**WEST HANTS REGIONAL MUNICIPALITY**
**Municipal Climate Change Acton Plan (MCCAP) Agenda**
**September 14, 2022 – 11:00am**
**Sandford Council Chambers / Zoom**

**1.0 Call to Order and Identification of Designates**

**2.0 Announcements**

**3.0 Approval of Agenda and Additions**

**4.0 Approval of Minutes**

**5.0 New Business**

5.1 PACE Atlantic Presentation (Julian Boyle and Brennan Kilfoil)

5.2 PACE report (John Ogilvie)

5.3 Coastal Setback Report (Alex Dunphy)

5.4 Summer Student Reports: Building Condition Survey and Investigating Solar PV at Municipal Complexes (Sara Poirier)

5.5 Discussion: Terms of Reference (Sara Poirier)

5.6 Discussion: MCCAP Workplan 2023 (Sara Poirier)

**6.0 Business Arising from the Minutes**

6.1 Workplan Updates

(a) Electric Vehicle Chargers (Sara Poirier)

(b) Feasibility study for Electric Vehicle Fleet Conversion (Sara Poirier)

(c) GHG Emissions Reductions Employee (Alex Dunphy)

**7.0 Roundtable Discussion**

**8.0 Next Meeting Date – November 9th**

**9.0 Adjournment**

PACE Atlantic CIC
A Community Interest Corporation

West Hants
something inspiring awaits

# West Hants MCCAP: PACE Program

Julian Boyle and Brennan Kilfoil

September 2022

# Agenda

- Property Assessed Clean Energy
- PACE Atlantic CIC
- What to Expect in West Hants
- Next Steps

# Agenda

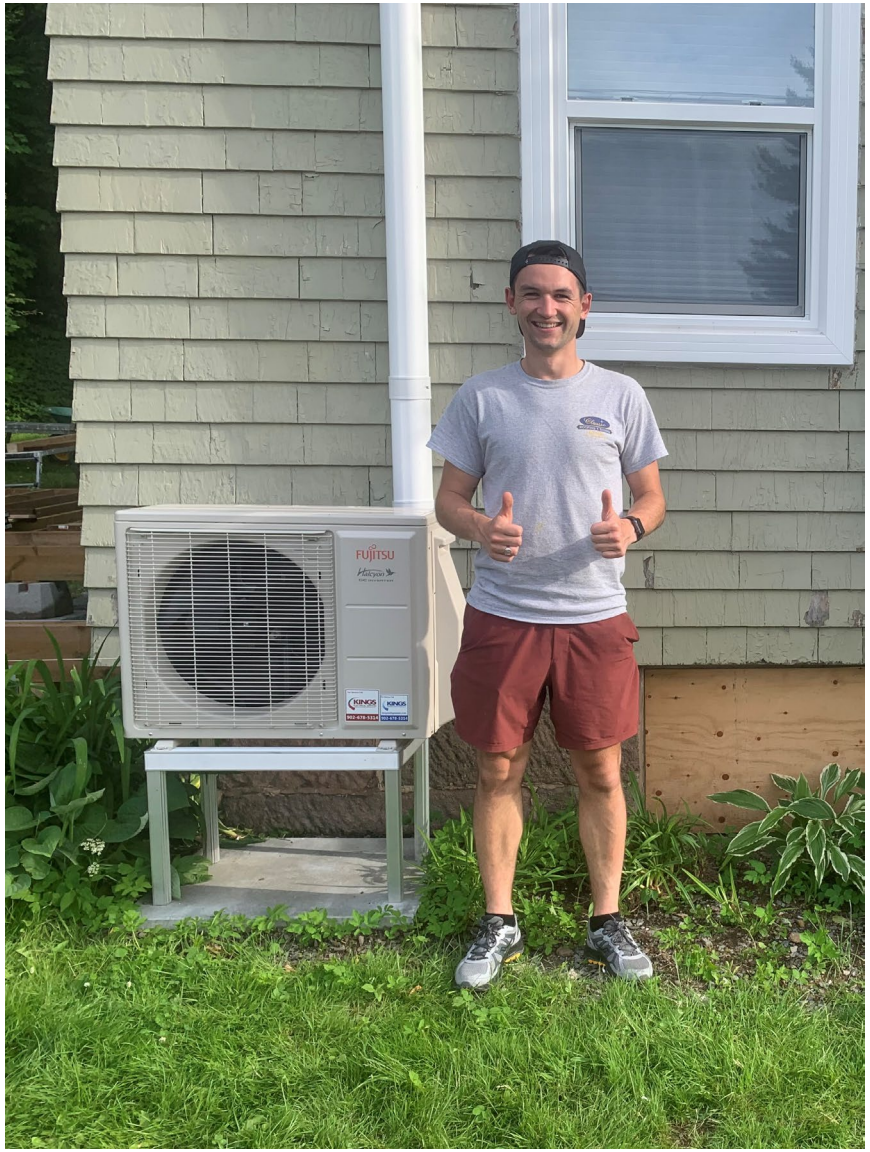
- **Property Assessed Clean Energy**
- PACE Atlantic CIC
- What to Expect in West Hants
- Next Steps

# Property Assessed Clean Energy

- PACE Mechanism – Similar to LIC (Local Improvement Charges)
- Used for both residential and commercial energy projects
- Can be funded by public and/or private lenders
- Nova Scotia is a Canadian leader – first PACE program originated 2010
- No operating cost to the Municipality
- User pay model (administration fee paid by participants)

# Agenda

- Property Assessed Clean Energy
- **PACE Atlantic CIC**
- What to Expect in West Hants
- Next Steps



# PACE Atlantic CIC

PACE Atlantic CIC
A Community Interest Corporation

- **Canadian leader** in Property Assessed Clean Energy (PACE) programming
- **Third-Party** development, administration, financing and loan management
- Running **$20M+** in active PACE Programming over four programs
- We are working with **1600+ Maritime participants**
- **700+ signed agreements** valued at $12M+ ($17k average project)
- **350+ completed projects** (solar, heat pumps, insulation, windows, etc.)

# Agenda

- Property Assessed Clean Energy
- PACE Atlantic CIC
- **What to Expect in West Hants**
- Next Steps

# PACE Atlantic CIC - Active Programming

| Registered Participants | Signed Agreements | Committed Capital | Loan Portfolio | Completed Projects | GHGs Reduced per Year |
|---|---|---|---|---|---|
| 1600 | 700 | $12M | $4.5M | 350 | 3000 |

Colchester
be centred here.

**Program Size: $7M**
**Launched: October 2021**

Town of Stratford
PRINCE EDWARD ISLAND

**Program Size: $2.5M**
**Launched: July 2021**

wolfville

**Program Size: $1.0M**
**Launched August: 2021**

CHARLOTTETOWN
Great things happen here.

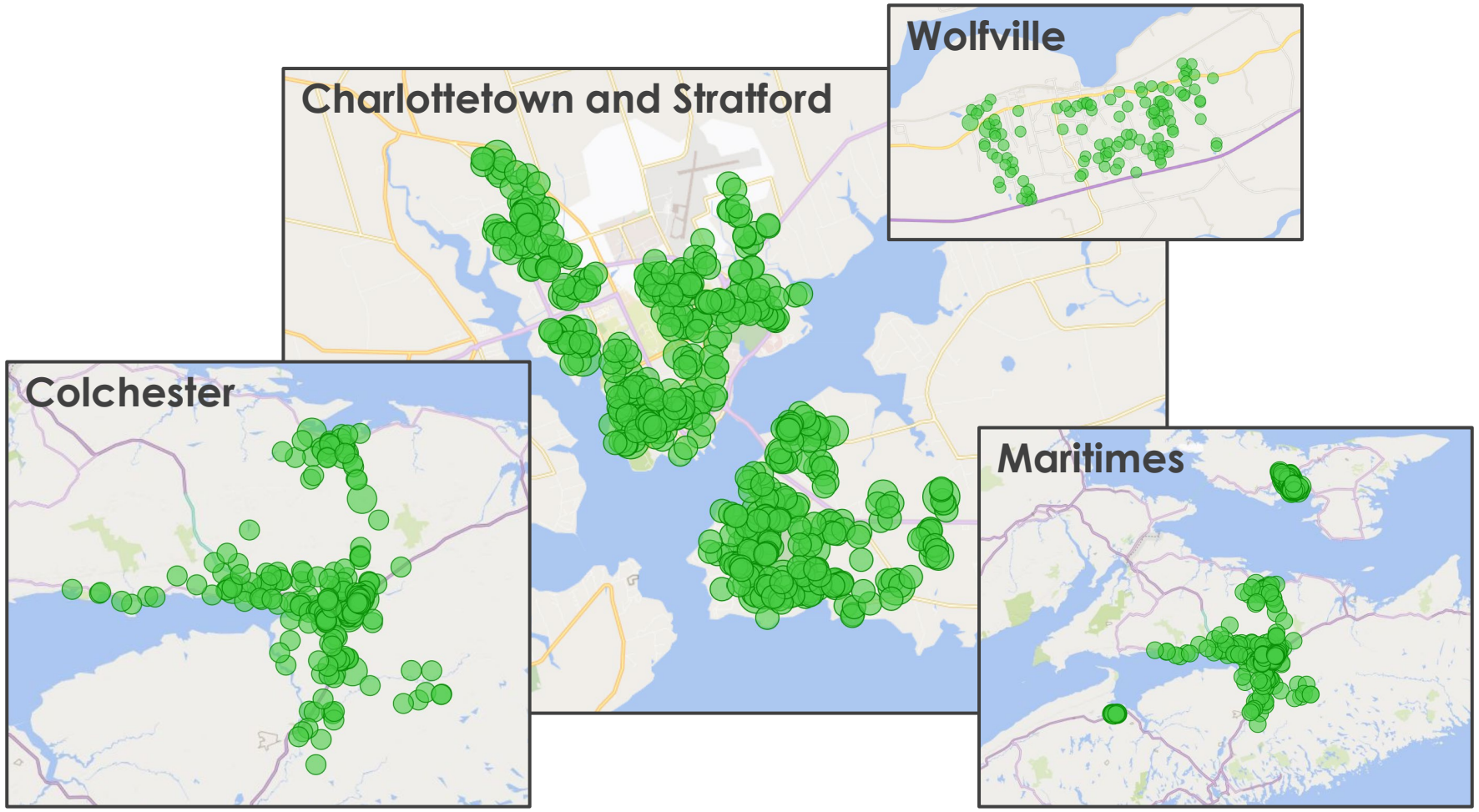
**Program Size: $8.75M**
**Launched: July 2021**

# PACE Atlantic CIC - Active Programming

Registered Participants
1600

Signed Agreements
700

Committed Capital
$12M




Completed Projects
350

Loan Portfolio
$4.5M

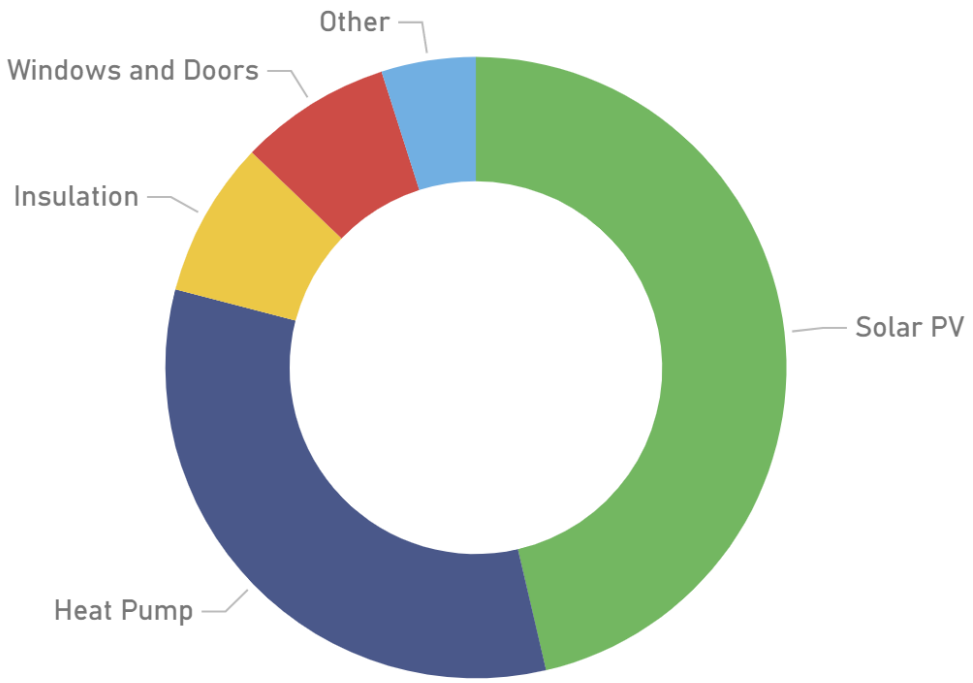
GHGs Reduced per Year
3000

Average Project

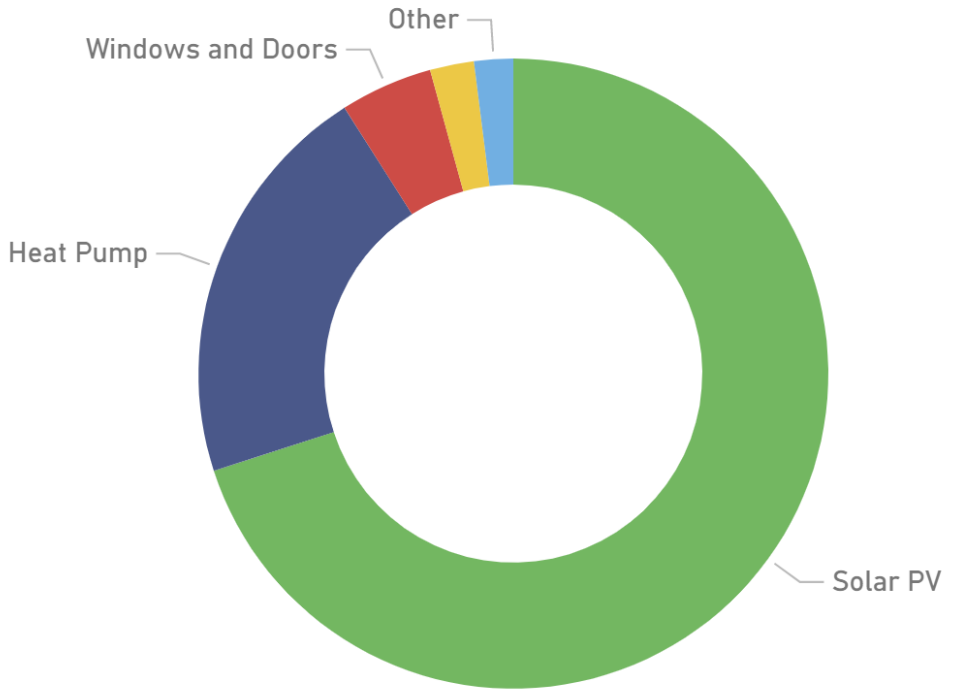
$17k

# Types of Energy Upgrades

## Job Types by Count



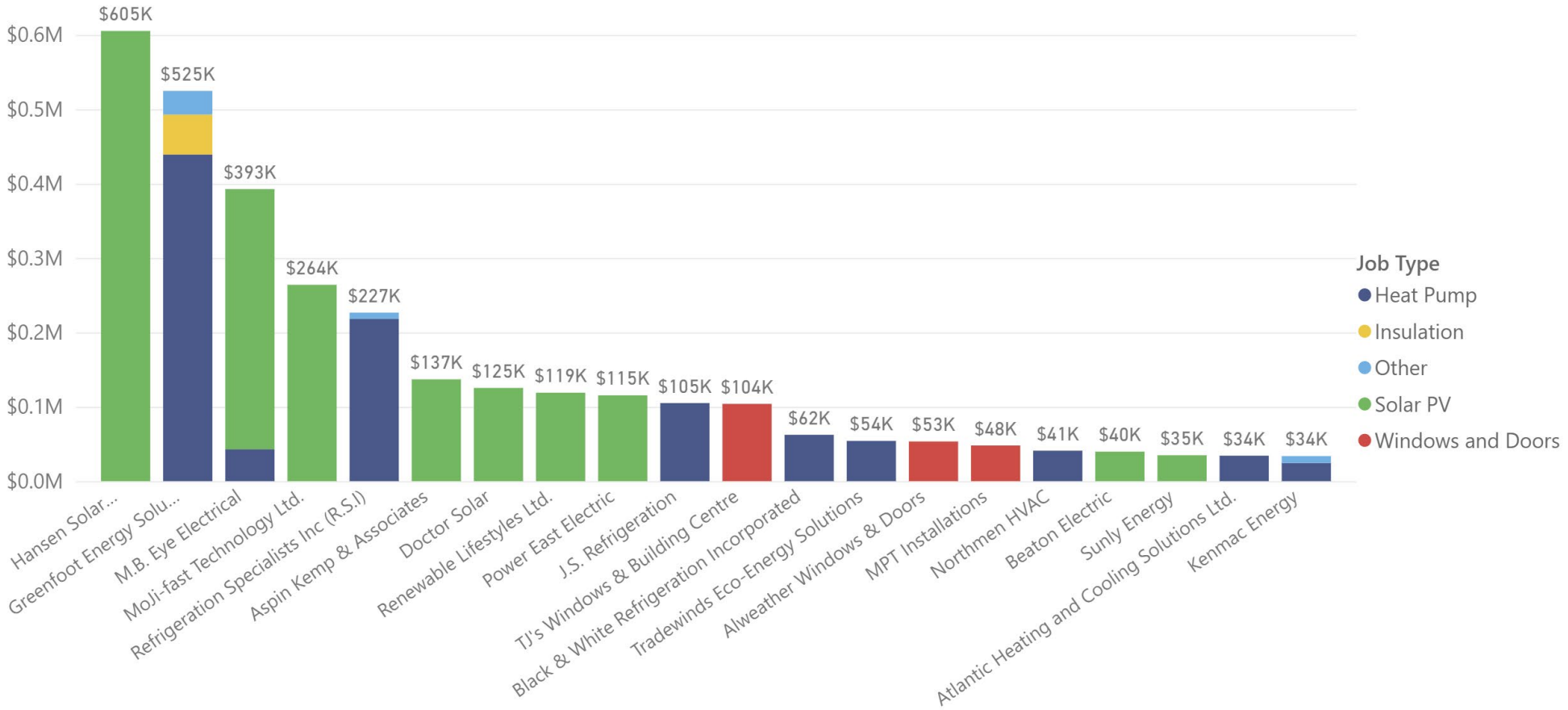

## Job Types by Value



Top 20 Contractors

85%

# Top Contractors and Job Types on PEI



# Agenda

- Property Assessed Clean Energy
- PACE Atlantic CIC
- What to Expect in West Hants
- **Next Steps**

# Next Steps:

West Hants
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- Approve PACE By-law
- Finalize Financing Plan (Under Development)
- Marketing and Communications (Under Development)
  - Engage Local Contractors (mid-Oct)
  - Community Engagement (Oct)
- Council to Approve PACE Program (Nov)
- Launch Programming this Year (mid-Nov)





PACE Atlantic CIC
A Community Interest Corporation

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# Questions?

**WEST HANTS REGIONAL MUNICIPALITY REPORT**

| | | | |
|---|---|---|---|
| Information ☐ | Recommendation X | Decision Request ☐ | Councilor Activity ☐ |

**To:** Municipal Climate Change Action Plan (MCCAP) Committee

**Submitted by:** _____
John Ogilvie, Climate Action Coordinator

**Date:** September 14, 2022

**Subject:** Property Assessed Clean Energy (PACE) Program Update, Details, and By-law

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**LEGISLATIVE AUTHORITY**

Municipal Government Act, Section 81A

**RECOMMENDATION or DECISION REQUEST**

…that the Municipal Climate Change Action Plan (MCCAP) Committee recommends that Council give First Reading and hold a Public Hearing to consider adopting a Property Assessed Clean Energy (PACE) By-law in a manner substantively the same as the draft in Attachment A of the report "Property Assessed Clean Energy (PACE) Program Update, Details, and By-law" to the MCCAP Committee dated September 14, 2022.

**BACKGROUND**

| | | | | | |
|---|---|---|---|---|---|
| Property X | Public Opinion ☐ | Environment X | Social ☐ | Economic X | Councilor Activity ☐ |

On February 22, 2022, Council approved the allocation of $10,000 in the 2022/23 operating budget to support the joint costs to apply to the Federation of Canadian Municipalities (FCM) Community Efficiency Financing (CEF) Program, for funding to develop and carry out a Property Assessed Clean Energy (PACE) Program.

On July 26, 2022, Council approved a recommendation to submit a joint application with the Town of Kentville to the FCM's CEF Program to assist with funding a PACE program. PACE

Atlantic has prepared and submitted the application on behalf of West Hants Regional Municipality (WHRM) and the Town of Kentville for a detailed program study. PACE Atlantic anticipates a response to the application around the middle of September.

The PACE program design and administration for WHRM are to be directed by the MCCAP Committee. This includes choosing eligible projects, determining the size of household funding allotments, and the creation of a by-law for program implementation.

**DISCUSSION**

*Potential Projects and Costs*

The MCCAP Committee needs to decide what type of residential projects will be included in the scope of the WHRM PACE program. Below is a list of projects that may have the most impact in energy savings (greenhouse gas emission reductions), water usage reductions, cost-efficiency, and building comfort. The list is not exhaustive; however, it represents what most existing PACE programs provide and what the FCM funding rules allow for. A key component of PACE funding is that upgrades are tied to the home, not the resident, so upgrades must be permanent.

Some items are listed as potentially free through Efficiency NS, as they currently have programs that complete those actions for free. Homeowners can contact Efficiency NS themselves for these upgrades, however they can also be suggestions made when homes are audited for PACE program applications. A major benefit of the design of the PACE program is that the loans it provides can be used in combination with federal and provincial funding sources. This means an audit for the PACE program will suggest the most cost-effective ways for homeowners to get upgrades to their homes and will assist homeowners in getting all applicable rebates/grants.

Building envelope upgrades:

- Insulation
- Replacement of windows and doors
- Weather/air sealing

Efficiency:

- LED lighting – potentially free through Efficiency NS
- Water heater replacement or blankets – $600-$3000 for new tank and professional installation, blanket potentially free through Efficiency NS
- Hot water pipe insulation – potentially free through Efficiency NS
- Drain water heat recovery – $100 or more with installation
- Low flush toilets, low-flow showerheads, etc. – potentially free through Efficiency NS
- Smart thermostat systems – approximately $100-$200 for professional installation

Fuel switching:

- Pellet/woodstoves – around $5000 depending on size
- Heat pumps (air or geothermal) – $4000-$8000 for ducted air-source heat pump, $1500-$3500 per zone for ductless air-source mini-splits, $15 000-$35 000 for geothermal systems
- Electric
- Heat pump/solar pool heaters
- EV charging stations

Green energy:

- Solar photovoltaic (PV) panels – average $0.10 per kWh, or $2 per watt
- Thermal solar panels

Climate Adaptation:

- Back-flow prevention valves
- Sump pumps
- Basement waterproofing

The MCCAP Committee can also choose to allow PACE funding for health and safety measures required for any home energy improvements. This may include wiring upgrades, service upgrades, or environmental remediation. The Town of Wolfville allows this in their PACE program.

*Individual Allotments*

PACE Atlantic anticipates that WHRM could receive up to $4 million to implement the PACE program if the funding application is successful. PACE Atlantic has suggested to achieve 200-250 building retrofits per year, the average project would cost ~$16,000. The MCCAP Committee can choose to set a project limit lower or higher than this, but to achieve maximal impact, staff recommend setting it higher than $16,000. Individual households may require multiple actions, which will cost more up front. This is due to the effectiveness of certain actions being compounded by others, such as proper building insulation and the installation of a heat pump. Without properly insulating a home, a heat pump will not be cost-effective or efficient. Larger allotments would also assist in achieving deeper greenhouse gas (GHG) emission cuts and increasing efficiency. The residential sector accounts for 31% of the entire GHG inventory in West Hants, producing 90,502 tonnes of $CO_2$ equivalent ($tCO_2e$) of the total 290,010 $tCO_2e$. To achieve the current goal of a 45% reduction in annual emissions by 2030, this program needs to achieve sizeable emission cuts in the residential sector.

Based on information from nearby jurisdictions, staff recommend a maximum loan of $30,000 or 25% of the applicant's home value, whichever is less. This would mean a home worth $120,000 or more would receive the maximum loan size. Homeowners can always opt to apply for a smaller loan, if they do not require the full allotment. Colchester County has the same loan limit and is a county with a similar rural/urban mixture to WHRM.

Loan periods in other PACE programs range from 10-20 years. The MCCAP Committee can decide the timelines being offered in the WHRM PACE Program, based on the minimum 1:1 savings-to-loan ratio. Staff recommend offering a maximum loan term of 20 years, with the ability for homeowners to sign an agreement with a loan term shorter than 20 years. Offering a long loan period will help ensure adequate resident uptake and make the Program accessible to low-income applicants. A core tenet of PACE Programs is that savings from energy efficiency help applicants pay for the capital cost of upgrades, so the loan terms need to be long enough to allow that to occur.

Another major consideration for the Municipality is the limited disposable income of some households, and energy poverty, within the Region. According to a study by the Canadian Urban Sustainability Practitioners, Nova Scotia has the fifth highest number of energy-poor families in the country, totalling 147,085. Generally, energy poverty occurs when a household spends six percent or more of its net income on energy bills. Breaking the cycle of energy poverty requires investments to reduce energy consumption, which means the PACE program may need to cover a large portion – or the entirety – of upfront project costs. These households are also most vulnerable to the direct and indirect effects of climate change, such as heat waves and market volatility. Reducing energy consumption and improving building comfort will help to adapt to the changing climate and enhance resiliency in WHRM.

*Examples in Other Towns and Municipalities*

Switch Wolfville began in 2021 with a $14.1 million investment from FCM, with approximately $4 million to provide grants, and the rest for loans. Data regarding the number of projects completed does not seem to be readily accessible at this time.

- 0% interest rate
- 15-year terms
- Financing up to $40,000 or 15% of property value (whichever is less)
- Early, partial, full payments accepted
- 5% admin fee
- Minimum project of $3000 (including HST)
- Applicants can use personal financing in combination with the program or break projects up into phases. Once the borrowed amount is paid back in sufficient quantities, additional program financing can be accessed
- Applicants can pick their own contractors if they meet program requirements
- Projects must be fixed at the property (no electric vehicles (EV) or appliances, but EV chargers allowed)
- If property is sold, payments can be transferred to new owners or remaining balances can be paid off
- Required health and safety upgrades are allowed, subject to a cap of 30% of the total financing provided

Cozy and Solar Colchester began in October 2021 with an approximately $8.3 million dollar investment from FCM; around $5.6 million is in the form of a loan, and the rest as a grant. To-date, over 500 participants have enrolled, and the program has provided financing for 223 home efficiency projects. The program is currently paused and is expected to restart in late 2022 or early 2023. It is generally a similar program to Wolfville's, with similar financing rules and project eligibility, but with different loan amounts. Staff recommend the WHRM PACE Program include provisions for a low-income admin fee exemption, like the Program in Colchester County. This can be outlined in the WHRM PACE Program Policy, to be developed by staff following ratification of a By-law.

- 0% interest rate
- Up to 15-year terms
- Financing up to $30 000 or 25% of property value (whichever is less)
- 5% admin fee
- No minimum project size
- Low-income admin fee exemption

| Family Size | Household Income |
|---|---|
| Single | <$26,485 |
| 2 | <$34,982 |
| 3 or more | <$41,978 |

Clean Energy Financing is financed through the Clean Foundation. It has been initiated in multiple municipal units throughout Nova Scotia including the Towns of Bridgewater (2016), Amherst (2019) and New Glasgow and the Municipalities of Digby (2016), Lunenburg (2016), Barrington (2017), Yarmouth (2018), Cumberland (2019), Victoria (2021) and East Hants (2022).

- 10-20 – year financing
- 1-4% interest rates
- Between $10 000-$40 000 in financing

*By-Law Creation*

WHRM must create a by-law to initiate this PACE Program, and to provide transparent details about Program administration and structure. The By-law explains the relevant authorities regarding Program administration, the application qualifications, and the way fees can be collected. It will enable Program financing of upgrades for qualified residential homes within the Region to enhance energy and water efficiency, GHG emission reductions, and renewable energy installations. Council has this authority specifically from the Nova Scotia Municipal Government Act in Section 81A (1):

"The council may make by-laws imposing, fixing and providing methods of enforcing payment of charges for the financing and installation of any of the following on private property with the consent of the property owner:

(a) energy-efficiency equipment;
(b) renewable energy equipment;
(c) equipment for the supply, use, storage or conservation of water…".

A draft by-law is attached to this report as Attachment A for review and recommendation by the MCCAP Committee. The draft by-law outlines the approval process for applicants, the record-keeping requirements, how loans will be repaid, and the payment term. Following the ratification of a PACE By-law, staff will develop a PACE Program Policy for approval by Council, which will further outline the eligibility requirements for applicants, the format of Participation Agreements, and the eligible upgrades for homeowners.

*Future Community Engagement*

There will need to be an extensive marketing campaign to engage the community on this program. To achieve targeted program engagement, information will need to be widely available and easily accessible. PACE Atlantic will provide WHRM with website and marketing information, with an eye on mail-out brochures at the start of the program as well as a social media campaign.

PACE Atlantic is also requesting the Municipality host a community and industry engagement session(s) in the Fall of 2022 to gather input on the proposed PACE Program.

**NEXT STEPS**

1. MCCAP Committee recommendation to Council for First Reading and Public Hearing of the proposed By-law
2. Approval of a Municipal By-law per the MGA Section 81(A)
3. WHRM PACE Policy Development
4. Spring 2023 – WHRM PACE Program launch

**FINANCIAL IMPLICATIONS**

There are no financial implications anticipated with the filing of this report and the adoption of a PACE Program By-law. Funding is being sought from the FCM's CEF program, to enable WHRM to launch a PACE program.

**ALTERNATIVES**

The MCCAP Committee may recommend that Council:

a. hold First Reading and authorize a Public Hearing to approve the By-law as drafted, or as specifically revised by direction of the MCCAP Committee;
b. provide alternative direction, such as requesting further information on a specific topic.

**ATTACHMENTS**

Attachment A Draft Property Assessed Clean Energy (PACE) By-law

Report Prepared by: _____
John Ogilvie, Climate Action Coordinator

Report Reviewed by: _____
Sara Poirier, Senior Planner

Report Approved by: _____
Madelyn LeMay, Director of Planning and Development

**Attachment A**

WEST HANTS REGIONAL MUNICIPALITY
PROPERTY ASSESSED CLEAN ENERGY (PACE) BY-LAW

RP-001

## 1. TITLE

This By-law shall be known, and may be cited, as the Property Assessed Clean Energy (PACE) By-law.

## 2. BACKGROUND AND SCOPE

2.1. The purpose of this By-law is to enable West Hants Regional Municipality to establish financing of energy and water efficiency, renewable energy, greenhouse gas emission reduction, and climate change adaptation for Qualifying Properties.

2.2. This By-law is enacted pursuant to the Nova Scotia *Municipal Government Act* (NS MGA) Section 81A (1), which states: *The council may make by-laws imposing, fixing, and providing methods of enforcing payment of charges for the financing and installation of any of the following on private property with the consent of the property owner:*

*(a) energy-efficiency equipment;*
*(b) renewable energy equipment;*
*(c) equipment for the supply, use, storage, or conservation of water*.

2.3. This By-law does not exempt any person from complying with the requirements of other by-laws, regulations, licenses, permits, authorities, or approvals in force and otherwise required by West Hants Regional Municipality, the Province of Nova Scotia, or the Government of Canada.

2.4. This By-law shall apply only to upgrades installed using the West Hants Regional Municipality PACE Program.

## 3. DEFINITIONS

3.1. "Act" means the *Nova Scotia Municipal Government Act*.

3.2. "Building" means any structure placed on, over, or under the land and every part of the same and any external chimney, staircase, porch, or other structure used in connection with such building.

3.3. "Certificate of Completion" means a form issued by the Program Administrator on behalf of the Municipality, completed and signed by the Contractor, and counter-signed by the property owner, stating that the Upgrade(s) and associated equipment have been installed on the property.

3.4. "Charge" means the charge for financing the Upgrade(s), which includes any interest levied.

3.5. "Chief Administrative Officer" or "CAO" means the administrative leader of West Hants Regional Municipality, appointed by Council

3.6. "Contractor" means the individual or corporation engaged by the property owner, and approved by West Hants Regional Municipality, to carry out the Upgrade(s), including but

not limited to suitability assessments and evaluations, equipment installation, and specialized work.

3.7. "Council" means the Mayor and other members of the Council of West Hants Regional Municipality.

3.8. "Installation" or "Upgrade" means any equipment that is permanently installed on a property which will result in:

(a) improved energy and/or water efficiency;
(b) increased renewable energy production;
(c) reduced greenhouse gas emissions; and/or
(d) enhanced resiliency to the negative effects of climate change.

3.9. "Municipality" means West Hants Regional Municipality.

3.10. "Owner" means a registered owner of property in accordance with records on file with the Province of Nova Scotia's Land Registry Office.

3.11. "Property Assessed Clean Energy Program" or "PACE Program" means the program established in this By-law under which Owners of Qualifying Properties may apply for and obtain financing for energy and water efficiency, renewable energy, greenhouse gas emission reduction, and climate change adaptation upgrades.

3.12. "PACE Program Policy" means the policy established by the Municipality to further delineate the detailed structure and operation of the PACE Program.

3.13. "Participation Agreement" means the written and signed PACE Program Participation Agreement between the Owner of a Qualifying Property and the Municipality for financing Upgrades.

3.14. "Program Administrator" means the person or third party designated by the Municipality to operate the PACE Program.

3.15. "Qualifying Property" means a property located with the Municipality that meets the requirements of this By-law, the PACE Program Policy, and the Participation Agreement.

## 4. APPLICATION AND APPROVAL

4.1. An Owner of a Qualifying Property may apply for Municipal financing of the cost of an Installation on the property, to the maximum limit of $30,000 or 25% of the applicant's home value, whichever is less.

4.2. Financing shall be subject to obtaining written approval of the CAO or their designate on behalf of the Municipality.

4.2.1. The following conditions must be met for the CAO or designate to grant approval of an application:

(a) The Owner is not in arrears of any Municipal taxes, rates, or charges;

(b) The Owner must execute the PACE Participation Agreement with the Municipality; and
(c) Any additional conditions specified in the PACE Program Policy must be met.

## 5. PAYMENT OF CHARGE

5.1. The charge shall become payable upon submission of the Certificate of Completion by the Contractor to the Program Administrator, who will in turn submit it to the CAO or their designate.

5.2. The charge may consist of the following:
(a) The cost of the Installation, including all labour and equipment costs;
(b) Permitting fees and applicable taxes;
(c) Applicable PACE Program fees;
(d) Interest accrued on the Charge including any additional interest arising due to any default of payment; and
(e) Less any applicable federal, provincial, or other funding received for the installation.

5.3. The Owner of a Qualified Property may elect to pay the Charge by equal installments over the period specified in the Participation Agreement.

5.4. The Charge period shall not exceed 20 years.

5.5. Interest will be levied on Charges as specified in the PACE Program Policy and the Participation Agreement and is payable annually on the entire amount outstanding and unpaid, regardless of if the Owner has elected to pay by installments.

5.6. In the event of default of any payment under the PACE Participation Agreement, the outstanding balance shall be immediately due and payable. Interest shall accrue on the amount then due and payable at the same rate applied by the Municipality for unpaid taxes.

5.7. The Director of Finance shall maintain a separate account of all monies due for PACE Program Charges, identifying the following for the subject property:
(a) The name(s) of the Owner(s), the property assessment value, the Property Identification Number (PID), and the civic address;
(b) The amount of the Charge levied on the Qualifying Property;
(c) The annual interest rate and amount of interest charges included within the Charge;
(d) The amount paid on the Charge; and
(e) The balance due on the Charge.

## 6. LIEN

6.1. The Charge, and lien, shall become effective when the Certificate of Completion has been issued by the Program Administrator.

6.2. A PACE Program Charge constitutes a lien on the Qualifying Property and may be collected in the same manner as taxes under the Nova Scotia *Municipal Government Act*.

6.3. The lien, or notice thereof, shall be registered on the title of the Qualifying Property, at the Owner's expense.

6.4. The lien shall remain in effect until the total Charge, including any interest, has been paid in full.

## 7. MUNICIPAL LIABILITY

7.1. The Municipality is not responsible for the quality of the Installation carried out by the Contractor or the equipment involved and is not responsible for guaranteeing any energy or water savings, renewable energy production or greenhouse gas emission reduction. As a result, the Municipality shall not be liable for any loss, liability, injury, or damage, direct or consequential, caused by the supply of equipment, its installation or use by the Owner.

I, (Municipal Clerk Name), Municipal Clerk of the West Hants Regional Municipality, the Province of Nova Scotia, do hereby certify that this is a true copy of the By-law as adopted by the Council of the West Hants Regional Municipality at a meeting duly called and held on the ____day of _____(month), _____(year).

*(Signature of Municipal Clerk)___*
*(Typed name of Municipal Clerk)*

| By-law Adoption | |
|---|---|
| First Reading | *date* |
| Notice Published | *date* |
| Second Reading & Approval | *date* |
| Final Publication | *date* |
| Notice to Municipal Affairs | *date* |
| Description: | |

# WEST HANTS REGIONAL MUNICIPALITY REPORT

| Information ☐ | Recommendation ☐ | Decision Request X | Councillor Activity ☐ |
|---|---|---|---|

**To:** Members of Municipal Climate Change Action Plan Committee (MCCAP)

**Submitted by:** _____
Alex Dunphy, Planner

**Date:** September 14th, 2022

**Subject:** Coastal Protection and Flood Planning Policy Update

## LEGISLATIVE AUTHORITY

Municipal Government Act Section 212 (4)

## BACKGROUND

| Property ☐ | Public Opinion ☐ | Environment X | Social ☐ | Economic ☐ | Councillor Activity ☐ |
|---|---|---|---|---|---|

Coastal Flooding was added to the 2021 MCCAP Workplan on January 21st, 2020. During the February 10th, 2021 MCCAP meeting, the Committee discussed a number of policy options for flood proofing and coastal flooding.

## DISCUSSION

During the last MCCAP meeting, I presented a set of policies based on previous direction given by the MCCAP Committee. The proposed policies would have only permitted new buildings in flood prone areas, rebuilding of existing buildings and the expansion of existing buildings if flood proofing measures were included in the design of the building.

### *Staff Meeting with Climate Change Adaptation Specialist*

I arranged a meeting with a member of Halifax Regional Municipality (HRM)'s Climate Change staff, Samantha Page and Planner, Matthew Conlin. We discussed how coastal regulations are applied similarly across all of HRM's planning documents. We also discussed the importance of

ensuring that definitions are clear and consistent. Some notable definition examples were coastal elevations, watercourse setbacks, and critical infrastructure.

Another topic that we had discussed during the meeting was liability in permitting new buildings in flood prone areas. There were some concerns from Municipal Solicitors regarding the possibility of the Municipality being liable for damages to structures permitted in flood prone areas. The potential liability of the Municipality may need to be reviewed in order to determine whether the requirement for flood proofing measures would be sufficient to prevent potential legal issues if development is allowed in flood prone areas.

HRM staff described how the Coastal Protection Act will provide vertical setbacks based on minimum building elevation values for new construction. This minimum building elevation will restrict development from occurring below it, aside from uses which require direct access to water. There will also be an option for the applicant to hire a designated professional to determine a horizontal setback and submit the designated professional's report.

***Coastal Protection Act Effects on MCCAP Policy Direction***

The Coastal Protection Act received Royal Assent on April 12, 2019. Royal Assent means that the Act has been accepted and is now in effect, however no official regulations have been approved yet. Staff believe the Province is close to finalizing these regulations based on the proposed regulations created in 2021 (Attachment 2), however we are unsure when they will be implemented.

Previous direction given by the MCCAP Committee was to permit new development and expansions in flood prone areas, provided flood proofing measures were incorporated. Once the Coastal Protection Act is implemented, this direction will no longer be possible, as the minimum building elevation will not permit new buildings to be constructed below the vertical setback, aside from exempted uses.

As it will be required for the Municipality to adopt the requirements of the Coastal Protection Act, it appears that the previous direction given by the Committee will not be possible to achieve under the requirements of the Coastal Protection Act. Any coastal protection or flooding policy introduced to WHRM documents will need to be updated to conform with the new requirements upon the implementation of the Coastal Protection Act.

**NEXT STEPS**

The Municipal Climate Change Action Plan (MCCAP) Committee may:

- use the direction given from the Coastal Protection Act to develop a more general set of policies which can be used until the Coastal Protection Act is implemented; or
- revisit the previous direction given by the former MCCAP Committee.

**FINANCIAL IMPLICATIONS**

There are no financial implications to the Municipality or residents with regard to the filing of this report.

**ALTERNATIVES**

The Municipal Climate Change Action Plan (MCCAP) Committee may:

- direct staff to wait until the Coastal Protection Act is implemented to develop policy; or
- provide alternative direction, such as requesting further information on a specific topic.

**ATTACHMENTS**

Attachment 1  Drafted Coastal Flooding Policies

Attachment 2  Proposed Coastal Protection Act Regulations – At a Glance

Report Prepared by: _____

Alex Dunphy, Planner

Report Approved by: _____

Madelyn LeMay, Director of Planning and Development

Drafted Coastal Flooding Policies:

**Policy X.X.1** It shall be the policy of Council to identify all areas which are prone to coastal flooding as (Environmental Constraints) on an overlay to be used in conjunction with the zoning map, Schedule 'A' of the Land Use By-law.

**Policy X.X.2** It shall be the intention of Council to establish regulations in the Land Use By-law governing development on land identified as Coastal Flooding on the Environmental Constraints Overlay.

**Policy X.X.3** It shall be the intention of Council that the land uses permitted in the areas identified as Coastal Flooding on the Environmental Constraints Overlay shall be those permitted in the underlying zone. Where there is conflict between the zone requirements and the regulations established for Coastal Flooding, the Coastal Flooding regulations shall take precedence.

**Policy X.X.4** It shall be the policy of Council that the following uses may not be considered within the area identified as Coastal Flooding:

(a) residential institutions such as hospitals, senior citizen homes, homes for special care and similar facilities where flooding could pose a significant threat to the safety of residents if evacuation became necessary;
(b) any use associated with the warehousing or the production of hazardous materials;
(c) Institutions relevant for emergency response; and
(d) Cemeteries.

**Policy X.X.5** It shall be the policy of Council that within the area identified as Coastal Flooding, new buildings may only be considered if flood proofing measures are included within the design of the building.

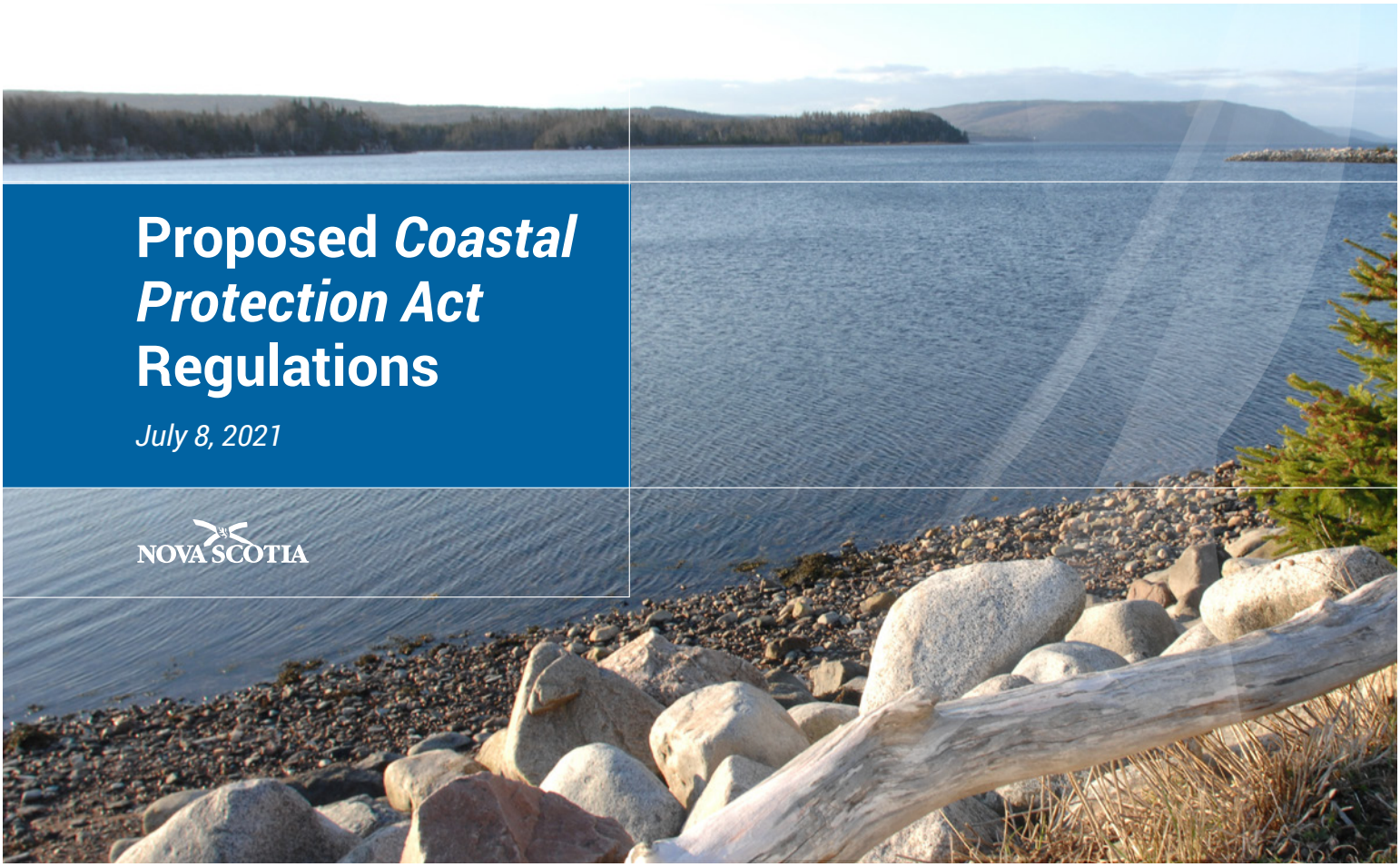
**Policy X.X.6** It shall be the policy of Council that the following uses shall be exempt from requirements of the area identified as Coastal Flooding:

(a) any residential accessory structures which do not contain dwelling units;
(b) marine dependant uses;
(c) recreational structures which do not require structures and parking lots;
(d) temporary uses permitted in accordance with the Land Use By-law;
(e) any use which does not require permanent structures; and
(f) infrastructure and utilities.

**Policy X.X.7** It shall be the policy of Council that within the area identified as Coastal Flooding, existing buildings may be rebuilt if only minor flood damage was incurred.

**Policy X.X.8** It shall be the policy of Council that within the area identified as Coastal Flooding, existing buildings may be expanded if flood proofing measures are included within the design of the building.

(a) If there is a change to the foundation -
(b) Other addition -
(c) Change in roofline -



# Proposed *Coastal Protection Act* Regulations

*July 8, 2021*

NOVA SCOTIA

## At a Glance

The *Coastal Protection Act* was passed in 2019 and will come into effect with the approval of accompanying regulations. When that happens, a new Coastal Protection Zone will extend around the coast of Nova Scotia and new requirements will apply to constructing houses and other structures in the zone.

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The regulations will outline the protections for sensitive coastal ecosystems and ensure that construction is at a safer height and distance from coastal shorelines. The purpose is to mitigate impacts from sea level rise, coastal flooding and coastal erosion.

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## The regulations will:

- **Create a Coastal Protection Zone.** This will be a narrow band surrounding the province's coast, including land and water-covered areas on either side of the high-water mark, where regulations will apply. The zone will include islands and parts of rivers nearest the ocean that are connected to coastal waters. Government is proposing the inland portion extend inland from the high-water mark by in the range of 80 to 100 metres. Government will select a single consistent distance following consultation, but this has not been determined.
- **Ensure any construction (wharves, boat ramps, shoreline armouring and other structures) do not unnecessarily interfere with the dynamic nature of the coast and sensitive coastal ecosystems.** This will be done by creating new restrictions for existing permitting processes of the Department of Lands and Forestry.
- **Improve protection from sea level rise and coastal erosion.** Setbacks will apply to municipal building permits to ensure greater future protection for structures.

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Vertical setbacks will be the minimum building elevation above mean sea level for new construction for different areas along the coast.

The horizontal setback will be determined by a designated professional as outlined in the regulations. Landowners will hire a designated professional to determine the appropriate setback distance and submit the designated professional's report when applying for a building permit.

Municipalities will be responsible for ensuring the proposed construction is consistent with the submitted report and above the minimum building elevation before approving a building permit. Some exemptions in certain areas may apply.

Repair and maintenance of existing structures will not be affected by the regulations unless the existing size of the structure increases.

The *Coastal Protection Act* does not apply to all buildings and structures or to federal Crown Land. Public infrastructure and commercial or industrial operations that need direct access to the water are exempted. In addition, some activities regulated under other legislation are also exempted.

**WEST HANTS REGIONAL MUNICIPALITY REPORT**

| | | | |
|---|---|---|---|
| Information X | Recommendation ☐ | Decision Request ☐ | Councillor Activity ☐ |

**To:** Members of Municipal Climate Change Action Plan (MCCAP) Committee

**Submitted by:** _____
Sara Poirier, Senior Planner

**Date:** 2022-09-14

**Subject:** Discussion: Summer Student reports – Building Condition Survey and Investigating Solar PV at Municipal Complexes

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**LEGISLATIVE AUTHORITY**

West Hants Local Action Plan, Action 1.1 "Perform internal building condition survey" and Action 2.4 "Investigate solar PV for water & wastewater treatment plants"

MCCAP Workplan 2022, "Explore the potential for a small to medium scale solar energy project"

**RECOMMENDATION or DECISION REQUEST**

Staff are providing this report to aid in discussion on the MCCAP Committee's priorities and request direction to staff on the focus of the small to medium scale solar energy project specified in the MCCAP workplan item. This report is for information purposes, there is no recommendation at this time.

**BACKGROUND**

| | | | | | |
|---|---|---|---|---|---|
| Property X | Public Opinion ☐ | Environment X | Social ☐ | Economic ☐ | Councillor Activity ☐ |

Summer student Will Chapple focused his 15-week work term on performing building condition surveys of select WHRM buildings and determining the potential for solar to offset the power required by these buildings. The reports are attached in Attachment A and B for review.

MCCAP discussion of the information provided in the reports will help provide direction to staff on the priority projects of the MCCAP Committee and the funding applications for building retrofits and energy efficient upgrades that staff should focus on.

**DISCUSSION**

The Building Condition Survey 2022 report (Attachment A) provides a survey and analysis of current conditions and energy management opportunities in 5 Municipally owned buildings: 76 Morison Drive, 100 King Street, 78 Thomas Street, 306 Stannus Street, and 16 Centennial Drive. Will used the Natural Resources Canada (NRCan) energy audit manual and tool to conduct the surveys on the specified buildings. The surveys identified a variety of potential upgrades that would reduce the energy demand of the buildings and in-turn reduce the greenhouse gas (GHG) emissions. Many of the proposed small-scale upgrades could be done over time when items reach their end-of-life such as lighting retrofits, window replacement and upgrading insulation, while other deep retrofits, such as fuel switching or renewable energy projects, would require a large investment.

The Investigating Solar PV Potential at Municipal Complexes report (Attachment B) provides an overview of the potential for a solar energy project at the highest energy consuming buildings and facilities within West Hants Regional Municipality's portfolio. Will used the 2018 GHG inventory and 2021-2022 Nova Scotia Power Inc. bills combined with Energy Hub formulas to estimate the size and cost of a solar array to offset the electrical energy consumption at each facility. He then used TownSuite orthophotos and measuring tools, along with site visits, to determine the usable space available for a solar array at each site. From the analysis, the Municipal Office at 76 Morison Drive, the Brooklyn Fire Station and the water treatment facility at 2160 Bishopville Road may have the most potential to offset electrical energy consumption using solar. The report highlights that the next step would be to get quotes from solar companies to provide the most accurate information on cost.

As noted in the Building Condition Survey 2022 report it is more feasible to achieve significant GHG reduction through these larger upgrades (i.e., solar) by ensuring the energy consumption systems in a particular building are already running as efficiently as possible. This ensures the renewable energy project is scaled appropriately to the demand.

**NEXT STEPS**

The discussion by MCCAP will provide staff direction on building retrofits and upgrades to prioritize and guide staff on what funding applications to focus on.

**FINANCIAL IMPLICATIONS**

There are budget implications associated with any upgrades proposed to buildings in the building condition surveys or solar report. These upgrades will need to be budgeted for in the 2022-2023 budget of Council. External funding will also be sought for many of these projects.

**ALTERNATIVES**

In response to the report, the MCCAP Committee may:

- provide alternative direction such as requesting further information on a specific topic.

**ATTACHMENTS**

| | |
|---|---|
| Attachment A | Building Conditions Survey 2022 |
| Attachment B | Investigating Solar Potential in Municipal Complexes |

Report Prepared by: _____
Sara Poirier, Senior Planner

Report Reviewed by: _____
Madelyn LeMay, Director of Planning and Development

**Attachment A**

# BUILDING CONDITIONS SURVEY 2022

## West Hants Regional Municipality


### Abstract

A survey and analysis of current conditions and energy management opportunities in municipally owned buildings. Submitted in partial fulfillment of GHG Emission Local Action Plan (2021) Action Item 1.1: Perform Internal Building Conditions Survey



William Chapple


August 2022

# Table of Contents

# Acknowledgements

The success of this project would not have been possible without ongoing support and assistance from multiple individuals during my time with West Hants this summer.

Firstly, thank you to the WHRM Planning and Development Department for providing the opportunity for me to learn, grow, and make tangible progress towards climate mitigation in West Hants through the Climate Action Coordinator summer position. Thank you, Madelyn LeMay, for providing a productive and supportive workplace, Sara Poirier, for your support in making connections to facilitate site visits and ongoing guidance, and to Alex Dunphy for taking countless time to troubleshoot and help to format this document. All of your dedication to providing a constructive and positive internship experience for me has not gone unnoticed, and I greatly appreciate the time you've all taken for progress meetings, report revisions, and general support over these past months.

Data collection would have been impossible without support from facility managers and maintenance staff. Thank you, Mitch Weatherbee, Glenn Wentzell, and John Sweet for taking the time to tour facilities and answer questions during site visits. The data and knowledge that was collected through the site visits will inform ongoing updates to these facilities, and your support and time made the process work.

Finally, thank you to the entire Clean Leadership Internship team at Clean Foundation for supporting my position with West Hants and my personal development this summer. Your support of paid youth positions in the environmental sector is what made this experience an option for me in the first place.

Thank you, all, so very much for making this project a reality!

Sincerely,

Will Chapple

# Glossary

ASHRAE:  American Society of Heating, Refrigerating and Air-Conditioning Engineers

ECCC: Environment and Climate Change Canada

EOC: Emergency Operations Centre

DX: Direct-Exchange

GHG: Greenhouse Gas

HRV: Heat Recovery Ventilation

LED: Light-emitting Diode

LFL: Linear Fluorescent Light

NRCan: Natural Resources Canada

SOP: Standard Operating Procedure

VRF: Variable Refrigerant Flow

WHRM: West Hants Regional Municipality

# Executive Summary

- This report partially fulfills the requirements of Action Item 1.1: Internal Building Conditions Survey as described in the 2021 GHG Emission Local Action Plan. Recommended upgrades will contribute to WHRM's target to reduce corporate emissions by 45% before 2030.
- NSPI's efforts to switch the grid power source to renewable energy will help realize these goals; greening the grid is forecasted to account for a maximum of 44% reduction in WHRM GHG profiles. WHRM can make many small adjustments and upgrades that add up over time, or a smaller number of large-scale retrofits to meet or even surpass the 2030 targets. Efficiency upgrades are still high priority to meet the provincial GHG reduction target of net-zero emissions by 2050.
- The NRCan Energy Audit Manual and checklists indicate energy management opportunities and aid the identification of glaring sources of energy waste. The conditions surveys are comparable to the requirements of an ASHRAE Level One energy audit.
- Manufacturer and market searches in combination with research-grade sources were used to develop an estimated cost-benefit analysis, where applicable, for potential upgrades, reported in **1.3 Technical Background** within this document.
- A brief overview of suggested upgrades is provided in the Summary section for each building. GHG reduction estimates were made conservatively (using the lower end of energy savings ranges) to estimate progress towards reduction targets.
- Common suggested upgrades between Municipally owned buildings included in the 2022 Conditions Survey are:
    a) All buildings require a posted SOP and preventative maintenance schedule for heating, cooling, and water services. Currently, maintenance is performed when performance issues arise with these systems. Preventative maintenance will detect chronic, long-term energy loss from minor malfunctions that would otherwise go unnoticed.
    b) Lighting systems at multiple buildings would benefit from a simple LED retrofit. 100 King St, 78 Thomas St, and 76 Morison Dr use primarily T8 LFL bulbs, which demand approximately 30-41% more energy than an equivalent LED tube (Ganandran et al., 2014).

c) When windows are replaced at any location, the budget should allocate resources to upgrade to Energy Star rated windows.
d) 100 King St and 78 Thomas St use a conventional oil-fired boiler system for heat. A geothermal or air-source DX heat pump system is recommended as a long-term upgrade at these locations. The unit at 76 Morison Dr is a good model to follow if these upgrades are desired.

# 1.0 Introduction

## 1.1 Project Overview

The Natural Resources Canada Energy Audit tool was modified to complete an internal building conditions survey as described in Action Item 1.1 of the 2021 GHG Emission Local Action Plan. This is a baseline survey and was completed to identify glaring energy efficiency problems and areas of high energy loss. Consult the NRCan Energy Audit Manual and Toolbox (2009) for full methodology. There were five buildings selected for the first round of surveying based on significant emissions noted in the 2018 GHG Inventory (Figure 1, Table 1). The newly constructed Sports Complex at 16 Centennial Dr was not included in the 2018 GHG Inventory.

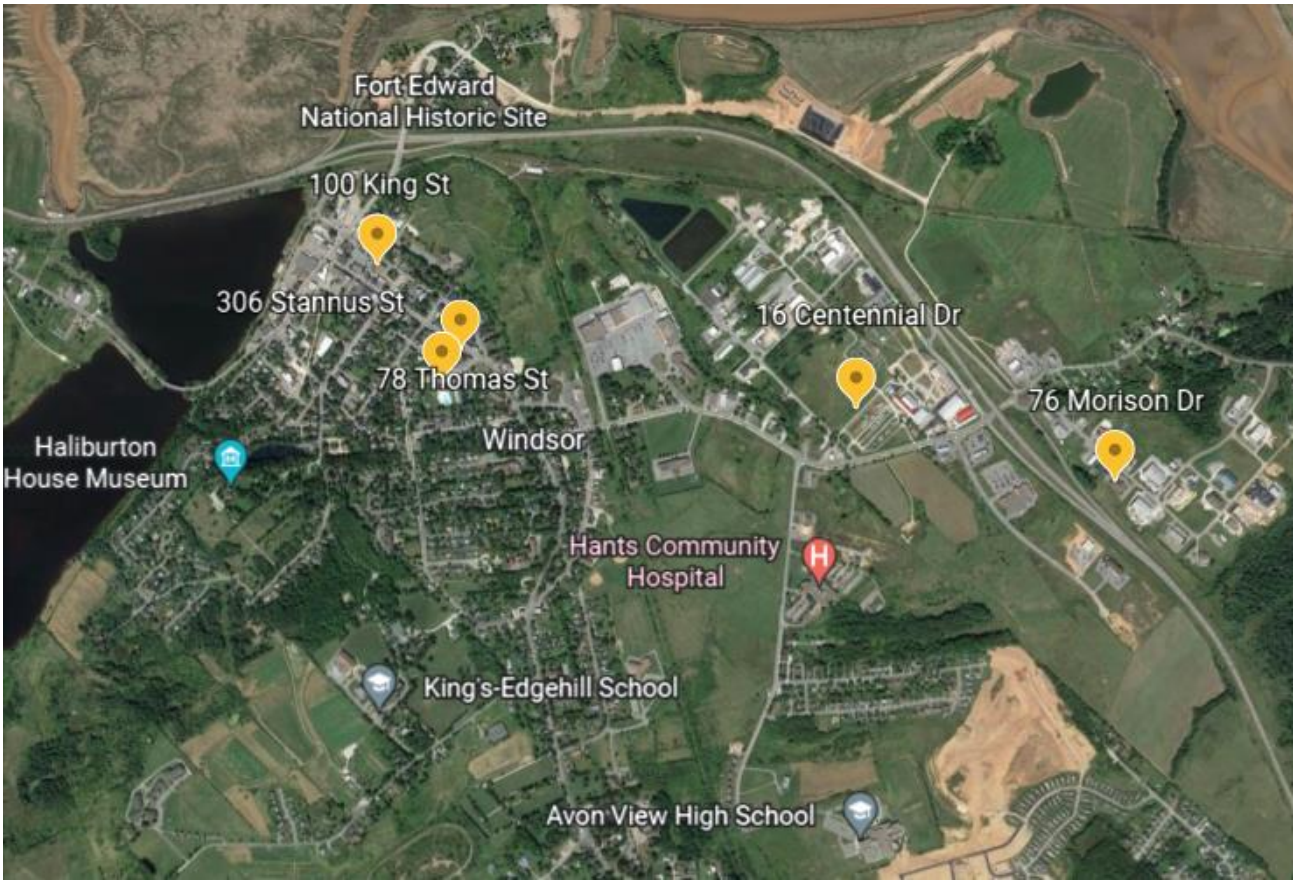


*Figure 1: Aerial photo highlighting sites included in the 2022 Building Conditions Survey. Yellow points indicate selected buildings (Google Earth, 2022).*

*Table 1: Study site list, GHG output, and contribution to 2018 corporate GHG profile.*

| Building Operation | Site Address | GHG Emissions 2021-22 (tCO2e) | % 2018 Corporate Profile |
|---|---|---|---|
| Municipal Office | 76 Morison Dr | 128.1 | 4.6% |
| Municipal Office/Windsor Fire Station | 100 King St | 181.0 | 7.5% |
| West Hants Sports Complex | 16 Centennial Dr | 812.5 | N/A |
| Hants Aquatics Centre | 306 Stannus St | 61.7 | 1.0% |
| Hants Memorial Community Centre | 78 Thomas St | 30.3 | 2.0% |

When assessing the reported energy efficiency ratings, it is important to note that scores between 80-100% describe structures and systems of extremely high efficiency. It would be impractical to strive for 100% efficiency in every structure, therefore it should be noted that for WHRM's purposes, ratings of 65% or greater are relatively acceptable efficiency scores. In this report, upgrades are recommended based on feasibility, cost, and potential emissions reduction.

This document does not include recommendations for high capital offset projects such as solar. Focusing initial upgrades towards efficiency rather than large-scale, deep retrofits will provide WHRM with emissions and energy cost reduction that will make major efficiency projects more achievable.

GHG reduction estimates for proposed upgrades are reported in each building section in the "Summary" tables. These values were calculated using one year of energy consumption in kWh from NSPI power, the percentage energy reduction expected from the upgrade, and an emissions factor of 0.00072 $tCO_2e/kWh$ for Nova Scotia's electricity grid consumption.

Within subsequent sections of this document, *CTRL + left click* any blue and underlined section titles to quickly navigate to the indicated section.

## 1.2 Checklist Considerations

Limitations of the NRCan (2009) building conditions survey checklists include:

*Lighting*

The full lighting checklist was designed for a detailed lighting audit that required dismantling and examining the inner workings of each fixture. All measurements that required extra equipment or dismantling fixtures were not included in the list.

Both T8 LFL and LED tube bulbs are appropriate for office spaces, however LED tubes are considerably more efficient. An Oklahoma State University study (Clark & Humphrey, 2018) determined commercial LED lighting required approximately 11.5 watts to illuminate compared to the LFL equivalent of 54 watts, and other studies have determined that LED lights demand 30-41% less energy than a fluorescent equivalent (Ganandran et al., 2014; Ruiz & Silvera, 2018). Therefore, fluorescent T8 tubes were given a rating of 0.5/1 for "source appropriate", while the LED replacements scored 1/1 as they are arguably 'more' appropriate in terms of efficiency. As LED fixtures do not produce measurable heat, any fixture that scored 1/1 also scored 1/1 for the "Lights Vented" checklist item. There will be no thermal energy lost from LED lighting due to lack of ventilation compared to LFL or incandescent bulbs.

*Ceilings*

Locations without suspended ceilings could score a maximum rating of just 33%. This is a disproportionate loss of points compared to 9-10.3% energy savings yielded by implementing drop ceilings for the average office building (Cisca, 2008).

Drop ceilings are more energy efficient because they reduce space between the floor and ceiling, allowing air to mix more easily (Dees, 2019). More efficient air mixing increases the stacking effect, described as the movement of air through a building due to thermal differences (Dees, 2019). The energy savings from a suspended ceiling are derived from reduced demand on the HVAC and air distribution system when air within the building is mixing efficiently. Some research indicates the energy savings could be as much as 17%, but the conservative value of 10.3% will be used within this report, so variability is more likely to be positive.

While energy savings are realized from implementing a suspended ceiling, particularly when using insulated panels, the extreme loss of points in any alternate ceiling design should be noted. To remain consistent with NRCan methods, the scores were not altered, however practicality and overall benefit is considered for any potential upgrades derived from the NRCan checklist.

*Windows*

The NRCan checklist places high weight, 27% of the total rating, on whether windows can open to the outside. While fixed, unopenable windows are far superior in draft mitigation, they are less practical in an office setting. Efficiency should not necessarily be prioritized over

staff freedom and comfortability in their workspace. It is also necessary for some windows to open for safety reasons, such escaping in the event of a building fire or other emergency. Windows designed to open to the outside could score a maximum rating of 77%, which must be considered for all buildings when analyzing ratings.

*HVAC*

The Heating and Cooling checklist ratings were designed for conventional boiler systems. In many cases, buildings surveyed used alternate methods for temperature control. For these systems, the checklist must be disregarded, however a qualitative analysis from site visits and communications with maintenance staff is provided instead.

## 1.3 Technical Background

This section reports potential costs to implement common upgrades and the expected benefit over time (Table 2). The information provided does not include building-specific upgrades; if an energy management opportunity is unique to a single building it is reported in the respective building section. The basic cost-benefit analyses are based on market searches and research-grade energy savings implications from external sources.

*Table 2: Basic cost-benefit summary of common upgrades between multiple study sites.*

| Checklist | Upgrade Type | Energy Savings | Cost | Buildings Affected |
|---|---|---|---|---|
| Exterior Walls | Insulation | 10-20% (increasing) | $4-$6/sqft | 100 King, 78 Thomas |
| Lighting | LED retrofit | 30-41% | $7-$15/unit, 2 units per fixture, cost of electrician | 76 Morison, 78 Thomas, 100 King |
| Lighting | Occupancy sensors | 29-38% | $30-$500/unit | All (excl. 16 Centennial) |
| Ceilings | Install suspended ceiling | 9-10.3% | $5-$28/sqft (incl. labour) | 100 King, 78 Thomas |
| Windows | Storm Windows | 10-30% | Dependent on original window type | All |
| Windows | Single Pane Energy Star window replacement | 20-30% | $400-$900/unit | All |
| Windows | Double Pane Energy Star window replacement | 15-20% | $400-$900/unit | All |
| Hot Water Service | Polyethelene insulation on distribution lines | 9% | $2-$5/6ft | All (excl. 16 Centennial) |

*Exterior walls*

Older buildings generally do not have insulation in exterior walls from the original construction period. This leaves the building susceptible to thermal energy loss during winter months and overheating during summer. Exterior insulation should be prioritized as the exact energy waste is difficult to quantify and could be very significant. The two buildings included in the survey that do not have original exterior insulation also use oil-fired boilers, making this issue even more problematic as higher emissions result from fossil fuel consumption. Closed cell insulation is more effective than open cell in exterior walls because of its higher insulating R-value and its capacity to reject water (Ecostar Insulation, 2021). The energy savings attributed to exterior wall insulation are 10-20%, increasing further when there is high demand on the heating and cooling systems.

*Lighting*

Multiple buildings require a lighting retrofit from T8 LFL to T8 LED fixtures. LED bulbs demand up to 41% less energy to produce equivalent illumination to the current LFL tubes (Ganandran et al., 2014; Ruiz & Silvera, 2018). According to Premier Lighting (2015), T8 LFL tubes have an average lifetime of 30,000 hours, while T8 LED models last 50,000 hours. Therefore, additional cost savings for replacement bulbs would be realized with the proposed new fixtures, calculable with a more detailed analysis.

Electricity bills and energy efficiency would both benefit from installing occupancy sensors for lighting. It has been reported that this efficiency upgrade has saved between 29-38% in electricity demand in case studies of other offices (Galasiu et al., 2018). These studies as well as EPA (2001) suggest occupancy sensors can save up to 68% of a building's annual energy waste. The cost of this upgrade heavily depends on the model; a cursory market search determined the price ranges from $30-$130 per unit (US Department of Energy, 2019) Infrared and ultrasonic models are most used in businesses and offices. Passive infrared sensors detect temperature changes, while ultrasonic sensors use high frequency sound to detect motion (USA Department of Energy, 2019). These models have a higher risk of false-triggers and are best used in large spaces such as open-concept work areas or long corridors. Dual-technology sensors use both methods, increasing accuracy and limiting false triggers, but at a higher cost. These models are best used in smaller spaces such as personal offices and washrooms. Passive IR and

ultrasonic models may not detect motion from inside stalls in washrooms, so users run the risk of being stuck in the dark. The Sports Complex at 16 Centennial Dr already uses dual-technology occupancy sensors for most of its lighting, however using less expensive models at other buildings would not significantly decrease the benefit of implementing this upgrade.

There are opportunities for rebates on a lighting retrofit of up to $500 towards product cost through Efficiency Nova Scotia. Available rebates and utility savings means these upgrades would pay for themselves over approximately 2-3 years, and the Municipality would continue to save money and reduce emissions thereafter.

*Ceilings*

A common checklist item that would improve the NRCan rating is installing mechanical ventilation above existing drop ceilings. This would increase the efficiency score by at least 18%. It is unclear due to lack of research what systems and costs are required for installing mechanical ceiling ventilation between the drop ceiling and the regular ceiling, or what emissions reduction would result. Prior to implementing such a project, a more detailed audit must be conducted to assess the true values of energy lost due to ceiling design specific to each building. If there is not an opportunity for significant emissions reduction from installing ceiling ventilation, upgrades to other systems should be prioritized instead.

If ceiling upgrades are desired or necessary due to ending life cycle, it is recommended suspended ceilings be installed wherever feasible. This item should not be prioritized, however when considering all options, as referenced above, note that suspended ceilings save up 10.3% on energy demand for heat (Cisca, 2008). For buildings that still use fossil fuels for temperature control, the emissions reduction would be more significant than a renewable energy temperature model such as the DX geothermal system at 76 Morison Dr.

*Windows*

The addition of storm windows would increase the NRCan ratings and contribute to resolving minor infiltration issues, which affected ratings negatively in several locations (Figure 2). Based on personal accounts from WHRM residents, storm windows are not commonly used in this area, and may not be a priority for the Municipality to implement. If a removable model is used, this upgrade also requires labour hours, likely from Public Works, to install and remove

storms each fall and spring. There are also considerations for storage space in this case. Some storm windows can remain installed year-round and would likely be the best design to choose if storm windows are desired, as this would eliminate labour and storage issues. There are alternate options available to mitigate energy loss from windows that are not listed on NRCan's checklists.

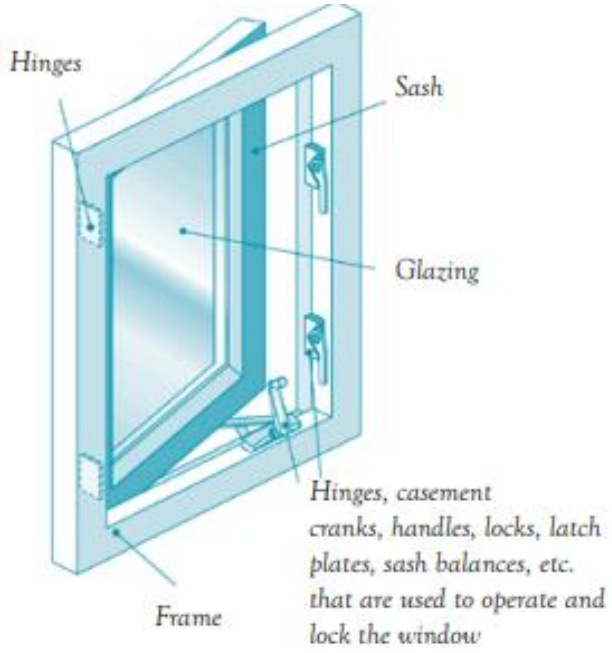


*Figure 2: Diagram of standard, exterior storm window (NRCan, 2015). This model is designed to be installed in fall and removed in spring.*

An alternative and likely more attractive option is to upgrade all windows to Energy Star certified models. While this is not a direct checklist item, Energy Star windows would address many of the concerns that contributed to lower scores such as infiltration issues and lack of solar protection. The technical design of Energy Star windows will mitigate virtually all energy loss to window drafts (Figure 3).

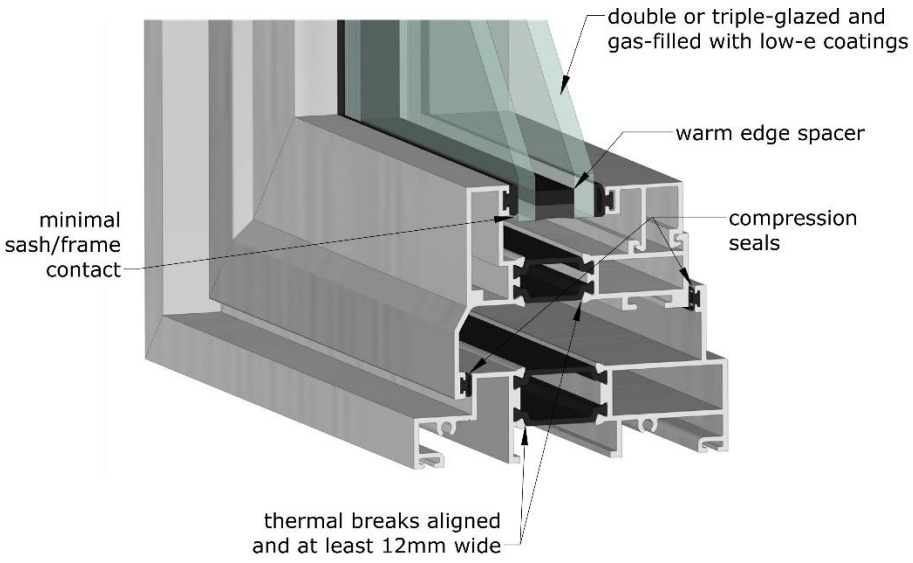


*Figure 3: Technical diagram of Energy Star low-emissivity window design (NRCan, 2019).*

Due to variability and practicality, it is difficult to accurately quantify the exact amount of energy lost to an existing, uncertified window. Efficiency NS can perform a draft analysis during a low-cost Energy Assessment to determine which windows are notable sources of energy loss. Energy savings and costs for Energy Star upgrades depend on the existing windows and climate. Low-emissivity windows in all climate zones have shown rapid incremental payback on the initial investment through energy savings (Culp, 2015). Research shows that these savings are more significant in colder climates as heat production, and in turn, waste, is inherently higher.

*Hot Water Service*

Many copper distribution lines for water and hot water throughout the buildings were uninsulated. Electric water heaters, used at all municipal buildings, are the more energy intensive model using approximately 17 GJ annually. Thus, WHRM should focus on making these systems as efficient as possible. While some pipes were wrapped in 3/4-inch polyethylene foam insulation, other sections were left exposed, which could lead to thermal energy loss as the water is distributed. This type of piping insulation is extremely low-cost for immediate benefit in this building. Based on a market search, six-foot sections are available at hardware and building stores for as little as $2.00 per length. They can be cut to size and easily fitted onto the pipes by any municipal staff.

This upgrade is highly recommended, as the energy lost to these exposed water pipes is difficult to quantify, so the amount of energy waste could be significant. Wilden Living Lab (2022) estimates approximately 9% of the energy input to heat water is lost to distribution lines (Figure 4). There is a total estimated loss of up to 57% of the input energy by the time hot water reaches the faucet (Wilden Living Lab, 2022). The low cost of this upgrade means it is of low risk – there are no negative implications and the only probable impact from this upgrade is mitigated energy loss from the hot water service process.

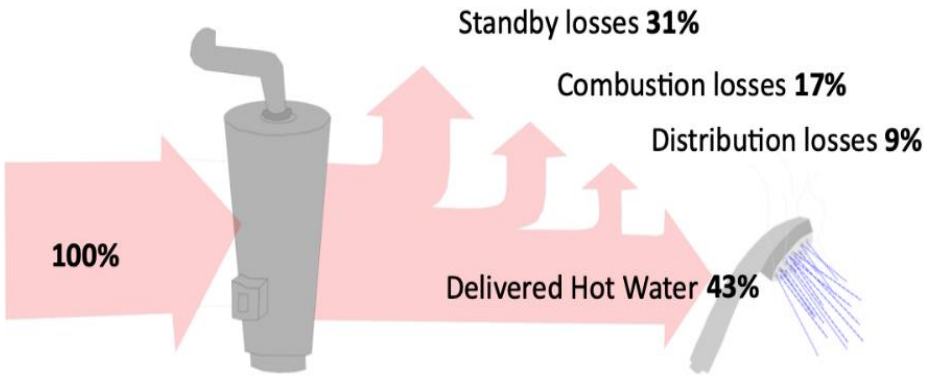


*Figure 4: Sankey diagram detailing potential energy loss for a standard electric water heater.*

# 2.0 Municipal Buildings

## 2.1 Municipal Office: 76 Morison Drive

The survey for 76 Morison Dr was conducted across multiple dates, beginning on May 26th, 2022 by Climate Action summer intern Will Chapple. Public Works staff Mitch Weatherbee and newly hired Climate Action Coordinator John Ogilvie assisted with the survey for HVAC and water services in late June 2022. The survey took approximately five hours in total.

This office building has two floors; the main level and basement. WHRM municipal operations such as the Administrative Department, Finance Department, Planning and Development Department, and CAO's office. There is a reception area for public interactions and the Council Chambers on this level. The downstairs basement level houses the Community Development and Parks and Recreation Departments. There is a large workshop for Parks and

Recreation staff and equipment storage. The EOC room is also located on this level, and there are two washrooms on each level of this building.

### 2.1.1 Exterior Structures

This building was constructed in 1988, housing municipal operations. The exterior structures at the municipal office building include the exterior walls, doors, and the roof. All exterior structures scored relatively well, with average ratings of greater than 65%. The final rating for exterior walls and doors were 71% and 73%, respectively. The roof scored slightly lower at 66%, however many improvements to this score would require expensive and invasive upgrades for unknown GHG emissions reduction.

There was one glaring efficiency issue identified in the exterior structures. The exterior garage door in the Parks and Recreation workshop scored a 0% efficiency rating (Figure 5). The shop garage door is not weather-tight, and staff have reported noticing the draft from upstairs during the winter. There is significant outside air infiltration, and the secondary interior doors between the shop and the rest of the building are not airtight. In the colder winter months, this means infiltration from the shop exterior door will cause increased work from the internal heating system, resulting in energy waste and increased emissions. If the Parks and Recreation Department continues to operate out of 76 Morison Dr, it is strongly recommended to fully replace this garage door system.

The cost range for this type of upgrade is reported in Nova Scotia as $1800-$4200, with an average price of $2500 including removal of old parts and installation labour (The Home Depot, n.d.). Overhead Door of Nova Scotia, a home garage door installation company, will provide a free quote if requested. The replacement garage door should use materials with an insulation R-value of at least 14; typically, either steel or aluminum with composite are used for this type of project. Higher R-values indicate better thermal regulation, and therefore higher efficiency. This upgrade will aid with heat loss prevention and staff comfortability in winter. Mitigating heat loss will save on energy demand and costs associated with regulating building temperature.  This upgrade is a simple, one-time expense that would mitigate a glaring source of energy loss at this building.


*Figure 5: Parks and Recreation workshop exterior door received an energy efficiency rating of 0% and should be heavily considered for upgrade. Significant outside air infiltration, rust along edges, and physical damage were observed.*

### 2.1.2 Lighting

The office lighting fixtures are being upgraded from T8 LFL to T8 LED tube models as necessary. The NRCan rating for upstairs lighting is 46%, and the downstairs rating is 42%. The survey yielded an overall building rating of 44%. Energy management opportunities to improve these scores are one-time costs and relatively simple installations in comparison to suggested upgrades in other categories.

A proposed upgrade to lighting is to complete the switch from the older T8 LFL tubes to new T8 LED tubes and diffusers in every light source. While this would raise the building score from 44% to just 51%, there is potential for cost savings on utility bills and materials with this upgrade. Recall the potential for 41% energy savings from this upgrade and refer to **1.3 Technical Background** for an estimated cost-benefit analysis. Overhead fixtures in corridors and shared spaces are generally left on throughout the day, which leads to higher energy consumption and more frequent bulb replacement. Over time, the cost of this upgrade would be offset by utility and material savings while contributing to GHG reduction goals.

An additional suggested upgrade is to install occupancy sensors for lighting in the corridors. The downstairs corridors are less often occupied; this upgrade would raise the downstairs NRCan rating to 47%. Occupancy sensors can save up to 68% of the building's energy waste and reduce energy demand by 29-38% (Galasiu et al., 2018). Potential costs and energy savings from this upgrade are described in in detail in the **1.3 Technical Background** section within this document.

It is recommended WHRM allocate approximately $7500-$9000 for lighting upgrades including an LED retrofit and occupancy sensor installation at this location. The benefits of small-scale lighting retrofits are quickly realized and would make a tangible difference in energy waste as described by case studies of similar office and academic buildings (Galasiu et al., 2018).

### 2.1.3 Ceilings

Most ceilings in the general office areas are uninsulated drop ceilings, however insulation does exist between the upstairs ceiling and the roof. The NRCan ceiling checklist, as mentioned, places disproportionate weight on suspended ceilings, which must be considered when assessing the ratings.

The overall building rating for ceilings was 47%. The upstairs scored 52% while the downstairs area scored 42%. The 10% discrepancy can be attributed to poor scores in the lower-level shop and shop washroom. Immediate ceiling upgrades to this location are not recommended, as upgrades to alternate systems would be more cost effective and achieve higher energy savings.

### 2.1.4 Windows

The windows in the downstairs area are unable to be opened, which resulted in a higher rating of 45% compared to the upstairs rating of 36%. These scores appear quite low; however, the weight of fixed windows described in **1.2 Checklist Considerations** contributes heavily to these low ratings. Qualitatively, the existing windows in this building are generally in acceptable condition. There were notable low ratings documented in the lunchroom and offices upstairs, and the EOC meeting area downstairs.

The addition of storm windows, even for solely winter months, would raise the upstairs window rating by 18% for an overall upstairs rating of 54%. If storms were also added to the

EOC meeting area downstairs, the total building rating would increase to 56%. This should be considered an efficient score for windows that are designed to open to the outside.

If storm windows are not desirable due to ongoing labour requirements, the efficiency of the current windows at this location can be improved by upgrading to Energy Star certified structures. The energy savings attributed to Energy Star window upgrades are dependent upon the existing window type. Refer to **1.3 Technical Background** for specific indications of energy savings and costs attributed to this upgrade. Most current windows at this location are standard double pane glass.

A more detailed audit, likely through assistance from Efficiency NS, is recommended to assess the amount of energy lost to windows at this building before investing in these upgrades. However, if windows need replacement, it is recommended to purchase exclusively low-emissivity or Energy Star designated windows.

### 2.1.5 Storage Areas

Storage in this building includes two janitor's closets, two vaults, and a large storage area downstairs. The storage areas in the municipal office are extremely energy efficient, rating 94% on the NRCan checklist. The downstairs storage area is temperature controlled to preserve the documents housed inside. There are no proposed changes to these rooms or their use.

### 2.1.6 Heating and Cooling System

In 2008, the boiler system at 76 Morison Dr was replaced with a DX refrigerant geothermal heating system (Hatch, 2018). The geothermal unit harvests stable, renewable thermal energy from deep underground and disperses it throughout the building using copper piping and antifreeze refrigerant (Figure 6; NRCan, 2021). The refrigerant flow valve is automatically reversed to remove hot air from the building to return through the piping to meet demand. This system is unique to 76 Morison Dr among surveyed buildings, and the NRCan checklist does not encompass this style of heating and cooling system. Instead, a qualitative analysis with comparisons to a traditional boiler system as observed in other municipal buildings is provided.

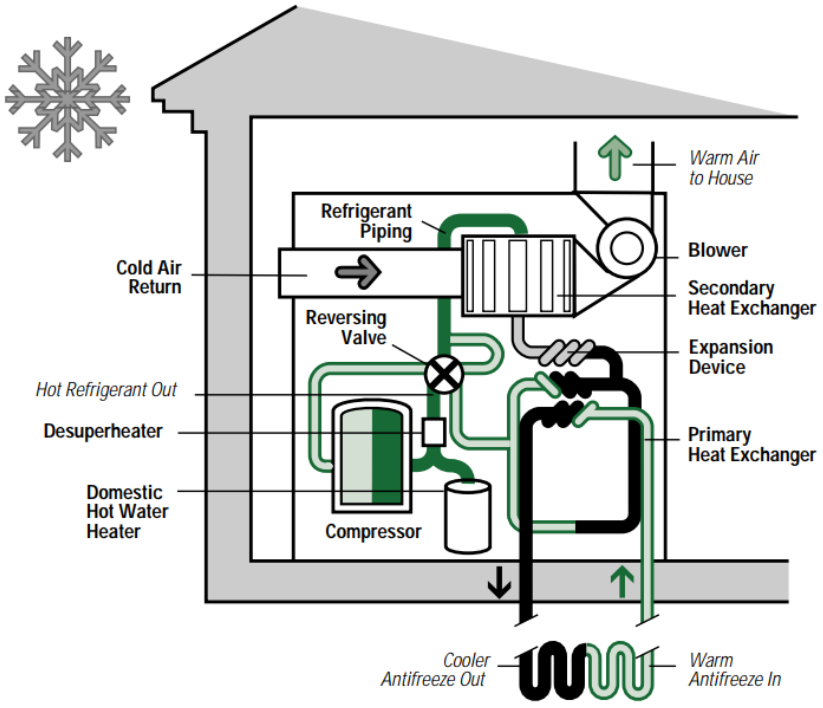


*Figure 6: Technical diagram detailing the complicated warming process conducted by the DX geothermal system. The antifreeze flow is reversed when warm building air requires cooling (NRCan, 2021).*

The geothermal system can run solely on electricity and does not require the input of any fossil fuels, unlike the conventional boiler or propane powered heating system (NRCan, 2021). According to NRCan (2021), geothermal systems require an input of one unit of electricity to produce four units of thermal energy. NSPI has committed to greening the grid, with 80% of provincial power expected to be derived from renewable sources by 2030 (NSPI, 2022). As a result, the electrically powered geothermal heat pump will gradually produce decreasing GHG

emissions annually. This compound emissions reduction effect of larger scale retrofits should be considered as decision makers assess budgets for potential energy efficiency projects.

A third-party auditor could be contacted to assess the efficiency of the new system compared quantitatively with emissions and energy loss in boiler systems. If a more detailed audit reveals considerable energy savings and emissions prevention attributed to the DX geothermal heat pump, albeit expensive, it may be beneficial in reaching WHRM's reduction targets to consider upgrading multiple municipal buildings to this model or a similar air exchange model. Geothermal heat pumps are slightly more expensive and more efficient than air exchange models because ground-source energy is more stable and consistent in colder climates (NRCan, 2021).

The cost of the project to upgrade the previous heating system to the current geothermal heat pump was approximately $220,000 in 2008. This project can be used as a baseline model for future upgrades to other municipal buildings and will be referenced in surveys of other sites. Temperature control requirements for each building will depend on size and use patterns, however the cost of the 76 Morison Dr project provides a ballpark price of a large-scale HVAC retrofit for other buildings.

### 2.1.7 Heating and Cooling Distribution

The DX geothermal system contains 5 units that control different areas of the building (Figure 7). This provides highly efficient, specific zone control to prevent unnecessary heating of unoccupied spaces. Controlling area temperature rather than an entire floor or building is a good way to maximize efficiency, as conditions in one area will not cause overwork on the whole system. Distribution pipes were all sufficiently insulated to minimize loss from thermal energy transfer.


*Figure 7: Direct-exchange geothermal temperature control system indoor units at 76 Morison Drive.*

In cases where the geothermal system overproduces heat, excess is allocated to the hot water service (NRCan, 2021). This is more efficient than a boiler system, where excess thermal energy escapes up the chimney or out of the system alternatively (Figure 8).

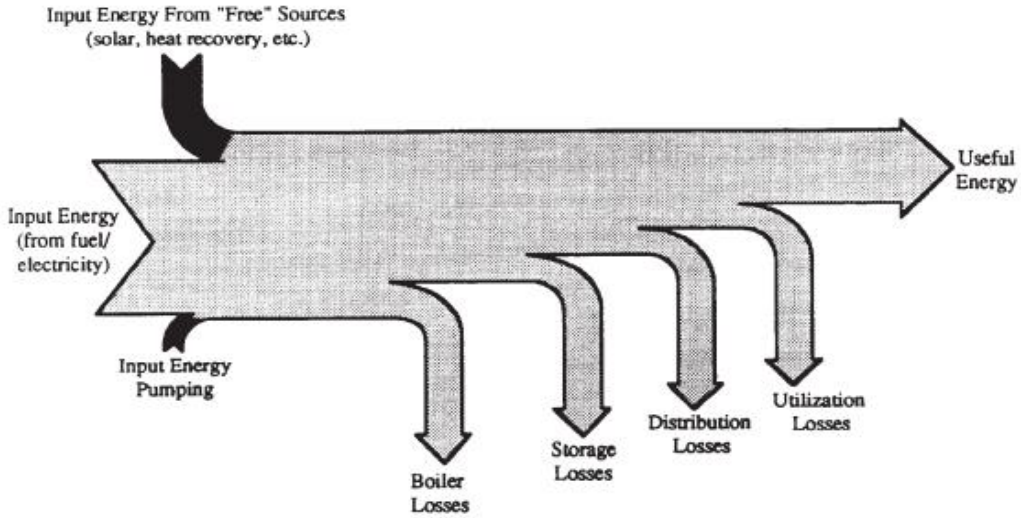


*Figure 8: Sankey diagram detailing energy loss to traditional oil-fired boiler systems (NRCan, 2009).*

Communications with staff have indicated displeasure with the geothermal system. Many individuals feel the zone control is inadequate, and the actual temperature of the workspace does not reflect the thermostat setting. Several employees explained the system does not efficiently warm their workspace when cold winter drafts occur. It may be helpful to further investigate the cause of these issues, and if improvements could be made to better allocate zone control or draft mitigation. Public Works maintenance staff Mitch Weatherbee advised during the survey that the current building layout was not designed for such a system, which may be part of the problem with distribution. In any case, the system's environmental benefits over time are far superior in meeting emissions reduction targets than conventional, oil-fired boilers.

### 2.1.8 Water and Hot Water Service

The water service at 76 Morison is partially warmed using excess heat generated by the DX refrigerant geothermal system. Hatch (2018) reported the domestic water service (DHW) was in good condition, and the building conditions survey confirmed there are no faucet leaks. DHW temperature was approximately 51ºC, which meets NRCan efficiency standards. The building had an overall rating of 80% for the water service and 63% for the hot water service. Posting and adhering to SOP would increase the water and hot water ratings to 100% and 75% respectively.

### 2.1.9 Summary

There are not as many efficiency upgrades to consider in this building compared to others included in the survey (Table 3). 76 Morison Dr is already quite energy efficient, as the building uses clean energy for temperature control and has relatively updated energy consumption systems. While reductions to the 2018 profile appear low, it is important to note this profile includes high-consumption water and wastewater treatment sites and the entire municipal building portfolio. Additional major GHG reduction would be realized from a large-scale offset project at this location.

*Table 3: Recommended upgrades at 76 Morison Drive with impact to 2018 corporate GHG profile.*

| Checklist | Upgrade | Energy Savings (%) | Annual GHG Reduction (tCO2e) | % 2018 Corporate Profile Mitigated |
|---|---|---|---|---|
| Lighting | LED retrofit | 30-41% | 38.44 | 0.011 |
| Lighting | Ocupancy sensors | 29-38% | 37.16 | 0.011 |
| Windows | Double-pane Energy Star | 15-20% | 19.22 | 0.005 |
| Exterior Doors | Garage door replacement | Draft analysis required | Draft analysis required | Draft analysis required |

## 2.2 Municipal Office: 100 King Street

The former office for Town of Windsor staff and the Windsor Fire Department at 100 King St, now occupied by the Public Works Department, is an older building, erected in 1960. It does use older energy consumption systems, but they are not as inefficient as one may expect. Upgrades have been ongoing since the building's construction. This building's efficiency could be improved greatly with low-cost, low-commitment upgrades. A major, larger scale energy efficiency issue at this location is the ongoing use of fossil fuels for temperature control.

This building is separated into two areas: the municipal operations office and fire station. The fire station side contains an expansive garage area where vehicles and equipment are stored when not in use. There is also a downstairs area on this side where staff gather for breaks or computer work. This downstairs area also contains a very large storage area and the boiler room.

The municipal office area has a main and upper level. The main level includes a reception area and several offices that are currently being used for file and furniture storage. The upper level was previously used for Town of Windsor staff and was divided into sections based on department. This level contains the former RCMP area and Town of Windsor Planning and Development offices. The upper area also houses the current WHRM Public Works Department, divided into several office spaces. There is a separated, smaller upstairs area that contains the fire chief's office and a boardroom.

The building conditions survey was completed on July 8$^{th}$ with assistance from Public Works staff Mitch Weatherbee and was revisited on July 16$^{th}$. The survey took approximately 4 hours in total.

### 2.2.1 Exterior Structures

The exterior structures at this location are dated. There was no insulation in the exterior walls upon construction, however spray foam insulation has been added to the basement level to retain heat during winter. The exterior walls were rated 29% according to NRCan standards. If spray foam insulation was added to the remaining exterior walls, this would raise the score to 71% efficiency.

The exterior doors scored 57% on the NRCan checklist. There were points lost due to poor weatherstripping. Repairing the weatherstripping on all exterior doors would raise the score to 64%. A standard commercial door closer could be installed on the basement exit to ensure the door is always firmly latched. Standard door closers, according to a market search, cost between $45-$150. Only one unit would be required with staff time to install the piece. This upgrade in conjunction with weatherstripping upgrades would increase the score to 67%.

The roof scored an acceptable 75%. Upgrades would be invasive and expensive and are therefore not recommended for this location.

### 2.2.2 Lighting

Lighting at this location was rated relatively well, scoring 76% overall. Most fixtures were LFL tubes with diffusers. The major loss of points was due to the fluorescent light source. Completing a simple LED lighting retrofit would raise the building score to 81% according to NRCan standards. Other minor losses were attributed to lack of specific area control within rooms; the entire room was illuminated rather than the work area. After completing the LED retrofit, this building's lighting will be quite efficient. Please refer to **1.3 Technical Background** for more information about the commonly recommended LED retrofit.

### 2.2.3 Ceilings

All ceilings at this site are uninsulated suspended drop ceilings, which resulted in higher scores than most other buildings in the survey. The upstairs scored 45%, while downstairs was rated 50%, for an overall building rating of 50%. Installing insulating tiles in the drop ceiling would raise the building score to 66%, and would cost approximately $3/ft$^2$ (Home Advisor, 2022). There is a large area to cover, so this upgrade may be expensive for the benefit that would be realized. However, if WHRM is interested in studying the energy savings associated with

suspended ceilings and insulated suspended ceilings, this building would be the best candidate to use for assessment.

### 2.2.4 Windows

Most of the windows at this location are designed to open to the outside, which left a significant negative impact on ratings. The limitations of the window checklist are described in **1.2 Checklist Considerations.** The upstairs windows scored 45%, and the downstairs windows scored 32% for an overall NRCan building rating of 40%.

Immediate upgrades are not necessary for the windows at this location. However, as with other buildings, Energy Star or low-emissivity windows should be purchased when the lifespan of the current windows ends. Replacement windows should all be exclusively Energy Star rated for all of WHRM's buildings. The cost and energy savings associated with this upgrade are highlighted in **1.3 Technical Background**, as the goal is to implement this item at all buildings.

### 2.2.5 Storage Areas

Former offices and meeting rooms behind the main floor reception area are currently being used for storage in the absence of municipal staff. Storage rooms that are used as designed were all rated above 80%. One glaring storage issue was the back room on the main floor, which scored 17% according to NRCan standards. It is important to allocate designated storage areas, so these rooms can be secured, and temperature control can be switched off when not necessary. The back room seems to be intended for meetings; the room has multiple windows and is quite large compared to the average office. During our visit, the door was left open, and windows were not covered, although coverings were installed. This could be a source of energy waste as building temperature control will direct energy to cool the makeshift storage room. It is unnecessary to control the temperature of an area where employees are no longer working and is being used to house extra furniture. If staff is to move back into this building full-time, an alternate storage area must be identified.

### 2.2.6 Heating and Distribution

Hatch (2018) described installations of conventional joint variant refrigerant (VRF) heat pump and heat recovery ventilation (HRV) distribution systems in the upstairs area in 2008. Similar systems were planned for install on the main floor in 2019, however it is unclear if the

installation is complete for this area. The VRF pump can provide simultaneous heating and cooling to different areas of the building using a refrigerant mixture alike the ground-source system at 76 Morison Dr. This system utilizes an air-source for thermal energy exchange rather than geothermal, and mini-split zone distribution units are located outside the building. The HRV system assists with air supply, energy recovery, and ventilation (NRCan, 2016). These systems are widely known for energy efficiency and sufficient zone control (NRCan, 2016). The NRCan rating for heating distribution was 86%. It should be investigated further if the VRF and HRV system has been implemented downstairs at this building.

The primary issue identified in these systems is that they are powered by two oil-fueled boilers. The boilers in the building scored an NRCan efficiency rating of 80%. While this is an acceptable score according to NRCan standards, the use of non-renewable fossil fuels heavily correlates with high emissions. Therefore it should be greatly considered in the long-term plans for any municipal building to transition away from fossil fuel energy. According to the 2018 GHG Emissions Inventory and other historical documents, the building consumes between 18,000L and 25,000L of light fuel oil for heating purposes annually. Fuel switching to clean energy will require large capital investment, but will provide payback in energy cost and emissions reduction.

### 2.2.7 Cooling and Distribution

Cooling at this location did not receive an NRCan efficiency rating because the design of the VRF air-exchange system does not correlate with NRCan checklist items. The VRF system is typically efficient in cooling generation, as warm outside air is conditioned by thermal energy exchange with the refrigerant. Upgrading the cooling generation at this location would not be a beneficial use of resources.

Cooling distribution could be improved by installing more mini-split systems to improve zone control and overall access to cooling in all areas of the building. As mentioned, it is unclear if the entire building has been upgraded to the VRF and HRV system. If areas that are unconnected to the system are not secured, the uncontrolled temperature will affect the entire building requiring increased work from the existing units.

### 2.2.8 Water and Hot Water Service

The gas-fired instantaneous water heater at this building is fundamentally efficient according to NRCan standards, scoring 80%. One point was lost for a lack of standard operating procedure for the unit, which can be easily rectified and should be implemented at all municipal locations.

Significant points were lost relating to hot water distribution, which scored an overall rating of just 38%. The low rating is attributed to several issues with the system. The most glaring problem was a lack of insulation around copper piping that moves hot water throughout the building, which leaves the distribution lines susceptible to thermal energy loss. There was no polyethylene insulation on any distribution lines, either connected to the heater or throughout the building. This upgrade is described in detail in **1.3 Technical Background**, as it applies to multiple buildings in the survey. Installing this low-cost insulation alone would raise the score to 63%.

The other major loss of points was because the temperature was not optimized for system requirements. For example, 78 Thomas St has individual water temperatures and heaters for the dishwasher and rest of the building. As there aren't many unique requirements at this location, adding in a temperature optimizing protocol would likely have an insignificant impact on energy consumption. This upgrade is not necessary at this time, but could be considered during future upgrades.

### 2.2.9 Summary

There are several action items to consider implementing at 100 King St (Table 4). The annual GHG reduction realized from fuel switching to a geothermal heating and cooling system is a unique calculation involving conversions and varying emissions factors. Using 2018 fuel oil consumption values from the Regional corporate and community GHG Inventory, the ECCC GHG Workbook was used to determine the annual GHG reduction from fuel switching to geothermal. Blank copies of the workbook are available through WHRM Planning and Development Department. The emissions reduction will increase over time as emissions factors decrease through NSPI's efforts to green the grid. At this location, fuel switching to geothermal would mitigate 32 $tCO_2e$ from the annual building profile in the first year, increasing to approximately 50 $tCO_2e$ annual GHG reduction by 2050.

To quantify energy savings attributed to the weatherstripping upgrades, a draft analysis is first required to determine how much energy is truly lost to the poorly sealed exterior doors. This study can be completed through Efficiency NS for a one-time payment of $199. Efficiency NS will perform the draft analysis and make other suggestions for upgrades for this cost. The cost to install new weatherstripping on exterior doors is approximately $65/door (Home Advisor, 2022).

*Table 4: Recommended upgrades at 100 King Street with impact to 2018 corporate GHG profile.*

| Checklist | Upgrade | Energy Savings (%) | Annual GHG Reduction (tCO2e) | % 2018 Corporate Profile Mitigated |
|---|---|---|---|---|
| Lighting | LED retrofit | 30-41% | 54.30 | 0.015 |
| Windows | Double-pane Energy Star | 15-20% | 27.15 | 0.008 |
| Heating | Fuel Switching - geothermal | Independently calculated | 51.00 | 0.014 |
| Hot Water Service | 3/4-inch polyethylene insulation | 9% | 16.29 | 0.005 |
| Exterior Doors | Weatherstripping replacement | Draft analysis required | Draft analysis required | Draft analysis required |
| | | **TOTAL:** | **148.74** | **0.042** |

## 2.3 West Hants Memorial Community Centre: 78 Thomas Street

The building conditions survey for the Community Centre was completed on June 29, 2022, by Climate Action Coordinators Will Chapple and John Ogilvie, with the assistance of Community Center Coordinator John Sweet.

The Community Center is an older building erected in the 1960s, which is reflected in many of its energy consumption systems. Energy efficiency upgrades in this building qualify for funding through FCM's Green Municipal Fund for GHG reduction retrofit pathways in municipally owned, community service buildings. Formulating a comprehensive retrofit plan for this building is recommended as it is a central location to lead by example, and expenses for a long-term deep retrofit can be partially covered through this funding.

This building has two floors, the main floor and basement area. One section of the main floor is separated by small offices and storage areas, containing the visitor's centre. There is a large auditorium and stage near the front entrance of the facility, and a small kitchen area near

the stairs. There are also two washrooms and the coordinator's office on this level. The basement includes various large meeting and activity rooms where camp programs often run during summer, and organizations such as the Lion's Club gather. There are also several storage areas, a boiler room, and two washrooms on this level.

### 2.3.1 Exterior Structures

The exterior of the Community Center is rather dated and would benefit from upgrades from both a construction and efficiency perspective.

To John Sweet's knowledge, the only exterior insulation is between the roof and attic, the exterior walls are uninsulated. This is a major energy efficiency issue because heating systems will demand more energy in cold months as heat produced is lost to the outside. Insulation in exterior walls is imperative to efficiently control building temperature. Installing insulation to the exterior walls would raise the rating significantly from 36% to 79%. The cost and energy savings derived from this upgrade are variable depending on materials and methods. More information is available in **1.3 Technical Background**. The exterior walls were otherwise in acceptable and watertight condition with some cracks in the mortar.

There are two roof styles on this building. The front area over the foyer is a flat-top roof, while the area over the gymnasium has a pitched roof. The roof scored 67%, which is generally a good rating for an older building that wasn't designed for maximum efficiency.

This building has five exterior doors that scored an overall efficiency rating of 54%. This score can be improved with zero-cost behavioural adjustments. The emergency exit is part of an air lock system that was propped open at both ends. Using the existing air lock system would increase the building score to 59%.

Another common loss of points was attributed to old weatherstripping. If existing air lock systems are used, and all five doors were upgraded with new weatherstripping, the rating would raise to 63%. According to Home Advisor, a national database for residential and commercial upgrades, the average cost to replace weatherstripping is $65 for each exterior door. Since there are five exterior doors at this location, the full upgrade would cost approximately $325-$400 including labour.

### 2.3.2 Lighting

As with many of the municipal buildings included in the conditions survey, lighting upgrades are a significant but low-cost energy management opportunity at this building. The building rating was 44%, with the upstairs scoring 50% and the basement 37%.

Alike other buildings, a glaring efficiency issue is the use of T8 LFL tubes with no diffusers rather than LED tubes. The building should be retrofitted to use all LED fixtures, which would save up to 41% of the energy demand (Ganandran et al., 2014). The costs and energy savings associated with the upgrade are described further in **1.3 Technical Background**. If the LED retrofit is implemented, the building's NRCan lighting rating would raise to 54% efficiency.

Occupancy sensors would be a good choice for this building as well. Many meetings and camp activities take place downstairs, but the corridor lights are not necessary to leave on throughout the day if occupancy sensors are installed. Please refer again to **1.3 Technical Background** for detailed information regarding this upgrade, as energy savings varies with model type.

### 2.3.3 Ceilings

There are major limitations when using the ceiling checklist for buildings that don't use a suspended ceiling, described in **1.2 Checklist Considerations.** All but one location in this building scored the maximum 17% for a regular ceiling. The Lion's Club meeting room scored 67% because of its drop ceiling. The overall NRCan ceiling rating was 20%.

The primary method to raise this score is to install drop ceilings in the rest of the building. This upgrade should be considered during renovations or other building upgrades, such as the proposed lighting retrofit, to limit closures of this widely used community service building. According to Home Advisor (2022), an online resource where certified contractors provide cost estimates, the price to install a drop ceiling is between \$5-\$28/$ft^2$. The cost would increase by approximately \$3/$ft^2$ if insulating panels are desired between the drop ceiling and the regular ceiling. As described previously, uninsulated drop ceilings can save up to 10.3% of a building's energy demand for temperature control (Cisca, 2008). This value would undoubtedly be higher if insulating tiles are used additionally. Studies have shown that insulated suspended

ceilings are very effective in conserving thermal energy, in some cases even causing overheating (Jimenez, 2015). In the case of Nova Scotia's mild climate, the insulating effect is unlikely to result in overheating. The energy savings are derived from increased top-to-bottom air mixing in a room, lowering the demand on temperature control system. If drop ceilings are installed in the rest of the building, the NRCan rating raises to 67%. If insulated panels are used as well, the rating will raise further to 83%.

### 2.3.4 Windows

The NRCan window efficiency rating checklist places 27% of its weight on fixed windows that are unable to be opened. This resulted in poor ratings for the Community Centre's windows; the building scored 33% on the top level and 31% in the basement for an overall rating of 32%. The windows were in relatively good condition with most other losses attributed to minor infiltration issues and lack of solar protection.

From a practical perspective, major retrofits to the windows would not be cost effective or necessary at this time. Rather, when windows need to be replaced, Energy Star rated windows should be purchased exclusively. Energy Star windows, while not a checklist item, would solve the infiltration and solar protection issues, resulting in acceptable NRCan ratings when considering the weight of fixed windows. Refer to **1.3 Technical Background** for energy savings associated with this upgrade.

### 2.3.5 Storage Areas

The storage areas at this building scored 67% on the NRCan checklist. All suggested upgrades for these rooms will only cost staff time and behavioural changes. It was noted that the door to Storage Room 6 is regularly left ajar. This door should remain closed to raise the storage area rating to 70%, because energy used to condition the building would no longer be unnecessarily lost to this storage room. Storage rooms generally do not require temperature control, so this open door allowing infiltration of heated air is a source of energy waste.

Additionally, behind the stage and the extra offices beside the visitor center were not designed for storage but were still being used to house miscellaneous materials. If the items in these areas were moved to a specified storage area, the building rating would raise to 78%. Efficiency is raised by moving stored material because storage areas are not typically

temperature controlled. Using conditioned areas for storage limits their designed use (i.e., office space), and the energy produced and delivered to these areas by the HVAC system is wasted. If the stored materials cannot be feasibly moved to a better location, heating and cooling should be turned off and these areas secured to reduce waste. These items can be immediately implemented for no cost.

### 2.3.6 Heating and Distribution

The Community Center's heat is powered by two conventional boilers that were recently replaced, with electric baseboards as backup. John Sweet advised the electric baseboards are often used during the winter for room-specific temperature control. The building's overall heating efficiency rating came to 43%. While there is room for improvement, it would not be cost effective to immediately upgrade this system because of its recent installation. The survey team were advised that a notable section of insulation was removed from piping due to potential asbestos and was not replaced – the asbestos and insulation issues must be addressed immediately for safety as well as energy efficiency.

Switching away from fossil fuels should be a primary action item for all municipal buildings that still use oil and propane-fired boiler systems. The DX geothermal system is efficient, and WHRM already has a model to follow at 76 Morison Dr. This system cost approximately $220,000 in 2008 and is described in detail in **2.1.6 Heating and Cooling System**.

Alternatively, Efficiency NS is willing to assist municipalities with fuel-switching to air-source heat pumps. Either of these options are sound solutions to the fossil fuel consumption for heat production, and the emissions associated with them at this location.

### 2.3.7 Cooling and Distribution

There is no central cooling unit at this location. Areas are cooled individually using electric window units. As such, the NRCan checklist for cooling and distribution is not applicable to this building. A qualitative assessment of energy management opportunities is more appropriate in this case. As above, a sound, long-term upgrade is the installation of a DX heat pump. This would eliminate the need for window units and significantly cut energy costs and emissions for temperature control.

Table 5 details monthly average energy consumption and cost for AC window units by room size (Morrison, 2022). While installing a DX heat pump is a future action item at this building, in the meantime it would be beneficial to ensure the current window units are appropriate for the area temperature they control. There is potential for energy waste if the correctly sized unit is not in use.

*Table 5: Average monthly energy usage, cost, and GHG equivalent for AC window units by room size assuming 8h daily runtime and energy cost of $0.15/kWh (Morrison, 2022).*

| Area (sqft) | BTU | Watts | kWh (Month) | Cost (Month) | GHG output (tCO2e/Month) |
|---|---|---|---|---|---|
| 150 | 5000 | 550 | 132 | $ 19.80 | 0.0950 |
| 350 | 8000 | 660 | 158.4 | $ 23.76 | 0.1140 |
| 450 | 10000 | 900 | 216 | $ 32.40 | 0.1555 |
| 550 | 12000 | 1100 | 264 | $ 39.60 | 0.1901 |

In cases where the unit is not big enough for the area according to the suggested BTU above, the unit should be replaced with an appropriate model to mitigate energy waste. Table 5 above provides a general idea of the expected cost and emissions, but a more accurate total annual energy cost and GHG emissions resulting from window AC units can be calculated following a detailed assessment of the current units. A general estimate using NSPI power bills and the Table 1 values, assuming 8-hour daily runtime for 5 months (May-September), suggests each window AC unit accounts for approximately 3-4% of the annual energy use at this building, costing $200-$250 in utilities and outputting up to 0.936t$CO_2$e annually. This is an estimate for each window AC unit, not the entire building, so the emissions and energy consumption from these units is a glaring energy efficiency issue. Ensuring the correctly sized unit is being used will be a simple action item while discussions about major HVAC retrofits are ongoing.

### 2.3.8 Water and Hot Water Service

There are two units that control water and hot water services at the Community Center. A smaller system exclusively connects to the upstairs dishwasher, while the main unit supplies the rest of the building. This is an efficient way to optimize the water temperature for the specific requirement, which is a checklist item. In this older building this feature is encouraging to note, as energy is not lost due to unnecessary heating. Overall, the building scored 40% on its water services systems and 50% on its hot water services.

It was noted that the domestic hot water (DHW) temperature was set to 82ºC, which is 22ºC hotter than the NRCan suggested setting for efficiency. It is recommended to reduce the DHW temperature in this building to 60ºC to prevent unnecessary work on the water heating systems. There is no cost associated with this adjustment, the building coordinator simply must change the setting.

Another useful upgrade, alike other municipal buildings, is to install ¾-inch polyethelene foam insulation on the copper hot water distribution lines. Uninsulated lines were noted throughout the building, which is concerning considering the current DHW temperature. The estimated energy loss to distribution lines in an efficient system is 9%, which is likely higher due to the lack of insulation (Wilden Living Lab, 2022). This is a very low-cost upgrade for immediate benefit; refer to **1.3 Technical Background** for more details on this common upgrade.

Implementing these two items would raise the NRCan rating for hot water systems in this building from 50% to 75% efficiency. These are very simple items with low cost compared to future returns in energy conservation. If implemented along with an enforced SOP and regularly scheduled maintenance, the hot water system at this building would score a perfect 100% efficiency rating according to NRCan standards.

### 2.3.9 Summary

This building would benefit from many small-scale efficiency upgrades to existing systems. Table 6 below lists quantifiable measures to summarize GHG reduction from the proposed upgrades. Many other upgrades recommended at this location are behavioural with an incalculable impact on the GHG profile. Some upgrades, such as installing the suspended ceiling, window replacement, or fuel switching, should be planned around the end of lifespan of existing systems. Others such as the LED retrofit or hot water distribution insulation can be implemented immediately for low cost.

*Table 6: Recommended upgrades at 78 Thomas St with resulting impact to 2018 corporate GHG profile.*

| Checklist | Upgrade | Energy Savings (%) | Annual GHG Reduction (tCO2e) | % 2018 Corporate Profile Mitigated |
|---|---|---|---|---|
| Exterior Walls | Insulation | 10-20% (dependent on heat demand) | 3.99 | 0.001 |
| Lighting | LED retrofit | 30-41% | 11.97 | 0.003 |
| Ceilings | Suspended Ceiling | 9-10.3% | 3.59 | 0.001 |
| Windows | Double-pane Energy Star | 15-20% | 5.98 | 0.002 |
| Heating | Fuel Switching - geothermal | Independently calculated | 20.00 | 0.006 |
| Hot Water Service | 3/4-inch polyethylene insulation | 9% | 3.59 | 0.001 |
| Exterior Doors | Weatherstripping | Draft Analysis required | Draft Analysis required | Draft Analysis required |
| | | **TOTAL:** | **49.12** | **0.014** |

The annual GHG reduction realized from fuel switching to a geothermal heating and cooling system is a unique calculation involving conversions and emissions factors. Using 2018 fuel oil consumption values from the Regional corporate and community GHG Inventory, the ECCC GHG Workbook was used to determine the annual GHG reduction from fuel switching to geothermal. Blank copies of the workbook are available through WHRM Planning and

Development Department. The emissions reduction will increase over time as emissions factors decrease through NSPI's efforts to green the grid. At this location, fuel switching to geothermal would mitigate 16 $tCO_2e$ from the annual building profile in the first year, increasing to approximately 20 $tCO_2e$ annual GHG reduction by 2050.

## 2.4 Hants Aquatics Centre: 306 Stannus Street

The survey at 306 Stannus St took place on July 6th with assistance from facility coordinator John Sweet. This facility is connected to two NSPI meters - one for the main building and change rooms, and one for a small pump shed for the outdoor swimming pool. The main building includes a reception area and the coordinator's office, as well as two changing rooms with showers. The building is a relatively small, open-concept design. The pump shed is a very small building that houses the five pumps that operate the outdoor swimming pool. It is also used for equipment storage.

Higher energy consumption is noted in summer months when the public pool area is fully operational. John Sweet advised this occurs for approximately 3-4 months out of the year. The only temperature-controlled area during the off season is the coordinator's office, where temperature-sensitive chemicals and materials are stored, which is reflected in the monthly electrical consumption at this building.

### 2.4.1 Exterior Structures

The exterior structures at this property include the exterior walls, doors, and roof of the main building and the pump shed. It is important to note that insulation is a highly weighted checklist item for exterior structures. However, it is not necessary to insulate the pump shed because it is not temperature controlled, so thermal energy is not being produced in the first place. To provide a practical rating, the exterior structures scores at this location are divided into two categories: main building and pump shed. Interior structures will not be separated between the two buildings.

The main building has insulated exterior walls, achieving an acceptable rating of 71%. The only loss of points was because the walls lack solar protection. This is not a major efficiency issue, therefore the walls will not need to be upgraded at this time. The exterior doors in the main building included the front and back entrance, and change room exits. These doors scored a 63% rating. This could be improved to 67% by installing automatic closers on the exterior doors.

Energy savings from this upgrade would likely not be significant at this location because it does not use a cooling system and is not used by the public when heating would be necessary. Therefore, energy loss to exterior doors is quite low, and this upgrade should be implemented only if a cooling system is installed. The roof of the main building scored an acceptable 83%; no upgrades are recommended at this time.

The pump shed scored very low on all exterior structures, due to factors described previously. However, while upgrades would increase the NRCan scores, they will not have significant real-life energy savings. It would not be worth the cost to insulate or otherwise upgrade a building that is not used for most of the year and does not consume energy through temperature control. When asked about upgrading the electric pumps, Mr. Sweet advised a VFD would not greatly improve the efficiency of the pumps (Figure 9). The NRCan ratings were 29% for the exterior walls, and 33% for both the exterior doors and roof.

*Figure 9: Electric pumps at 306 Stannus St.*

### 2.4.2 Lighting

Lighting at this location scored quite well because all fixtures were LED models. The overall score for the property was 86%, which could be improved to 100% by allowing specific area lighting. The switches currently operate the entire room rather than the “work area”, so better control over which lights are running based on necessity would increase efficiency.

Otherwise, lighting was in acceptable condition in all areas. Occupancy sensors are not a good option for this location as the building is made up of three large, high-traffic rooms: the main reception area and two change rooms.

### 2.4.3 Ceilings

The ceiling of the Aquatics Centre is an insulated open-plenum style ceiling. The insulation exists between the roof and the ceiling, but there is no drop ceiling in place. This resulted in the maximum rating of 17% for regular ceilings. Please consult **1.2 Checklist Considerations** for more information regarding the limitations of the NRCan ceiling checklist. Due to low energy demand from temperature control at this location, upgrading the ceiling should only be considered during required structural upgrades. If structural upgrades occur, it is recommended to consider installing a suspended ceiling at this location.

### 2.4.4 Windows

The front entrance wall is partially made up of large, fixed windows. Remaining windows are located in the change rooms and coordinator's office. Overall, windows were in good condition, but scored a relatively low 48% by NRCan standards. The main loss of points was lack of solar protection (i.e., curtains, shrubbery, etc.) that would block solar rays from unnecessarily raising building temperature. If curtains or blinds were installed to mitigate the unwanted heating, the efficiency score would raise to 54%.

As with other buildings, only Energy Star windows should be purchased in future window replacements. The coordinator's office and change room windows appear to be single paned, so this upgrade would be highly effective at this location. Please refer to **1.3 Technical Background** for a cost-benefit analysis of Energy Star windows.

### 2.4.5 Storage Areas

There are no specified storage areas in this building. Items are stored in the outbuildings, which are not connected to electricity or temperature control. Therefore, storage is fully optimized at this location and uses no energy. The NRCan score for storage areas is 100% efficiency.

### 2.4.6 Heating and Distribution

The heating system at this location is electric baseboard heaters for each room in the main building. The pump shed is not temperature controlled. The NRCan checklists were designed for conventional boiler systems, so they will not be relevant or applicable to this location. Qualitatively, the zone control was adequate for an electric baseboard model, with individual thermostat controllers for different rooms/areas. All heating is turned off when the public is not using the building in the colder months.

Any upgrades to this system would involve installing air-source or geothermal DX heat pumps, which are more efficient than electric baseboards. However, this would be a high-cost upgrade to consider for a building that is closed for most of the year. This upgrade is not recommended at this time.

### 2.4.7 Cooling and Distribution

This facility lacks a central cooling unit and does not use alternate methods to cool the building. During the site visit, the exterior doors were open to allow air flow and to create an inviting atmosphere for the public. If a cooling system was implemented, this open-concept design would become a source of energy waste.

It is not necessary to implement a cooling system, again attributed to the short span in which the facility is operational every year. Through the site visit and surveying, it was clear this building would not directly benefit from a cooling system. Upgrades to fossil-fuel based HVAC systems in other buildings should be prioritized instead.

### 2.4.8 Water and Hot Water Service

The water and hot water services at this location do not include any processes for the outdoor public pool. The water service scored 60% efficiency, losing points for the absence of a SOP. Some equipment, including the shower, uses water once-through before discharging to the sewer. A grey water system may be most efficient at this building compared to others in the survey because of the higher water demand in the change room showers. Water from showers and sinks is used once-through and discharged, which is not the most efficient method. Grey water systems collect the used ‘grey’ water from showers and sinks and use this water to flush toilets and water gardens, among other uses. Implementing a grey water system at this location

would aid in water conservation, and in combination with a posted SOP, would raise the NRCan score to 100% efficiency.

Water is heated using a conventional electric domestic water heater. The survey team was unable to determine the exact DHW temperature, but it was assumed it was likely greater than 60C. The hot water service was rated at 50% efficiency. The distribution lines are uninsulated, as with other buildings in the survey. Installing polyethylene foam insulation around the copper piping would mitigate up to 9% of energy loss related to DHW processes, described in detail in **1.3 Technical Background.** This upgrade would raise the hot water service score to 75%. Lowering the temperature to 60C and posting a SOP would raise the NRCan score to 100%.

### 2.4.9 Summary

Overall, recommendations are limited at this location. There are some action items that could be implemented during scheduled structural upgrades (Table 7). The building conditions survey identified several areas for improvement theoretically, but many did not make sense practically. Since the facility is only under full operation for a small portion of each year, efficiency upgrades would not be as effective at this location compared to other complexes. Allocating limited budgetary resources to this building, where the energy consumption is low for much of the year, would not be in the best interest of WHRM.

A more effective project at this location would be to investigate thermal solar energy to heat the public pool. This is outside of the scope of the 2022 building conditions survey but could be investigated further if funding becomes available for such a project.

*Table 7: Recommended upgrades at 306 Stannus Street with impact to 2018 corporate GHG profile.*

| Checklist | Upgrade | Energy Savings (%) | Annual GHG Reduction (tCO2e) | % 2018 Corporate Profile Mitigated |
|---|---|---|---|---|
| Ceilings | Suspended Ceiling | 9-10.3% | 3.26 | 0.001 |
| Windows | Single Pane Energy Star Replacement | 20-30% | 7.25 | 0.002 |
| Hot Water Service | 3/4-inch polyethylene insulation | 9% | 3.26 | 0.001 |
| | | **TOTAL:** | **13.78** | **0.004** |

## 2.5 Sports Complex: 16 Centennial Drive

The West Hants Sports Complex is one of WHRM's newest additions to the building portfolio. It was designed to be extremely energy efficient, although its processes are inherently energy intensive. Temperature must be controlled to maintain ice in the arena, and the facility is much larger than any other corporate building leading to more energy consumption structures/systems. In 2021-22, NSPI energy bills showed this building demanded over 1 million kWh in electricity and output over 800 $tCO_2e$. For context, this is more than double the GHG output of the highest-emitting corporate facility in the 2018 GHG Inventory, a sewage treatment plant at 48 Falmouth Connector.

The Sports Complex, while emitting a high GHG volume, boasts some of the most energy efficient systems and structures of all municipal buildings. This is reflected in the NRCan checklist scores. Most recommended upgrades at this site involve behavioural changes or simple upgrades that require staff time. The energy consumption systems at this location should be used as a guideline or benchmark for other high-emitting complexes to aim for as soon as possible.

This building is two stories, divided into areas specific to their intended activity. On the main floor, the front entrance opens into a wide corridor and seating areas. To the east side of the building is an expansive indoor field house, extending to the roof. To the west area, there is the ice rink and changing rooms, as well as storage for hockey and arena equipment. The Zamboni and maintenance is also located in this area. Upstairs, there are various rooms including a warm

room for the ice arena and a meeting area with a kitchen. The seating for the ice rink extends to the top floor, and HVAC operating rooms are located aside the stands.

The building conditions survey for the Sports Complex was completed on July 6th, with assistance from Sports Complex Coordinator Glenn Wentzell. The survey took approximately three hours.

### 2.5.1 Exterior Structures

The exterior of the building was designed as efficiently as was feasible. The metal exterior walls are insulated, watertight, and their grey colour provides some reflective protection against solar rays. The exterior walls scored 86% on the NRCan checklist.

The exterior doors also scored well, at 70% efficiency. Points were lost because building design did not provide wind screening, but this is not a likely source of energy waste as the weatherstripping is secure on all doors. Points were also lost because some exterior doors were not part of an air lock system. While this is great to strive for, building design does not always allow for air lock systems to be used. It was noted the air lock system for the front doors was not being used; this behaviour should be adjusted to mitigate energy loss as patrons come and go.

The roof is flat and gravel-covered, which is considered somewhat reflective material. The roof is insulated, and no leaks have been detected since the building was erected. The roof was rated 92% according to NRCan standards. There are no proposed upgrades to any exterior structures in this building.

### 2.5.2 Lighting

Lighting fixtures and control at this site were the best among all buildings, scoring 95% on the NRCan checklist. All fixtures were LED models, used dual-technology occupancy sensors, and had highly specific controls. The user can manipulate how many fixtures are on, and how brightly they shine.

The only loss of points was in areas where area-specific controls were not implemented. This means the lights in those areas would only illuminate the entire room, without options to light a specific work area. Considering the high overall rating, these items are not necessary to implement in the remaining rooms. Additionally, most areas that lacked specific controls were either small rooms, such as the Warm Room, or important workspaces, such as the front office.

Operators at other municipal buildings should use the Sports Complex's lighting arrangements as a model to follow during recommended lighting retrofits.

### 2.5.3 Ceilings

The ceiling checklist, as referenced, is quite limited for areas that do not have suspended ceilings. Refer to **1.2 Checklist Considerations** for more details. The building's overall score for ceilings was 36%, affected negatively by rooms with regular ceilings. Furthermore, some areas of the Sports Complex have irregular ceiling design for unique operations, such as the arena or field house. The ceiling checklist is likely not as effective in detecting energy management concerns for these unique ceiling styles. While the low ceiling score may indicate room for improvement, the site visit confirmed the ceiling design is not necessary to change or upgrade at this time.

### 2.5.4 Windows

Windows at this location were quite unique, especially in the arena and field house. This made them difficult to survey; some inaccuracy is expected for these ratings. The overall rating was 66%, highly supported by the windows' inability to open to the outside. This is heavily weighted, as described in **1.2 Checklist Considerations**. The only major efficiency issue was a lack of window coverings in the main reception area. Installing blinds for hot days is important to reduce overheating and mitigate extra work from the cooling system. This would raise the window score to 71%.

### 2.5.5 Storage Areas

Storage areas at the Sports Complex were not a huge concern to the efficiency of the building. The NRCan score was 87%, which is quite high as it is. A simple behavioural adjustment to ensure doors to storage areas are always closed would raise this score to 95%. It was noted at two of the four storage areas that doors were not secured even though the storage area was not being accessed.

### 2.5.6 Heating/Cooling and Distribution

The central heating and cooling system in this building is quite different from others and will be reported as one unit. The antifreeze glycol is used as a heat-transfer fluid in the hydronic heating and cooling system. A mixture of glycol and water is pumped around the building using

a complex piping and ventilation system to supply heat and cooling, specific to individual areas at the demand of the operator (Figure 10). Thermal energy is collected by the glycol mixture, either through air-source or ground-source, for distribution throughout the facility. This heating and cooling system allows highly specific zone control and efficient energy allocation, as excess thermal energy is sent to the hot water service.

*Figure 10: Glycol heating and cooling system operating room at West Hants Sports Complex.*

The heating system checklist is designed for a steam boiler. The checklist was modified to account for items that do not apply to this system. The overall NRCan rating for heating and for heat distribution was 86%. Cooling and distribution were rated 83% and 91%, respectively. There are plans to further optimize this system by implementing a dehumidifying step in the cooling process. This is a highly efficient system and may be a useful model to follow when upgrading HVAC systems in other large facilities. A system of this scale would not be applicable to some of the smaller buildings, such as the Aquatics and Community Centres.

### 2.5.7 Water and Hot Water Service

The water service at this location was rated 80% according to NRCan standards. The water service lacks a posted SOP, which would raise the score to 100%. The faucets in washrooms and change rooms were all sensor-operated and free of leaks. Staff should take time to develop a SOP and stricter scheduled maintenance to detect and prevent long-term issues with the water service.

The hot water service scored 75% on the NRCan checklist. The loss of points was again attributed to a lack of SOP, and the DHW temperature is >60C. The score can be improved to 100% by addressing these items. The DHW service at this location is even more energy efficient than the conventional system because excess thermal energy from the glycol heating system is allocated to heat the water. This reduces energy waste from the heating system, and energy consumption from the DHW system. During upgrades, other municipal buildings should aim to implement a similar method of excess heat reallocation.

### 2.5.8 Summary

As mentioned, this facility is highly efficient in its current state. At this time, there are no suggested upgrades derived from the NRCan building conditions survey. The energy consumption systems at this location should be used to guide efficient construction and retrofits in the future of WHRM.

## 3.0 Conclusion

The 2022 NRCan Building Conditions Survey successfully identified various energy management opportunities through five of WHRM's municipal buildings. To complete Action Item 1.1 in the GHG Emission Local Action Plan: Perform Internal Building Conditions Survey, this methodology should be replicated at remaining municipal buildings, where applicable.

Initial upgrades should focus on completing small-scale efficiency upgrades recommended in this report to prepare for deep retrofits or offset projects. Smaller upgrades include lighting retrofits, window replacement, insulating hot water service lines, and ensuring exterior insulation is sufficient. These less significant and invasive types of upgrades, among other smaller projects, increase energy efficiency and reduce overall demand and emissions from the facility. By lowering energy demand, large-scale upgrades such as fuel switching, or renewable energy projects will require less investment and capacity to offset the building's GHG

emissions. It is more feasible to achieve significant GHG reduction through these larger upgrade types by ensuring the energy consumption systems are already running as efficiently as possible.

Efficiency NS has been involved with assisting other municipalities to implement smaller efficiency upgrades. Many of these items are covered by the NRCan (2009) checklists, such as lighting retrofits, while others, such as wrapping electric water heaters with insulating blankets, are not. Generally, Efficiency NS is willing to assist municipalities with smaller, immediate items through the Business Energy Rebates and Small Business Energy Solutions Programs. Efficiency NS can also perform low-cost draft analyses to guide weatherstripping and insulation upgrades. A partnership between WHRM and Efficiency NS should be investigated to implement immediate, low to zero-cost efficiency upgrades at as many municipal complexes as possible. Where Efficiency NS will not cover the cost of upgrades, savings on utility costs would eventually repay the cost of recommended action items from this report.

Completed checklists from site visits for this report, and a blank template for future use are available upon request.

# References


Cisca. (2008). *Life Cycle Analysis - Wall-to-Wall Ceilings and Open Plenum*. Energy Savings and Other Benefits of Suspended Ceilings vs. Open Plenum. Retrieved August 25, 2022, from https://www.cisca.org/files/public/LCS_brochure_rev_9-08_lo-res.pdf

Culp, T. D., Widder, S. H., & Cort, K. A. (2015). Thermal and optical properties of low-E storm windows and panels. *Conference Paper: Regional Technical Forum Policy Advisory*. https://doi.org/10.2172/1226413

Dees, P. (2021, September 8). *The stack effect: How it works and impact on Energy Efficiency*. Therma: A Ledence Company. Retrieved from https://www.therma.com/the-stack-effect/

Ecostar Insulation. (2021). *Benefits of Spray Foam Insulation*. Ecostar Insulation. Retrieved from https://www.ecostarinsulation.ca/blog/spray-foam-insulation-cost

Galasiu, A. D., Newsham, G. R., Suvagau, C., & Sander, D. M. (2007). Energy Saving Lighting Control Systems for open-plan offices: A field study. *LEUKOS*, *4*(1), 7–29. https://doi.org/10.1582/leukos.2007.04.01.001

Ganandran, G. S., Mahlia, T. M., Ong, H. C., Rismanchi, B., & Chong, W. T. (2014). Cost-benefit analysis and emission reduction of energy efficient lighting at the Universiti Tenaga nasional. *The Scientific World Journal*, *2014*, 1–11. https://doi.org/10.1155/2014/745894

Home Advisor. (2022, July 18). *Drop Ceiling Cost per Square Foot*. Install a Drop Ceiling. Retrieved from https://www.homeadvisor.com/cost/walls-and-ceilings/drop-ceiling-install/

The Home Depot. (n.d.). *Garage Door Prices and Installation Cost*. The Home Depot Canada. Retrieved from https://www.homedepot.ca/en/home/ideas-how-to/windows-doors/how-much-does-a-garage-door-cost-to-install.html

Morrison, D. (2022, May 10). *Window AC vs Central AC: Which is Better for You?* Home Air Guides: Air conditioners, air cooling. Retrieved from https://homeairguides.com/window-ac-vs-central-ac-which-is-better-for-you/

National Electrical Manufacturers Association. (2006). Demand Reduction and Energy Savings Using Occupancy Sensors. *NEMA Lighting Systems Division Document*.

NRCan. (2009). *Energy Savings Toolbox: An Energy Audit Manual and Tool* . Office of Energy Efficiency, Natural Resources Canada.

NRCan. (2016). *Major Energy Retrofit Guidelines for Commercial and Institutional Buildings*. Government of Canada.

NRCan. (2019, December 31). *Technology Primer: Factors Affecting Energy Efficiency*. Windows, doors, and skylights. Retrieved from https://www.nrcan.gc.ca/energy-efficiency/products/product-information/windows-doors-and-skylights/technology-primer/14432

NRCan. (2021, August 9). *Heating and Cooling with a Heat Pump*. Natural Resources Canada. Retrieved August 25, 2022, from https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about/energy-star-announcements/publications/heating-and-cooling-heat-pump/6817

NSPI. (2022). *Powering a Green Nova Scotia, Together*. Nova Scotia Power. Retrieved from https://www.nspower.ca/cleanandgreen/renewable-energy-sources#:

Premier Lighting. (2015). *T8 fluorescent lamps vs T8 led tubes*. Premier Lighting. Retrieved from https://www.premierltg.com/should-you-replace-your-t8-fluorescent-lamps-with-t8-led-tubes-2/

U.S. Department of Energy. (2019). *Wireless sensors for Lighting Energy Savings: An Applications Guide for Federal Facility Managers*. Energy Efficiency and Renewable Energy. Retrieved from https://www.energy.gov/sites/default/files/2019/12/f70/wireless_occupancy_sensor_guide.pdf

Wilden Living Lab. (2022). *Efficient water heating makes a huge difference*. Wilden Sustainable Home Living Project. Retrieved from https://wildenlivinglab.com/2022/01/10/efficient-water-heating/

**Attachment B**

# Investigating Solar PV Potential in Municipal Complexes

## WEST HANTS REGIONAL MUNICIPALITY

William Chapple
CLIMATE ACTION COORDINATOR | AUGUST 2022

# Introduction

The Municipal Climate Change Action Plan (MCCAP) Committee 2022 workplan included an action item to "explore the potential for a small to medium scale solar energy project" to offset a portion of the energy demand from municipally owned complexes. The greenhouse gas (GHG) emissions output from most municipal facilities were reported in the 2018 GHG Inventory, a report which divides West Hants Regional Municipality (WHRM) GHG emissions into community and corporate profiles. The GHG Emission Local Action Plan 2021 details a goal of 45% reduction in annual corporate and community emissions by 2030, which will require intensive and rapid action at a scale that smaller municipalities are not yet familiar with. Nova Scotia Power (NSPI) has made commitments to switch the province's electrical grid to renewable energy sources. By 2030, it is estimated their efforts to 'green the grid' could account for up to 44% reduction in WHRM's corporate GHG profile, helping to realize the Municipality's goal. This means a small to medium scale solar energy project on municipal property is a good option to achieve the 2030 corporate GHG reduction target.

Solar PV projects for corporate buildings will typically require large initial investments for long-term reductions in electricity cost and GHG emissions. Solar power was selected for analysis over alternate renewable energy sources at the request of the Municipal Climate Change Action Plan (MCCAP) Committee to enhance public awareness of renewable energy options. The study sites selected included high-consuming properties identified through the WHRM 2018 GHG Emissions Inventory, including municipal buildings and water/wastewater treatment facilities (Table 1). It is important to note the current GHG profile differs from the 2018 values due to changes in building operation and behavioural variability. The 2018 values are reported alongside 2021-22 consumption values because they are the basis for reduction targets in the 2021 GHG Emission Reduction Action Plan.

***Table 1:*** *List of study sites, 2021-22 electricity demand and GHG emissions, and percentage share of 2018 corporate GHG profile.*

| Municipal Buildings | Demand 2021-22 (kWh) | GHG Emissions 2021-22 (tCO2e) | % 2018 Corporate Profile |
|---|---|---|---|
| 76 Morison Dr | 177,960 | 128.1 | 4.6% |
| 100 King St | 251,400 | 181.0 | 7.5% |
| 995 Hwy 215 | 203,626 | 146.6 | 4.6% |
| 16 Centennial Dr | 1,128,480 | 812.5 | N/A* |
| 306 Stannus St | 85,637 | 61.7 | 1.0% |
| 78 Thomas St | 42,071 | 30.3 | 2.0% |
| **Water Treatment** | **Demand 2021-22 (kWh)** | **GHG Emissions 2021-22 (tCO2e)** | **% 2018 Corporate Profile** |
| 786 Windsor Back Rd | 317,160 | 228.4 | 8.0% |
| 2160 Bishopville Rd | 160,920 | 115.9 | 4.9% |
| 242 Eldridge Rd | 274,539 | 197.7 | 6.0% |
| **Wastewater Treatment** | **Demand 2021-22 (kWh)** | **GHG Emissions 2021-22 (tCO2e)** | **% 2018 Corporate Profile** |
| 48 Falmouth Conn | 490,140 | 352.9 | 10.9% |
| 3 Lagoon Dr | 877,416 | 631.7 | 9.5% |
| *The Hants Sports Complex was not operational at the time of the 2018 GHG Inventory. | | | |

The purpose of this report is to identify potential sites to consider for a solar PV project. The reported values serve as an estimate to guide the Municipality's engagement for quotes through an external solar power installation company and can be used to understand which sites have realistic potential for such a project. These estimates should not be considered accurate quotes for an on-the-ground project. The load capacity and structural requirements of the roofs, shading, and spacing among other considerations were not directly studied in this project. The solar installation company would need to confirm any of these items during the quote survey. The Municipality can use the values in this report as a basis to direct an external solar company to sites with better relative potential to obtain accurate and detailed quotes for solar energy projects.

## Methodology

The 2018 GHG Inventory lists corporate emissions by energy type and building. Using this in combination with energy use data from 2021-2022 NSPI bills and emissions factors, progress towards the 45% corporate emissions reduction goal can be quantified.

According to Environment and Climate Change Canada (ECCC), the emissions factor for electricity in Nova Scotia was reported as 720 $gCO_2e/kWh$, or **0.00072 $tCO_2e/kWh$** in 2018 to

account for renewable energy powering the electrical grid. The value has not changed since according to ECCC documents. Annual emissions by building in $tCO_2e$ reported in Table 1 above were calculated by multiplying 2021-22 electricity consumption (kWh) and the emissions factor.

Formulas were sourced from Energy Hub, an open-source solar installation guide that collects data from Natural Resources Canada (NRCan) Photovoltaic potential and solar resource maps, and provides provincial and national averages for solar irradiance (Figure 1).

| Month | kWh/kW |
|---|---|
| January | 66 |
| February | 89 |
| March | 105 |
| April | 98 |
| May | 106 |
| June | 112 |
| July | 111 |
| August | 111 |
| September | 102 |
| October | 82 |
| November | 56 |
| December | 52 |
| **Annual Total** | **1090** |

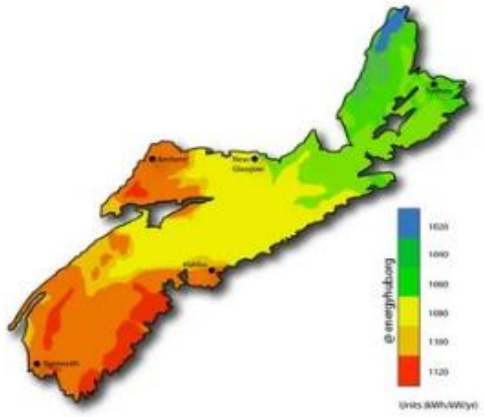

***Figure 1:*** *Solar irradiance averages for Nova Scotia. The average solar array in NS can produce 1090 kWh/kW of solar panels (Energy Hub through Natural Resources Canada, 2021).*

An annual inventory of energy use (kWh) can be collected from NSPI power bills and substituted into Energy Hub formulas to estimate the size and cost of a solar array to offset electrical energy consumption at each facility. The formulas are used as follows:

*Formula A (size of installation (kW))*

$$\text{Size of system needed (kW)} = \text{yearly energy use } (kWh) \,/\, \text{annual equivalent full sunlight hours (h)}$$

$$(\text{annual equivalent full sunlight hours} = 1090)$$

*Formula B (size of installation (sqft))*

$$\text{Physical space required} = \text{size of system needed (in kW)} \,/\, \text{size of panel (in kW)} * \text{physical size of panel (in sqft)}$$

$$(\text{average size of panel } = 0.3\text{kW}, \text{average physical panel size } = 18\text{sqft})$$

*Formula C (cost of installation ($))*

$$\text{System cost } = \text{ size of system needed} * \text{cost per installed watt}$$

$$\frac{\$2.75}{\text{watt}} = \text{ the average cost of installing a solar PV system in Nova Scotia.}$$

Site visits were conducted in July and August 2022 to establish several feasibility items for installation. In many cases, a large area (>10,000 square feet) will be required to offset all power from the facility or building due to the high demand. Panels can be installed on the rooftop or unused yard areas; the site visits provide a qualitative analysis including building considerations and area available for a solar PV installation.

To determine available space, parcel size was determined through TownSuite Orthophoto and measuring tools to supplement qualitative analysis from site visits. Available space was considered unoccupied roof or yard space. Existing parking areas, gardens, or forested areas were not included in these measurements. Most properties will not have sufficient space to install a solar array to offset all power from the building, however partial offsets will still facilitate progress towards GHG reduction goals.

# Municipal Buildings

## Overview

The Energy Hub calculations described above were used to estimate the solar PV system size and cost required to offset the *total* annual electricity consumption at each municipal building (Table 1). The consumption values do not account for fuel oil consumption; oil-fired boilers are used for heating in 100 King St and 78 Thomas St. The size of the system in both kW and square feet do not account for spacing or mounting equipment for the panels. Also not considered quantitatively in this report are considerations for shading or aspect (i.e., due south facing). These items were analyzed through a qualitative assessment during site visits and reported in the respective site sections below.

| Building | Address | Size of System (kW) | Size of System (sqft) | System Cost |
|---|---|---|---|---|
| Municipal Office | 76 Morison Dr | 163 | 9796 | $ 448,981.65 |
| Municipal Office | 100 King St | 231 | 13839 | $ 634,266.06 |
| Brooklyn Fire Station | 995 Hwy 215 | 187 | 11209 | $ 513,735.32 |
| Sports Complex | 16 Centennial Dr | 1035 | 62118 | $ 2,847,082.57 |
| Aquatics Centre | 306 Stannus St | 79 | 4714 | $ 216,056.65 |
| Community Centre | 78 Thomas St | 39 | 2316 | $ 106,142.43 |

***Table 2:*** *Estimated size and cost requirements for a solar PV project to offset total annual electricity consumption using 2021-22 consumption values at each of the selected municipal buildings.*

Based on the available space determined in square feet using TownSuite tools described above, the Energy Hub formulas provide an estimated size and cost of a solar project each site could feasibly hold (Table 3). By comparing these new values to the size and cost of a project to offset total annual electricity consumption in Table 2, the portion of annual electricity demand each site has the capacity to offset through solar PV power was determined.

***Table 3:*** *Estimated size and cost requirements for a solar PV project based on available space as determined through TownSuite - including the estimated portion of annual electricity consumption offset by the project based on 2021-22 consumption values.*

| Building | Address | Size of System (kW) | Availalable Space (sqft) | System Cost | % Consumption Offset |
|---|---|---|---|---|---|
| Municipal Office | 76 Morison Dr | 158 | 9500 | $ 435,416.67 | 97% |
| Former Municipal Office | 100 King St | 88 | 5300 | $ 242,916.67 | 38% |
| Brooklyn Fire Station | 995 Hwy 215 | 167 | 10000 | $ 458,333.33 | 89% |
| Sports Complex | 16 Centennial Dr | N/A | N/A | N/A | N/A |
| Aquatics Centre | 306 Stannus St | 28 | 1700 | $ 77,916.67 | 36% |
| Community Centre | 78 Thomas St | 78 | 4700 | $ 215,416.67 | 203% |

## 76 Morison Dr.

### Site Description

76 Morison Dr is the current municipal office for WHRM staff operations. Most staff have moved to this office from 100 King St following consolidation. The property lies in the industrial park in Windsor, a short distance away from downtown Windsor. The Orthophoto shows that most of the property outside of the main building footprint is reserved for three parking areas (Figure 2). The southwest side of the property is a small yard area facing Highway 101. It is unlikely solar panels in this area would be highly visible to the public, due to trees blocking the view from that perspective. The roof is visible from the highway.


***Figure 2:*** *TownSuite Orthophoto of 76 Morison Dr.*

### Available Space and Feasibility

The total property size is 1.36 acres. Of this, it was determined that the pitched roof has approximately 6800ft$^2$ of available space, and the yard space on the southwest side and alongside the upstairs staff entrance has 2700ft$^2$. It is unclear if the entire roof area could be used, but this could be determined more accurately if this site is selected for a quote. As reported in Table 3, the total available space is 9500ft$^2$. A project of this size is estimated to cost $435,416 and offset 97% of this building's annual electricity consumption.

In the 2018-19 fiscal year, 76 Morison Dr was the third highest-emitting municipal building, accounting for 11.7% of municipal building emissions and 4.6% of the total corporate GHG profile. The potential for such a significant offset to the corporate GHG profile makes this site an attractive option for further investigation by an external solar company.

### Additional Site Considerations

- Hatch (2018) reported the roof was in good condition, constructed with asphalt tiles on plywood on wood trusses. Structural upgrades to the roof including tile replacements were forecasted to cost approximately $37,000 at the time of the Hatch report. Repairs or replacements to roof structures would likely be required prior to installing solar panels due to the 20-year lifespan of most solar panels.
- There are picnic tables set up in the yard space included in the 9500 square feet of available space. Staff often eat their lunch or otherwise occupy these spaces in warmer months. It is important to note a solar array using all available space would require sacrificing these social and personal areas.
- A backup diesel generator that is housed behind the building must be avoided when considering the project.
- The trees along the southwest property line may need to be removed, both to prevent shading of the solar panels and for better public visibility.
- Referring again to visibility, the public in Windsor would likely be less aware of a project at this location because the property is situated away from the downtown core.

## 100 King St.

### Site Description

This site is the municipal office where Town of Windsor staff operated pre-consolidation, and the Public Works Department is now located. It also houses the Windsor Fire Station. The property is situated in downtown Windsor in a relatively high-traffic and visible area. 100 King St is a tightly packed property with parking on either side and no available yard space (Figure 3). The expansive


***Figure 3:*** *TownSuite Orthophoto of 100 King St.*

flat roof, however, could work perfectly for a solar installation.

### Available Space and Feasibility

The roof is the only available space at this property. The property size is 15,765 square feet, with approximately 5300 square feet on the rooftop. The formulas determined an estimated 38% offset of annual electricity consumption if the entire roof area is used for solar panels. This is a less significant offset than other sites in this study and does not account for the fuel oil consumption used for temperature control. Compared to other sites, if WHRM aims to produce the most power possible from a solar project, 100 King St is not the best option.

One factor that makes 100 King St a notable option for consideration is its high public visibility, being situated within the downtown Windsor core. If the municipal operations transition back to this building, WHRM could boast an energy efficient, central town hall. The high roof reduces risk of energy loss to shading or solar citing (direction), but also means the array may be difficult to see from street level. Compared to other properties, the project would still be quite 'visible' at this site even if the solar panels are not directly viewable from the ground. The high public concentration in this area means the project would be a big talking point around town, which leads to heightened awareness even if people cannot see the physical panels. If this site is selected for a project, it is highly recommended to place significant emphasis on promotion and public engagement. If WHRM chooses to conduct main operations from this building, even more public members would be visiting the site of the solar project daily, further increasing visibility through word-of-mouth and displaying WHRM's commitment to climate change mitigation.

### Additional Site Considerations

- A solar PV quote from Natural Forces Solar was obtained for this property. The quote details a feasible project size of 78.3kW, estimated to cost approximately $212,000. The estimated system using the above formulas and TownSuite was 88kW for $243,000. This highlights the inherent error in the Energy Hub estimates of about 12% due to required spacing, mounting equipment, existing rooftop infrastructure, etc. As mentioned, the values in this report are designed to direct an external solar company to the best-suited sites for accurate quotes.
- There may be structural roof upgrades necessary prior to installation.

## Brooklyn Fire Station – 955 Highway 215

### Site Description

The Brooklyn Fire Station is a large property that houses the Brooklyn Volunteer Fire Department and community centre. There is a large field space surrounded by a walking track on the west side of the property as shown in the Orthophoto (Figure 4). The large field appears to be a good candidate for a solar array; however, the grounds are designated a helicopter landing area and used regularly for Fire Department training purposes. As the project would need to avoid these areas, detailed conversations with operating managers and fire station volunteers will be required to determine the true available space if this site is selected for quote.


***Figure 4:*** *TownSuite Orthophoto of 995 Highway 2, Brooklyn Fire Station.*

### Available Space and Feasibility

This is a larger property, measuring 7.18 acres of land. The field space hold an area of approximately 38,000 square feet, however, the entire space would not be used due to training and helicopter landing considerations. To prevent inaccuracy, the field area was not included in the estimate of available space.

The flat rooftop is 10,000 square feet, and may be a great option for a solar project. The Brooklyn Fire Station tied with 76 Morison Dr as the third highest-emitting building in the 2018

municipal portfolio, accounting for 4.6% of the corporate GHG profile. If the entire rooftop was used for solar panels, up to 89% of this building's annual electricity consumption could be mitigated. This is a 4% reduction to the 2018 corporate GHG profile, which would put WHRM on target to meet 45% corporate GHG reduction targets when also considering grid adjustments to clean energy.

### Additional Site Considerations

- This is the only study site where a site visit and interview with operations manager has not yet been conducted. This would provide a better idea of the facility's energy consumption and capacity for solar. It would also identify any other considerations at this location.
- An accurate measurement of available, unused space in the west yard would increase the offset potential if more available area were identified.

## West Hants Sports Complex – 16 Centennial Dr.

### Site Description

The West Hants Sports Complex at 16 Centennial Dr was constructed in 2018. The building is extremely energy efficient considering its inherently high-consumption operations, including maintaining the ice in the arena and highly controlled temperature regulation processes. The 2018 GHG Inventory does not include this building, and the TownSuite Orthophoto aerial photo for this property has not been updated since the structure was erected. The complex at 16 Centennial Dr is alongside the high-traffic Wentworth Rd, however a potential solar project would not be visible by drivers or passersby; the roof gently slopes away from Wentworth Rd, and any other available space is behind the building.

### Available Space and Feasibility

The lack of aerial imagery made this property difficult to assess for available space and feasibility. The property size is 4 acres. Compared to others in this report, a solar project at this location is not recommended. The building is already highly efficient in terms of its energy consumption systems. Its kWh usage is high due to the nature of the processes going on to maintain the building's operation, leading to a high cost of >$1 million to offset the annual electricity demand. The project would be better suited to a building where most of the electricity demand would be offset. This would aid in the simplification of tracking GHG reduction progress, as the complex was not included in the 2018 inventory, and for marketability to the

public. Since this building is already highly efficient, spreading effort across WHRM's building portfolio would be more beneficial, and likely reach more people. Additionally, the project would not be at all visible to the public, due to the high roof sloped towards the rear of the property and the lack of space in front.

### Additional Site Considerations

- Solar PV is not recommended at this location.
- Advertising energy efficiency to the public at this building should focus on what it already has, including an efficient glycol air-exchange and area controlled central HVAC system, energy recycling and reallocation features, low consumption lighting fixtures and appliances, future electric vehicle charger, and more.

## Community Centre - 78 Thomas St.

### Site Description

The Windsor Community Centre is used for public gatherings, summer camp programs, other fundraising, and outreach programs, and is situated in a central location in downtown Windsor (Figure 5). Its location on the corner of Thomas St and Gerrish St directly beside the main King St is a high traffic area, and the roof is visible from the street level to drivers and pedestrians. It is also very close to the Hants Aquatics Centre at 306 Stannus St, where members of the public gather in large numbers during warm months, further increasing visibility.


***Figure 5:*** *Orthophoto of Windsor Community Centre at 78 Thomas St.*

### Available Space and Feasibility

The roof at this location is peaked in the centre with approximately 4700 square feet available for a solar installation. There is a flat section of roof above the front entrance and foyer.

One side of the pitched roof is positioned almost perfectly due-south facing, which is the ideal aspect for maximizing power harvested from the solar array. The other side of the pitched roof would need to be assessed professionally to determine if the aspect will work for solar.

Electrical consumption is low at this location because temperature control is currently powered using oil-fired boiler systems. This led to a notable offset potential of 203% if the maximum amount of available space is used. There is potential to mitigate 2% of the 2018 corporate GHG profile if this building is selected. The site has been selected for electric vehicle charger installation in fall 2022, so the addition of solar power (along with additional efficiency upgrades) would make this project a great choice for the visibility and promotion of energy efficiency to the public. It is recommended a quote be obtained for this building because of its visibility, feasibility, and opportunity for funding.

### Additional Site Considerations

- Roof should be replaced or upgraded prior to any solar project due to 20-25-year lifespan of solar projects.
- Some glaring and easily reparable efficiency issues were identified in the 2022 Internal Building Conditions Survey. These items should be addressed to maximize the impact of a solar PV project at this location (i.e., exterior insulation).
- Preliminary staff conversations have taken place about using this building as the central focus for a funding application to FCM's Community Buildings Retrofit program. The proposed project would likely include solar power on the rooftop, among other upgrades if Council is in favour of such an application.

## Hants Aquatics Centre – 306 Stannus St.

### Site Description


This site contains two buildings: the main area with change rooms, and the pump house. The main building is noted with the civic number "306" on the Orthophoto, and the pump house is the small building on the east side of the property (Figure 6). The property size is 75,000 square feet, however, much of the yard space on the west side of the property is used for volleyball courts and public park space. It is connected to two power meters, one for each building. The building is located in central Windsor, across from the Community Centre.

***Figure 6:*** *TownSuite Orthophoto of 306 Stannus St.*

### Available Space and Feasibility

Overall, this building should be considered a possibility, but not a priority when considering a solar project. The primary selling factor for this building is its high public visibility and potential for public education, as it is a popular public gathering spot in summer.

There is an area of approximately 1700 square feet of available space on the roof, which facilitates a potential electricity offset of just 36%. Since the consumption is already considerably lower than the other buildings included in the study, this value does not make this building a great option for solar power. Other buildings would likely be better options for MCCAP's proposed project.

### Additional Site Considerations

- The operations on this property are shut down for most of the year. One heater stays on in the coordinator's office, but all other baseboard temperature control is switched off.
- Extremely visible, but maintenance would be challenging due to proximity of children in warmer months when maintenance would take place.

- Since consumption is far less in winter months, extra power could be directed to other municipal buildings to continue to save on costs.
- Roof upgrades likely required to ensure 20-25-year lifespan of a solar array.

## Water and Wastewater Treatment Facilities

Water and wastewater treatment plants in WHRM were included in this report to correspond with wishlist item 2.4 in the GHG Emission Local Action Plan (Figure 7). These facilities are responsible for the Municipality's highest corporate emissions, at 50.2% of the 2018 corporate GHG profile. The operations in these facilities are inherently high-consumption processes; it is difficult to reduce demand at these locations, which is why offsetting with solar or green power is a good option to consider to reduce their impact.

| 2.4 INVESTIGATE RENEWABLE ENERGY OPPORTUNITIES – SOLAR PV FOR THE WATER AND WASTEWATER TREATMENT PLANTS | |
|---|---|
| **Cost/Funding** | $557,700 for 650 panels and 13 two-axis trackers (Scalable solar system is $900-$1,100 per solar panel based on 2019 numbers)<br>Funding may be available through Low Carbon Communities |
| **Dept. Responsible** | Public Works |
| **Timeline** | Medium term |
| **Details** | Expected emissions reduction is 244 tCO2e with a ground mounted solar PV system on the Falmouth Sewer Plant (48 Falmouth Connector), which equates to a 13.8% reduction in the water and wastewater sector. Small scale systems are typically grid connected without battery storage, with net metering available to balance the hourly differences between facility electricity demand and system generation. The water and wastewater treatment plants are the greatest source of emissions in the corporate sector, so renewable energy can help offset the energy |

***Figure 7:*** *Action Item 2.4 detailing goals to use solar PV for water and wastewater treatment plants. This item identifies and assigns reduction values to 48 Falmouth Conn as the primary site for consideration; however, this report highlights five high-consumption sites.*

The methodology described above was used to determine the system size requirement for each site to offset total annual electricity consumption (Table 4).

***Table 4:*** *Estimated size and cost requirements for a solar PV project to offset total annual electricity consumption using 2021-22 consumption values at each of the selected treatment facilities.*

| Building | Address | Size of System (kW) | Size of System (sqft) | System Costs |
|---|---|---|---|---|
| Water Treatment | 786 Windsor Back Rd | 291 | 17458 | $ 800,174.31 |
| Water Treatment | 2160 Bishopville Rd | 148 | 8858 | $ 405,990.83 |
| Water Treatment | 242 Eldridge Rd | 252 | 15112 | $ 692,644.27 |
| Wastewater Treatment | 48 Falmouth Conn | 450 | 26981 | $ 1,236,642.20 |
| Lift Station | 3 Lagoon Dr | 805 | 48298 | $ 2,213,664.22 |

Available space and capacity were again determined using TownSuite Orthophoto (Table 5). In these facilities, the site visits and interviews with operations managers often revealed that what appeared to be available space on TownSuite was being used for future infrastructure or underground operations that require access to maintain. The value calculated from Orthophoto was not altered to prevent bias, but these items will be reported qualitatively for consideration. A professional solar company would have the ability to assign more accurate values for available space upon obtaining a quote.

## 786 Windsor Back Rd.

### Site Description

This site is the primary water treatment facility for WHRM, with a property size of 33.81 acres. Much of this is forested area, with a watercourse running through the property that supplies the treatment operations. It is not recommended to remove trees to make space for solar due to habitat loss and potential public backlash. It is best to select a site that already has available space for an appropriately sized system.

***Table 5:*** *Estimated size and cost requirements for a solar PV project based on available space as determined through TownSuite - including the estimated portion of annual electricity consumption offset by the project based on 2021-22 consumption values.*

| Building | Address | Size of System (kW) | Availalable Space (sqft) | Cost | % Consumption Offset |
|---|---|---|---|---|---|
| Water Treatment | 786 Windsor Back Rd | 163 | 9800 | $ 449,166.67 | 56% |
| Water Treatment | 2160 Bishopville Rd | 120 | 7200 | $ 330,000.00 | 81% |
| Water Treatment | 242 Eldridge Rd | 28 | 1700 | $ 77,916.67 | 11% |
| Wastewater Treatment | 48 Falmouth Conn | 445 | 26700 | $ 1,223,750.00 | 99% |
| Lift Station | 3 Lagoon Dr | N/A | N/A | N/A | N/A |

Notably, this building uses oil-fired boilers for temperature control. The consumption values for these systems are not included in the building's annual electricity consumption or estimates of percentage offset from a solar project. This study focuses solely on current electricity demand and the potential to offset it through solar.

## Available Space and Feasibility

The 9800 square feet identified as available space includes the flat roof (2300 sqft) and the grassy area on the north side of the main building (7500 sqft) (Figure 8). Through communication with operations manager Martin Croney, this yard space is not slotted for infrastructure or other use. The aspect of the slope in this area of the property is approximately NE facing, which is not the ideal orientation for solar panels, but is likely still feasible. If the roof and yard space are appropriate for solar upon quote, the potential offset is 56% of the building's annual electricity consumption. This is a 4% reduction to the 2018 corporate GHG profile. If only the roof can be used, the potential for offset is only 13% of the annual electricity consumption, for a 2018 corporate GHG profile mitigation of just 1%. This site is a good candidate if the yard space is appropriate for solar. A quote is recommended to be obtained for this location.

***Figure 8:*** *TownSuite Orthophoto of 786 Windsor Back Rd. Main operations take place where infrastructure is shown on the southwest area of property. The referenced yard space is highlighted in yellow.*

The property is a considerable distance away from nearby infrastructure or public areas. It is likely the majority of WHRM residents would be unaware of a project's existence at this location. If this property is selected for a solar project, high priority must be taken to promote the project and ensure the public is aware of WHRM's sustainability efforts to satisfy the visibility piece.

### Additional Site Considerations

- The environmental impact of construction and installation near a watercourse must be considered. The location is a known turtle nesting site, including snapping turtles (provincially listed species), so precautions must be taken to ensure compliance with all species protection legislation.
- Roof upgrades recommended/investigated prior to any solar installation
- Confirm through quote if yard space on north side of building is appropriate for solar. Backup diesel generator should be relocated to maximize this space.

## 242 Eldridge Rd.

### Site Description


***Figure 9****: TownSuite Orthophoto of 242 and 238 Eldridge Rd*

The water treatment operations at 242 and 238 Eldridge Rd take place on a massive property of 42.7 and 7.42 acres, respectively. However, as shown in the Orthophoto, much of this space is forested or waterlogged (Figure 9). The surrounding area is relatively undisturbed forest and removing trees to create more space for a solar array would likely bring negative publicity to WHRM.

### Available Space and Feasibility

A small, peaked roof (1800 sqft) was identified as the only available space for solar at these large properties. Even if the entire space was used for solar panels, which is unlikely to be the case in a realistic scenario due to spacing and mounting equipment, the potential for electricity offset is only 11% of the annual demand. Alternative water and wastewater facilities would be better options for a solar PV project.

### Additional Site Considerations

- Solar PV is not a good option at this location attributed to lack of available space - due to heavy forest, watercourse running through property, and lack of public visibility.
- Species inventories and environmental assessments (ecological land classification, impact assessments, etc.) would be required to remove vegetation or otherwise alter the land, further increasing costs.

## 2160 Bishopville Rd.

### Site Description

The water treatment facility at 2160 Bishopville Rd is made up of one main operation building, and a yard space in the back where two waste ponds are situated (Figure 10). The building is internally efficient compared to other facilities, using heat pumps, LED lighting, and process water heater optimization among other efficient practices. Of the water treatment facilities, solar would be most visible at this location as it is the most proximal to high-traffic areas. A project at this location, however, would still be less visible to the public compared to some of the building and wastewater facility options.


***Figure 10**: TownSuite Orthophoto of 2160 Bishopville Rd.*

### Available Space and Feasibility

It was determined through Orthophoto measuring tools that of the 1.53-acre property, approximately 7200 square feet are available for solar panels. This includes 4500 square feet in yard space behind the building, and 2800 square feet atop the roof.

If 7200 square feet were used for a solar array, the potential electricity offset is 81% of the annual demand. This high offset potential makes this facility a top contender of the water and wastewater treatment facilities for a potential solar project. This site should be investigated further through a quote from a professional solar company.

### Additional Site Considerations

- Additional roofed infrastructure including a small, sheltered car-park area and roof over the generators could be erected, increasing available space.
- Roof reinforcement is likely required as roof is original to construction.
- The pitched roof faces NE on one side and SW on the other. The SW portion of the roof will produce more solar energy due to the relatively ideal aspect.
- A third waste pond is unlikely to be required in the near future at this location, leaving the current yard space open for solar panels.

## 48 Falmouth Connector

### Site Description

This complex is one of the main wastewater treatment facilities for WHRM. The wastewater enters the facility, where it is processed through various infrastructure before discharging the treated effluent into the Avon River (Figure 11). The property lies just off the main Highway 101 and is highly visible to the public. A large solar array at this location would likely be the first thing drivers notice as they travel into the Windsor area going eastbound. The high visibility of the project means the impact would be readily apparent to WHRM residents and is likely the best option out of all the water and wastewater treatment facilities in terms of public engagement and promotion.


***Figure 11****: TownSuite Orthophoto of 48 Falmouth Conn. The fenced area visible in the photo is not suitable for solar, but the surrounding green space may be.*

## Available Space and Feasibility

Using TownSuite, it was determined that 65,000 square feet is free of infrastructure in the yard space, while 1800 square feet is available atop the roof of the main office. The site visit and interview with operations manager Martin Kehoe indicated a substantial portion of the yard space inside the fence would not be available once infrastructure expansions are completed. Without accounting for these items, the property does have potential to offset up to 99% of its electricity consumption via solar power.

It is impossible to assess the exact amount of available space without plans, technical drawings, and a background in solar feasibility. Therefore, a quote is highly recommended at this facility to assess how much space is truly available. It was determined that the property has the physical space to accommodate a large enough solar array to mitigate almost its entire annual electrical consumption, and a quote will define exactly how much of that space will be suitable for a solar project. As this property has the second highest electrical consumption of all the water and wastewater treatment plants, even a partial offset would have a significant impact to the corporate GHG profile.

## Additional Site Considerations

- Much of the yard space inside the fence is not suitable for solar because it has been sectioned off for infrastructure expansion. Where there is currently green space will be a new clarifier and underground piping that would be difficult to maintain if covered by solar panels.
- The yard space outside of the fence is available for solar but will need to be assessed professionally for wetland or other geological conditions.

- WHRM has an existing relationship with an adjacent landowner; who may be willing to sell a portion of his property for WHRM's solar project. Further discussion with the landowner would be required.
- Access to the inner workings of infrastructure is required, meaning solar panels cannot be implemented atop the treatment buildings. The roof of the main office building is the only suitable roof space.
- The roof will need to be assessed for reinforcement before any solar panels are installed.

## 3 Lagoon Dr.

### Site Description

Dubbed "The Lagoons" by operations staff, this property holds two large wastewater ponds (Figure 12). The rectangular pond is original, and the triangular pond is a more recent addition to this property. The green space surrounding the water bodies is used by operations staff to travel around the ponds to complete routine maintenance. There are two small buildings on this property. One holds electric pumps, and the other is a small lab and chemical storage area. Chlorine and sulfur dioxide are added to the effluent at this location, but there are plans to change chemicals to environmentally safer peracetic acid in the near future.


***Figure 12:*** *TownSuite Orthophoto of wastewater lagoons at 3 Lagoon Drive.*

### Available Space and Feasibility

The TownSuite Orthophoto shows the entire property is covered by water. It was determined that there is no available space at this location for a solar PV project. It is not feasible to cover the ponds, and any greenspace is used by operations staff on ATVs to perform maintenance.

Therefore, solar PV should not be considered further for this location. 3 Lagoon Drive is still the highest-consumption site of all water and wastewater facilities, so efficiency upgrades should be investigated to reduce this value. As offsetting is not an option, variable-frequency drives (VFD) for the pumps and motorized components are the best option to reduce this facility's GHG footprint. These devices regulate motor speed and control by varying the frequency and voltage of the power supply, which is especially useful for systems that do not normally run at their full capacity. VFDs are regularly used in water and wastewater facilities to reduce energy waste and regulate motor speed during startup and shutdown. Solar will be considered for other water and wastewater treatment facilities instead.

### Additional Site Considerations

- Any solar project at this location would require covering the lagoons. Covering the lagoons with solar panels would limit maintenance to air pumps that oxidize the water in the lagoons.
- There is ongoing debate in wastewater management regarding the positive and negative aspects of dilution with rainwater. Either way, covering the lagoons would limit rainwater influx, decreasing dilution and also decreasing volume treated during storm events.

## Summary

Using the Energy Hub calculations and Nova Scotia electricity emissions factor, emissions derived from electricity consumption can be compared in the business-as-usual (BAU) scenario, where current operations are continued unaltered, versus a solar PV project scenario where the maximum available space for each site is used for solar panels (Figure 13, Figure 14).

The Sports Complex at 16 Centennial Dr and the wastewater treatment site at 3 Lagoon Drive are not included in these analyses because available space was unable to be determined from the Orthophoto.

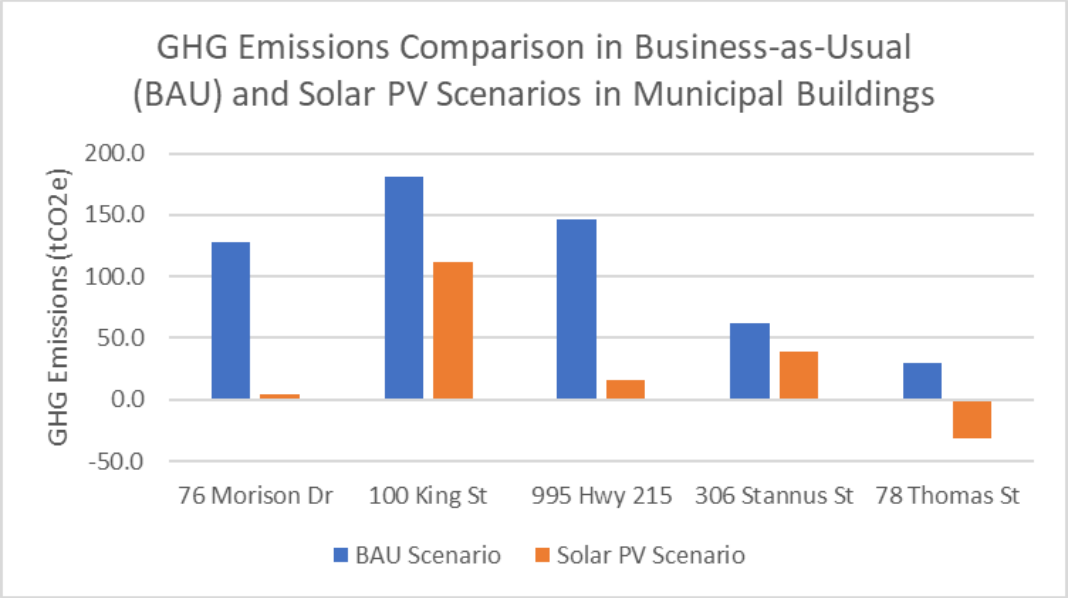


***Figure 13**: Graphical depiction of GHG reduction in $tCO_2e$ if the maximum available space determined through TownSuite is used for a solar PV project in the selected municipal buildings. Based on 2021-22 electricity consumption values. Additional energy efficiency upgrades will alter the potential GHG reduction and offset values.*

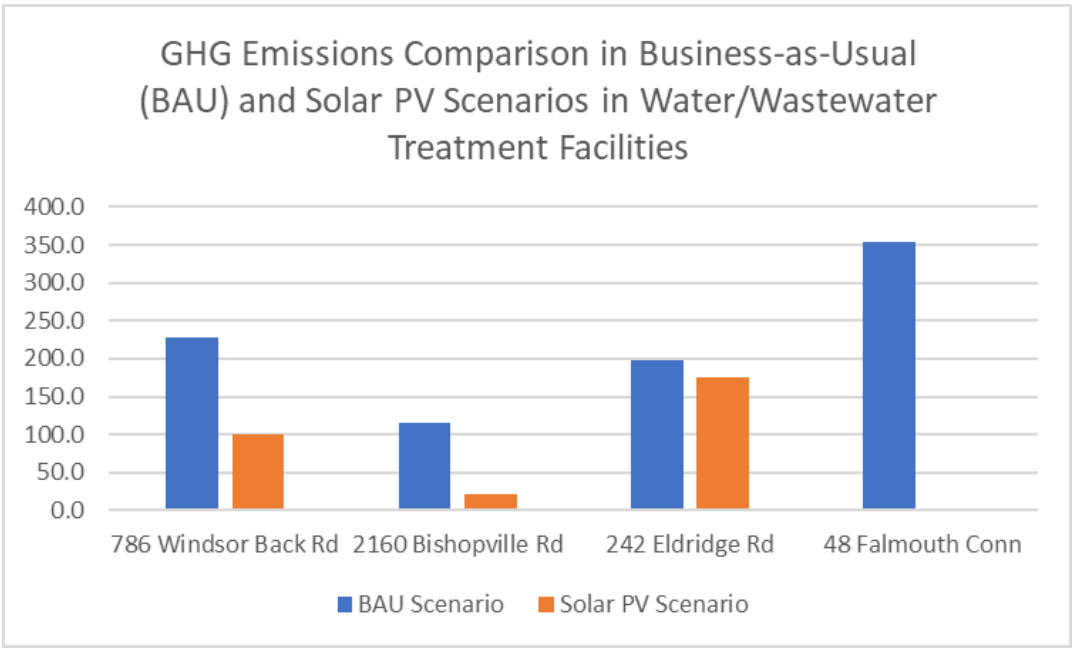


***Figure 14**: Graphical depiction of GHG reduction in $tCO_2e$ if the maximum available space determined through TownSuite is used for a solar PV project in the selected water and wastewater treatment facilities. Based on 2021-22 electricity consumption values. Additional energy efficiency upgrades will alter the potential GHG reduction and offset values.*

The buildings and facilities included in this study would all benefit to different degrees when considering a solar project to offset electricity consumption. Quotes from professional solar companies are generally free of charge and will supply decision makers with the most accurate information to select a site for MCCAP's proposed solar PV project. WHRM should focus efforts on buildings with high disparity between the BAU and Solar PV scenarios. Priority should also be given to complexes with higher BAU emissions because an offset project at these locations would be more impactful and better facilitate progress towards GHG reduction targets.

In conclusion, based on each site's potential capacity for offset, professional quotes from an external solar company are recommended to be obtained at the following locations:

**Municipal Buildings:**

- 76 Morison Drive
- 78 Thomas St
- 100 King St (already obtained)

**Water and Wastewater Treatment:**

- 786 Windsor Back Rd
- 2160 Bishopville Rd
- 48 Falmouth Conn

## Funding Opportunities

Funding via Low Carbon Communities (LCC) through the Department of Natural Resources and Renewables could become available in the future for these projects. The interest period for 2021-2022 has ended, however the popularity and demand for climate mitigation projects will continue to grow. It is likely there will be multiple rounds of funding, which can cover up to 75% of the cost of a solar or other renewable energy installation.

*For more information: https://novascotia.ca/low-carbon-communities/*

The Green Municipal Fund (GMF) has funding available for Municipalities to work on climate mitigation and emission reduction projects for community use buildings. The program allocates funding to municipalities or non-profit groups to implement upgrades to buildings over

time that lead towards near net-zero emissions. A combined loan and grant of up to 80% of project costs is offered to eligible projects. The amount available per project is up to $5 million, with 25% as a grant and remaining costs as a loan. The program emphasizes projects with pathways to near net-zero, which does not limit funding to solely solar installations. Funding applications are currently open and will close when all the funding has been allocated. A feasibility study is required to accompany an application, and buildings providing a public service (not offices) are prioritized. WHRM should capitalize on this opportunity to have costs for large-scale retrofits partially covered by the Province. The building conditions survey in conjunction with this solar feasibility report can be used to identify appropriate buildings to fully retrofit to near net-zero using this funding.

| Funding | Details |
|---|---|
| **Community building monitoring and analysis grant** | • Grant for up to 80% of eligible costs<br>• Up to $25,000<br>• Only one project of this type is eligible for funding within an individual municipality regardless of whether the included building or buildings are owned by the municipality or a not-for-profit organization. |
| **Community building recommissioning grant** | • Grant for up to 60% of eligible costs<br>• Up to $55,000<br>• Only one project of this type is eligible for funding within an individual municipality regardless of whether the included building or buildings are owned by the municipality or a not-for-profit organization. |

| | |
|---|---|
| **GHG reduction pathway feasibility studies** | • Grant for up to 80% of eligible costs<br>• Up to $65,000 for a single building<br>• Up to $200,000 per portfolio of buildings (the average per building must not exceed $65,000)<br>• Only one feasibility study of this type is eligible for funding within an individual municipality regardless of whether the included building or buildings are owned by the municipality or a not-for-profit organization. |
| **GHG impact retrofit capital projects** | • Combined grant and loan for up to 80% of eligible costs<br>• Maximum of $5 million per project. Up to 25% as a grant and the remainder as a loan<br>• See the note below on the number of capital projects eligible for CBR funding. |
| **GHG reduction pathway retrofit capital projects** | • Combined grant and loan for up to 80% of eligible costs<br>• Maximum of $5 million per project. Up to 25% as a grant and the remainder as a loan<br>• See the note below on the number of capital projects eligible for CBR funding. |

For more information: https://fcm.ca/en/funding/gmf/capital-project-ghg-reduction-pathway-retrofit

**WEST HANTS REGIONAL MUNICIPALITY REPORT**

| | | | |
|---|---|---|---|
| Information X | Recommendation ☐ | Decision Request ☐ | Councillor Activity ☐ |

**To:** Members of Municipal Climate Change Action Plan (MCCAP) Committee

**Submitted by:** _____
Sara Poirier, Senior Planner

**Date:** 2022-09-14

**Subject:** Discussion: MCCAP Terms of Reference

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**LEGISLATIVE AUTHORITY**

Municipal Climate Change Action Plan (MCCAP) Workplan, Ongoing Tasks.

**RECOMMENDATION or DECISION REQUEST**

This report is for information purposes, there is no recommendation.

**BACKGROUND**

| | | | | | |
|---|---|---|---|---|---|
| Property ☐ | Public Opinion ☐ | Environment X | Social ☐ | Economic ☐ | Councillor Activity ☐ |

Based on the MCCAP Committee Workplan, the Committee is to review and update the Terms of Reference annually.

**DISCUSSION**

The MCCAP Committee was formed pursuant to the Meeting and Committee Procedural Policy dated March 23, 2020. The MCCAP Terms of Reference were originally approved by the Committee at the Committee's first meeting on September 9th, 2022.

The MCCAP Committee Terms of Reference were reviewed with the Committee on November 10, 2021. Discussion included revising the Terms of Reference to:

- appoint the Director of Financial Services or a designate to the Committee;

- extend the Chair and Vice-Chair positions to a 2-year term; and
- allow previous applications on file to be considered by the Chair and staff in the case of an unexpected vacancy.

The revised Terms of Reference were approved by the Committee on February 9th, 2022.

Staff have reviewed the Terms of Reference and do not propose any changes.

**NEXT STEPS**

The Terms of Reference will be placed on file and reviewed again in 2023.

**FINANCIAL IMPLICATIONS**

There are no budget implications associated with the review of the Terms of Reference.

**ALTERNATIVES**

In response to the report, the MCCAP Committee may:

- request staff revise the Terms of Reference based on direction from the MCCAP Committee;
- provide alternative direction such as requesting further information on a specific topic.

**ATTACHMENTS**

Appendix A MCCAP Terms of Reference

Report Prepared by: _____
Sara Poirier, Senior Planner

Report Reviewed by: _____
Madelyn LeMay, Director of Planning and Development

## 1. Official Name

The official name of this committee is the Municipal Climate Change Action Plan Committee. It may be referred to as MCCAP.

## 2. Members/Composition

The Committee consists of a eleven (11)members:

- three (3) Councillors;
- two (2) resident members, who are not members of Council
- Chief Administrative Officer or designate;
- Director of Public Works or designate;
- Director of Planning and Development or designate;
- Director of Community Development or designate;
- Director of Finance or designate;
- Protective Services Manager or designate.

All members of the Committee are appointed by resolution of Council, and each member appointed serves the Committee for a two year term Members are eligible for reappointment.

Resident members are chosen through an evaluation process and recommendation to Council.

All positions, whether or not an existing member has re-offered, will be reviewed through the evaluation process when the specified term is over.

In the case of an unexpected vacancy, previous applications on file may be considered by the Chair and staff, or the option to re-advertise may be applicable. A recommendation will be made to Council for appointment. That new person's appointment will serve the remainder of the term of the person replaced or as deemed appropriate.

The Chair and the Vice-Chair are elected by a majority of the members and hold office for a two-year term. The Chair acts as the liaison with Council.

MCCAP may recommend to Council that a Committee member who fails to attend three (3) consecutive meetings of MCCAP, without good reason accepted by the MCCAP Chair be dismissed from the Committee.

## 3. Goals

The Municipal Climate Change Action Plan Committee provides a forum for all municipal departments and Council representatives to work co-operatively on implementing and evaluating the adaptation and mitigation actions outlined in the Municipal Climate Change Action Plans of the Municipality hereafter referred to as “the MCCAP”. These policy and adaptation procedures help protect people, properties, special places, and municipal infrastructure from the negative impact of climate change.

The Committee will strive to reflect the best interests of the Region in any recommendation.

## 4. Deliverables

The Committee will:

- develop an annual Work Plan of actions based on the MCCAP. This work plan will include the estimated timeline and cost for the action, anticipated partners and recommendations for funding sources such as the Gas Tax Agreement or other provincial and federal funding programs. The annual Work Plan will summarize actions completed in the previous year;
- submit the Work Plan annually to Council to be placed on file;
- keep Council fully informed on the progress of MCCAP implementation;
- undertake, as it determines appropriate, pilot projects that carry out actions outlined in the MCCAP, funded in part or in whole through the Committee’s approved annual budget;

## 5. Jurisdiction

MCCAP was formed pursuant to the Meeting and Committee Procedural Policy dated March 23, 2020.

The Committee's duration is indefinite, based on:

- Council's continued support of the above Goals and Deliverables.

## 6. Resources/Budget

Following their appointment new Committee members will be given an introductory workshop organized by staff to assist them in their duties.

MCCAP resident members are remunerated in accordance with the Councillor Remuneration Policy.

Municipal planning staff will provide ongoing support to the Committee. Staff will:

- arrange meeting times and venues and take Committee minutes;
- circulate meeting agendas and minutes;
- provide reports or status updates on identified projects or applications; and
- make public presentations on behalf of the Committee as required.

## 7. Governance

MCCAP meetings will generally take place the morning of the second Wednesday of the month in February, April, September and November but additional meetings may be called by the Chair on an as-needed basis or as directed by Council. Members will be informed of all meetings and supplied with an agenda prior to each scheduled meeting date.

A quorum is a majority of the number of appointed members at the time of the meeting.

Orders and rules of conduct for debate for MCCAP meetings are the same as those for Council in the Meeting and Committee Procedural Policy.

## 8. Communications

MCCAP members and staff will communicate with each other at meetings (in person or electronic), by telephone or by email.

Draft minutes of MCCAP meetings are available to the public and will be approved at the next meeting.

All MCCAP meetings are open to the public, except as specified Section 203 of the MGA.

MCCAP agendas may set aside a period of time during the meeting for public comment or presentation.

## 9. Related Policies, Procedures and Legislation

West Hants MCCAP
Hantsport MCCAP
Windsor MCCAP
West Hants ICSP
Hantsport ICSP
Windsor ICSP
Meeting and Committee Procedural Policy
Council Remuneration Policy

Approved by: _____
Committee Chair

| Adoption | |
|---|---|
| Notice to Council: | Not Applicable |
| Initial Approval: | Sept. 9, 2020 |
| Amendment #1 | February 9, 2022 |
| Description: MCCAP Committee Terms of Reference | |

**WEST HANTS REGIONAL MUNICIPALITY REPORT**

| | | | |
|---|---|---|---|
| Information X | Recommendation ☐ | Decision Request ☐ | Councillor Activity ☐ |

**To:** Members of Municipal Climate Change Action Plan (MCCAP) Committee

**Submitted by:** _____
Sara Poirier, Senior Planner

**Date:** 2022-09-14

**Subject:** Discussion: MCCAP 2023 Work Plan

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## LEGISLATIVE AUTHORITY

Municipal Climate Change Action Plan (MCCAP) Committee Terms of Reference, Section 4.

## RECOMMENDATION or DECISION REQUEST

Staff are providing this report to aid in discussion on the MCCAP Committee's workplan priorities for 2023. This report is for information purposes, there is no recommendation at this time.

## BACKGROUND

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|---|---|---|---|---|---|
| Property ☐ | Public Opinion ☐ | Environment X | Social ☐ | Economic ☐ | Councillor Activity ☐ |

Based on the MCCAP Committee Terms of Reference, a work plan needs to be submitted to Committee of the Whole for review on an annual basis. This report is for informational purposes to aid in discussion. A recommendation report will be prepared based on the discussion and direction from the Committee. The recommendation report will be presented at the November MCCAP meeting.

## DISCUSSION

Staff have provided the MCCAP Workplan for discussion.

I recommend the Committee keep "working on Milestone 4 of the PCP program" and "hiring a dedicated GHG emissions reduction employee" on the "tasks to complete" portion of the workplan as these are two necessary components required to ensure the Municipality can continue to work towards the Municipality's greenhouse gas emissions reduction goals. A summer Climate Action Coordinator, Will Chapple, was hired from May – August 2022 with financial support from the Clean Foundation Internship program. A 1-year term Climate Action Coordinator, John Ogilvie, started on June 27, 2022 with financial support from ECO Canada Science Horizon Youth Internship program. Both Will and John have been able to dedicate their time to work on the Committee's workplan items, action items within the local action plan, and provide support to staff for funding applications which require emissions calculations.

Many of the tasks that were added for 2022 have been moved to the "on-going" section. These include:

- explore the potential for a small to medium scale solar energy project;
- implement an electric vehicle charging station; and
- participate in a feasibility study for electric vehicle fleet conversion

Will and John have been gathering information on the condition of Municipal buildings and John will be preparing information on potential energy retrofits including the use of solar power to offset the remaining building demand.

The Municipality received funding support from the Government of Canada and Government of Nova Scotia through the EV Boost program for two dual-port Level 2 electric vehicle chargers. These chargers will be installed at the West Hants Sports Complex and Windsor Community Centre in September and be fully operational by October 31, 2022.

The Planning and Development Department fleet is currently being used in an electric vehicle feasibility study through the Clean Foundation. WHRM is one of four Municipalities currently participating in this study. Data collectors were installed in the vehicles on July 27th, 2022 and will stay in the vehicles for three months to collect data on vehicle use and driver habits. Surveys have also been sent out to the vehicle drivers to fully gauge user experience and preferences. The Clean Foundation will compile all the data and report back to the Municipality.

**NEXT STEPS**

**Approval Process**

**Staff Review and MCCAP Committee Discussion – September 14**

▼

MCCAP Committee Recommendation – November 9

▼

Committee of the Whole – December*

▼

Council Decision – December*

*anticipated dates; final dates set by Council

**FINANCIAL IMPLICATIONS**

There are budget requests associated with the 2023 Work Plan. These requests would be submitted to Council for consideration with the MCCAP Committee 2023 budget. External funding will also be sought for many of these projects.

**ALTERNATIVES**

In response to the report, the MCCAP Committee may:

- request staff revise the MCCAP 2023 Work Plan based on direction from the MCCAP Committee;
- provide alternative direction such as requesting further information on a specific topic.

**ATTACHMENTS**

Appendix A MCCAP 2023 Work Plan

Report Prepared by: _____
Sara Poirier, Senior Planner

Report Reviewed by: _____
Madelyn LeMay, Director of Planning and Development

**Appendix A**
**MCCAP 2023 Work Plan**

| Tasks to Complete | | Cost of Action | Funding | Partners | Timing |
|---|---|---|---|---|---|
| Goal: Reduce Greenhouse Gas Emissions | Work on Milestone 4 of the PCP program by implementing actions from the local action plan developed in Milestone 3 | Staff time and project costs | Staff time; Applications for funding will be submitted when required | Planning / Public Works / Community Development / Office of the CAO | Annual |
| | Hire a dedicated GHG emissions reduction employee | Approx. $40,000 | Municipal budget | Planning | 2023 |
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| **Ongoing Tasks** | | **Cost of Action** | **Funding** | **Partners** | **Timing** |
| Goal: Reduce Greenhouse Gas Emissions | Hire a dedicated GHG emissions reduction employee | Approx. $30,000 | Potential Eco Canada funding opportunities to cover up to 80% of the position for the first 12 months | Planning / Eco Canada | 1-year term began on June 27, 2022 |

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| | Explore the potential for a small to medium scale solar energy project | Staff time and project costs (dependent on location, site conditions, number of solar panels, how much electricity the Municipality wants to offset, etc.) | Staff time; Applications for funding will be submitted when required | Planning / Public Works / Community Development / Office of the CAO | Solar installation by 2023 |
| | Implement an electric vehicle charging station | Staff time and project costs (approx. $6,000 for a level 2 charger; approx. $50,000 for a level 3 charger) | Staff time; Applications for funding will be submitted when required | Planning / Public Works / Community Development / Office of the CAO | Anticipated completion by October 2022 |
| | Participate in a feasibility study for electric vehicle fleet conversion | Staff time and project costs (approx. $1,500 in-kind for study) | Staff time; Applications for funding will be submitted when required | Planning / Clean Foundation | Anticipated completion by December 2022 |
| Goal: Increase awareness of local best practices | Continue the recognition program for businesses and community groups | Staff Time | Staff Time | Planning / Community Development | Began Summer 2021; Annual |
| Goal: Update Windsor's storm drainage infrastructure to ensure it meets the | Windsor Flood Risk Assessment | Staff Time and Consultant Costs | FRIIP 50% Funding (up to $39,109) | Public Works | Currently reviewing RFP's and recommendation to Council to proceed |

| | | | | | |
|---|---|---|---|---|---|
| future needs of the Town | | | | | |
| Goal: Reduce the impact of anticipated climate change on infrastructure and development | Consider options to restrict zoning in flood-prone areas | Staff Time | Staff Time | Planning | Plan Review |
| Goal: Develop sustainable solutions to address sea-level risk in Avondale | Work collaboratively with community groups, government organizations, and non-profits to assess sustainable solutions. | Staff Time | Staff Time | Public Works, Planning, Department of Agriculture | Fall 2021 |
| Goal: Implement MCCAP | Annual action items review and update | Staff Time | Staff Time | Planning | Annual |
| | Annual review and update Terms of Reference | Staff Time | Staff Time | Planning | Annual |
| Goal: Heighten resident's awareness of flood risk and emergency preparedness | Public education | Staff Time | Staff Time | EMO | On-going |
| | Develop planning processes, policy and ordinances | Staff Time | Staff Time | EMO | On-going |
| Goal: Build mapping (GIS) capabilities | Update software as needed | Staff Time | Staff Time | Planning | On-going |
| Goal: Climate-informed | Annual review and update of All-Hazards Plan | Staff Time | Staff Time | EMO | On-going |

| | | | | | |
|---|---|---|---|---|---|
| Emergency Preparedness Plans | | | | | |
| Goal: Record storm surge impacts | Record storm surge impact details as means of improving emergency preparedness and response planning | Staff Time | Staff Time | EMO | On-going |
| Goal: Secure local source of aggregate | Identify possible sources of local aggregate in inventory of municipal land | Staff Time | Staff Time | EMO | On-going |
| Goal: Stormwater management planning | Implement findings from the Hantsport Storm Water Management Study | Staff Time | Staff Time | Public Works and Planning | On-going |
| | Implement findings from the Three Mile Plains Storm Water Management Study | Staff Time | Staff Time | Public Works, Planning, Department of Infrastructure and Renewal | On-going |
| **Completed** | | **Cost of Action** | **Funding** | **Partners** | **Completed** |
| Goal: Reduce Greenhouse Gas Emissions | Complete Milestone 2 in the PCP program by providing the necessary information for Council to set an emissions reduction | Staff Time | Staff Time | Planning/ Public Works | August 2021 |

| | | | | | |
|---|---|---|---|---|---|
| | target for corporate and community emissions | | | | |
| | Complete Milestone 3 in the PCP program by developing a local action plan | $5,222.64 for summer student | MCCAP budget (Clean Foundation grant paid 50% of the position) | Planning/ Public Works, Clean Foundation | Submitted September 2021 |
| Goal: Reduce Greenhouse Gas Emissions | Complete an updated GHG emissions inventory for corporate emissions | $9,000 | MCCAP Budget, Co-op Education Incentive | Clean Foundation | Fall 2019 |
| | Complete a GHG emissions inventory for community emissions | $25,000 | MCCAP Budget, Co-op Education Incentive | Clean Foundation | Fall 2019 |
| | Complete a GHG emissions forecasting model | $36,000 | MCCAP Budget | Clean Foundation | Winter 2020 |
| Goal: Reduce the impact of anticipated climate change on municipal infrastructure along the Minas Shore | Complete the National Disaster Mitigation Program Risk Assessment Study | $80,000 | MCCAP Budget and National Disaster Mitigation funding | CBCL Limited Consulting and Government of Canada | Spring 2019 |
| Goal: Stormwater management planning | Complete plan for Falmouth | $50,000 | PW Budget | Public Works | 2016 |
| | Complete plan for Hantsport | $50,000 | PW Budget | Public Works | 2018 |

| | | | | | |
|---|---|---|---|---|---|
| | Complete plan for Three Mile Plains | $50,000 | PW Budget | Public Works | 2019 |
| Goal: Build mapping (GIS) capabilities | Hire a GIS Technician | N/A | Planning | Planning | 2015 |