021
19:00

Meeting Type: Regular **Meeting:** # HAC 21-08
Facilitators: Charlotte Luscombe, Planning Assistant
Attendees: Angharad Wenz (Chair), Rebecca Jansen, Jim Williams, Patrik Pikálek, Megan Gamble
Regrets: Eve Dewald
Meeting Called to order at 7:07 PM.

Minutes

Agenda Item: **Agenda Adoption** **Presenter:** Angharad Wenz
Resolution: #21-08-01 **Seconder:** Patrik Pikálek

THAT the Agenda for Heritage Advisory Committee Meeting 21-08 has been adopted.

Discussion:

- None

Discussion: None.

Votes For: 4 Votes Against: 0 Abstained: 0
CARRIED

Agenda Item: Conflict of Interest
Resolution: #21-08-02

Discussion:

- Angharad Wenz declared conflict of interest in application 21-035 regarding the exterior renovations of the Dawson City Museum.

Agenda Item: Committee of the Whole
Resolution: #21-08-03

THAT the Heritage Advisory Committee move into the Committee of the Whole.

Discussion: None
Votes For: 4 Votes Against: 0 Abstained: 0
CARRIED

Agenda Item: Delegations **Presenter:** Angharad Wenz
Resolution: #21-08-04 **Seconder:** Patrik Pikálek

Mike Ellis and Lee Manning – Development Permit Application 21-034

Discussion:

- Building is being completely gutted and reformatted, still single family but creating separation so you could have privacy / multi generational
- Asking to add two porches to increase storage and make building easier to manage.
- Also replacing roofing, and changing of window layout.
- Proposing to move chimney to different part in roofline
- French door backing on to a porch on west side on the street side, will be a roof overhang

- Steps will be depth of porch and same orientation
- Windows: Replacing existing windows. North side windows will be changed from full wall to a smaller double window. No symmetry at the moment, trying to even it out. Trim around windows, doors and corners, wooden siding but instead of brown, it will be white. 1 x 6.
- Materials: Siding on north and south is tin, east and west including porches will be timber clad horizontal rough cut timber - board and batten. Skirting currently timber - looking at tin skirting but not to grade, switch to silver but could go straight. Corrugated metal for roof, proposed polycarbonate over deck that follows the line of metal to allow more light.
- Pitch of roof will be roughly 20°
- Railing around the deck not yet decided on

Agenda Item: Delegations **Presenter:** Angharad Wenz
Resolution: #21-08-05 **Seconder:** Patrik Pikálek

Tim Ekholm – Development Permit Application 21-035

Discussion:

- Full renovation of Museum exterior and interior
- Reinstate original skirting material which was stamped rock face siding similar to mason's lodge
- Assessing all the changes against Heritage Standards
- The portico was added as part of 1986 renovation, post modern interpretation and so is being removed
- Fuller's original focus is that 5th avenue door be the focus
- HAC asked if there any new prominent mechanical venting exhausts on the roof other than what is there now
    - No - ventilation work removing attic work from 1980s and adding it all to the crawl space
    - Building used to have a basement, but plan is to treat louvers like windows, frame them out and maintain original look of building

---

Agenda Item: Delegations **Presenter:** Angharad Wenz
Resolution: #21-08-06 **Seconder:** Patrik Pikálek

Daniel Fraser – Development Permit Application 21-044

Discussion:

- Replacing foundations
- Remove existing siding, put styrofoam in and then side it with new siding of same design currently
- All the windows are staying but will be renovated
- 4 new doors, 6 panel Northerm doors
- Decks will be the same design but replaced
- Painted but colour hasn't been decided, but leaning towards more historical colouring
- Not changing elevation significantly
- Skirting replaced with corrugated metal

Agenda Item: Delegations **Presenter:** Angharad Wenz
Resolution: #21-08-07 **Seconder:** Patrik Pikálek

Brodie Klemm – Development Permit Application 21-046

Discussion:

- Replacing 7 existing windows and installing an 8th one on the gable on Dugas street side so more symmetrical
- Windows will be a mix of fixed and casement, no awning windows

Agenda Item: Delegations **Presenter:** Angharad Wenz
Resolution: #21-08-08 **Seconder:** Patrik Pikálek

Leslie Piercy – Development Permit Application 21-047

Discussion:

- Windows and doors are currently single pane and not suitable
- HAC advised that awning windows are not appropriate, can be fixed, casement or vertical sliders
- Trim is going to remain the same

Agenda Item: Delegations **Presenter:** Angharad Wenz
Resolution: #21-08-09 **Seconder:** Patrik Pikálek

Kat Derusha and Julie Kruhlak: Yukon Lou Proposal

Discussion:

- Lot plan shows that the proposed building will be quite small
- Small pathway or a plank up to the boardwalk, about the same length as Peggy's to the front door
- HAC noted that they are worried about the integrity of the boat – they like the boat as is
- Applicants advised if they can't add an extension, they can't make it into a viable business
- HAC member Jim Williams suggested applicants consider what would exist around a boat – i.e. docks. One way to add a building at the rear is to build a warehouse as if the boat is pulled up. This way the boat stays intact as a showpiece, with the bar and facilities at the rear.

Agenda Item: Revert to Heritage Advisory Committee **Presenter** Angharad Wenz
Resolution: #21-08-10 **Seconder:** Patrik Pikálek

THAT the Committee of the Whole revert to the Heritage Advisory Committee.

Discussion: None.

Agenda Item: Business Arising from Delegations **Presenter** Angharad Wenz
Resolution: #21-08-11 **Seconder:** Patrik Pikálek

Kat Derusha and Julie Kruhlak's Yukon Lou Proposal

Discussion:

- Important for HAC is that the Lou remain authentic and as original as possible. Do not want them to alter it and turn it into a mini-Keno.
- Rebecca Jansen noted that the Downtown Core isn't the most authentic for warehouses, but some do exist e.g. on Third Avenue next to the Dawson Lodge.
- If warehouse option is chosen, want to ensure that if it will look authentic and suitable in that location

---

Agenda Item: Adoption of the Minutes **Presenter:** Angharad Wenz
Resolution: #21-08-12 **Seconder:** Patrik Pikálek

THAT the Minutes for HAC meeting 21-07 are accepted as presented.

Discussion:

- None

Votes For: 4 Votes Against: 0 Abstained:0 CARRIED

Agenda Item: Business Arising from the Minutes **Presenter:** Angharad Wenz
Resolution: #21-08-13 **Seconder:** Patrik Pikálek

Discussion: None.

Agenda Item: Applications **Presenter:** Angharad Wenz
Resolution: #21-08-14 **Seconder:** Patrik Pikálek

THAT the Heritage Advisory Committee move to TABLE development permit 21-034.

Discussion:

- French door is street side, typically there are no French doors in town facing the street (perhaps if they were panelled like Madame Tremblays it would be acceptable)
- No polycarbonate on the roof
- Roof pitch must be 15d minimum (312) – just to confirm this
- Windows - could consider the north side, if two separate windows with wood trim in between.
- Windows out of proportion
- No awning windows
- Need the window and schedule, presumably from Northerm?
- Horizontal board and batten, cove siding if horizontal siding is desired
- The major concern is that it's very modern - 3 photos of existing if they really want the horizontal board and batten
- Confirm 1 x 6 trim around windows, and also they asked if the windows include a sill?
- Is it possible to centre the door on the arctic entrance facing 3rd? Currently seems asymmetrical
- New rendering of the front façade, how is the gable going to look? Can't tell from the current rendering.
- As a note, this can be a hand drawing, a lot of folks do it and it doesn't need to be to scale if that makes it easier
- Front symmetry is off as is the rhythm, even if French door was a picture window
- What is the corner match up of the front shed and the side shed for the deck area, need a rendering this
- Need to see a rendering of the railing and deck

Votes For: 4 Votes Against: 0 Abstained: 0 CARRIED

Agenda Item: Applications **Presenter:** Angharad Wenz
Resolution: #21-08-15 **Seconder:** Patrik Pikálek

THAT the Heritage Advisory Committee move to APPROVE development permit 31-035

Discussion:

- Ags recused herself from voting due to declared conflict of interest.

Votes For: 3 Votes Against: 0 Abstained: 0 CARRIED

Agenda Item: Applications **Presenter:** Angharad Wenz
Resolution: #21-08-16 **Seconder:** Patrik Pikálek

THAT the Heritage Advisory Committee move to APPROVE development permit 21-038.

Discussion:

- None.

Votes For: 4 Votes Against: 0 Abstained: 0 CARRIED

Agenda Item: Applications **Presenter:** Angharad Wenz
Resolution: #21-08-17 **Seconder:** Patrik Pikálek

THAT the Heritage Advisory Committee move to APPROVE development permit 21-044.

Discussion:

- None.

Votes For: 4 Votes Against: 0 Abstained: 0 CARRIED

Agenda Item: Applications **Presenter:** Angharad Wenz
Resolution: #21-08-18 **Seconder:** Patrik Pikálek

THAT the Heritage Advisory Committee move to APPROVE development permit 21-045 as per the conditions noted below.

Discussion:

- Conditional upon the existing fencing being removed, and any future fencing being reviewed by HAC
- HAC also recommended to the applicant that landscaping be considered although they know this is not enforceable

Votes For: 4 Votes Against: 0 Abstained: 0 CARRIED

Agenda Item: Applications **Presenter:** Angharad Wenz
Resolution: #21-08-19 **Seconder:** Patrik Pikálek

THAT the Heritage Advisory Committee move to APPROVE development permit 21-046 as per the conditions noted below.

Discussion:

- All windows must be in the Dawson style which permits fixed, casement or vertical sliders;
- Awning windows are not permitted.

Votes For: 4 Votes Against: 0 Abstained: 0 CARRIED

Agenda Item: New Business **Presenter:** Angharad Wenz
Resolution: #21-08-20 **Seconder:** Patrik Pikálek

Diocese of Whitehorse applying for energy refit of St. Mary's Church.

Discussion:

- Patrik asked if HAC would support St. Mary's Church and offer a letter indicating their support of energy retrofits and noting the property's value to the Heritage of Dawson.
- Administration advised they would draft the letter and circulate.

HAC appointments

Discussion:

- Administration advised that 3 members will be up for renewal: Jim Williams, Angharad Wenz and Eve Dewald.

- Positions will be advertised later in the summer – members advised they will need to renominate themselves should they wish to continue serving on the Committee

---

Agenda Item: Unfinished Business **Presenter:** Angharad Wenz
Resolution: #21-08-21 **Seconder:** Patrik Pikálek

Discussion:

- None

Agenda Item: Adjournment **Presenter:** Angharad Wenz
Resolution: #21-08-22 **Seconder:** Patrik Pikálek

That Heritage Advisory Committee meeting HAC 21-08 be adjourned at 8:51pm on May 6th, 2021.

Discussion: None.

Minutes accepted on: 17th May 2021

From:	CAO Dawson
To:	Executive Assistant
Subject:	FW: YHC Community Needs Assessment - Dawson City
Date:	June 4, 2021 3:52:10 PM
Attachments:	image001.png Housing Needs Assessment - YHC - Dawson City.pdf

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From: MaryAnne.Clarke@yukon.ca [mailto:MaryAnne.Clarke@yukon.ca]
Sent: June-02-21 2:51 PM
Subject: YHC Community Needs Assessment - Dawson City

Good afternoon,

On behalf of Colin McDowell, V.P. Operations, Yukon Housing Corporation, please see attached a housing needs assessment report for Dawson City. The report was completed in March, 2021 by Options Consulting, a firm whose scope of practice encompasses a diverse spectrum of community-based housing and health care programs, including housing availability and affordability; the continuum of housing and supports for seniors; hospice palliative care; and housing linked with supports for clients with physical or cognitive disabilities, and mental health and addictions. We want to thank you and all community stakeholders for the input provided to inform this report; the report attached is more accurate and ultimately more useful as a result of the input from each person and each agency that participated.

This independent assessment of housing needs identifies and documents the unique and specific housing needs within the community of Dawson City. The objective of this report is to provide Yukon Housing Corporation with relevant and credible information that provides guidance for decisions about meeting the housing needs of Yukoners. However, we will engage with your community again on any future developments as they take shape to ensure our decisions are rooted in community need. We hope and expect the attached report will also provide useful information to you and your organization - as key housing stakeholders in your community.

Please feel free to distribute the report as you see fit and as appropriate. If you have questions about the report, please contact me and I will direct you to the right person to answer your questions.

MaryAnne Clarke
Executive Assistant
Yukon Housing Corporation
W 867-667-5155 | C 867-336-0104 | Yukon.ca

I respectfully acknowledge that I work in the Traditional Territory of the Kwanlin Dün First Nation and the Ta'an Kwäch'än Council.

Housing Needs Assessment

- Dawson -

Submitted to Yukon Housing Corporation

March 31, 2021

OPTIONS CONSULTING
Exploring Options. Finding Solutions.

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Summary of Key Findings and Recommendations

This independent assessment of housing needs identifies and documents the unique and specific housing needs within the community of Dawson. The objective of this report is to provide Yukon Housing Corporation with relevant and credible information that provides guidance for decisions about meeting the housing needs of Yukoners.

The City of Dawson is located on the Yukon River, 532 kilometres northwest of Whitehorse; it is the largest community in Yukon outside Whitehorse, and in 1902, became the first municipality in Yukon. Today the townsite is a Parks Canada designated heritage site, and the Klondike gold rush history sustains a vibrant tourism economy. Mining remains an active industry in the region; public sector employment for federal, territorial, First Nations and municipal governments is also a significant component of the local economy, as is typical in all Yukon communities, including Whitehorse.

Dawson is located on the traditional territory of the Tr'ondëk Hwëch'in First Nation - the "people of the river". Tr'ondëk Hwëch'in First Nation achieved self-government in 1998.

Characteristics of Dawson

- The demographic and socioeconomic metrics of Dawson are comparable with Whitehorse, and do not fit the pattern consistent across other rural communities in Yukon. Relative to Whitehorse, Dawson has a higher proportion of subsidized housing, and older housing stock.

- The current population of Dawson is 2,277 people.[1] The population of Dawson has increased 21% in the past decade, at times exceeding the growth of Whitehorse. (Appendix 7.6)

- Unlike other rural communities, the population of Dawson has grown consistently, and is projected to increase faster than Whitehorse in the coming decades. Current population projections for Dawson are that the population will increase by 49.8% between 2018 and 2040, to a projected 3,480 people.[2]

- While the absolute number of seniors and Elders has nearly doubled between 2010 and 2020, that cohort is a small proportion of the total population. Migration, likely linked with employment, has been a larger factor, with a decrease in the 45-65 population, and an increase in the 25-44 age cohort.

- Dawson exemplifies the unique demographic trends of the Yukon: a very low proportion of children and seniors relative to Canadian averages, and a relatively larger, highly mobile working age population (Appendix 7.6)

- In Dawson, 18% of the population is Indigenous, comparable with 15% of the population in Whitehorse, and much lower than the average of 40% of the population in rural communities.[3]

- The median age in Dawson is 39.7 years, compared with 39.5 years for all of Yukon, and 38.3 years for Whitehorse.[4]

- In Dawson, the median household income was $68,608; ranking sixth of communities outside Whitehorse.[5]

- 2016 census data on employment rates indicate an overall employment rate of 68.5% in Yukon; 71.3% in Whitehorse, and an average of 58.5% across all rural communities. In Dawson, the employment rate is 71.0%.[6]

- The primary housing issue identified in Dawson is the availability of both rental housing and home ownership. The consistent, rapid growth of the population in Dawson has created increasing pressures across the housing continuum and a growing gap between housing supply and demand. There are also significant gaps in adequately and appropriately meeting the diverse needs of housing with services for vulnerable individuals.

- There are multiple physical and geographic factors that impact housing within Dawson, including the historic designation of many buildings and sites, the relatively small area of serviced land, the small legal lots on the historic townsite, and the ongoing impacts of permafrost and flood risk.

- The proportion of households in Dawson that are renters is 54%, compared with 33% for Yukon overall. In Dawson, 48.6% of renters live in subsidized housing compared with 25.1% for all of Yukon. (Appendix 7.11).

- In Dawson, the ratio of Yukon Housing Corporation units is one housing unit for every 23 people, equal to the average across rural Yukon communities, and significantly higher than Whitehorse.

- In Dawson, Yukon Housing Corporation has a current inventory of 97 housing units, comprising 60 units of social housing and 37 units of staff housing.

- There are a total of 23 households that are waitlisted for subsidized housing, including eight seniors.

Synopsis of Recommendations

Recommendation - Housing Availability: It is recommended that YHC prioritize Dawson as a rural community that has the needs and potential capacity to benefit from all the tools in the YHC housing toolbox, including the array of funding approaches to support both rental housing and home ownership, rationalization of existing YHC inventory, modernization of the staff housing program, and partnerships with Tr'ondëk Hwëch'in Government, the City of Dawson Government, and local NGO's.

Recommendation - Housing Affordability, Suitability and Adequacy: It is recommended that YHC prioritize construction of at least one seniors' multiplex in Dawson. It is recommended that Fairview Manor be replaced, and that total seniors' housing capacity be expanded. The current YHC waitlist includes eight seniors; the Dawson home support program identified at least 10 individuals currently receiving home care who need accessible, affordable, appropriate housing.

It is recommended that YHC evaluate and prioritize capital asset renewal and rationalization options in Dawson. Renovation or new construction should prioritize the demand for smaller units for single adults and smaller family households. Consideration should be given to addressing the documented housing preference for housing privacy and autonomy (row housing, tiny houses, and

other models that reduce the impacts of apartment style shared living). This approach is recommended because it may provide increased flexibility in addressing diverse housing needs and reducing tenant conflict, particularly with vulnerable clients.

Recommendation - Housing for Vulnerable Individuals: It is recommended that YHC engage with Government of Yukon Health and Social Services, Tr'ondëk Hwëch'in First Nation Government, and local community organizations to explore and evaluate approaches to more appropriately meet the specific and diverse housing needs of vulnerable adults, including permanent housing with supports, low barrier approaches, and transitional housing capacity.

It is recommended that YHC prioritize a low barrier supportive housing project that focuses on older single males, potentially similar to the physical and operational design of St. Elias Group Home in Whitehorse, which provides a mix of self-contained units and congregate housing. Consideration should be given to a partnership with Health and Social Services, which operates St. Elias.

1.0 Introduction

This independent assessment of housing needs identifies and documents the unique and specific housing needs within the community of Dawson. The objective of this report is to provide Yukon Housing Corporation with relevant and credible information that provides guidance for decisions about meeting the housing needs of Yukoners.

Housing in Yukon is distinct from much of Canada. Across the northern territories, there are unique geographic, demographic and physical challenges to housing availability, affordability, construction, repair and maintenance. Yukon Housing Corporation plays a key role in contributing to housing solutions in Yukon communities.

Yukon Housing Corporation's five year strategic plan addresses Yukon-specific factors that impact housing availability, affordability and suitability throughout Yukon; community housing needs assessments are integral to the strategic objective of rebalancing and renewing housing stock and housing programs.[7]

1.1 Environmental Scan - Current Context

This housing needs assessment is being undertaken within a context of significant transformation of housing mandates, priorities and resources in Yukon, including the implementation of the National Housing Strategy, the delegation of housing roles to First Nations governments, and diverse health and social initiatives within Yukon that link with housing needs.

Two core housing needs are gaining recognition and awareness as priorities in Yukon: an aging population, and individuals with vulnerabilities.

There is a growing gap between currently available housing and support options and the increasing population of Elders and seniors in Yukon; this impact is evident in Yukon Housing Corporation waitlists, and the construction of increased housing and care resources for Elders and seniors throughout the past decade. There is a need for ongoing resources to adequately and appropriately meet the needs of an aging population and enable Elders and seniors to age in place.

There is increasing awareness of the links between housing, homelessness, and diverse vulnerabilities, including intergenerational cultural trauma, family violence, substance use, mental well-being and disabilities, particularly FASD. Vulnerable clients require supports to achieve successful housing outcomes because they have characteristics which compromise their capacity to successfully attain and sustain housing stability even when appropriate, affordable housing is available.

A synopsis of Yukon initiatives that contribute to the broader social context and environment of housing needs and priorities in Yukon includes:

Housing Action Plan for Yukon

Yukon Housing Corporation is responsible for leading the implementation of the Housing Action Plan for Yukon which was launched in 2015 and established a vision of a "Yukon where a diversity and abundance of housing options increases the health and stability of all individuals and communities". The ten year plan is based on three goals:

1. Housing with Services: Help people gain and maintain housing with services.
2. Rental Housing: Increase access to adequate and affordable market and non-market housing and support for tenants and landlords.
3. Home Ownership: Increase and diversify home ownership options.

The implementation of this plan is integrated with the federal National Housing Strategy; progress to date has involved multiple partnerships, including Yukon First Nations governments, municipal governments, the federal government and private sector partners.

Yukon Aging in Place Action Plan

The vision of the Aging in Place Action Plan is to ensure that Yukoners can access the supports needed to live safe, independent, and comfortable lives in their own home or community for as long as possible, regardless of age, income, or ability level. Housing is identified as one of five core pillars to achieving that vision; the goal is to provide a full continuum of housing and support options that are adequate, suitable and affordable for seniors and Elders.[8]

Putting People First: Review of Yukon health and social services programs

The recently completed Health and Social Services review, *Putting People First*, articulates a vision and plan that aligns with the goals, objectives and priorities of Yukon Housing Corporation, and contributes to creating opportunities for an integrated, person centered approach to housing as an intrinsic component of healthy citizens and healthy communities.

A range of housing options "for people with a range of incomes, and health, social, and housing needs"[9] was identified as intrinsic to healthy communities. While acknowledging that the capacity and resources to achieve and sustain housing stability had increased in recent years, the report recommended that Yukon housing initiatives be aligned under one provider, in order to enable clarity, continuity, accountability and an integrated continuum of housing options that address diverse housing needs.[10]

Safe At Home: Ending and Preventing Homelessness in Yukon

This multi-year, collaborative action plan to address homelessness was initiated in 2017 as a community based plan. Ongoing work includes an annual Point in Time (PiT) count of homeless individuals in Whitehorse, the implementation of a Coordinated Access system, and ongoing stakeholder collaboration and community capacity building.

Yukon FASD Action Plan

Between 2016 and 2019, an interagency advisory committee, led by the Health and Social Services and Justice departments of Government of Yukon, developed an action plan *"to support healthy pregnancies, to expand maternal and pre-natal community-delivered supports, and to work across departments and collaboratively with our community partners to harmonize supports for people with FASD"*.[11]

The action plan identified that up to 4% of the population may have FASD, and that 17.5% of inmates at Whitehorse Correctional Centre met the criteria for diagnosis. Poor housing outcomes and risk of homelessness are a common risk for individuals living with FASD. The action plan identifies the need for a range of housing and support options to meet the long term needs for supports and structure: *"Collaborate with the Yukon Housing Corporation and other housing partners to ensure that a continuum of supported housing is available for people living with FASD, including those who are involved in the justice system."*[12]

Forward Together: Yukon Mental Wellness Strategy 2016 - 2026

The mental wellness strategy was developed to improve collaboration, co-ordination, and comprehensive and integrated supports for substance use and mental health. The strategy established a strengths based, whole person centered, culturally competent approach to a system *"to coordinate mental health, trauma and substance use care for Yukon people... where care providers and programs are working together to provide coordinated, holistic and seamless care."*[13]

Mental wellness was framed in a context of *"individual, family and community wellness that is fully supported by a comprehensive continuum of services building on the strengths and capacities of communities."*[14]

The approach articulated in the strategy identified housing as a significant determinant of mental wellness. Access to adequate housing was identified as a major barrier and priority challenge to be addressed; the linkages with other initiatives, including the Housing Action Plan, were identified as integral to progress and transformation.

1.2 Data Sources and Needs Assessment Methodology

There are unique methodological limitations and risks intrinsic to statistical, or quantitative, evidence based approaches in small communities in Yukon. These constraints have been identified by Yukon Bureau of Statistics, and have been widely acknowledged in multiple reports.

> *Collecting accurate statistics in Yukon can be challenging; data is often limited, and sometimes existing data must be suppressed in order to ensure the privacy and confidentiality of the individuals represented. Further, fluctuations in some statistics due to our small population size are not uncommon. Statistics may shed light on a difference between one population and another, but they don't tell us why that difference exists.*
>
> - *Forward Together: Yukon Mental Wellness Strategy 2016 -2026. Yukon Health and Social Services, 2016:vi.*

Limitations of Data in Yukon Communities

Quantitative data of any form, including housing data, for Yukon communities is limited and unreliable. The population numbers are typically too small to credibly determine trends; in other words, it is often challenging to accurately differentiate signal from noise.

The available evidence clearly demonstrates that migration in and out of all Yukon communities is by far the largest impact on community demographics. The rate in Yukon is higher than the national average, and the rate in rural communities is higher than Whitehorse (Appendix 7.7). Migration has a more significant demographic impact than births and deaths, and migration tends to be highly variable and unpredictable because it is often linked with economic trends, as well personal and family health, educational and social priorities.

The specific socioeconomic and cultural dynamics of each community in Yukon are distinct. Appropriately identifying and differentiating universal trends and community level distinctions based on statistical data is challenging.

Housing Data Sources

The primary source of data, particularly housing data, for Yukon is the Statistics Canada census data, which is available every five years; this means that the data being referenced for this report was obtained in 2016. There are unique limitations to Census data in Yukon: in some communities, the population is so small that data is suppressed to protect privacy; in some communities First Nations choose not to participate in the Census; and much of the Census data is extrapolated based on a 25% sample, which with a very small population, can result in unreliable data.

Yukon Bureau of Statistics (YBS) uses Government of Yukon data to produce highly credible and relevant data that is of significant value because it is timely and detailed. In particular the population reports enable detailed annual analysis of population size and age at the community level.

YBS population projection data provides forecasts for Yukon, and for the communities of Dawson, Watson Lake and Haines Junction; there are no community level forecasts for any other Yukon communities because the small populations and relatively large annual fluctuations in population preclude credible forecasting of population change.

The YBS quarterly rent surveys provide detailed rental housing market information for Whitehorse, Dawson, Watson Lake and Haines Junction because those communities have sufficiently large rental housing markets. There is no data available for other communities.

CMHC is a good source of housing information and data, but their strength is economic and technological elements of housing; their limited demographic data is not relevant to rural Yukon communities because it relies on Statistics Canada data. Their detailed reports on housing markets are limited to Whitehorse.

First Nation governments may also have demographic and housing data, including housing needs assessments, however this data is not in the public domain.

Yukon Housing Corporation Data

Currently, the technical and fiscal database management resources of Yukon Housing Corporation are structured to manage housing operations and the recurring monthly and annual operational reporting requirements. **Developing and implementing data management that would provide evidence to inform and guide operational, capital and strategic planning would be of value to the organization.**

Most of the population (78%), and most of the Yukon Housing Corporation inventory (55%), is located in Whitehorse. Outside of Whitehorse, YHC operates a total of 402 units of housing across 14 communities. There is value in YHC data that provides comparative analysis between Whitehorse and all of the communities, but the data on specific communities would generally be too small to be valid or reliable for assessing housing demand. Community level data could be of value for fine grained analysis of capital and operating costs.

In terms of an evidence based approach to assessing housing needs within small rural Yukon communities, there are several critical structural limitations to a quantitative evidence based approach, including:

- Any YHC data on client housing needs specific to a single community would be unreliable because of the extremely small numbers, and there would a high probability that community level data would need to be suppressed to protect privacy.

- YHC waitlist data, which would be an ideal source of evidence, consistently underestimates actual demand in communities because potential applicants know that there is no housing available and don't apply.

- YHC community housing managers often have detailed evidence, including application forms, supporting letters, and personal contact with applicants. While that evidence is of significant value, it is qualitative, not quantitative, and, more importantly, is confidential.

- An emerging priority and transformative shift within housing, and particularly within Yukon Housing Corporation, is the diverse and complex needs of individuals with vulnerabilities. There is very limited data available for this cohort - the data is often held across multiple organizational entities both within Government of Yukon and First Nation Governments, and this data is highly subject to confidentiality and privacy requirements.

- Much of the housing needs are linked with First Nations citizens. There are logistical and cultural barriers in terms of housing priority status within each housing system, differences in affordability, and application practices that are deterrents to First Nations citizens applying to YHC unless there is a specific crisis situation or housing opportunity.

- First Nations Governments manage their own housing, social and health programs; while this data could provide important evidence of housing needs, sharing of information and data is at the prerogative of each First Nation Government.

Needs Assessment Methodology and Rationale

Appropriately and accurately identifying current and emerging housing needs within specific, unique, and very small populations requires a methodological approach that addresses the limitations and risks of the quantitative data. This housing needs assessment methodology incorporates a diligent approach to the analysis and interpretation of available data.

In this context, an evidence based approach that incorporates qualitative data is valuable and appropriate. Qualitative data includes informant interviews that provide perspectives and insights about the unique, specific gaps, challenges and priorities in each community. By engaging in individual interviews with multiple informants in diverse roles within each community, issues and themes are identified and explored, and the range of perspectives enables an evidence based approach to identification of housing priorities. In methodological terms, the identification of the same issue by diverse informants is termed convergent validity.

The methodology of this community housing needs assessment integrates quantitative and qualitative information, and assumes a diligent approach to analysis and synthesis of the evidence. **This methodology enables an evidence based approach that optimizes both quantitative and qualitative data, and provides a more comprehensive and contextual understanding of community housing needs.**

2.0 Community Overview: Dawson

Dawson is located on the Yukon River, 532 kilometres northwest of Whitehorse. Dawson was established during the Klondike Gold Rush in 1898/99, becoming, briefly, the largest Canadian community west of Winnipeg. In 1902, Dawson became the first municipal government incorporated in Yukon, nearly 50 years before Whitehorse. However, by 1953, Whitehorse was designated the territorial capital. Dawson City defines itself as the "cultural capital of the Yukon". The community is proud of both the Klondike Gold Rush heritage and the Tr'ondëk Hwëch'in First Nation roots that run millennia deep.

The unique Klondike history of Dawson is preserved and protected under both a Parks Canada historic site designation, and the *Yukon Historic Resources Act*, which empowers municipalities to designate Municipal Historic Sites in order to protect the heritage character of these sites. Dawson has also enacted a Heritage Bylaw. The heritage character and size of the townsite is unique in rural Yukon.

Today, the City of Dawson is a much smaller, but more diversified community that provides amenities that are unavailable in other communities outside of Whitehorse, including educational opportunities through high school and the Yukon University School of Visual Arts campus; McDonald Lodge Continuing Care for seniors and Elders, a hospital, and diverse recreational, social and commercial opportunities.

"Honouring the Past, Sharing the Present, Embracing the Future"

The City of Dawson has developed a comprehensive framework for achieving its vision, goals and policies, guided by the following principles:

Work Together

- • Collaborate with Tr'ondëk Hwëch'in
- • Create and maintain partnerships
- • Engage residents
- • Use open and transparent decision-making processes

Foster a Sense of Home

- • Create a complete, year-round community
- • Encourage healthy and active lifestyles
- • Promote inclusion and universal accessibility
- • Encourage the development of diverse housing options

Be Authentically Dawson

- • Celebrate Dawson's multi-faceted heritage, history, and culture
- • Promote opportunities and solutions that are authentic to our local situation
- • Promote outdoor lifestyles

Grow Responsibly

- • Maintain a sufficient land supply for future development
- • Use comprehensive development practices
- • Invest in municipal infrastructure
- • Enhance emergency preparedness

Promote Environmental Stewardship

- • Protect and respect the natural environment
- • Support a healthy ecosystem and biodiversity
- • Mitigate environmental hazards
- • Use comprehensive waste management practices

Strive for Economic Resilience

- • Support a strong and diverse economy
- • Encourage opportunities for local employment
- • Develop local skills and knowledge

2.1 Tr'ondëk Hwëch'in First Nation

The City of Dawson is located on the traditional territory of the Tr'ondëk Hwëch'in First Nation.

Tr'ondëk Hwëch'in translates as "people of the river": there are approximately 1,000Tr'ondëk Hwëch'in citizens who are descended from the Hän-speaking people, who have lived along the Yukon River for millennia, and a diverse mix of families descended from Gwich'in, Northern Tutchone and other language groups.

Tr'ondëk Hwëch'in First Nation achieved self-government in 1998. The Government's mandate is to "ensure a strong and healthy future for citizens while maintaining connections to traditional knowledge and the land".[15] Government roles and responsibilities include housing for Tr'ondëk Hwëch'in citizens on settlement lands.

During the gold rush years, Chief Isaac took the songs and dances of his people across the border to the village of Mansfield, Alaska, and entrusted them to the people there, to be returned when the time was right and the Tr'ondëk people were ready. Today, Tr'ondëk Hwëch'in First Nation is actively engaged in regaining and restoring their traditional heritage and culture.[16]

3.0 Demographic Profile and Trends

The current population of Yukon is 42,230; 78% of the Yukon population lives in Whitehorse.[17] The population growth in the Whitehorse census subdivision accounts for 91.5% of Yukon's population growth.[18]

3.1 Yukon Population Profile

There are two distinct population profiles in Yukon: population growth is concentrated in Whitehorse and is "stagnant or declining in other population centres in Yukon".[19] The population in Whitehorse is higher income, younger, and slightly less transient than the population in rural communities.

There are 17 rural communities in Yukon; three of those communities (Haines Junction, Watson Lake, and Dawson) are sufficiently large to be included in the Yukon Bureau of Statistics quarterly rent surveys. The remaining 14 communities are very small - the average size is 317 people; the current population ranges from 54 in Johnston's Crossing to 598 in Carmacks.[20]

The current population of Dawson is 2,277 people.[21] The 2016 census count for Dawson identified a population of 1,375 people living in 680 dwellings.[22] (Yukon Bureau of Statistics data is more reliable; Statistics Canada census data will only be used where other data is not available).

3.2 Indigenous Population in Yukon

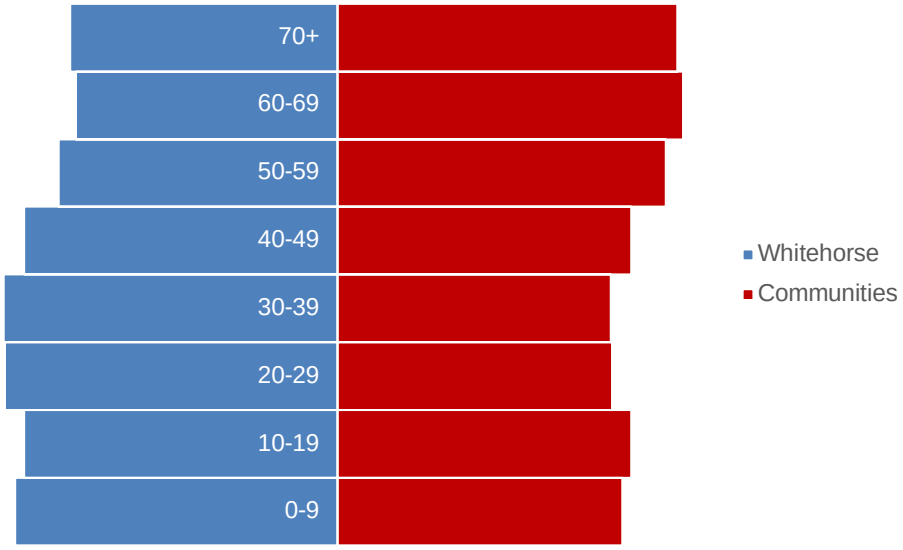
There are 14 First Nations in Yukon; 11 have signed treaties, including the Tr'ondëk Hwëch'in First Nation. Approximately 20% of the population in Yukon is Indigenous; slightly more than half of Yukon citizens who identify as Indigenous live in Whitehorse. In rural communities, Indigenous citizens comprise an average of 40% of the population.[23]

In Dawson, 18% of the population is Indigenous, comparable with the 15% proportion of the population in Whitehorse, and much lower than the average of 40% of the population in rural communities across Yukon.[24]

3.3 Population Age Distribution

Yukon has the lowest demographic dependency ratio (percentage of the population that is children and seniors) in Canada.[25] The population profile for Whitehorse is distinct from the profile for Yukon communities; there are more Elders and seniors, and fewer working age adults in rural Yukon communities compared with Whitehorse (Appendix 7.2).

The median age in Dawson is 39.7 years, compared with 39.5 years for all of Yukon, and 38.3 years for Whitehorse.[26] The median age for the Indigenous population in Yukon is 34.0 years; for non-Indigenous, it is 40.3 years.[27]



Data: Appendix 7.2

3.4 Migration and Mobility

Interprovincial migration is the main source of recent population growth in Yukon; Yukon has the highest share of people who were born outside of the territory or country in Canada.[28] The population of Yukon is highly mobile, particularly in rural communities. **Over a five year period, on average 63% of the total population moved in or out of a rural community.**[29] Of those who moved, 52% moved to Whitehorse, 38% moved out of Yukon, and 10% moved between communities. (Appendix 7.7) **Migration and mobility within Yukon is a significant demographic factor that directly impacts housing demand.**

Informant insights suggest that there is significant mobility within the community of Dawson, consistent with available data that indicates that a high rate of mobility is normative in Yukon communities. It was identified that some residents leave during the winter months, and that there is an influx of seasonal workers during the summer. Additionally, government staff often move between communities throughout their careers.

3.5 Yukon Population Trends

Census data indicates that the population of Yukon increased by 5.8%, slightly greater than the overall Canadian average population growth of 5.0% in the census period 2011 - 2016.[30]

There are two distinct population trends in Yukon: population growth is concentrated in Whitehorse but has been characterized as "stagnant or declining in other population centres in Yukon".[31]

Currently, 78%[32] of the Yukon population lives in Whitehorse; an increase from 74%[33] twenty years ago. Population growth in Whitehorse is influenced by migration both from outside Yukon and from rural communities in Yukon (Appendix 7.1).

In the past decade, the population of Whitehorse has increased by 23%; a growth rate more than double that of rural communities. Overall, in the past decade populations in rural communities increased by 10% but that figure represents a total of only 825 people across all communities (Appendix 7.1).

Population patterns across the 17 rural communities of Yukon are divergent, and at the community level, there is high variability in annual population counts due to migration - **migration has a larger demographic impact than births and deaths in all Yukon communities, including Whitehorse** (Appendix 7.7). Because of the very small populations, growth trends are generally not measurable at the community level, except in larger communities such as Dawson, Watson Lake and Haines Junction.

The population, particularly in rural Yukon communities, is highly mobile: between 2005 and 2010, on average 63% of the population moved in or out of the community, compared with 46% in Whitehorse (Appendix 7.7).

Demographic data clearly indicates that, while there is insignificant population growth in rural Yukon communities, there is a consistent trend of an **aging population** (Appendix 7.5).

Yukon Bureau of Statistics is projecting consistent population growth - ranging from 1.2% to 2.1% annually - for Yukon over the next 20 years[34]. Population projections at the community level[35] are calculated only for the larger communities (Whitehorse, Dawson, Watson Lake and Haines Junction).

Current population projections for Dawson are that the population will increase by 49.8% between 2018 and 2040, to a projected 3,480 people.

Overall, demographic patterns for Dawson more closely match Whitehorse than rural Yukon communities. Most significantly, the population trend shows consistent growth; additionally, the age profile shows a comparable bulge in working age population, median household income that is above the average for rural Yukon communities, employment rate, and the proportion of the community population that is First Nations is comparable with Whitehorse and about half the average for rural Yukon communities.

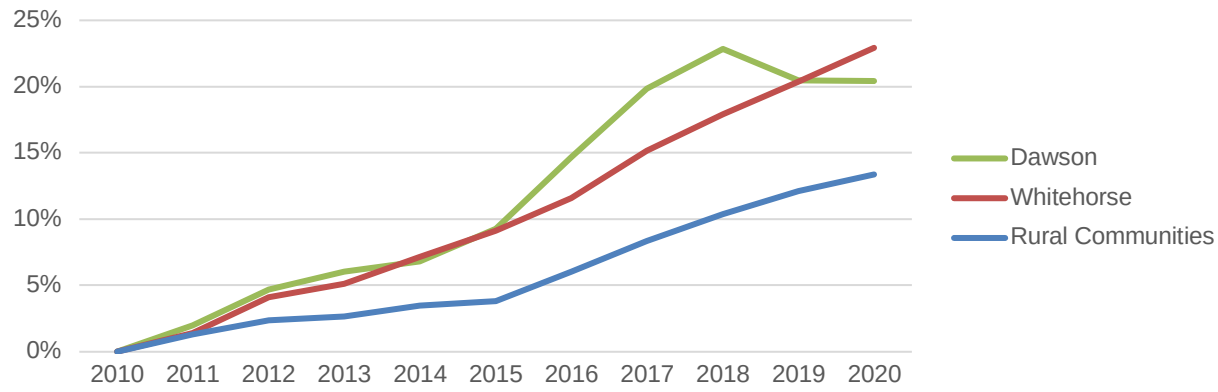
3.6 Dawson Population Trends

The population of Dawson has grown steadily in the past decade, at times exceeding the growth of Whitehorse. The total population in 2010 was 1,883, and the total population in 2020 was 2,277, an increase of 21%.

While the absolute number of seniors and Elders has nearly doubled between 2010 and 2020, that cohort is a small proportion of the total population. Migration, likely linked with employment, has been a larger factor, with a decrease in the 45-65 population, and an increase in the 25-44 age cohort.

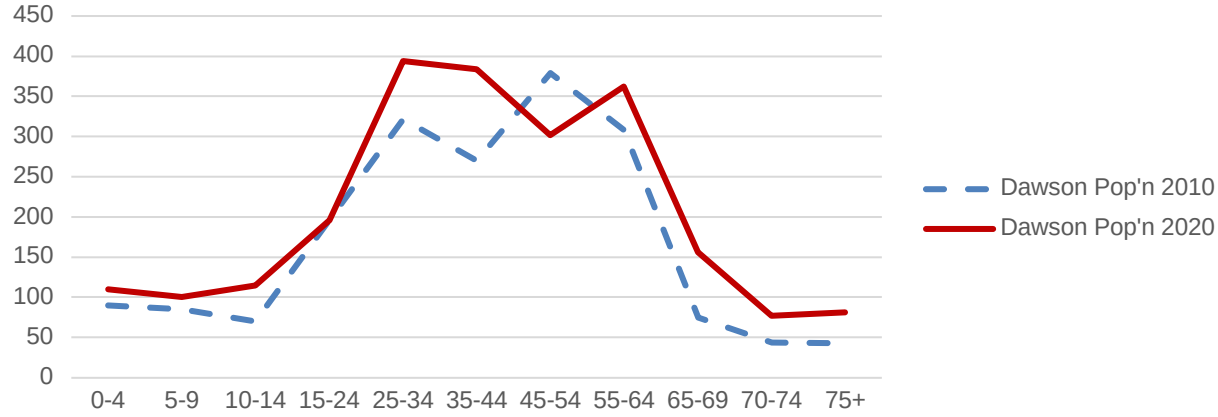
Dawson exemplifies the unique demographic trends of the Yukon: a very low proportion of children and seniors relative to Canadian averages, and a relatively larger, highly mobile working age population (Appendix 7.6).

Proportional Population Change 2010 - 2020: Whitehorse, Communities, Dawson



Yukon Bureau of Statistics: Population Report, Second Quarter 2020

Dawson Population Change by Age Group 2010 - 2020



Data: Yukon Bureau of Statistics Population Report, Second Quarter 2020; 2010 Statistical Review

3.7 Socioeconomic Indicators

According to the 2016 Census data, the median individual income in Yukon in 2015 was $45,804; the second-highest in the country and $11,600 above the national median income ($34,204).[36]

Indigenous Yukoners have the highest incomes of all Indigenous populations in Canada: the median individual income in 2015 was $33,581, $8,055 above the national median individual income ($25,526). However, in Yukon and all Canadian jurisdictions, incomes for all Indigenous populations are below overall median incomes for Canadian citizens.[37]

Within Yukon, incomes are highest in Whitehorse, and vary widely across the rural communities. The median household income in Yukon in 2016 was $84,521. In Whitehorse, the median household income was $93,652. [38]

In Dawson, the median household income was $68,608; ranking sixth of communities outside Whitehorse.[39] Median household income across all rural Yukon communities averaged $65,676 (Appendix 7.13).

2016 census data on employment rates indicate an overall employment rate of 68.5% in Yukon; 71.3% in Whitehorse, and an average of 58.5% across all rural communities. **In Dawson, the employment rate is 71%.**[40] Like most rural Yukon communities, public sector employment with the First Nations, municipal, territorial, federal government is a significant element of the local economy.

In Dawson, mining and tourism are also significant economic drivers. The historic, geographic and cultural aspects of Dawson contribute to a diversifying and growing tourism and film industry.

"Mining's huge ... there's definitely a lot of activity in Dawson as a result,"[41]

The significant mineral deposits in the region continue to sustain a gold mining industry. The Dome Gold mine in Dawson has been in operation for many years, and there are also more than 200 family owned and operated placer mining operations in the Klondike region.

Government of Yukon recently completed a review of health and social programs and services[42] that focused on population health and community well-being; specifically acknowledging that individual health and well-being is directly linked with relationships, community and wider society. The importance of community well-being may be uniquely important in Yukon:

> *Yukoners have a strong sense of community belonging. This is one of the benefits of living in Yukon. In the 2017-18 Canadian Community Health Survey (CCHS), 80.6%of Yukoners reported a somewhat or very strong sense of community belonging. This is higher than the national average of 68.9%. This is an important strength, particularly for youth. Feeling a sense of belonging and safety within a community can play a protective role and prevent youth from developing risk-taking behaviours.*[43]

4.0 Housing Overview: Yukon Communities

Most of the issues and challenges of housing in Yukon, along with other northern regions of Canada, are related to the unique conditions of northern communities. The Northern Housing Forum identified that:

> *In Canada's North there are many unique and regional-specific challenges influencing housing conditions, including: the high costs of transportation of materials and fuel, shortages of local skilled labour, a lack of affordable and suitable housing, overcrowding, short building seasons, climate change, and inadequate or inconsistent funding. In addition, lack of local building material and machinery, limited and aging supporting infrastructure, requirements for unique foundations, lack of municipal services, as well as challenges in land planning and ownership increase the complexity of building and maintaining housing in the North.*[44]

Four Yukon communities (Whitehorse, Haines Junction, Dawson City and Watson Lake) are considered to have a housing market; the remaining communities are considered non-market communities in terms of housing.[45] In addition to the unique economic, geographic and infrastructure barriers to the construction and maintenance of housing, there are demographic factors that impact housing.

In non-market communities, there are too few households to achieve a viable housing market or economy: the rental and home ownership markets are too small to efficiently match supply and demand, and seasonal short term accommodation for tourists and seasonal workers can also impact housing stability and availability.

Additionally, a significant portion of housing inventory in rural Yukon is non-market: staff housing, social housing, housing owned by Yukon or federal governments, and First Nations housing.

Together, these factors create structural inequities and challenges in housing availability and affordability in rural Yukon communities.

The current National Housing Strategy, the multilateral Housing Partnership Framework, and the Homelessness Partnering Strategy "offer opportunities for federal, provincial and territorial governments to work together toward achieving a long-term shared vision for housing, and to provide support and funding to communities to develop local solutions that address homelessness."[46]

4.1 Yukon Housing Corporation

Purpose and Strategic Goals

Yukon Housing Corporation delivers community housing and programs that address the housing needs of Yukon residents. The core purpose of Yukon Housing Corporation is working collaboratively to provide responsive and innovative solutions to diverse housing needs that contribute to healthy, sustainable, inclusive Yukon communities.[47] The current Yukon Housing Corporation Strategic Plan, *Bringing the Future Into Focus* identifies three goals:

1. Be a Trusted Housing Partner - By engaging in housing partnerships and achieving housing solutions that contribute to healthy communities.
2. Community Housing Renewal and Rebalancing - By addressing aging infrastructure and shifts in housing needs, priorities and programming.
3. Strengthen Corporate Stewardship - By aligning operational activities to achieve government priorities through client service and program delivery.

The strategic plan focuses on establishing a framework for modernization of the social housing program, in response to the long term fiscal funding shifts, and evolving housing needs and priorities in Yukon.

Housing for Employees in Rural Communities

In 2019, Government of Yukon announced that the staff housing program was being modernized *"to better support local economies and the delivery of programs and services in rural communities"*.[48] Yukon Housing Corporation is leading the implementation of the updated policy, and working with the Public Service Commission and other stakeholders to address the need for rental housing availability in communities, including for employees, as part of the strategic transformation of the housing portfolio and programs.

Community Partnering and Lending

The Community Partnering and Lending branch of Yukon Housing Corporation delivers financing options, including robust incentives, for developers and rural Yukoners to buy or build housing, providing housing resources that are inclusive of owners and renters in Whitehorse and rural communities. The demand for the lending programs exceeds current budget capacity.

Informant insights in Dawson and other communities have clearly expressed the diverse and unique challenges that arise with a very small non-market housing sector. A chorus of voices articulated that all the pieces are connected: in a small community, non-market community housing, market rental housing, and home ownership are all moving parts, and that if any piece of the housing puzzle is stuck, the impact is felt disproportionately across the continuum. **The recommendations in this report are embedded in the context of the housing continuum - any solution will impact both the identified housing need, and will contribute to the health and resilience of the community**.

4.2 YHC Community Housing Resources

The following map shows current Yukon Housing in Yukon communities. Comparing the housing with population provides a baseline comparison measure across communities. In Whitehorse, the ratio of population:YHC housing unit is 68:1, which means there is one housing unit for every 68 people. In rural communities, the average is one housing unit for every 23 people - this includes subsidized housing and housing allocated to employees (Appendix 7.9). In response to transformative shifts in housing programs, Yukon Housing Corporation is modernizing housing terminology from designations of housing as "staff housing" or "subsidized housing" and it is now inclusively referenced in the YHC portfolio as "community housing".

In Dawson, the ratio is 1 housing unit for every 23 people, equal to the average across rural Yukon communities, and significantly higher than Whitehorse.

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Yukon Housing Corporation has identified that housing adequacy and suitability are both issues with their inventory in rural Yukon communities. Aging buildings are fiscally and operationally inefficient to maintain, and an increasing proportion of the housing portfolio requires major repair or replacement. Additionally, much of the existing inventory comprises three to four bedroom single family dwellings, and this is contributing to chronic overhousing as the demand for both staff and social housing is for smaller one and two bedroom units. Overhousing is a widespread issue in all rural Yukon communities; **the YHC inventory in Dawson is mismatched to current demand, which is primarily for single adults or couples, and seniors.**

In Dawson, Yukon Housing Corporation has a current inventory of 97 housing units, comprising 60 units currently allocated as subsidized housing and 37 units currently allocated as employee housing. The YHC inventory in Dawson is predominantly single family dwellings (27) and duplexes (14). There are two apartment buildings, with 13 and 19 units, a sixplex, and a seniors fourplex.

The YHC housing portfolio in Dawson is comparable than the average across Yukon communities; 52% of units are over 35 years old, compared with an average of 49%. In Dawson, 20% of units are less than 10 years old, which is consistent with the average across the portfolio.

The Yukon Housing Corporation waitlist for housing in Dawson indicates that there are 23 households waitlisted for subsidized housing, including eight seniors. Nearly all waitlisted applicants are requesting bachelor or one bedroom units. Five households are identified as having pets. It was identified that the client profile of applicants is shifting from affordability to vulnerability, and this is contributing to tenant conflict, particularly with tenants who are not receiving adequate or appropriate supports.

"Folks are reluctant to get YHC housing because they become lower priority on the Tr'ondëk Hwëch'in housing waitlist"

There is limited turnover of the existing inventory. YHC data indicates that the overall average length of stay of current social housing tenants is 4.2 years, and that 29% of tenants have been in social housing for five years or longer.[49]

4.3 Tr'ondëk Hwëch'in First Nation Housing in Dawson

The Tr'ondëk Hwëch'in Housing Department provides housing programs and services to their citizens. Tr'ondëk Hwëch'in First Nation Government is working to narrow the gap and meet the housing needs of citizens; however, as with many First Nations Governments there is a gap between funding resources and housing needs. Current housing priorities identified by the Tr'ondëk Hwëch'in Housing Department are transitional housing, seniors housing, rental housing, and affordable home ownership.

Tr'ondëk Hwëch'in Government actively manages their waitlist to ensure that is active and updated. It can be an underestimate of actual demand as some households give up on being on a waitlist. There is a current gap between supply and demand for housing for single adults and smaller families, including single parents with one child.

Tr'ondëk Hwëch'in Government is working to develop innovative and market based approaches to housing, including home ownership on settlement land, housing development and management within a development corporation structure, and increased housing resources for Elders and individuals living with vulnerabilities. Tr'ondëk Hwëch'in First Nation Government is currently completing a needs assessment for transitional housing for vulnerable individuals who require supports to sustain housing stability; Tr'ondëk Hwëch'in currently operates a small program in a duplex and is aiming to expand the capacity. An ongoing priority is to maintain housing adequacy, particularly with ventilation and maintenance to ensure that the housing is clean, safe and doesn't develop mold. An ongoing challenge is access to skilled trades, which impacts housing maintenance and repair.

4.4 Chief Isaac Development Corporation

The Chief Isaac Group of Companies was established in 1984 with the mandate to operate as a for-profit corporation to create sustainable wealth for the Tr'ondëk Hwëch'in First Nation. In 2009, the Tr'ondëk Hwëch'in Trust was established as the sole shareholder of the Chief Isaac Group of Companies for the purpose of holding and managing the financial assets and business investments of the Tr'ondëk Hwëch'in on behalf of the Trust's beneficiaries – the citizens of the Tr'ondëk Hwëch'in.

> *"The Trust's mandate is to preserve the Trust Property for future generations of the Tr'ondëk Hwëch'in and to receiving, holding, managing, investing, allocating and otherwise any income earned by the Trust for the purposes of promoting, funding or carrying out social, community or economic development activities of direct benefit to the Tr'ondëk Hwëch'in."*[50]

Currently, the Chief Isaac group of companies comprises Chief Isaac Mechanical, Mackenzie Petroleum Ltd., Tr'ochëk Limited Partnership, and the Chief Isaac Group.

4.5 Klondike Development Organization

Klondike Development Organization (KDO) is a partnership of City of Dawson, Dawson City Chamber of Commerce, Klondike Visitors Association, Dawson City Arts Society and Chief Isaac Incorporated, the development corporation of the Tr'ondëk Hwëch'in. This unique collaborative organization has a mandate to *"engage with partners to find solutions to local problems, to encourage investment in Dawson City, and deliver community and economic development projects jointly funded by Yukon Government, Department of Economic Development, and the City of Dawson."*[51]

"YHC housing funding programs are beneficial"

In recent years, KDO has focused on the rental housing shortage in Dawson and has developed two eight unit apartment buildings, with contributions from the City of Dawson, Yukon Housing Corporation and the Canada – Yukon Investment in Affordable Housing agreement. As a non-profit organization, KDO is mandated to achieve rental housing affordability to the extent feasible; their rental housing is at market and near market rents. Tenants may also apply for subsidies. It is not fiscally viable for KDO to deliver rent geared to income (RGI) housing.

4.6 Community Organizations Linked to Housing

Dawson is sufficiently developed community that there are diverse housing, social, health and community resources that contribute to the continuum of housing resources.

Alexander McDonald Lodge, operated by the Continuing Care division of Health and Social Services, supports 15 long term care residents (including two respite spaces). The Lodge is a territorial resource and accommodates Elders and seniors from other communities as well as Dawson. In recent years, there has been a shift towards a higher level of care at the lodge and increased threshold for admission eligibility. This aligns with increased community supports to enable people to remain living independently in their own homes for as long as possible - including in the seniors fourplex that Yukon Housing Corporation operates in Dawson.

The Dawson Women's Shelter provides emergency shelter and transitional housing based in a duplex that is rented from Yukon Housing Corporation. The building is homelike but has significant issues with accessibility and capacity. The majority of clients are Tr'ondëk Hwëch'in citizens; most are single women. Many are older women who have mobility limitations; in some cases, clients have had to sleep on couches because they are unable to navigate the stairs to the bedrooms upstairs. The greatest challenge is securing affordable housing for women so that they can leave the emergency shelter; there is a significant shortage of affordable one bedroom housing. The absence of transitional housing is also a gap. An estimated 50% - 60% of clients struggle with mental health, substance use, and FASD. There are significant needs for permanent housing and supports for all age ranges from youth to Elders, particularly First Nations individuals who are impacted by intergenerational cultural trauma. A lot of the shelter clients are in an cycle of shelter, housing, eviction and back to the shelter; supportive housing was identified as a critical component to breaking this cycle.

The Tr'ondëk Hwëch'in Jëje Zho/Men's Shelter and Transitional Housing Program provides a total of 14 beds: two emergency intake beds, two flex beds for permanent/supportive shelter, and six transitional beds. The shelter is located next door to the Tr'ondëk Hwëch'in Wellness Centre and there are strong, collaborative connections. The majority of men's shelter clients are chronically seasonally homeless (work at mining camps or live in wall tents during the summer). These men do not have sufficient income or lifestyle stability to sustain housing tenure, and as single males, are the lowest priority for subsidized housing. Many also have complex vulnerabilities and require a low barrier approach to housing.

"Not a chance of getting housing - everyone else is ahead of them"

The greatest gap for clients accessing the men's shelter is permanent, highly supported housing for individuals with significant vulnerabilities that compromise their capacity to live independently. An estimated 2% - 5% of clients at the men's shelter are in need of this type of housing. Max's Place, operated by Challenge Disability Resource Society in Whitehorse was identified as a relevant model.

4.7 Dawson Community Context

The primary housing issue identified in Dawson is the gap between supply and demand of both rental housing and home ownership. There are also significant gaps in adequately and appropriately meeting the diverse needs of housing with services for vulnerable individuals.

The consistent, rapid growth of the population in Dawson has created increasing pressures across the housing continuum. Recent initiatives, including new construction by Yukon Housing Corporation and KDO have not been sufficient to address the growing demand.

"Our housing situation in Dawson is desperate and dire"

There are multiple physical and geographic factors that impact housing within Dawson, including the historic designation of many buildings and sites, the relatively small area of serviced land, and the small legal lots on the historic townsite. Dawson is located on the shore of the Yukon River, and there are ongoing impacts of permafrost and flood risk. The Dawson Climate Change Adaption Plan[52] identified the following impacts of concern:

- Permafrost thaw could destabilize soils and thereby threaten the integrity of local buildings and infrastructure.
- Drier summers might increase the frequency and intensity of forest fires, a major health and security risk, particularly for residents living in remote areas.
- Earlier river freeze-thaw periods and more extreme precipitation events may increase the risk of an extreme flood. Such an event could overwhelm present flood defences.
- The small communities of West Dawson and Sunnydale are connected to the main Dawson town site by an ice bridge in winter and by boat in summer. A longer seasonal transitional period could disrupt travel across the river and increase periods of isolation.

KDO has undertaken research[53] into housing needs in Dawson: a survey on housing rental and ownership demand was undertaken in 2017 and updated in 2020. Their surveys indicate that there are substantive challenges within the housing market in Dawson, including rising rents, combined with a growing gap in the mid-range of rents; increasing dissatisfaction with the quality of rental housing, and a strong consensus that availability of rental housing is an increasing issue.

Yukon Bureau of Statistics rent survey data indicates that there has been a very significant tightening of the rental housing market since 2017.[54] The semi-annual vacancy rate has been 0% in five of the six periods in 2018, 2019 and 2020, and the median rent of $1,000 is approaching that of Whitehorse ($1,155) and far higher than Watson Lake ($800) or Haines Junction ($620).[55]

The market rental housing sector in Dawson remains embryonic: the YBS rent survey includes a total of 66 units; as a comparison, this comprises approximately one third of the YHC inventory (which is excluded from the rent survey, as is First Nations housing).

The KDO research identified that for home ownership, most respondents are less interested in acquiring land and constructing home; the majority would prefer to purchase a house.

There is very limited market activity for land or houses. A scan of currently available properties identified no listings within the Dawson townsite, and three rural residential properties - including one acreage listed at $700,000.

The City of Dawson is currently engaged in the master planning process for a new serviced subdivision on Dome Road. The total area, of more than 33 hectares, will be developed in four phases. It is planned to provide a range of housing types and will ultimately include about 300 new units of housing. This major initiative will greatly contribute to increasing the capacity of the housing sector in Dawson and may contribute to increasing rental housing capacity by enabling some renters to transition to home ownership.

"The YHC lending program is good but it's not big enough to meet the demand"

There is an ongoing need for appropriate housing options as a recruitment resource for employees, seasonal workers and students at the School of Visual Arts. The role of staff housing is changing as Dawson grows and becomes closer to Whitehorse in terms of developing a functional housing market. Additionally, the Government of Yukon is modernizing the staff housing program.

The proportion of households in Dawson that are renters is 54%, compared with 33% for Yukon overall. In Dawson, 48.6% of renters live in subsidized housing compared with 25.1% for all of Yukon. (Appendix 7.11)

5.0 Informant Insights on Housing in Dawson

Multiple key informants (Appendix B) shared their insights and perspectives on housing needs, gaps, challenges and priorities in Dawson. Thematic analysis of the commentary is summarized below.

5.1 Community Demand and Capacity

There was a very strong consensus that there is a growing gap between demand and capacity both for rental housing and home ownership and that this was impacting community well-being.

Adequate housing capacity was recognized as integral to sustaining a healthy, vibrant community and the well-being of citizens, and there was a perception that the unique housing needs in Dawson were not being adequately acknowledged or addressed by Yukon Housing Corporation or the Government of Yukon.

"The Dawson Shuffle: come to Dawson, scrounge to get anything, then keep an eye out for a golden opportunity"

There is a consensus that the waitlist for Yukon Housing Corporation units is an underestimate of actual demand; very low turnover is a deterrent to potential applicants; potential applicants enquire but choose not to apply when they learn that there is no housing available. There is significant demand for housing for Tr'ondëk Hwëch'in First Nation citizens, and many citizens live in overcrowded or inadequate housing. It was reported that some Tr'ondëk Hwëch'in citizens do not choose Yukon Housing Corporation housing because it reduces their priority on the Tr'ondëk Hwëch'in housing waitlist.

"YHC is underfunded for repair and maintenance"

There was recognition that there are challenges and barriers to moving along the housing continuum, particularly for young adults who require affordable, available housing, and transitions into home ownership. Issues with the availability and suitability of YHC lending programs were identified; the Municipal Matching Fund was identified as an approach that placed a disproportionate burden on a small community like Dawson. The City of Dawson has offered incentives for secondary suites but there has not been much interest. Tiny homes are perceived as a good cultural fit with housing preferences in Dawson and Tr'ondëk Hwëch'in First Nation is exploring that approach.

While the Dome Road subdivision will incrementally contribute a significant increase in housing inventory, it is a long term initiative. **There was a widespread sense of urgency about the current gap in housing availability and the impacts on the community.**

5.2 Housing for Individuals with Vulnerabilities

Informants consistently identified that there are vulnerable citizens in Dawson who are at risk and are living in housing that is unstable, unhealthy, inadequate, or precarious.

Dawson was identified as distinct from most rural communities in Yukon in that many residents do not have family or social supports. The historic mining culture endures and for some, Dawson is a transient community, a place where people come to be left alone and live their own way, often relying on seasonal work opportunities and marginal housing, including cabins that are off the grid.

There was widespread acknowledgement of the impact of intergenerational cultural trauma, including mental health, substance use, and FASD. There was widespread recognition of the need for affordable housing, together with ongoing, often permanent, supports for young adults living with multiple disabilities and vulnerabilities. There was consensus that supporting vulnerable individuals needed to be based on meeting each individual where they are at, and providing culturally appropriate, strengths based, collaborative approaches to the provision of housing and supports.

There was concern about the need - and gap - in the "housing with services" pillar of housing in Dawson. It was identified that some individuals have significant vulnerabilities which can place both individuals and families at risk in the absence of adequate supportive housing resources. Both the men's and women's shelters identified that the absence of transitional or long term supportive housing was needed by a large proportion of their clients.

Informants identified that lack of housing contributes to overcrowded, multi-generational households, or chronic couch surfing, and that these housing situations can cause stress and amplify risks including anxiety, depression, and risks of violence and substance use.

"People end up in precarious or inappropriate housing - couch surfing and hanging out with people who are a bad influence"

Several cohorts of single adults were identified with distinct vulnerabilities: young adults who are transitioning into independence and adulthood and may only require transitional support and assistance in achieving independence and building life skills; a smaller cohort of adults, including youth aging into adulthood who will require ongoing, lifelong supports in order to achieve housing stability, and a cohort of aging adults, particularly men, who are "not going to fit in" at McDonald Lodge.

"There are older guys living in shacks on creeks and they can't haul water any longer"

While the population of seniors in Dawson is small relative to other rural communities, there is a higher proportion of lower income seniors, especially males, who have worked seasonally in the mining industry and are low income and in deteriorating health. Multiple informants characterized this cohort as unique, describing the "rough lives" that they lived and the chronic substance use. It was identified that there is a need for low barrier supportive housing that would support aging in place; the needs of this cohort may be comparable with the residents of the St. Elias Adult Group Home operated by Health and Social Services in Whitehorse.

Emergency family housing for families in crisis was also identified as an intermittent but recurring need - if a family loses their housing, the currently available shelter resources mean that the family is separated.

As with most rural communities in Yukon, **transitional housing capacity was repeatedly and emphatically articulated as a significant gap in Dawson.**

There is a need to provide transitional supports for individuals experiencing diverse vulnerabilities, including family violence and abuse, substance use, challenges with their housing situation, or who are returning to the community following treatment for substance use, incarceration in Whitehorse, or other transitions. Distinct and incompatible needs include gender, cultural, abstinence based, and low barrier harm reduction approaches.

"Housing compounds all the other issues"

The work of Safe At Home, including a project evaluating discharge planning for rural Yukon citizens, has highlighted that limited housing inventory in rural communities is a structural barrier. "Assumptions about where a client should live" has also been identified as a bias; "some clients do not want to return to their community or origin and some clients, while being from a rural community, call Whitehorse home."[56] Safe At Home advocates discharge planning that empowers clients to have "the right to reside where they want to reside".

Inclusion Yukon identifies a perspective shared by many informants: that there is a need for "real choices", including culturally relevant approaches, to meet the diverse support needs of individuals with cognitive disabilities and differences. Options in small communities such as Dawson are limited by the number of citizens and households that could potentially be approved family homes, and the lack of resources for respite staffing or other trained support workers. Community capacity building was identified as a measure that would contribute to enabling vulnerable individuals to successfully attain and sustain housing in their own communities. Yukon University is introducing training and education to build capacity in communities, and federal funding based on the Jordan's Principle enables increased resources and options for First Nations communities.

5.3 Housing Suitability

Informants clearly identified the need to address housing suitability issues in Dawson, including overhousing, wheelchair accessibility, and aging buildings that require major repairs, renovation or replacement.

Overhousing was acknowledged as an issue; there was awareness that most of the demand for rental housing was one bedroom units for single adults, and that this was mismatched with the current, aging inventory.

The need for accessible housing that supports mobility disabilities and aging in place was repeatedly emphasized. It was identified that there is a growing population cohort that is aging and has chronic health conditions that may impact mobility and accessibility, including COPD, diabetes, obesity, workplace injuries, and other chronic and degenerative health conditions. The integral role of housing in maintaining health, functioning and independence was acknowledged; there was also awareness that in the context of residential school trauma, sending people to a care facility created a risk of further cultural disconnection and loss.

The issue of the YHC pet policy was raised; "everyone" in Yukon has pets. KDO does not accept pets in their housing; the current YHC waitlist includes five applicants with pets.

6.0 Housing Needs in Dawson - Findings and Recommendations

Based on a comprehensive review of all available data and research, combined with qualitative information from interviews with key informants, the qualitative and quantitative evidence indicates that there are current housing gaps and needs in Dawson.

6.1 Housing Availability

Findings: All available evidence and information consistently indicates that housing availability is a significant systemic issue across the housing continuum in Dawson. The Yukon Bureau of Statistics rent survey data indicates that the vacancy rate is 0%; the research by KDO identifies the demand, and waitlists for both YHC and Tr'ondëk Hwëch'in housing are acknowledged to underestimate actual demand. Housing availability in Dawson has historically been challenging as there is both limited inventory and much of the inventory is impacted by the dominance of the seasonal tourism industry in Dawson: housing is withheld from the market, or tenants are evicted, in order to make housing available for lucrative short term rental during the summer tourism season. The availability gap has increased in recent years, as housing infrastructure has not increased with the rapid population growth.

The initiatives of KDO, and the planned Dome Road subdivision are incremental, long term contributions to addressing the gap in housing availability; however there is need for shorter term increases in housing availability to address the growing gap between supply and demand.

Recommendation: It is recommended that YHC prioritize Dawson as a rural community that has the needs and potential capacity to benefit from all the tools in the YHC housing toolbox, including the array of funding approaches to support both rental housing and home ownership, rationalization of existing YHC inventory, modernization of the staff housing program, and partnerships with Tr'ondëk Hwëch'in Government, the City of Dawson Government, and local NGO's.

Justification and Rationale: Both the overall size and community capacity of Dawson are unique in Yukon communities outside of Whitehorse. The sustained and significant population increase in Dawson, which is projected to continue to grow at a rate exceeding Whitehorse, combined with an aging population, creates significant and growing demands for an active YHC role comparable with the scale and diversity of housing initiatives in Whitehorse.

YHC has a large inventory of housing that is aging and increasingly mismatched with current demand for smaller, accessible units. Dawson is an optimal location to prioritize the strategic goal of renewal and rationalization of the housing inventory, and to realign resources to address emerging housing needs and priorities.

Approximately one third of the YHC inventory is staff housing and will be impacted by the modernization of that program; Dawson is an ideal community to pilot innovative, collaborative approaches to modernizing the existing staff housing program.

6.2 Housing Affordability, Suitability and Adequacy

Findings: Informants identified that the need for larger family housing was minimal, and that this cohort was prioritized by both Tr'ondëk Hwëch'in First Nation and YHC. Smaller housing units were identified as a gap, with a particular need for housing for single adults.

Multigenerational households living in overcrowded housing, and the prevalence of deteriorating and unsafe housing were identified as significant challenges for Tr'ondëk Hwëch'in First Nation housing.

The current inventory of YHC housing in Dawson is aging and increasingly inadequate due to health, safety, maintenance and repair issues. More critically, the inventory of YHC housing is increasingly unsuitable, particularly in relation to accessibility and overhousing. The evidence clearly and consistently demonstrated a need for studio and one bedroom units and accessible units.

As the population ages, the needs for wheelchair accessible housing to support disabilities and aging will continue to be a priority. The existing seniors' fourplex, Fairview Manor, is more than 35 years old and does not adequately meet mobility needs. Alexander McDonald Lodge provides residential care and there is a growing cohort of seniors who are being supported to age in place in the community, who are in housing that is - in some cases grossly - inadequate and unsuitable.

Housing affordability is an issue, particularly for low income individuals. Affordability challenges are increasingly linked with vulnerabilities; KDO does not have the mandate to support this cohort and that there is increasing demand for affordable housing for vulnerable individuals.

Recommendation: It is recommended that YHC prioritize construction of at least one seniors' multiplex in Dawson. It is recommended that Fairview Manor be replaced, and that total seniors' housing capacity be expanded. The current YHC waitlist includes eight seniors; the Dawson home support program identified at least 10 individuals currently receiving home care who need accessible, affordable, appropriate housing.

It is recommended that YHC evaluate and prioritize capital asset renewal and rationalization options in Dawson. Renovation or new construction should prioritize the demand for smaller units for single adults and smaller family households. Consideration should be given to addressing the documented housing preference for housing privacy and autonomy (row housing, tiny houses, and other models that reduce the impacts of apartment style shared living). This approach is recommended because it may provide increased flexibility in addressing diverse housing needs and reducing tenant conflict, particularly with vulnerable clients.

Justification and Rationale: These recommendations are embedded both in the strategic context of the priorities and objectives of Yukon Housing Corporation, and the unique housing needs and opportunities in Dawson. The existing inventory, combined with the National Housing Strategy and local community capacity, provide a unique opportunity to modernize staff housing, renew and rationalize the aging inventory, and realign YHC housing resources in Dawson to better address growing gaps related to aging, vulnerability, affordability and availability.

6.3 Housing for Vulnerable Individuals

Findings: There was a strong consensus that many of the adults in need of housing were vulnerable, particularly single young adults. The need was not only housing availability and affordability, but also appropriate housing that would support tenants' well-being and reduce risks. Many of the individuals in need of housing are also engaged with community counsellors for mental health and substance use supports.

The identified need is for housing that provides security of tenure for single adults and couples, many of whom have vulnerabilities that increase their risk of eviction or other negative housing outcomes. Informants identified that the diverse housing needs of vulnerable adults are often incompatible with the housing needs of low income families, and that different vulnerabilities can also be incompatible with each other.

Based on current housing inventory and waitlists, the evidence suggests that addressing the housing needs of vulnerable clients requires both increased housing capacity, as well as adequate and appropriate operational and support resources to enable successful housing outcomes for diverse, and potentially incompatible, client cohorts.

Informants clearly identified that there is significant, ongoing need for both permanent supportive housing and transitional housing capacity to facilitate diverse transitions that can be challenging, including family violence and abuse, youth transitioning into adulthood (often out of a care system), and community return following incarceration or treatment.

Recommendation: It is recommended that YHC engage with Government of Yukon Health and Social Services, Tr'ondëk Hwëch'in First Nation Government, and local community organizations to explore and evaluate approaches to more appropriately meet the specific and diverse housing needs of vulnerable adults, including permanent housing with supports, low barrier approaches, and transitional housing capacity.

It is recommended that YHC prioritize a low barrier supportive housing project that focuses on older single males, potentially similar to the physical and operational design of St. Elias Group Home in Whitehorse, which provides a mix of self-contained units and congregate housing. Consideration should be given to a partnership with Health and Social Services, which operates St. Elias.

Justification and Rationale: The housing gaps for vulnerable individuals are complex, challenging, and significant. Much work has been done in Yukon, including the Safe At Home initiative, the recent Health and Social Services review, *Putting People First*, the Yukon FASD Action Plan, and the Housing Action Plan for Yukon, which incorporated housing with services as one of the core pillars of housing.

7.0 Appendix A - Housing Needs Assessment Data

7.1 Population Trends by Community 2010 - 2020

The intent of this data is to indicate that overall growth trend in rural Yukon communities relative to growth in Whitehorse. This data should be interpreted with caution and an understanding of statistical methodology. Statistically insignificant changes may appear as proportionately significant due to the very small populations.

The following table shows that there are two distinct population trends in Yukon: In the past decade, the population of Whitehorse has increased by 23%; a growth rate more than double that of rural communities. Overall, in the past decade populations in rural communities increased by 10% but that figure represents a total of only 825 people across all communities.

At the community level, there is high variability in annual population counts due to migration. Because of the very small populations, growth trends are generally not measurable at the community level, except in larger communities such as Dawson, Watson Lake and Haines Junction.

Community	2010	2020	Change
Other	91	84	-8%
Watson Lake	1,569	1,493	-5%
Teslin	475	473	0%
Burwash Landing	101	105	4%
Mayo	452	471	4%
Faro	413	436	6%
Carcross	430	477	11%
Ross River	361	407	13%
Old Crow	235	265	13%
Pelly Crossing	346	396	14%
Tagish	245	283	16%
Haines Junction	856	989	16%
Carmacks	500	598	20%
Dawson City	1,891	2,277	20%
Destruction Bay	48	59	23%
Beaver Creek	99	124	25%
Whitehorse Area	**26,872**	**33,033**	**23%**
Rural Communities	**8,112**	**8,937**	**10%**
Yukon Total	**34,984**	**41,970**	**20%**

Data: Yukon Bureau of Statistics, Population Report, Second Quarter, 2020

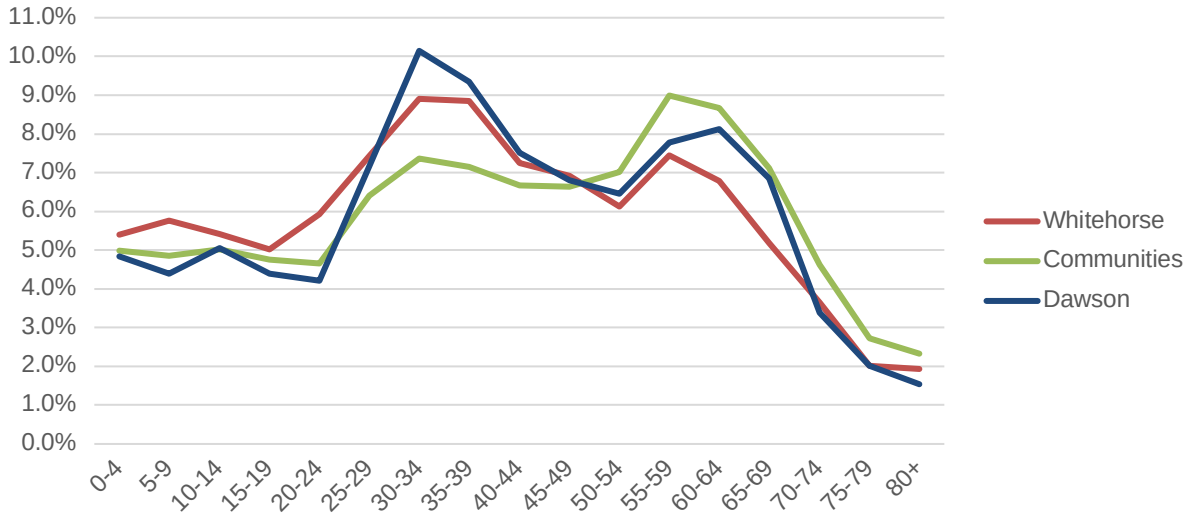
NOTES: Table excludes Mendenhall and Johnston's Crossing due to absence of 2010 population data. The data for Tagish is based on March 2020 population estimates, prior to methodological changes and boundary adjustments. The March 2020 has been used to enable a consistent comparison with the 2010 data.

7.2 Comparison of Age Distribution: Whitehorse, Rural Communities and Dawson

	Whitehorse		Communities		Dawson	
Age Cohort	Pop'n Count	% of Total	Pop'n Count	% of Total	Pop'n Count	% of Total
0-4	1,781	5.4%	459	5.0%	110	4.8%
5-9	1,902	5.8%	447	4.9%	100	4.4%
10-14	1,787	5.4%	462	5.0%	115	5.1%
15-19	1,656	5.0%	437	4.8%	100	4.4%
20-24	1,960	5.9%	428	4.7%	96	4.2%
25-29	2,457	7.4%	589	6.4%	163	7.2%
30-34	2,942	8.9%	678	7.4%	231	10.1%
35-39	2,923	8.8%	658	7.2%	213	9.4%
40-44	2,395	7.3%	614	6.7%	171	7.5%
45-49	2,287	6.9%	610	6.6%	155	6.8%
50-54	2,025	6.1%	646	7.0%	147	6.5%
55-59	2,458	7.4%	827	9.0%	177	7.8%
60-64	2,242	6.8%	798	8.7%	185	8.1%
65-69	1,710	5.2%	655	7.1%	156	6.9%
70-74	1,205	3.6%	425	4.6%	77	3.4%
75-79	665	2.0%	250	2.7%	46	2.0%
80+	638	1.9%	214	2.3%	35	1.5%
Totals	**33,033**		**9,197**		**2,277**	

Data: Yukon Bureau of Statistics, Population Report, Second Quarter, 2020

The following chart compares the average age distribution across all 17 rural communities in Yukon, Whitehorse, and Dawson. The chart shows that the age profile of Dawson is more like Whitehorse than rural communities. Dawson has proportionately fewer children and more working age adults than either Whitehorse or rural Yukon.



Data: Yukon Bureau of Statistics, Population Report, Second Quarter, 2020

7.3 Indigenous Population in Yukon by Geography

Geographic Area	Indigenous Population	Total Population	% Pop'n Indigenous
Yukon	8,591	42,230	20%
Whitehorse	4,867	33,033	15%
Rural Communities	3,724	9,197	40%
Dawson	416	2,277	18%

Data: Yukon Bureau of Statistics, Population Report, Second Quarter, 2020

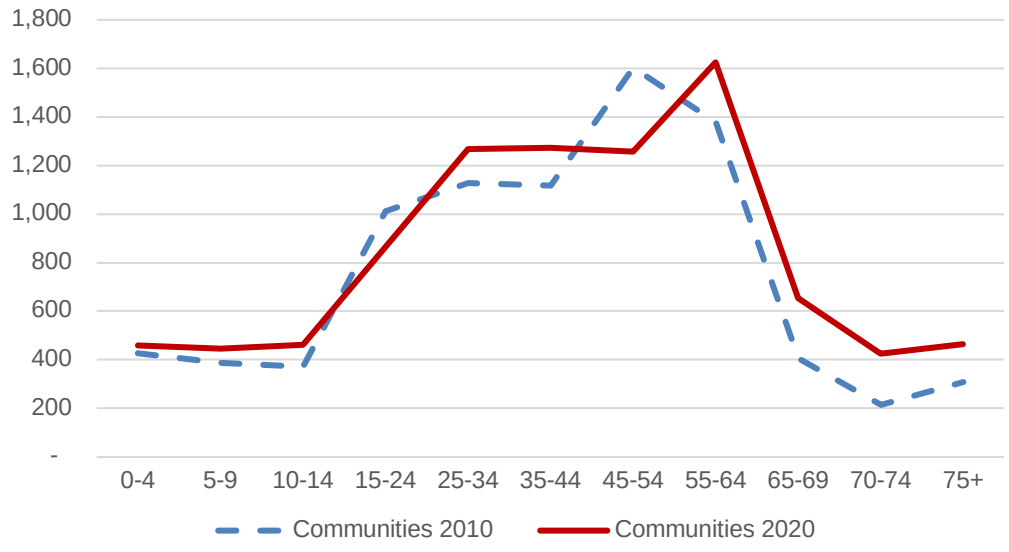
7.4 Median Age by Geography

Geographic Area	Median Age
Yukon	39.5
Whitehorse	38.3
Dawson	39.7

Data: Statistics Canada Census 2016

7.5 Aging Population in Yukon Communities 2010 - 2020

The data shows that while there is insignificant population growth in rural Yukon communities, there is a clear trend of an aging population. This chart shows a comparison of the age profile across all rural communities in Yukon in 2010 and 2020.



Data: Yukon Bureau of Statistics Population Report, Second Quarter 2020; 2010 Statistical Review

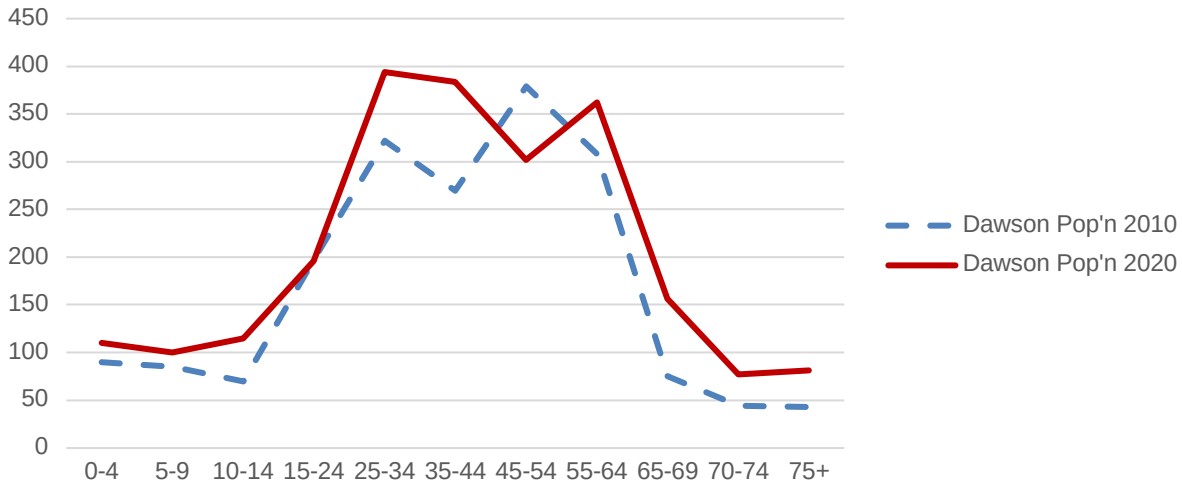
7.6 Population Shifts in Dawson 2010 - 2020

The following data shows that the while the proportion of the population of Dawson is aging, consistent with the trend across rural Yukon communities, there has also been a shift towards a younger working age cohort.

While the absolute number of seniors and Elders has nearly doubled between 2010 and 2020, that cohort is a small proportion of the total population. Migration, likely linked with employment, has been a larger factor, with a decrease in the 45-65 population, and an increase in the 25-44 age cohort. The total population in 2010 was1,883, and the total population in 2020 was 2,277, an increase of 21%.

Dawson exemplifies the unique demographic trends of the Yukon: very low proportion of children and seniors relative to Canadian averages, and a relatively larger, highly mobile working age population.

Age Cohort	Dawson Pop'n 2010	Dawson Pop'n 2020	% of Pop'n 2010	% of Pop'n 2020
0-4	90	110	5%	5%
5-9	85	100	5%	4%
10-14	70	115	4%	5%
15-24	197	196	10%	9%
25-34	322	394	17%	17%
35-44	270	384	14%	17%
45-54	379	302	20%	13%
55-64	308	362	16%	16%
65-69	75	156	4%	7%
70-74	44	77	2%	3%
75+	43	81	2%	4%



Data: Yukon Bureau of Statistics Population Report, Second Quarter 2020; 2010 Statistical Review

7.7 Migration and Mobility - Impact on Community Demographics

The population, particularly in rural Yukon communities, is highly mobile: between 2005 and 2010, on average 63% of the population moved in or out of the community, compared with 46% in Whitehorse. The total migration rate in Dawson between 2005 and 2010 was 61% - close to the 63% average for rural communities and significantly higher than the 46% rate in Whitehorse.

Yukon Bureau of Statistics data on migration patterns between 2005 and 2010 found that of those who moved within Yukon, 52% moved to Whitehorse, 38% moved away from Yukon, and 10% moved between communities.

	2005 Pop'n	In migrants	Out migrants	Total migrants	% of 2005 Pop'n
Beaver Creek	120	54	58	112	93%
Burwash Landing	89	50	28	78	88%
Carcross	444	157	139	296	67%
Carmacks	378	164	82	246	65%
Destruction Bay	59	19	23	42	71%
Dawson City	1,825	602	504	1,106	61%
Faro	381	156	116	272	71%
Haines Junction	817	246	197	443	54%
Mayo	378	141	80	221	58%
Marsh Lake	336	161	101	262	78%
Old Crow	259	108	89	197	76%
Other Yukon	111	51	54	105	95%
Pelly Crossing	281	114	70	184	65%
Ross River	345	97	68	165	48%
Tagish	187	94	60	154	82%
Teslin	417	172	114	286	69%
Watson Lake	1,522	425	380	805	53%
Subtotal Communities	**7,949**	**2,811**	**2,163**	**4,974**	**63%**
Whitehorse	**23,270**	**6,539**	**4,247**	**10,786**	**46%**
Outside Yukon	-	(126)	(68)	(194)	
Yukon Total	31,219	9,224	6,342	15,760	50%

Data: Yukon Bureau of Statistics, Yukon Migration Patterns 2010

Note: 2010 data is the most recent available data for migration trends at the community level in Yukon

Migration has a larger demographic impact than births and deaths in all Yukon communities, including Whitehorse.

	2005 Pop'n	Births	Deaths	Net Pop'n Replacement	Net Migration
Beaver Creek	120	4	2	2	(4)
Burwash Landing	89	7	4	3	22
Carcross	444	16	28	(12)	18
Carmacks	378	34	9	25	82
Destruction Bay	59	2	2	-	(4)
Dawson City	1,825	88	44	44	98
Faro	381	21	12	9	40
Haines Junction	817	39	34	5	49
Mayo	378	12	12	-	61
Marsh Lake	336	8	12	(4)	60
Old Crow	259	14	15	(1)	19
Other Yukon	111	-	5	(5)	(3)
Pelly Crossing	281	30	7	23	44
Ross River	345	17	13	4	29
Tagish	187	4	14	(10)	34
Teslin	417	25	22	3	58
Watson Lake	1,522	79	44	35	45
Subtotal Communities	**7,949**	**400**	**279**	**121**	**648**
Whitehorse	**23,270**	1,273	569	704	2,292
Outside Yukon	-	126	68	58	(58)
Yukon Total	31,219	1,799	916	883	2,882

Data: Yukon Bureau of Statistics, Yukon Migration Patterns 2010

Note: 2010 data is the most recent available data for migration trends at the community level in Yukon

Statistics Canada 2016 Census includes mobility data. This data has been included because it is more recent than the YBS data. However, **the Census 2016 data on mobility should be interpreted with caution as it is likely to be an underestimate due to census methodologies**. The census data in Yukon is incomplete due to census boundaries and gaps in participation. Additionally the mobility data is estimated from a 25% sample. The differentiation of "movers" and "migrants" may also contribute to an underestimate: "Movers include non-migrants and migrants. Non-migrants are persons who did move but remained in the same city, town, township, village or Indian reserve. Migrants include internal migrants, who moved to a different city, town, township, village or Indian reserve within Canada".

The Census data indicates that a minimum total of 21% of the population in rural Yukon communities had migrated in or out of their community in the five year period, compared with the Canadian average of 17% of the population.

Mobility Status - 5 Years Ago	Yukon	Whitehorse	Rural (calculation)	Canada
Total - 25% sample data	32,985	23,015	9,970	32,568,560
Non-movers	18,040	11,820	6,220	20,134,760
Movers	14,945	11,195	3,750	12,433,805
Non-migrants	8,245	6,610	1,635	6,755,630
Migrants	6,705	4,585	2,120	5,678,175
Internal migrants	5,515	3,665	1,850	4,296,720
Intraprovincial migrants	1,235	495	740	3,467,670
Interprovincial migrants	4,280	3,170	1,110	829,045
External migrants	1,190	925	265	1,381,460

Mobility Status as a Percentage	Yukon	Whitehorse	Rural (calculation)	Canada
Non-movers	55%	51%	62%	62%
Movers	45%	49%	38%	38%
Non-migrants	25%	29%	16%	21%
Migrants	20%	20%	21%	17%
Internal migrants (within Canada)	17%	16%	19%	13%
Intraprovincial migrants	4%	2%	7%	11%
Interprovincial migrants	13%	14%	11%	3%
External migrants	4%	4%	3%	4%

Source: Statistics Canada Census 2016

Note: Refers to the status of a person with regard to the place of residence on the reference day, May 10, 2016, in relation to the place of residence on the same date five years earlier at the provincial level. Persons who have not moved are referred to as non-movers and persons who have moved from one residence to another are referred to as movers. Movers include non-migrants and migrants. Non-migrants are persons who did move but remained in the same city, town, township, village or Indian reserve. Migrants include internal migrants, who moved to a different city, town, township, village or Indian reserve within Canada. External migrants include persons who lived outside Canada at the earlier reference date.

7.8 Core Housing Need Data

Core housing need comprises three dimensions:

1. Affordability – is based on housing cost that is more than 30% of total before-tax household income.
2. Adequacy – is a measure of whether or not the housing requires major repairs.
3. Suitability – is housing that has enough bedrooms for the size and make-up of resident households, according to National Occupancy Standard (NOS) requirements.

Core need is dependent on both the housing conditions and income. CMHC defines core housing need in any household that falls below at least one of the standards **AND** if that household would have to pay more than 30% of its total household before-tax income to pay the median market rent of alternative local housing that meets all three of the standards.

Yukon Bureau of Statistics has published a detailed analysis of core housing need based on Census 2016 data. The following table provides a summary comparison.

Community	Rate of Core Need	Rate of Unaffordable Housing	Rate of Inadequate Housing	Rate of Unsuitable Housing
Canada	12.7%	24.1%	6.5%	4.9%
Yukon	15.2%	18.4%	12.5%	4.8%
Whitehorse	12.9%	19.8%	8.7%	4.3%
Communities-average	28.2%	15.4%	24.0%	6.1%
Dawson	18.8%	14.0%	11.7%	5.8%

Yukon Bureau of Statistics Housing Census 2016

- **The overall rate of core need in Dawson is higher than Whitehorse, but lower than the average for rural communities in Yukon.**
- **The rate of unaffordability in Dawson is lower than anywhere else in Yukon or Canada.**
- Core housing need in Whitehorse matches the national average, but the prevalence of core need rate in rural communities is nearly double the rate for Yukon overall.
- In Whitehorse, despite much higher incomes, affordability is a key factor because the cost of the housing is high. In the communities, despite lower incomes, the gap in housing adequacy is greater than the gap in housing affordability, relative to Yukon overall.
- Overall in Yukon, 12.5% of housing requires major repairs, but the proportion for First Nations housing is 41% across Yukon.[57]
- The rate of inadequate housing in rural communities is very high, indicating a high prevalence of core need, although the absolute number of households is low.

7.9 Yukon Housing Corporation Ratio Population:Housing by Community

Community	2020 Pop'n	YHC Units*	Ratio Pop'n: Housing
Other	84	0	0
Beaver Creek	124	3	41:1
Burwash Landing	105	0	0
Carmacks	598	41	15:1
Destruction Bay	59	2	30:1
Faro	436	21	21:1
Haines Junction	989	28	35:1
Johnstons Crossing	54	0	0
Mendenhall	130	0	0
Old Crow	265	7	38:1
Pelly Crossing	396	10	37:1
Ross River	407	37	11:1
Tagish	359	0	0
Teslin	473	27	18:1
Watson Lake	1,493	87	17:1
Carcross	477	10	48:1
Dawson City	2,277	97	23:1
Mayo	471	32	15:1
Whitehorse Area	33,033	489	68:1
Rural Subtotal	9,197	402	23:1
Yukon Total	42,230	891	47:1

Yukon Bureau of Statistics Population Report, Second Quarter 2020, YHC Annual Report 2020

** Community housing units may be allocated either as employee or subsidized housing*

7.10 Census 2016 Housing Data - Canada and Yukon

Compared with the Canadian average, the home ownership rate in Yukon is 4.2% lower.

Nearly twice as many Yukon renters live in subsidized housing than the national average.

Compared with the Canadian average, 5.7% fewer Yukon households spend more than 30% of their income on housing.

Canada and Yukon - Key Housing Metrics	Canada	Yukon
Median total household income	$70,336	$84,521
Home ownership rate	67.8%	63.6%
% of tenant households in subsidized housing	13.0%	25.0%
Households spending more than 30% of income on housing	24.1%	18.4%

Yukon Bureau of Statistics: Housing. Census 2016

7.11 Census 2016 Housing Data - Yukon and Dawson

Dawson has a higher proportion households that rent compared with the Yukon average, but nearly twice as many renter households are in subsidized housing - a total of 48.6% of all renters.

Key Housing Metrics	Yukon		Dawson	
Total households in sample	15,215		680	
Housing tenure - renter	5,005	33%	370	54%
Housing tenure - owner	9,680	64%	310	46%
Band housing	530	3%	0	0%
Spending 30% or more on shelter	2,680	28%	100	15%

Statistics Canada Census 2016

Housing Costs and Subsidies	Yukon	Dawson
% of tenants in subsidized housing	25.1%	48.6%
Average monthly cost - rental housing	$1,038	$733

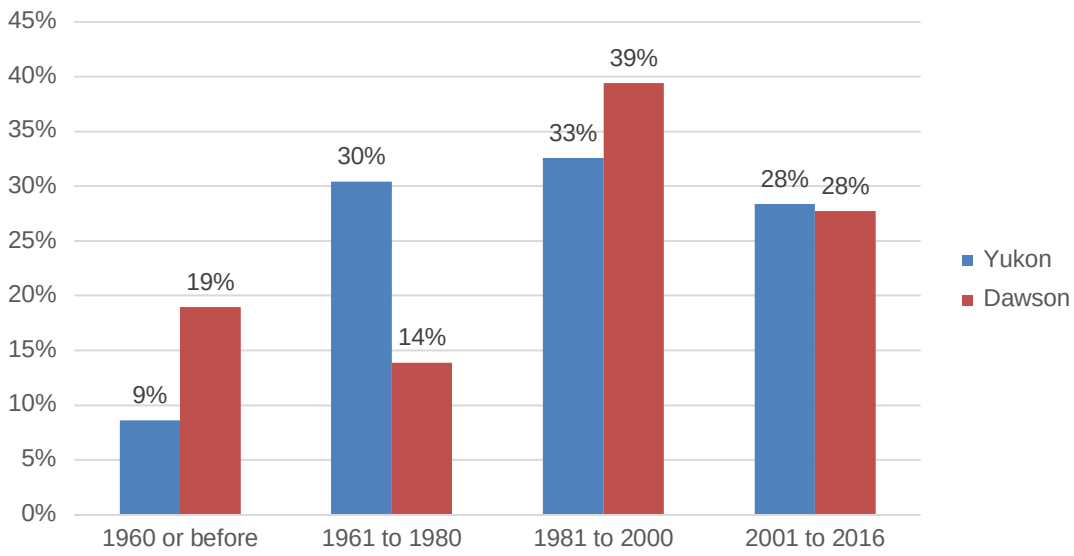
Statistics Canada Census 2016

7.12 Dwellings by Period of Construction

For both Yukon overall and Dawson, 72% of dwellings are more than 20 years old. Dawson has a disproportionately high proportion (19%) of dwellings that were constructed in 1960 or earlier; this is likely due to the number of designated heritage structures.

Dwellings by Period of Construction	Yukon	Dawson
1960 or before	9%	19%
1961 to 1980	30%	14%
1981 to 2000	33%	39%
2001 to 2016	28%	28%
% of housing that is more than 20 years old	72%	72%

Statistics Canada Census 2016



Statistics Canada Census 2016

7.13 Median Household Income by Community

1	Beaver Creek	$85,760
2	Teslin	$85,077
3	Old Crow	$77,056
4	Mayo	$75,264
5	Haines Junction	$69,824
6	Dawson	$68,608
7	Watson Lake	$63,872
8	Faro	$62,165
9	Burwash Landing	$61,995
10	Carmacks	$61,824
11	Pelly Crossing	$56,448
12	Carcross	$54,848
13	Tagish	$51,712
14	Ross River	$45,013
	Average*	**$65,676**

Yukon Bureau of Statistics: Income. Census 2016

** Note: unweighted average*

8.0 Appendix B - Key Informant Interviews

Jillian Hardie, Executive Director/CEO, Challenge Disability Resource Group

Shonagh McCrindle, Executive Director, Inclusion Yukon

Frank Bachmier, Yukon Council on Aging

Wenda Bradley, Executive Director, Fetal Alcohol Syndrome Society of Yukon (FASSY)

Kate Mechan, Executive Director, Safe at Home

Rachel McRorie, Supervisor, Home Care Services, Yukon Health and Social Services

Caroline Alain, Community Liaison Coordinator, Yukon Health and Social Services

Lisa Robertson, Community Liaison Co-ordinator, Continuing Care, Yukon Health and Social Services

Savannah McKenzie, Regional Social Worker, Health and Social Services

Jason Watters, Probation Officer, Department of Justice

Amaris Poznikoff, Manager, McDonald Lodge, Continuing Care, Health and Social Services

Cari Tangedal, Substance Use Counsellor, Health and Social Services

Wendy Wilson, Dawson Manager, Yukon Housing Corporation

Evelyn Pollock, Community Economic Development Officer, Klondike Development Corporation

Nancy Hunter, Supervisor, Dawson Medical Clinic, Health and Social Services

Wayne Potoroka, Mayor, Dawson City

Jen Gibbs, Executive Director, Dawson Women's Shelter

Sean Schmidt, Men's Shelter Coordinator, Tr'ondëk Hwëch'in Government

Peter Marangu, Housing and Infrastructure Director, Tr'ondëk Hwëch'in Government

Mike Massarey, Chief, Dawson Fire Department

Endnotes

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RCMP·GRC
ROYAL CANADIAN MOUNTED POLICE • GENDARMERIE ROYALE DU CANADA

MONTHLY POLICING REPORT
April 2021

Dawson City RCMP Detachment
"M" Division Yukon

The Dawson City RCMP Detachment responded to a total of 143 calls for service during the month of April, 2021.

OCCURENCES	April, 2021	Year to Date 2021	April, 2020	Year to date 2020	Year Total 2020
Assaults (all categories)	2	21	0	16	52
Sexual Assault	1	5	0	3	6
Break and Enter	1	6	0	3	13
Thefts (all categories)	2	12	0	8	56
Drugs (all categories)	2	8	0	8	28
Cause A Disturbance	6	21	3	14	70
Mischief	18	44	0		144
Impaired Driving	3	9	0	6	33
Vehicle Collisions	2	15	2	17	44
Mental Health Act	3	18	7	19	42
Assistance to General Public	1	13	0	40	81
Missing Persons (Search and Rescue) and Missing	0	5	0	1	28
Wellbeing Checks	6	18	6	32	74
Check Stops (represents number of vehicles checked at one check stop)	0	0	0	288	502
Other Calls for Service	104	300	125	334	922
Total Calls for Service	151	495	143	789	2095
Total Criminal Code Charges	3	48	3	11	69
Total Liquor Act/MVACharges	2 MVAct 1 Liquor Act 1 CEMA	3 MVAct 1 Liquor Act 1 CEMA	3 MVAct	6 MVAct	9 Motor Vehicle Act

PLEASE NOTE: The statistic numbers in the report may change monthly as file scoring is added, deleted or changed. This occurs as investigations develop resulting in additional charges or proving an incident to be unfounded.

It's Spring time in the Klondike!

	April, 2021	Year to Date 2021 Total	April, 2020	Year Total 2020
Prisoners held locally	6	20	3	44
Prisoners remanded	0	3	0	2
Total Prisoners	6	20	3	46

Justice Reports	April, 2021	Year to Date 2021	April 2020	Year Total 2020
Victim Services Referrals Offered	7	26	3	54
Youth Diversions	1	1	0	1
Adult Diversions	0	0	0	2
Restorative Justice Total	1	1	0	3

Annual Performance Plan (A.P.P.) Community Priorities

Community approved priorities are:

(1) Substance Abuse
(2) Road Safety
(3) Youth Initiatives
(4) Attendance at THFN and Community Events
(5) Restorative Justice

(1) Substance Abuse

As the temperature has increased, so have foot patrols and licensed premises checks in and around the downtown area. RCMP members have continued to make it a priority to ensure that individuals are enjoying the warm weather responsibly through increased patrols. More specifically, patrols have been conducted at higher traffic hours in order to encourage people to make appropriate decisions. Should individuals be found without a suitable driving arrangement, RCMP have continued to offer rides for safety purposes.

(2) Road Safety

The RCMP Traffic Section from Whitehorse have been scheduled to attend the area and assist in both enforcement and education to help ensure compliance with commercial vehicle regulations.

With the ever increasing flow of traffic, all members have upped efforts to curb the dangers of impaired driving by conducting more traffic stops where Mandatory Alcohol Screening is conducted.

(3) Youth Initiatives

The Top Cop Reading Program continues with grades K to 4. Children are being encouraged to read or be read to at home with the program. Partnerships have been sought with local business for prizes which will be distributed the following month.

Members have been active with school zone patrols and have participated in numerous events with youth both during and outside of school hours. Events such as hall hockey and soccer games have been well received by the youth and are planned to continue.

Cst. Tower conducted two separate safety talks with Kindergarteners as well as children at the Little Blue Day Care.

(4) Attendance at THFN and Community Events

The majority of detachment members hosted the Women's Shelter for training in relation to

gender identity, violence in relationships and potential biases surrounding such issues. The presentation was well received and the RCMP's relationship with the women's shelter continues to benefit from a shared understanding of each other's respective roles within the community.

Members have continued volunteer efforts with community events such as elder bingo and the Moose Mountain event where supervision and assistance was given to riders using the T-bar.

Several meetings were conducted throughout the month including an emergency management tabletop exercise for an aircraft related scenario. Additionally, meetings with the Recreation Department regarding a youth trail project as well as a meeting with the Hospital for safety planning were conducted.

(5) Restorative Justice

A Restorative Justice Circle was held involving several youths and was considered extremely beneficial. As a result, it is anticipated that the criminal case will be diverted and there will instead be focus on healing and understanding. The matter remains outstanding and will be fully addressed during the next court circuit.

Fun Fact

Canadians between the ages of 14 and 25 have one of the highest rates of cannabis use in the world. It's the drug they use most after alcohol. Most young people see cannabis as a benign drug, far less dangerous than alcohol. Driving under the influence of cannabis is not risk free and studies have shown that driving while impaired by Cannabis can result in a shorter attention span, altered perception of time and distance and a slower reaction time to sudden events in traffic.

Some private insurance companies will not insure drivers for a period of three years after an impaired driving conviction. Should a company decide to provide insurance, the premium can increase drastically (up to 365%).

It's never too early or late to educate someone you care about on the risks of impaired driving.

Kindest regards,

Cst. David MacNeil

for

Sgt. Rob MORIN
N. C. O. In Charge

20 May 2021

Mayor and Council
Municipality of the City of Dawson

RE: Klondike Visitors Association (KVA) Board of Directors Advisory Position

Dear Mayor Potoroka,

We are pleased to invite you to become an advisory board member of the Klondike Visitors Association (KVA).

In order to be successful, KVA depends on a network of relationships with stakeholders across the tourism sector. Accordingly, our constitution provides for annual appointment of non-voting board advisors representing specific stakeholder agencies, including Tr'ondëk Hwëch'in Government and Yukon Government. The board appreciates the wealth of knowledge that a City of Dawson representative would contribute to the development of tourism in the Klondike region.

Advisors receive a formal KVA board orientation binder with background reference materials. Regular board meetings are generally held on the evening of the third Wednesday each month and board meeting packages are available in advance of meetings. All advisors are welcome to attend all board meetings but attendance is not mandatory and advisors may choose their level of involvement as well as designate substitute attendees depending on availability or issues and topics under consideration.

Elected members of KVA's Board of Directors for the 2021/2022 operating year are:

Chair:	Sue Lancaster	Past Chair:	Brian Stethem
1st Vice Chair:	Ueli Kunzi	Member:	Dianne Brooks
2nd Vice Chair:	Alex Somerville	Member:	Paul Townes
Treasurer:	Marianne Collins	Member:	Lindsay Birss
Secretary:	Steve Nordic		

We look forward to the collaborative development of tourism assets and in turn look forward to your favourable response to this invitation.

Sincerely,
ON BEHALF OF KLONDIKE VISITORS ASSOCIATION

Ricky Mawunganidze
Executive Director
Tel: (867) 993-5575 Ext. 104
Email: rmawunganidze@dawson.net

From: Molly Shore
To: CAO Dawson; Executive Assistant
Subject: Fwd: Block Q Ladue Estates
Date: June 2, 2021 4:28:27 PM

For correspondence record

---------- Forwarded message ---------
From: **Xander Mann** <mann.xander@gmail.com>
Date: Wed, Jun 2, 2021 at 4:12 PM
Subject: Block Q Ladue Estates
To: <stephen.johnson@cityofdawson.ca>, <bill.kendrick@cityofdawson.ca>, <molly.shore@cityofdawson.ca>, <natasha.ayoub@cityofdawson.ca>, <wayne.potoroka@cityofdawson.ca>

Good afternoon, I will keep this brief as I'm sure the five of you are sifting through more than the usual amount of correspondence.

I am fortunate enough to have a house in Dawson City, a community I am proud to call home, and have for over 20 years. We all know that our town is small and populated with human beings, and as a result of that, I have seen nepotism and blatant favouritism cause deep and powerful schisms throughout our community. Unfortunately Mayor and Council have not always been immune to these issues (not specifically this group, but also not specifically not this group) so when there is an issue that affects the entire town and I see and hear what to me seems like personal feelings and relationships being an overly strong factor in some Counselors decision making, it upsets me deeply.

Dawson City has had a housing crisis just about as long as I can remember. It's very easy when you haven't had to do the Dawson Shuffle every 4-6 months in a decade or more to forget what it's like to not know where you're going to live next month. To have down payments, mortgage brokers on board, fistfulls of cash, and still not have a safe roof over your head because there simply isn't anything out there.

I beseech you to think about how it weakens our community when vibrant, talented people leave our town because they can't find a place to raise their family. Next compare that to the idea of every tax payer in this community continuing to subsidize a private business at the direct cost of those potential citizens and a place to house them.

No one can deny the importance of the tourism sector to our towns economy. But prioritizing and subsidizing a private campground whose existence will not make or break tourism in town over making space for our community to actually grow seems short sighted and frankly obscene.

Thank you for taking time to read this, and good day.

Xander Mann
Dawson City Resident 1985-1994, 2008-Current

From:	Wayne Potoroka
To:	CAO Dawson; Executive Assistant
Subject:	FW: TONIGHTS BLOCK Q VOTE
Date:	June 3, 2021 5:43:42 PM

From: Aaron W <ajworoniuk@gmail.com>
Sent: June 1, 2021 11:16 PM
To: stephen.johnson@cityofdawson.ca; molly.shore@cityofdawson.ca; wayne.potoroka@cityofdawson.ca; bill.kendrick@cityofdawson.ca; natasha.ayoub@cityofdawson.ca
Subject: TONIGHTS BLOCK Q VOTE

Hey Ya'll

I'm not looking for a response to this, but more as a rhetorical thought experiment for my CoD elected representatives.

Do you personally know anyone that is currently looking to purchase a house or lot?

Do you personally know anyone who has left town because"there's no housing available" whether for sale or for rent?

Have you ever expressed the opinion that "YG doesn't release enough land"?

Do you complain about a lack of healthcare, trades or other professionals moving to Dawson?

Do you attempt to spend taxpayer dollars in the most fiscally responsible way?

Are you concerned about a labour shortage for local businesses?

If you vote against Block Q for residential housing, consider the above as your vote will be in direct opposition.

It's a bit absurd to prioritize tourists instead of residents in a geographically constrained townsite that everyone is aware is in a housing crisis.

I'd expect every elected CoD official knows this already, even you. Businesses will be fine, Dawson City residents have nowhere to live at this very moment.
Water and sewer to Block Q is cheap. North end sucks,.Dome/Slinky sucks. Expensive and a mess.

We all know this.
Natasha.
Stephen.
Bill.
Molly

Wayne.

There's nowhere to live in Dawson, and I say this as a homeowner
Open Block Q to residential development, tourism will survive but it gives residents a chance

Aaron Woroniuk
Dawson Resident (2003-?)

June 2, 2021
Dawson, YT

To Dawson City Council,

This letter is in regards to the upcoming decision being made about Block Q and its future as either a campground or as residential lots.

First and foremost, I would like to assert my belief that these lots should unequivocally be sold for residential use. It has been clearly and repeatedly proven that Dawson City is and has been facing a severe housing crisis for many years. Housing is absolutely essential to the long-term viability of Dawson City as a thriving, healthy and inclusive community. Furthermore, it is essential to living anywhere, period. I have lived year-round in Dawson for over 5 years and for most of that time, my partner and I were essentially professional house sitters, due to an unstable and extremely expensive rental market with very little tenant protection. Owning a home was never even a factor in our minds, it seemed so out of reach. We are now better established here, and as our circumstances slowly change, we find ourselves looking forward into the future and wondering whether there is a place for us here in Dawson City. We love this place, and would like nothing more than to make this our home for the foreseeable future, to build our life here.

I mention our own experience because our story is completely unremarkable and not unique whatsoever. The demand for places to live is sky high, and the demand exists right now. As mentioned at the June 1 council meeting, the 20+ lots in Block Q in addition to the 15 lots slated for imminent development in the North End would only serve to barely meet the current demand. This should be a massive priority and a glaring red flag. If even these immediate needs are not met, it will only serve to exacerbate the situation for years to come.

In deferring these lots to be slated for residential use “some other time”, what I’m hearing from certain members of council is that the housing needs of year-round, tax-paying residents should be second to seasonal and fluctuating tourism interests. This is completely and utterly unacceptable. Dawson is here and continues to thrive because people have chosen to make it their home. If an entire generation is unable to do that, the town will suffer in many ways, including significantly impacting the desirability of Dawson as a tourism destination.

I would also like to point out that of the many voices in support of the campground that almost all, including council, are property owners. In some cases, multiple property owners. To be in that position, only to tell other residents that they need to wait their turn for some unspecified date in the future is, frankly, insulting. It shows a disconnect and an indifference to the uncertainty and instability faced by so many in our community.

My own personal needs and feelings aside, I also feel compelled to point out that council voted to hire Stantec for what I imagine to be a significant amount of money to determine the best course of action. For several councillors to ignore, undermine and speculate outside the scope of the study is incredibly inappropriate and a flagrant waste of valuable City funding. What was the purpose of spending money and the community’s time only for council members to assert that they personally know better than an expert firm hired by this very council? I find that astonishing.

I urge council to make the best choice for this community, and to vote for residential lots.

I thank you for your time.

Sincerely, Nate Jones

May 31, 2021

City of Dawson,

Box 308

Dawson City, Yukon

RE: **Lease Termination at Gold Rush Campground**

Dear Mayor Potoroka and City Councillors,

Klondike Visitors Association (KVA) is writing to you as a follow up to our letter dated May 12, 2020 in relation to the abovementioned. Please consider these comments in addition to the comments in the aforementioned letter.

The KVA requests a postponement of the lease cancellation until a time the City of Dawson (the City) has developed a substantive affordable housing/home ownership plan, identified an alternative location for an in-town RV park, and/or allocated designated RV parking within the downtown core.

Our previous comments identified the importance of tourism to the Dawson City economy; attracting over 75,000 visitors to the community annually, sustaining over 300 jobs and creating millions of dollars in revenue. The availability of a downtown RV facility is an essential part of the overall visitation and economic benefits that the community receives from tourism.

We are concerned by the gaps in analysis by Stantec Consulting Ltd & Vector Research (Stantec) that could have further informed the City and the community's decision making. Addressing these gaps, is beyond the scope of this letter, however they include and are not limited to;

- Considerations for a City of Dawson operated RV park; as an alternative option
- Considerations for an alternative location for a downtown RV park
- Consideration of the effects of sharing economy short-term rentals (Airbnb etc.) on the available rental stock

Affordability is a critical factor negatively impacting the readiness of young Dawsonites to become homeowners or access long-term rentals. In the Klondike Development Organisation's (KDO) 2017 household survey report the majority of respondents identified affordability as a barrier to home ownership (p. 15). In the 2020 KDO survey report, 50% or respondents cited cost factors as barriers to homeownership (p. 19), and 73% of respondents identified affordability as a barrier to long-term rentals (p. 14). As such, the City should go beyond simply allocating Block Q as residential land and develop a homeownership/rental plan that ensures first-time homeowners and low-income residents have prioritised and/or equitable access to proposed properties across the municipality. Of course, accommodating larger populations must also include broader sustainability components such as adequate childcare services, and general municipal infrastructure development considerations.

The absence of an in-town RV park is likely to have unintended spillover effects not limited to an overwhelming increase in RVs blocking traffic and visibility on Front St. In the 2013 Downtown Revitalization Plan, the City committed to the allocation of a designated parking lot for RVs in recognition of the growing impact of RV traffic in the town. Based on record Canada and US RV sales in 2020, it is logical to presume that Canadian destinations will experience a greater influx of RV traffic in future years. It is therefore reasonable to assume that the absence of a downtown RV park coupled with the absence of designated RV parking locations, and relevant signage, is likely to exacerbate concerns in the City of Dawson.

The KVA envisions a City-led approach that balances tourism assets, and resident homeownership and rental needs. This is only possible through a measured approach that ensures that local businesses do not experience a gap in income from a downtown RV park, and the right residents have equitable access to the right housing options. An ad hoc approach to the development of Block Q fails to adequately meet the complimentary needs of residents and the business sector.

It is therefore our request that the City postpone the termination of the Gold Rush Campground lease until a time that these issues have been adequately addressed.

Sincerely

On behalf of the Klondike Visitors Association Board of Directors

Sue Lancaster

Sue Lancaster

Chairperson, Klondike Visitors Association

867-993-5575

kva@dawson.net