TATHAM ENGINEERING

Enhancing our communities

Corporate GHG Inventory and Regional Climate Change Mitigation Plan

FINAL REPORT

District of Muskoka Lower-Tier Area Municipalities

File 223555 | November 18, 2024

Document Control

File:

223555

Date:

November 18, 2024

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	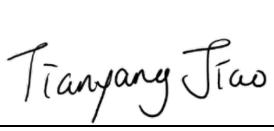	
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1 Acknowledgements

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2 Glossary of Terms and Acronyms

TERM	DEFINITION
Federal Carbon Pollution Price	A national minimum price on carbon emissions in Canada, to reduce greenhouse gas emissions and encourage innovation
IPCC Fifth Assessment Report	A comprehensive evaluation by the Intergovernmental Panel on Climate Change (IPCC) in 2014, assessing scientific, technical, and socio-economic information on climate change
Net-zero Future Muskoka	An initiative aiming to reduce Muskoka's community greenhouse gas emissions by 50% by 2030 and achieve net-zero emissions by 2050 through improvements in transportation, buildings, and community systems
New Leaf Climate Action Plan	District of Muskoka Climate Change Action Plan approved by the District Council in December 2020
RETscreen Software	A software developed by the Government of Canada for evaluating the feasibility, performance and financial viability of renewable energy and energy efficiency projects
Save on Energy	A program in Ontario, Canada. Offering incentives and resources to help residents and businesses reduce energy consumption and improve energy efficiency

ACRONYM	FULL PHRASE
AC	Air Conditioning
AM	Area Municipality
ASHP	Air Source Heat Pump
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAU	Business As Usual
Bracebridge	Town of Bracebridge
CAGBC	Canada Green Building Council
CAP	Climate Action Plan

ACRONYM	FULL PHRASE
COP	Coefficient of Performance
Cost of Carbon	Federal Carbon Pollution Price
ECCC	Environment and Climate Change Canada
ECM	Energy Conservation Measure
EPA	Environmental Protection Agency
EUI	Energy Use Index
EV	Electrical Vehicle
FCM	Federation of Canadian Municipalities
Georgian Bay	Township of Georgian Bay
GHG	Greenhouse Gas
GJ	Gigajoules
Gravenhurst	Town of Gravenhurst
GWP	Global Warming Potential
HSPF2	Heat Seasonal Performance Factor 2
Huntsville	Town of Huntsville
HVAC	Heating Ventilation and Air Conditioning
Lake of Bays	Township of Lake of Bays
LCCA	Life Cycle Cost Analysis
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
MHDV	Medium- and Heavy-Duty Vehicle
Muskoka Lakes	Township of Muskoka Lakes

ACRONYM	FULL PHRASE
PCP	Partners for Climate Protection
PPU	Population Per Unit
PV	Photovoltaic
RCCMP	Regional Climate Change Mitigation Plan
RTU	Roof Top Unit
Tonnes CO_2e	Tonnes of Carbon Dioxide Equivalent
ZCB	Zero Carbon Building
ZEV	Zero-Emission Vehicle

3 Introduction

Tatham Engineering Limited (Tatham) was retained by the six lower-tier Municipalities (Area Municipality) of The District of Muskoka to prepare a corporate Greenhouse Gas (GHG) Baseline Inventory and Regional Climate Change Mitigation Plan (RCCMP) for corporate assets.

The six Area Municipalities (AMs) included in this study are:

- Town of Bracebridge
- Town of Gravenhurst
- Town of Huntsville
- Township of Georgian Bay
- Township of Lake of Bays
- Township of Muskoka Lakes

3.1 SCOPE OF WORK

The scope of this work is as follows:

1. Prepare the corporate GHG baseline inventory for the corporate assets (buildings, fleet, and streetlights) and complete the GHG emission forecasting to year 2050;
2. Determine the GHG reduction targets for corporate emissions; and
3. Prepare Climate Change Mitigation Plan for corporate assets.

3.2 BACKGROUND AND PURPOSE

The District of Muskoka consists of the District Municipality of Muskoka (upper-tier), it's six lower-tier AMs, and two First Nations communities (Moose Deer Point First Nation and Wahta Mohawk First Nation). Geographically, Muskoka extends from Georgian Bay in the West to the Northern top of Lake Couchiching in the South, and to the western border of Algonquin Provincial Park in the East. The six AMs in the District of Muskoka teamed up to prepare the corporate GHG baseline emission inventory and RCCMP to move towards a Net-zero Future Muskoka.

The purpose of the RCCMP is to determine ambitious but achievable GHG reduction targets for short term (2030) and long term (2050), along with a clear pathway to invest in infrastructure to decarbonize the corporate assets. The targets, at a minimum, shall meet the provincial and federal climate change and GHG reduction targets. The goal is to achieve net-zero GHG by 2050

for all corporate assets. A Regional Working Group, comprising of at least one representative from all the above-mentioned AMs was established to coordinate the preparation of the RCCMP. The purpose of this collaboration was that each AM use a similar approach to determine the GHG reduction targets and appropriate plans to achieve the targets.

4 Climate Change and Area Municipalities

4.1 CLIMATE CHANGE IN MUSKOKA

In December 2020, the Muskoka District Council declared a Climate Emergency and approved the New Leaf Climate Action Plan (CAP) to address climate change at both corporate and community levels, with the lower-tier municipalities declaring subsequently, demonstrating a shared commitment to addressing climate issues. The CAP consists of two segments:

- Part 1 – Regional Climate Change Adaptation Plan (ReCAP)
- Part 2 – Regional Climate Change Mitigation Plan (RCCMP)

A Regional Working Group, comprising of one representative from the following AMs: Town of Bracebridge, Town of Gravenhurst, Town of Huntsville, Township of Lake of Bays, and Township of Muskoka Lakes; was established to coordinate the development of the first segment of the CAP, the ReCAP. The ReCAP outlines the actions each AM plans to take to address the impacts of climate change. In early 2023, the Municipal Councils of the AMs approved the ReCAP.

Following the approval of the ReCAP, and the success of the collaboration between the AMs in creating the ReCAP, a similar approach was proposed for the development of the second segment, the Regional Climate Change Mitigation Plan (RCCMP). This report provides the RCCMP for each AM (including Township of Georgian Bay), which comprises of a corporate GHG inventory for a baseline year, Business-As-Usual (BAU) GHG emissions forecasting to year 2050, emissions reduction targets and the mitigation plan.

4.2 FEDERAL AND PROVINCIAL CLIMATE CHANGE TECHNICAL REPORTS AND ACTION PLANS

The policies, technical information, and action items included in the following federal and provincial climate change plans and technical guidelines were used to determine the targets and climate change mitigation plans for AMs.

4.2.1 Canada's 2030 Emissions Reduction Plan – Canada's Next Steps for Clean Air and a Strong Economy

The Federal Government's 2030 Emissions Reduction Plan describes the actions that are currently reducing GHG as well as new measures that will reduce GHG emissions to reach the emissions reduction target of 40 to 45% below 2005 levels by 2030 and achieve net-zero emissions by 2050.

The Plan considers the gradual reduction of energy costs for buildings by reducing emissions to net-zero by 2050 and the improvement of climate resiliency in buildings by focusing on existing

initiatives and setting new policies, programs and incentives to promote the retrofit of existing buildings to net-zero.

Through the plan, additional funding of $400 million is being provided for Zero Emission Vehicle (ZEV) charging stations in support of the Government's objective of adding 50,000 ZEV chargers throughout Canada. The Government plans to place a sales mandate to ensure at least 20% of new light-duty vehicle sales are ZEVs by 2026, at least 60% by 2030, and 100% by 2035. To reduce emissions from medium- and heavy-duty vehicles (MHDV), the Government aims to ensure at least 35% of MHDV sales are ZEVs by 2030 and will develop a MHDV ZEV regulation to achieve 100% by 2040.

To support the transition from other fuel and energy sources to electricity, a Pan-Canadian Grid Council will be established to promote clean electricity infrastructure investments and additional funding will be available.

The plans included above were used to determine the phasing plan of the fleet in the RCCMP.

4.2.2 Made in Ontario Environment Plan

In November 2018, the Provincial Government released the Made-in-Ontario Environment Plan that considers specific priorities to reduce GHG emissions to 30% below 2005 levels by 2030, a target that aligns with the Federal Government's Paris commitments. The Made-in-Ontario Environment Plan replaces the Climate Action Plan released in 2016.

The recommendations, technology availability and phasing plans included in the above-mentioned plans were used in determining the feasible options for the RCCMP, as applicable.

4.2.3 Technical Guide Related to The Strategic Assessment of Climate Change, ECCC, August 2021

This Technical Guide provides technical guidance on quantification of GHG emissions, impacts on carbon sinks, mitigation measures and plans to achieve net-zero emissions by 2050.

Table 30 in Annex C of the technical guide was used to determine the annual electricity grid emission factors in Ontario from 2020 to 2030.

4.2.4 Climate-Resilient Buildings and Core Public Infrastructure, ECCC, Climate-Resilient Buildings An Assessment of the Impact of Climate Change on Climatic Design Data In Canada

This report provides an assessment of how climatic design data may change as the climate warms. The assessment and modeling completed in this ECCC report is based on current understanding of climate change from national and international assessments.

The climatic data included in this ECCC report was used to model the GHG emissions forecasting for buildings by the year 2050 in the BAU scenario.

4.3 MUNICIPAL PLANS

Municipal plans and studies were reviewed, and applicable recommendations and best practices were considered for this study. The list of municipal plans, studies and reports reviewed are provided below.

- District of Muskoka Growth Strategy, Phase 1 – Growth Projections and Area Municipal Allocations report prepared by Watson & Associates dated February 1, 2024
- District Municipality of Muskoka Regional Climate Change Adaptation Plan - ReCAP
- Muskoka Community Energy and Emissions Reduction Plan - CEERP
- Energy Conservation and Demand Management plans
- Building condition assessment reports
- Asset management plan reports
- Official Plan reports

The full list of municipal plans and information sources are provided in Appendix A.

4.4 OTHER GUIDELINES

This study follows the requirements of the 2021 PCP (Partners for Climate Protection) Protocol – Canadian Supplement to the International Emissions Analysis Protocol and the Federation of Canadian Municipalities (FCM) guidelines. The PCP Program is a network of Canadian municipalities that work together to create changes in their local communities to act against climate change by reducing emissions in their respected municipalities. The GHG emission inventory was completed in accordance with the above requirements as well as the Environment and Climate Change Canada (ECCC) emissions factors, and the US EPA's (Environmental Protection Agency) 2018 database. The Global Warming Potentials (GWPs) used in this assessment are based on the IPCC Fifth Assessment Report (Table 8.7 on pg. 714) as included in the ECCC requirements.

The adoption of this plan will signify the completion of Milestone 3 of the PCP Protocol.

5 Methodology

5.1 GHG EMISSION BASELINE INVENTORY

5.1.1 Baseline Year

Year 2018 was considered for the baseline year as it is the most recent year with a complete dataset for all AMs.

5.1.2 GHG Emission Inventory

The GHG emission inventory for the baseline year was calculated based on the framework (Milestone 1) provided in the PCP Protocol for all corporate assets.

The AMs provided fuel and energy consumption information for their corporate buildings, fleet and streetlights for the baseline year. The fuel and energy consumption in conjunction with the emission factors and GWP were used to determine the GHG emissions in tonnes CO_2 e (tonnes of carbon dioxide equivalent) for the baseline year.

5.2 GHG EMISSION FORECASTING FOR BUSINESS-AS-USUAL

The GHG emission forecasting for BAU scenario was modelled based on the framework (Milestone 1) provided in the PCP Protocol. The BAU forecasting projects future GHG emissions (to year 2050) based on assumptions made about the population growth, urbanization and climate change effects and global warming, by assuming that existing corporate buildings, fleet and streetlights operating patterns will remain the same as the baseline year with no actions to reduce energy consumption and/or GHG emissions. To provide a better context to this forecasting, the fuel cost and cost of carbon pollution (federal carbon pollution price) was also projected to year 2050. As the cost of carbon pollution increases significantly over the coming years, taking no action will cost more.

The methodology to forecast GHG emissions for BAU varies for buildings, fleet and streetlights. BAU forecasting for buildings include the impacts of population change and urbanization as well as forecasted change in climatic data due to global warming (changes in building cooling and building heating depending on ambient temperature) while the BAU forecasting for fleet and streetlights include the impacts of population growth on projected future developments and additional roads and streetlights needed due to population growth.

Global warming affects climatic design data for buildings as the heating degree days will be decreased, while the cooling degree days will be increased. This will result in an overall effect of total energy reduction for building heating/cooling due to global warming. However, as the AMs

grow as projected, corporate infrastructure (roads, buildings, streetlights) needs to be expanded which will cause a net increase in total corporate energy consumption and GHG emissions over the coming years. The increase in GHG emissions does not have a linear relation with population growth. To accurately project the GHG emissions increase due to population growth, an assessment of the roads, buildings and streetlights expansions to serve the projected growth was completed and the GHG emission projections were modelled accordingly.

The GHG emissions projections incorporate the change in Ontario's electricity grid emission factor for the coming years. Based on the published provincial grid electricity emission intensity projections, Ontario's grid will become less green until year 2025 and start to transition to a greener grid after that by implementing clean electricity generation expansion projects.

5.2.1 Assumptions

The following assumptions were made for the BAU forecasting.

Table 1: General Assumptions for BAU Forecasting

COMPONENT	DESCRIPTION AND ASSUMPTION
Building	Corporate buildings' operating hours will increase or building expansions will happen due to population growth and will result in an increase in GHG emissions.
	New developments are forecasted to be constructed in and around already established settlements. Therefore, no additional buildings such as recreation centres or libraries are expected to be constructed to service population and housing growth.
	The global warming of 2˚C assumed by the year 2050, with respect to the 1986-2016 baseline, will affect the building heating and cooling demand. Based on modelled changes in heating and cooling degree days, building heating demand will decrease and building cooling demand will increase which will result in a reduction in GHG emissions.
Fleet	All fleet fuel usage and emissions will increase due to the construction of additional roads as a result of potential new developments.
Streetlight	Since most growth will be compact and infilling, new commercial developments will be built in areas where there are already roads and streetlights. From the District of Muskoka's Growth Strategy report (2024), future housing units will be targeted towards a lower PPU (person per unit) due to a decline in household sizes. It was assumed that these new housing units will be constructed in new subdivisions which will require the construction of new roads and streetlights and that these new subdivisions will be accessed by existing roadways (with existing streetlights). These assumptions also consider the future development growth plans (e.g. there

COMPONENT	DESCRIPTION AND ASSUMPTION
	will be more high-density dwellings than low-density dwellings in the future) in the AMs Official Plans.
Carbon Pollution Pricing	The federal government has published "A Healthy Environment and a Healthy Economy" plan which introduces a minimum cost of carbon pollution of $50/tonne for 2022. This cost will increase $15/tonne per year to reach $170/tonne by 2030. It was assumed after 2030 the cost of carbon will not increase anymore.

5.3 GHG REDUCTION TARGETS

GHG reduction targets were determined based on the energy and emission profile of the corporate assets for each AM while considering the main policies and recommendations of the federal and provincial climate change mitigation plans. The following targets are determined:

1. **Short term target by 2030:** An ambitious GHG reduction scenario that maximizes decarbonization for all corporate assets by using energy conservation measures, fuel alternatives, electrification and retrofitting building components that are reaching their end of life, to achieve a GHG reduction of 30-45% compared to the 2018 baseline year by 2030 for all corporate emissions.
2. **Long term target by 2050:** Achieve net-zero by 2050 by continuing to gradually decarbonize building components and fleet as building components reach their end of life and as ZEV technology for heavy duty fleet and equipment become available in Canada.

The short term (2030) and long term (2050) GHG reduction targets for the AMs are ambitious and will meet or exceed the federal and provincial plans. While these targets are ambitious, they have been based on the careful engineering assessment of existing corporate assets and plans to ensure the targets are achievable.

5.4 CLIMATE CHANGE MITIGATION PLANS

The climate change mitigation plans for each AM were prepared in support of the AMs reaching their short term and long-term reduction targets in a cost effective and feasible way. The three pillars of achieving net-zero for corporate assets are as follows:

1. **Decarbonization of all existing corporate assets (buildings, fleet, streetlights)**, and reduction of GHG emissions to the lowest amount that is possible with continuous implementation of energy conservation measures (ECM), fuel switching, electrification and mitigation measures by 2050;

2. **Installation of rooftop solar photovoltaic (PV) on all corporate buildings** to use the maximum available potential to offset some of the remaining GHGs through clean electricity generation and offset the rest through other offset programs or clean electricity purchase agreements; and
3. **Development of a net-zero new building policy and net-zero new fleet policy** to ensure that all new buildings, building additions and/or expansions will follow the net-zero building design and that all new fleet purchases will be zero-emission vehicles (ZEVs), where possible.

Economic and technological feasibility assessments were completed to investigate the pathway to Net-zero Future Muskoka. This will help AMs in successful implementation of the plan.

The methodology in determining the action plans and ECMs is explained in the following sections for buildings, fleet and streetlights.

5.4.1 Buildings

A significant portion of energy use in buildings is related to building heating, ventilation and air conditioning (HVAC). Domestic hot water was assumed to be 5-25% of building energy usage dependent on building type. To achieve the highest value in return for cost, only feasible decarbonization ECMs and retrofits that may lead to substantial energy savings were modelled. Building envelope upgrades that only reduce operating energy usage marginally but had a high capital investment, were not considered. The following ECMs were considered:

- Replacement of all existing rooftop heating and cooling units with a Package Rooftop Air Source Heat Pump (ASHP) system when existing units reach their end of life.
- Replacement of all existing furnaces/split AC units with split ASHP systems including backup gas or electric heating coils (depending on the current service) when existing units reach their end of life.
- Replacement of all non-LED lighting to LED lighting.

To maximize the benefits of implementing ECMs, buildings with the highest energy use index (EUI) (i.e., those that are less energy efficient) were prioritized for earlier retrofits. This approach will lead to significant energy and fuel cost savings that would otherwise be spent on inefficient systems. Additionally, buildings with higher GHG emission profiles, typically larger buildings, were selected for earlier retrofits due to the substantial impact these savings will have on overall corporate emissions and long-term costs. All retrofits are scheduled to occur when existing building components reach their end of life, minimizing the financial impact on municipalities.

Consequently, the cost involved will be the difference between replacing equipment with like-for-like units and upgrading to more energy efficient options.

A preliminary sizing of the ASHP was completed for buildings based on the following assumptions:

- ASHPs were sized based on current available technology in the market.
- COP for ASHP furnace/AC units is 1.7. This is based on the Heat Seasonal Performance Factor 2 (HSPF2) rating of 7.5 for climate zone V. The HSPF2 number represents the average efficiency of the heat pump over a climatic year.
- COP for ASHP rooftop units is 1.5. This is based on HSPF 2 for climate zone V.
- Equipment lifespan estimated using ASHRAE equipment life expectancy chart.
- Typical EUI values for similar buildings were gathered from Energy Star EUI database.

The energy and GHG savings for the ASHPs and LED lighting retrofits were calculated for each building and the maximum possible GHG reductions from building energy efficiency retrofits were determined for all corporate buildings. Based on the above-mentioned logic and methodology, the building retrofits are scheduled to start in 2025 and be completed before 2050. The implementation planning for all buildings in each AM are included in their respective report sections.

5.4.2 Fleet

The phasing plan for fleet emission reduction is based on Canada's plan to make ZEV available for Canadians through investment in new zero emission vehicle production facilities, purchase agreements, and the projected availability of ZEV in the market. Similar to the plans for buildings, fleet decarbonization and electrification will be implemented when the equipment reaches its end of life and when the technology is available in the market. EV charging stations are expected to be installed in various municipal buildings by year 2030 to support the 2030 EV replacements for municipal fleet. No additional EV charging stations is expected to be constructed after 2030 as it is assumed that sufficient publicly available EV/ZEV charging stations will be developed by 2050 by the federal or provincial government.

5.4.3 Streetlights and Traffic Lights

The reduction plans for streetlights and traffic lights include the conversion of non-LED lighting infrastructure to LED lighting, were applicable and the implementation of solar PVs to offset the electricity consumption.

5.4.4 GHG Offset

The implementation of energy efficient building systems, fuel alternatives and electrification are expected to reduce energy consumption and GHG emissions for buildings, fleet and streetlights to the minimum amount that is technologically and economically feasible. However, the energy demand of a building cannot be reduced to zero as long as the building is in operation. To offset remaining GHG emissions, all available rooftop spaces of corporate buildings could be utilized by installing rooftop solar PVs to generate clean electricity. The maximum amount of electricity generation from rooftop solar PVs for corporate buildings and the amount of GHG offset were calculated for each AM. However, it was found that the implementation of rooftop solar PVs alone do not reduce building emissions to net zero. Therefore, to offset the remaining GHG emissions from corporate assets, either additional ground-mount solar PVs or elevated ground-mounted solar PVs, such as car ports, or clean energy purchase agreements or offsite clean electricity generation projects will need to be initiated. The solar PV installation for all corporate buildings is scheduled at the same time with building HVAC retrofits to account for potential electrical upgrade requirements. Furthermore, a detailed solar feasibility assessment including a structural integrity assessment must be completed for all buildings.

The following assumptions were made for estimating the maximum solar power generation capacity of the rooftop solar PV:

- Roof area has been estimated from Google Earth satellite images.
- 70% of roof area could be used for solar PV with remainder (30%) considered for mounting and access.
- An average normalized annual generation rate per area of 148.80 kWh/m^2 is used in the estimation of the annual solar power generation. This is based on performance of existing solar PV systems within the Town of Huntsville.
- Sun exposure and shade cover analysis or RETscreen modeling is not included in our assessment.

5.4.5 Net-Zero Future Corporate Assets

Achieving net-zero by 2050 will not be possible unless all new future assets (buildings, fleet and streetlights) are designed to produce net-zero GHG emissions. A policy that will provide standards as well as guidance for the construction and/or installation of new corporate assets will be developed by each AM. In general, the following could be considered when developing these policies:

- All future light and medium duty fleet purchases starting 2024 shall be net-zero.

- If available, when purchasing heavy duty fleet or equipment, a zero-emission alternative shall be considered.
- Design and construction of major renovations for existing and new corporate buildings shall be net-zero. This can be done by installing energy efficient systems that lower the building's energy use and GHG emissions, so the remaining energy needs of the building can be met or offset by on-site renewable energy generation (i.e. solar PV).
- Building designs may adhere to any of the following design criteria or certifications which aim to improve buildings thermal energy demand intensity, total energy use intensity and airtightness over current building code:
  - Canada Green Building Council's (CAGBC) Zero Carbon Building ™ (ZCB) guidelines;
  - Passive House Canada; and
  - LEED (Leadership in Energy and Environmental Design).
- Building material, system selection and refrigerant types shall aim to reduce the building embodied carbon to the lowest possible.
- Construction best practices to be developed to minimize the GHG emissions during the construction phase.

5.5 COST OF IMPLEMENTATION

5.5.1 Capital, Energy and Carbon Costs

The capital cost of the recommendations included in the climate mitigation plan will assist the AMs in budgeting and implementation planning. Energy costs and cost of carbon was calculated for the net-zero plan and these costs were compared to the BAU to determine the operating cost savings under the net-zero plan.

The following costs were estimated in this assessment:

- Installation cost of equipment for buildings, fleet and streetlights.
- Cost of energy and carbon for buildings.
- Energy cost saving compared to BAU for buildings.

5.5.2 Assumptions

The following general assumptions were made for the cost estimates:

- The cost estimates are based on 2024 dollars.

- It is assumed that all corporate buildings will undergo the retrofits. If municipalities decide to build a new building to replace a facility due to its age or other implications the costing and details of the plan will not be applicable.
- The capital and operating costs exclude GST/HST.
- Costs to bring the buildings up to code (including ventilation or structural changes) are not included.
- Costs to upgrade the electrical service of the buildings are not included.
- Full construction cost, including additional design costs and contingencies are not included. As these would need to be done on a building-by-building basis.
- Life cycle cost analysis (LCCA) is not completed.
- Assumed no significant step changes in fuel costs or adjustments to current carbon pricing plan.
- Assumed no changes to building envelope performance (e.g. not adding insulation to walls and roofs, or replacing existing windows with more insulative alternatives)

The following assumptions were made for the installation cost of building ASHPs:

- The estimated installation cost for rooftop units (RTU) is based on HTS Daikin R32 Rebel units with economizer, exhaust fan, ASHP plus backup gas heat.
- The estimated installation cost for split ASHP is based on HTS low ambient heating splits and standard accessories for standalone operation.
- It is assumed that equipment is running at stated efficiency, and regularly maintained in good operating condition.
- The cost estimates do not include any additional ducting, piping or rezoning that maybe required for the system. As these would need to be done on a building-by-building basis.

The following assumptions were made for the operating cost of building retrofits:

- Forecasted population growth and its effect on building energy demand was included in the operating cost calculations.
- Equipment efficiencies assume that equipment will run at stated efficiency and be regularly maintained in good operating condition.
- Building occupancy is assumed to remain the same as the year analyzed (2018).
- It is assumed that new building additions will be net-zero.

The following assumptions were made for determination of the building energy cost:

- Assumed that the price for natural gas, propane, fuel oil, and other fuels will increase by 5% annually after 2030. It is assumed that the electricity price will be fixed after 2030 because Ontario is expected to have enough capacity through demand forecasting, capacity planning and conservation programs, with no need to import electricity.
- Assumed electricity generated from solar systems can be sold back to the grid for revenue (feed-in tariff program). This can be limited by local program availability and local feeders' restriction. For example, the net metering program only allows solar system operators to receive electricity usage credit for future consumption.

5.5.3 Buildings

To determine the cost of equipment for building retrofits, a preliminary ECM sizing was completed by Tatham, and the equipment and installation costs were estimated based on the sized ECMs. In addition, we have determined the new energy consumption of the buildings after implementing the ECMs and determined the energy and carbon cost for each building accordingly. As the building retrofits phase in according to the implementation planning, the energy and GHG emission profile will change for corporate buildings. The energy use of the net-zero plan was calculated by year 2050 for all corporate buildings and was compared to BAU scenario to determine the amount of energy and carbon cost saving for corporate buildings under the net-zero plan.

5.5.4 Fleet

The cost of fleet electrification was completed based on the price of available Electrical Vehicles (EV) in the market for light and medium duty vehicles. For heavy duty vehicles, and equipment, market price is not available at the time of this study. The cost of EV alternatives for these vehicles were estimated based on the differential cost of medium and light duty EVs compared to their gasoline or diesel fueled vehicle alternatives.

The cost of level II EV charging stations needed to support the AMs EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is assumed that by 2050 many public gas stations and infrastructure will be replaced with infrastructures for EVs and ZEVs and therefore AMs won't need to invest more in EV charging infrastructure to accommodate the need for the increased EV or ZEV fleet.

5.5.5 Streetlights

The equipment cost of converting the existing streetlights to LED lighting is included in the cost assessment package for streetlights.

6 Available Funding Opportunities

Several available funding programs are offered from the below sources:

- Green Municipal Fund, A Program of Federation of Canadian Municipalities (FCM)
- Enbridge
- Save on Energy
- Natural Resources Canada, Government of Canada
- Provincial Government

Opportunities target the reduction of emissions across several industries including municipal fleet electrification, municipal and community buildings, local electrical grids, and wood construction.

Several opportunities allow application submissions at any time until funding is exhausted while some have limited timelines. Eligible applicants include municipalities, for-profit organizations, and applicants proposing eligible projects.

Awarded funds include combined grants and loans often ranging from 50% to 80% of eligible costs. Maximum funding may range from $200,000 for municipal projects and up to several billion dollars for provincial and federal projects, depending on the project and scope. Additional funding may be available for listed conditions, including remediation of brownfield sites.

Some currently active funding opportunities are listed in Appendix B. Funding sources and availabilities do change so it is important to remain up to date with these and identify and pursue project funding as early as possible.

TATHAM ENGINEERING

Climate Change Mitigation Plan
Town of Bracebridge

BRACEBRIDGE
The Heart of Muskoka

1 Bracebridge Corporate Baseline Energy and GHG Inventory

This section provides a comprehensive overview of the Town of Bracebridge (Bracebridge) energy consumption and GHG emissions.

1.1 CORPORATE ASSETS

The corporate assets included in the RCCMP for Bracebridge for the 2018 baseline year are presented below.

1.1.1 Buildings

In 2018, there were 11 corporate buildings in operation, with the largest being the Sportsplex (recreation centre) with a total building area of 6,410 m^2. Buildings use electricity, natural gas, and/or propane for internal lighting, heating, cooling, ventilation, domestic hot water and other building functions.

Bracebridge currently has one rooftop solar PV system installed on the main structure in Annie Williams Memorial Park.

Table 2 presents an overview of the corporate buildings included in the energy and GHG emissions inventory. Further details regarding the building profiles are included in Appendix C.

Table 2: Town of Bracebridge 2018 Building Profile

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m^2)	YEAR BUILT
Administration	2	1,980	1918, 1987
Community Centre	2	505	1882, 1959
Fire Hall	2	656	1982, 2018
Public Library	1	833	1908
Recreation Centre & Arena	3	9,909	1949, 1957, 2006
Storage Facility	1	790	1987
Total	**11**	**14,673**	

It should be noted that in 2024, the Muskoka Lumber Community Centre replaced the Bracebridge Arena (also known as the Memorial Arena) and Bracebridge Library. The Bracebridge Arena has been demolished while the Bracebridge Library will be used for administrative purposes.

1.1.2 Fleet

In 2018, there were approximately 43 corporate fleet in operation, with the majority of fleet being heavy duty vehicles or construction equipment. All corporate fleet are fueled by diesel or gasoline. Table 3 presents an overview of the corporate fleet included in the baseline inventory. See Appendix C for vehicle details.

Table 3: Town of Bracebridge Fleet Profile

DEPARTMENT	FLEET TYPE		# OF FLEET
By-Law	Vehicle	Light Duty	1
Planning & Development	Vehicle	Light Duty	1
Public Works	Vehicle (Licensed)	Light Duty	6
		Medium Duty	1
		Heavy Duty	13
		Uncategorized	5
	Equipment (Unlicensed)		15
Recreation	Vehicle	Light Duty	1
Total			**43**

1.1.3 Streetlights

In 2018, there were approximately 1,400 streetlights in Bracebridge. Through the Save on Energy Retrofit Program, Bracebridge converted approximately 933 of their streetlights to LED bulbs in 2015. Based on correspondence with Bracebridge, the wattage of the streetlights ranges from 36, 54, 80 and 133 W, however, the exact quantity of each type is unknown. For this study, it was assumed that all LED streetlights have a wattage of 54 W, and all non-LED streetlights have a wattage of 133 W.

Table 4 presents an overview of the corporate streetlights included in the baseline inventory.

Table 4: Town of Bracebridge Streetlight Profile

BULB WATTAGE	# OF STREETLIGHTS	TYPE OF BULB
54	933	LED
133	467	Non-LED
Total	**1,400**	

1.2 BASELINE ENERGY CONSUMPTION

In 2018, the total energy consumption in Bracebridge was 29,301 gigajoules (GJ). Bracebridge used 21,995 GJ of energy (75% of total energy consumption) across their corporate buildings, 5,484 GJ (19%) across their corporate fleets and 1,822 GJ (6%) across their corporate streetlights. Figure 1 provides the total energy consumption of the buildings, fleet and streetlights by energy source. The energy consumption inventory for corporate assets is provided in Appendix C.

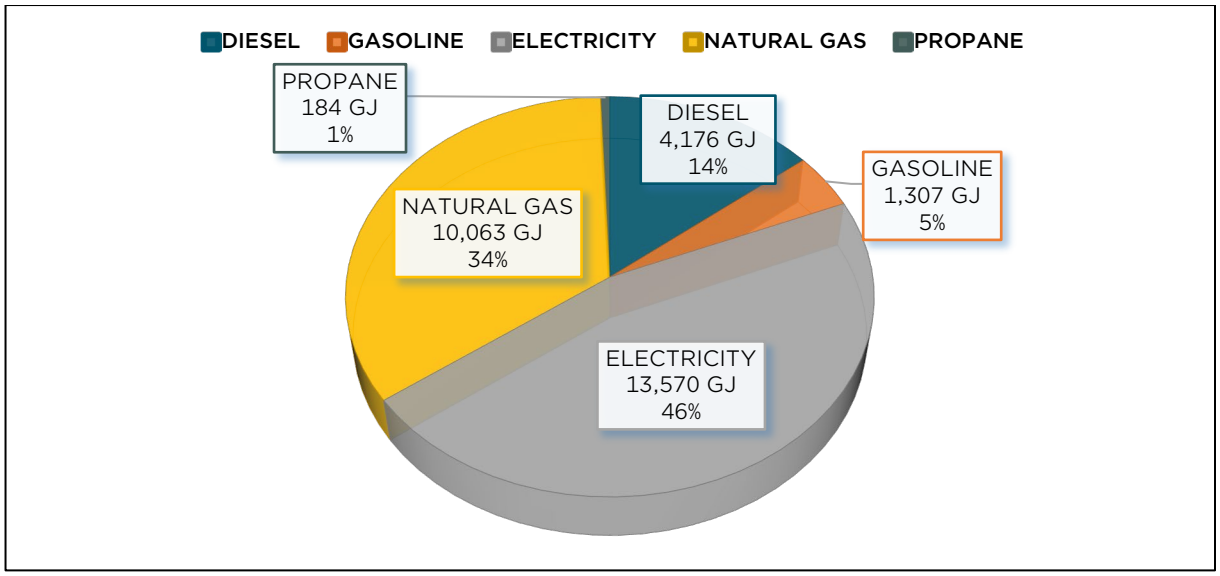

Figure 1: Town of Bracebridge Total Energy Consumption in 2018

1.3 BASELINE GHG EMISSIONS

In 2018, Bracebridge produced 616 tCO_2e of GHG emissions (61%) from their corporate buildings, 382 tCO_2e (38%) from their corporate fleet and 15 tCO_2e (1%) from their corporate streetlights. Figure 2 provides the baseline GHG emissions emitted in total by the buildings, fleet and streetlights.

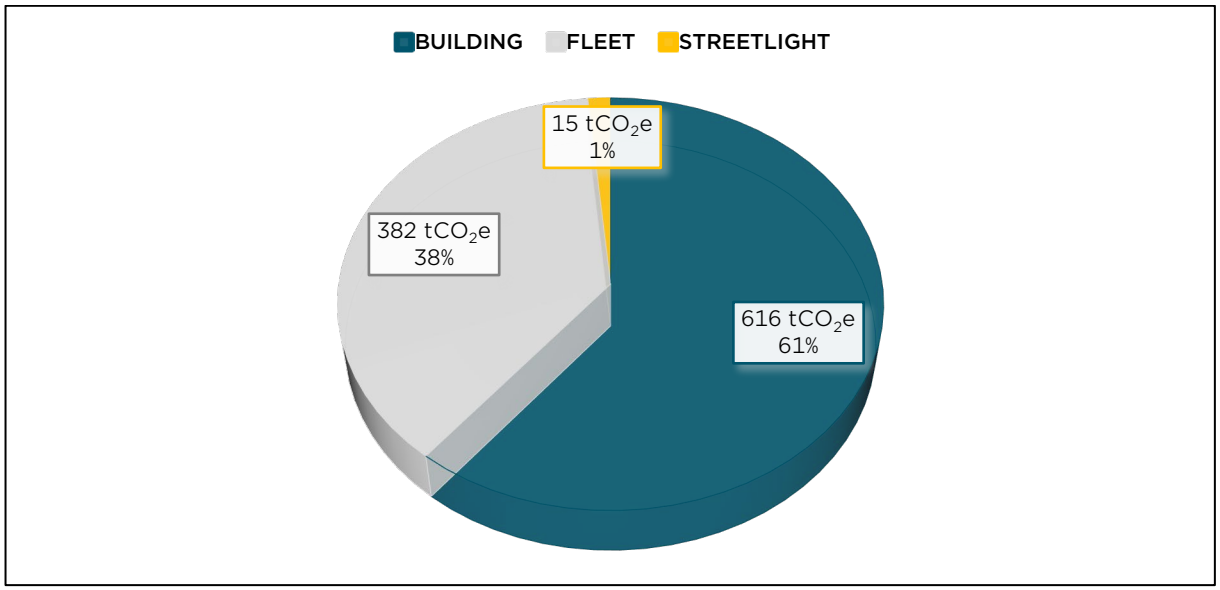

Figure 2: Town of Bracebridge Total GHG Emissions in 2018

Figure 3 presents the GHG emissions produced from the corporate buildings categorized by operation type. The recreational facilities and arenas are the two major operations producing the highest GHG emissions (71% of the total). These facilities also account for 62% of the floor area of the corporate assets and has more energy consuming operations like pools and arenas.

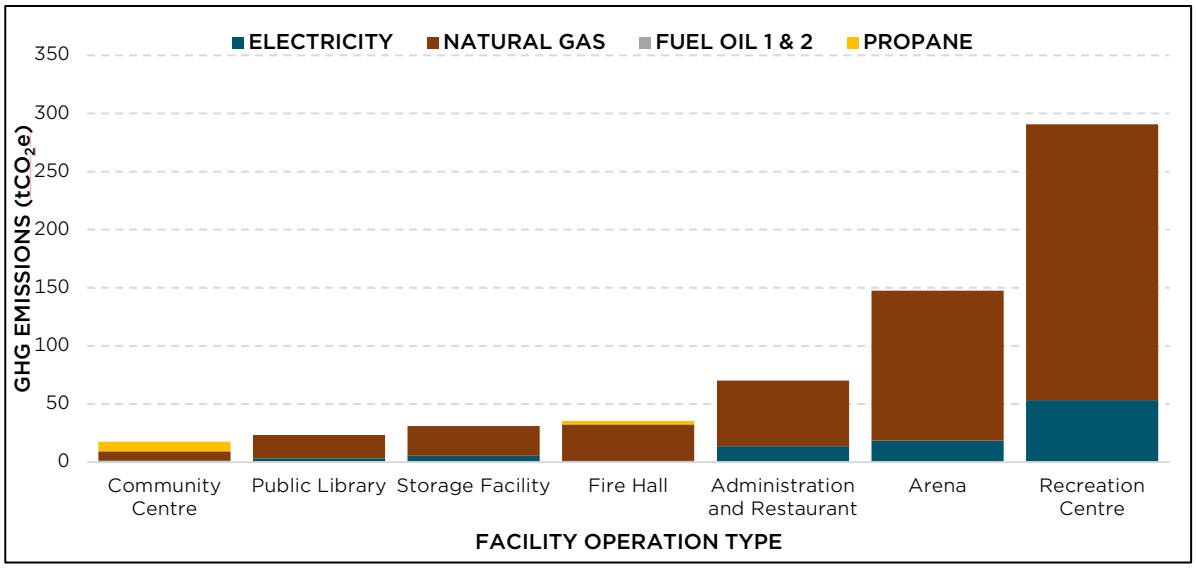

Figure 3. Town of Bracebridge Building GHG Emissions in 2018 by Operation Type

The GHG emission intensity (Figure 4) shows the facilities GHG emissions per m^2 of the floor area. Facilities with lower GHG emission intensity are either using fuels with lower GHG emissions or are more energy efficient. Fire Station 1 has the highest GHG emission intensity.

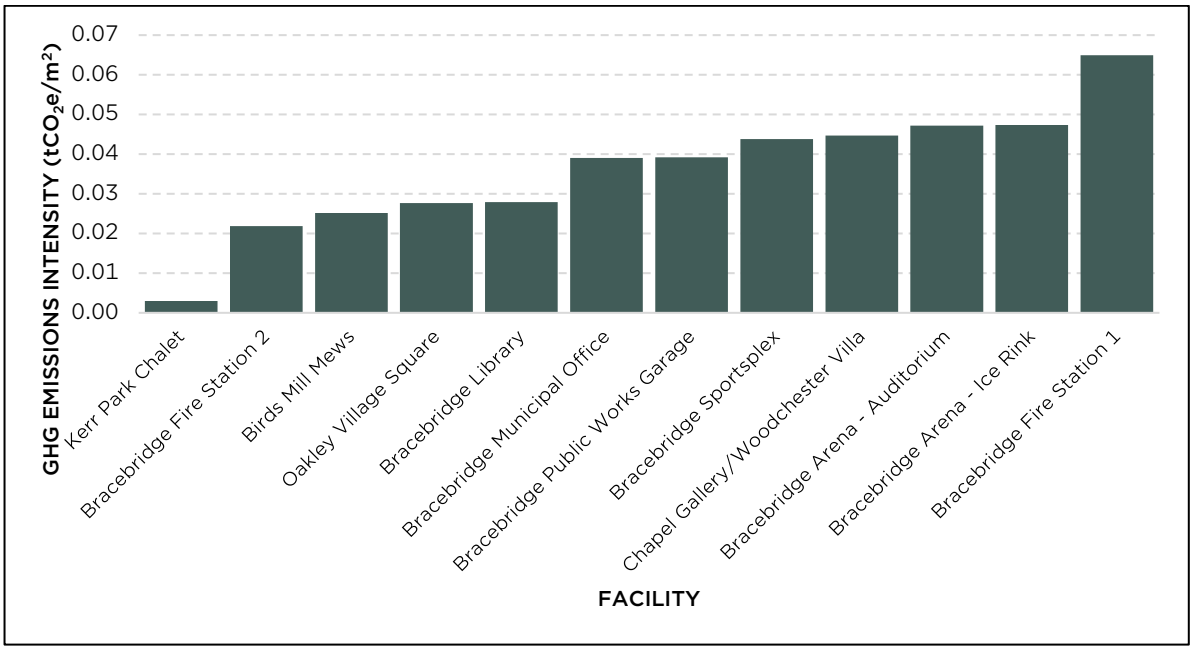

Figure 4. Town of Bracebridge GHG Intensity in 2018 by Facility

Figure 5 presents the GHG emissions produced from the corporate fleet categorized by type (light-, medium- or heavy-duty and/or equipment). Heavy duty vehicles generated approximately half of the GHG emissions while equipment and light-duty vehicles generated the other half.

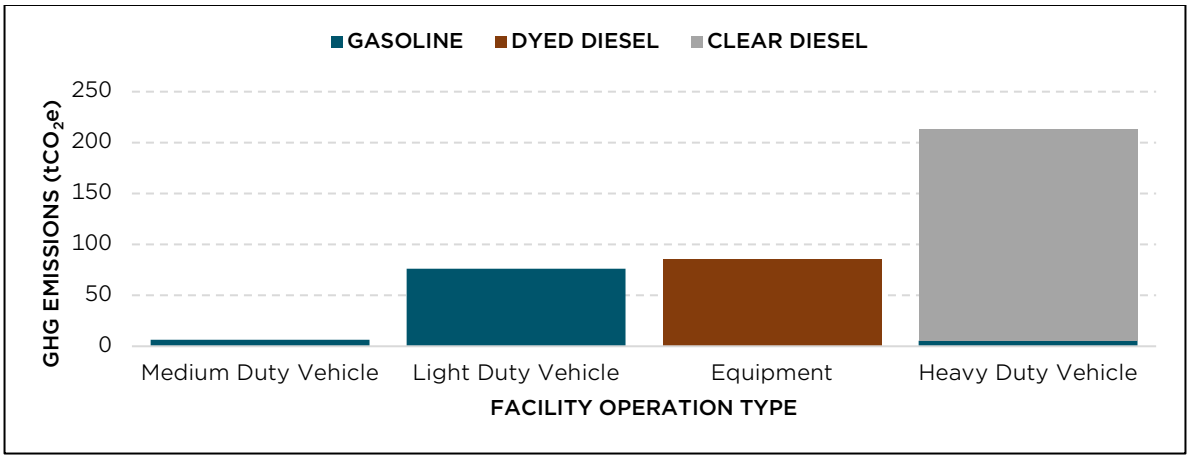

Figure 5: Town of Bracebridge Fleet GHG Emissions in 2018 by Fleet Type

Full GHG emissions inventory for corporate assets is provided in Appendix C.

2 Bracebridge GHG Emission Forecasting for BAU by 2050

The GHG emissions for Bracebridge was projected to the year 2050 based on the GHG emissions from the 2018 baseline year, permanent population and housing projection information from the District of Muskoka Growth Strategy- 2024, and projected climatic data changes from the ECCC.

Based on the Growth Strategy report, the population in Bracebridge is projected to grow from 17,021 in 2018 to 19,675 by 2030, and to 24,355 by 2050, and the permanent housing is projected to increase from 6,938 in 2018 to 8,251 by 2030, and to 10,442 by 2050.

Table 5 summarizes the projected population and housing units based on provided information from the Growth Strategy report to determine the forecasted GHG emissions.

Table 5: Town of Bracebridge Projected Population and Housing Units

COMPONENT	2018	2030		2050	
	Baseline Year Value	Projected Value	Change from Baseline	Projected Value	Change from Baseline
Projected Population	17,021	19,675	+14%	24,355	+36%
Projected Housing Units	6,938	8,251	+17%	10,442	+41%

Table 6 summarizes the assumptions made and modelling completed to determine the forecasted GHG emissions.

Table 6: Town of Bracebridge BAU Forecasting

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
Building	Change due to population growth	728	18%	930	51%
	Change due to global warming	589	-4%	543	-12%
	Total	701	14%	858	39%
Fleet	Change due to population growth and new roads	396	4%	421	10%
Streetlight	Change due to population growth, new subdivisions, new roads	16	6%	17	15%

Figure 6 provides the BAU forecasting to the year 2050 along with the estimated fuel costs including cost of carbon.

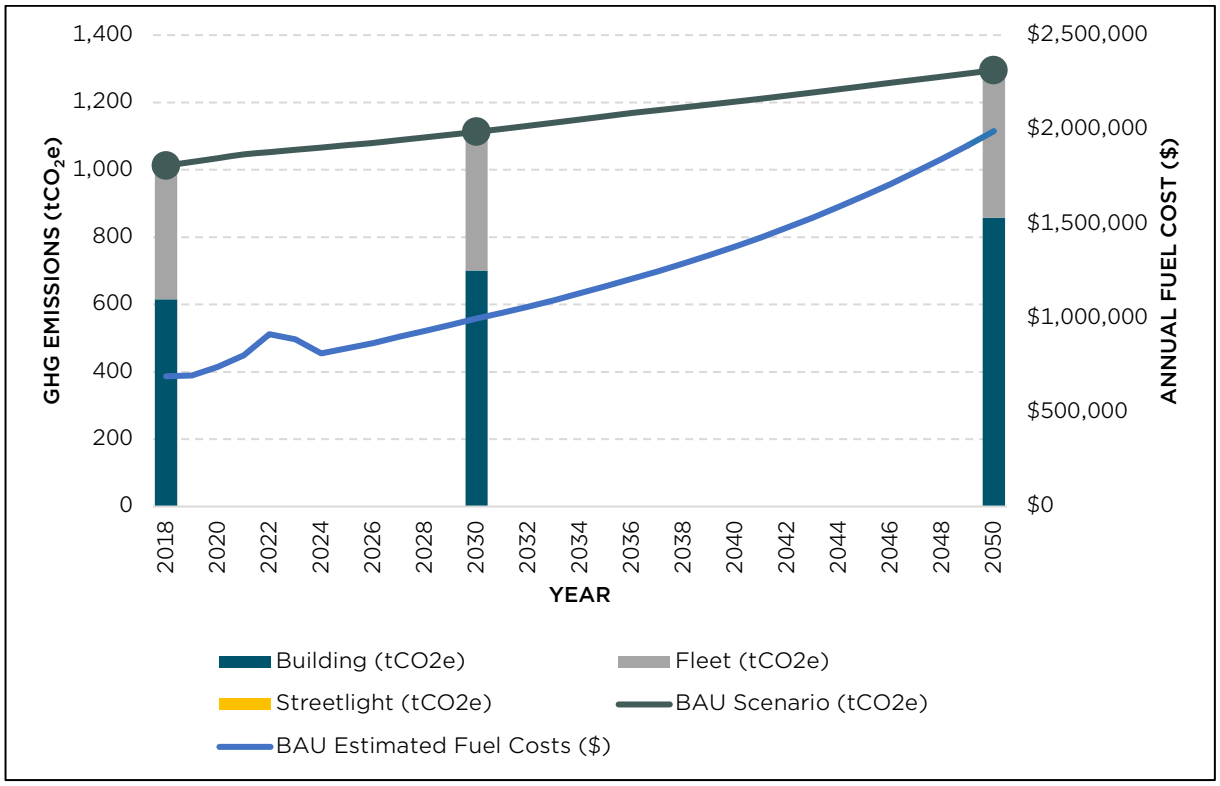

Figure 6. Town of Bracebridge GHG Emissions BAU Forecasting to 2050

Two milestones (2030 and 2050) are shown in the above forecasting figure to reiterate the importance of taking immediate actions to prevent the GHG emission increase and deviation from the set reduction targets. The above figure indicates that under the BAU scenario by year 2030 Bracebridge's annual GHG emissions will increase 13% above the baseline year 2018. This increase will be 30% or 300 tCO_2e by year 2050.

The increase in the energy costs will be more significant than the GHG emission increase due to rapidly increasing cost of carbon. Under the BAU scenario by year 2030 Bracebridge's annual energy costs (including the carbon costs) will increase 44% above the baseline year 2018. By year 2050, Bracebridge's energy costs will be more than 2.8 times of the energy costs of the 2018 baseline year. Bracebridge understands the importance of taking rapid actions. This is shown in their short-term (2030) reduction target and the retrofit plans to meet those targets.

3 Bracebridge GHG Emission Reduction Target

3.1 SHORT TERM (2030 PLAN)

All AMs aim to achieve 30-45% reductions in corporate GHG emissions from 2018 levels by 2030 to meet the federal and provincial ambitious targets. The short-term target for Bracebridge was determined based on the engineering review of the buildings, fleet and streetlight profile and their available potential to decarbonize the assets in a feasible way. Based on this assessment, the short-term target for Bracebridge was determined to be 45% reduction below 2018 levels.

3.2 LONG TERM (2050 PLAN)

Bracebridge aims to reduce corporate GHG emissions to net-zero by 2050 to be in line with the international agreements and, federal and provincial plans.

4 Bracebridge Climate Change Mitigation Plan

The details of the climate change mitigation plan for Bracebridge corporate assets are listed below. Chapel Gallery/Woodchester Villa buildings has been excluded from the assessment due to its heritage designation. Buildings that are decommissioned since 2018 are excluded from the following assessment.

4.1 BUILDINGS

4.1.1 Short Term 2030 plan

To achieve the short-term 2030 corporate GHG reduction target, Bracebridge plans to implement the following building retrofits before 2030:

1. Replace the Rooftop RTU units with an air source heat pump (ASHP) and backup heating coils at the following buildings:
    - Bracebridge Fire Station 1
    - Bracebridge Municipal Office
2. Replace the furnace with a split ASHP and back up heating coils at the following buildings:
    - Birds Mill Mews
    - Oakley Village Square
3. Replace the gas tube heaters with a split ASHP and backup heating coils at the following buildings:
    - Bracebridge Public Works Garage
4. Replace the electric baseboard units with a split ASHP and backup heating coils at the following buildings:
    - Kerr Park Chalet
5. Install rooftop solar PV on the above-mentioned buildings.
6. Replace all non-LED internal lighting to LED for the above-mentioned buildings.

The rooftop solar PV for corporate buildings is scheduled to be implemented at the same year that the building mechanical systems are retrofitted.

4.1.2 Long Term 2050 plan

To achieve the long-term 2050 corporate GHG reduction target, Bracebridge plans to implement the following building retrofits:

7. Install rooftop solar PV on the above-mentioned buildings, and at the following building:
    - Bracebridge Sportsplex

8. GHG Offset: Install additional solar PVs to offset the remaining GHG emissions and achieve net-zero by 2050. The total solar PV capacity needed to offset the GHG emissions for Bracebridge corporate assets is estimated to be 7930 kWp. For this estimation we assumed that any major building additions or new buildings will be net-zero GHG going forward. Therefore, the projected growth will not add to the corporate GHG profile. For Bracebridge the additional solar PV installations or purchase agreements will be phased starting 2041 and will be installed in eleven (11) phases. The phasing plan is shown in Table 7. The additional solar PVs can be installed on corporate assets (ground-mount solar PVs) where possible or investments will be made for the installations in other community areas or alternatively clean electricity purchase agreements will be signed. Bracebridge will review the feasibility of these alternatives before 2041. For the purpose of this assessment and costing we assumed that additional ground-mount solar PVs will be installed in corporate assets.

In 2024, the Bracebridge Arena and Library was replaced by the Muskoka Lumber Community Centre. As a result, a retrofit plan for these buildings is not included in this report. The Bracebridge Fire Station 2 is proposed to be relocated and is excluded from our assessment. The implementation planning for building retrofits and additional solar PV are listed in the following table. As previously mentioned, EUI and equipment lifespan was considered when determining the phasing plan for building retrofits.

Table 7: Town of Bracebridge Building Retrofit and Solar PV System Phasing

YEAR	IMPLEMENTATION PLAN		
		Solar PV Array Rated Size (kW_p)	
	Proposed Buildings to be Retrofitted with ASHP And LED	Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2025	Birds Mill Mews	27	

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP And LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2026	Bracebridge Municipal Office	291	
2027	Bracebridge Public Works Garage	870	
2028	Bracebridge Fire Station 1	297	
2029	Oakley Village Square	35	
2030	Kerr Park Chalet	21	
2031	Bracebridge Sportsplex (Note 1)	1480	
2032	Additional Solar 1		✓ 700
2033	Additional Solar 2		✓ 700
2034	Additional Solar 3		✓ 700
2035	Additional Solar 4		✓ 700
2036	Additional Solar 5		✓ 700
2037	Additional Solar 6		✓ 700
2038	Additional Solar 7		✓ 700
2039	Additional Solar 8		✓ 700
2040	Additional Solar 9		✓ 700
2041	Additional Solar 10		✓ 700
2042	Additional Solar 11		✓ 930

Note 1: Bracebridge Sportsplex will not be retrofitted with ASHP. Only rooftop solar PV is included for this building.

A feasibility assessment of installing RTU ASHP or split ASHP was completed for all corporate buildings. Based on this assessment, ASHP is not feasible for Bracebridge Sportsplex building due to the sheer size and cost of the existing systems. We assumed the HVAC systems will remain in place for this building, and they will be replaced like for like with marginally more efficient equipment throughout the building's lifespan. A more detailed assessment and energy modeling can be completed for this building to further analyze the feasibility of ASHP. The following additional measures can be considered for this building to enhance the energy efficiency:

- Demand controlled ventilation systems
- Outdoor temperature resets for boiler systems
- Daylighting control systems
- Low flow plumbing fixtures
- New dehumidifier system in pool area
- Heat recovery on ventilation air and pool hot water

By implementing the building retrofits and solar PV rooftop retrofits Bracebridge's building emissions will be reduced to 283 tCO_2e (54% reduction from 2018 baseline) by 2030 and will be reduced to 239 tCO_2e (61% reduction from 2018 baseline) by 2050. Implementing the additional solar PV offset projects will reduce the corporate GHG emissions to net-zero by 2050. Figure 7 presents the reductions.

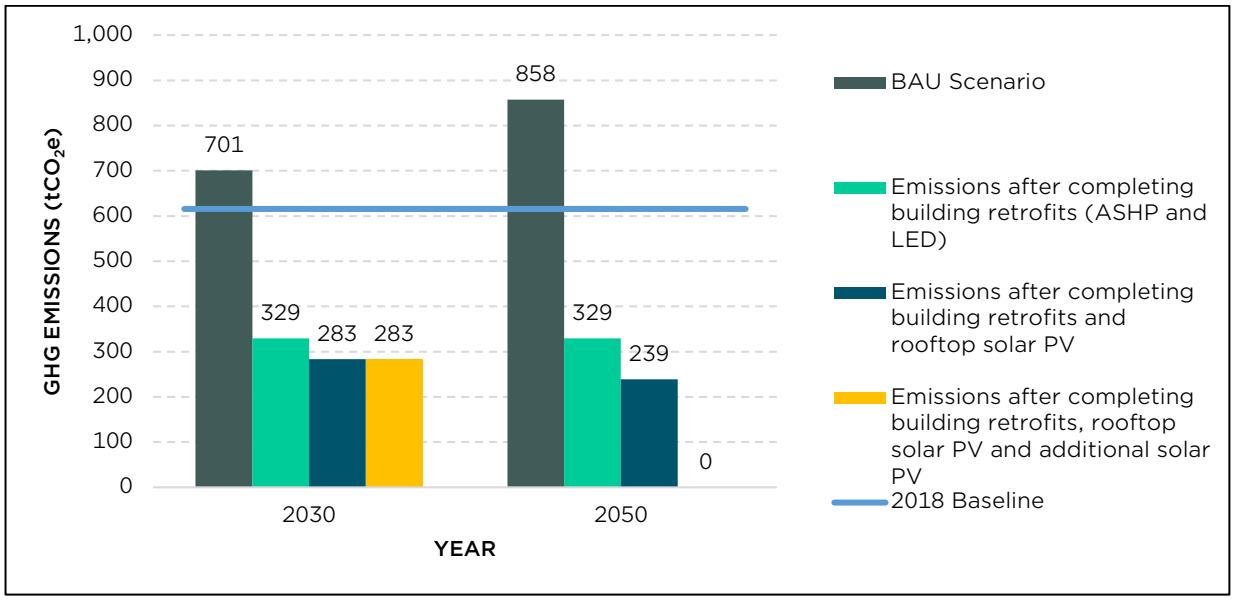

Figure 7. Town of Bracebridge Building GHG Emissions Reduction Comparison

4.2 FLEET

4.2.1 Short Term 2030 plan

To achieve the short term 2030 corporate GHG reduction target Bracebridge plans to implement the following changes to the fleet:

1. Replace all passenger car, light, and medium duty vehicle with EVs (10 vehicles)
2. Replace 35% of heavy-duty vehicles with EV or ZEV (5 vehicles)
3. Replace 23% of heavy equipment with EV or ZEV alternatives (3 vehicles)
4. Install 9 EV charging stations in municipal buildings to accommodate the increased EV vehicles

4.2.2 Long Term 2050 plan

To achieve the long term 2050 corporate GHG reduction target Bracebridge plans to implement the following changes to the fleet:

5. Replace 100% of heavy-duty vehicles with EV or ZEV (8 vehicles)
6. Replace 100% of heavy equipment with EV or ZEV alternatives (12 vehicles)

Bracebridge won't need additional EV or ZEV charging infrastructure beyond 2030 as it is anticipated that sufficient publicly available EV/ZEV charging stations will be developed by 2050. Table 8 below shows the transition plan of EV and ZEV, and Figure 8 shows the plan compared to BAU forecasting.

Table 8: Town of Bracebridge Fleet EV/ZEV Phasing and GHG Emissions

YEAR	% ELECTRIC FLEET RETROFITS			GHG EMISSIONS (tCO_2e)			
	Light and Medium EV	Heavy Duty EV	Equipment	Light And Medium EV	Heavy Duty EV	Equipment	Total GHG Emission
2030	100%	35%	23%	0	139	86	225
2050	100%	100%	100%	0	0	0	0

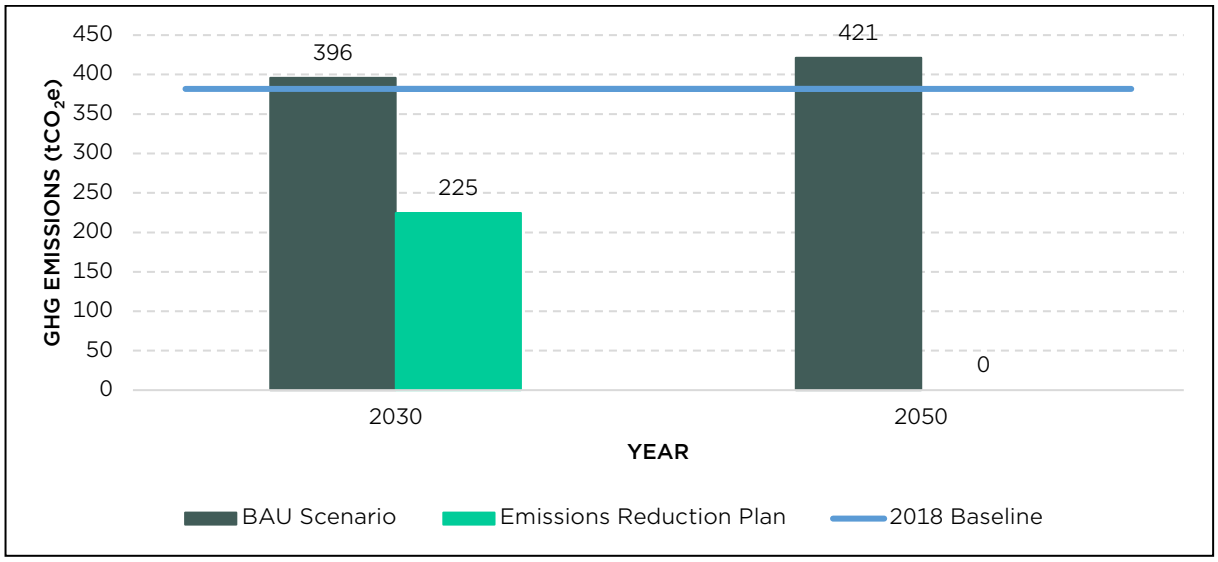

Figure 8. Town of Bracebridge Fleet EV/ZEV GHG Emissions

By implementing the above-mentioned measures, Bracebridge's fleet emissions will be reduced to 225 tCO_2e (41% reduction from 2018 baseline) by 2030 and will reach net-zero by 2050. Bracebridge will prepare a detailed fleet electrification strategy to identify suitable candidates for EV/ZEV transition based on usage patterns, age and mileage, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs/ZEVs, prioritizing high-emission and urban vehicles first.

4.3 STREETLIGHTS

Bracebridge is proposing converting all non-LED streetlights to LED streetlights when they reach their end of life. An LED conversion plan will be developed based on the life expectancy of the equipment and the available funding opportunities.

4.4 FUTURE ADDITIONS AND NEW BUILDINGS

To achieve the short term and long term targets any future developments and future equipment/fleet purchases should be net-zero, where possible. Bracebridge will develop a net-zero new building policy and net-zero new fleet policy. Additionally, any future streetlight purchases/installations should be LED, where possible. Bracebridge will develop a progressive LED conversion for existing streetlights to support the plan.

5 Bracebridge Cost of Implementations

The details of the cost of implementation for Bracebridge are listed below. The assessment includes installation costs for buildings, fleet, and streetlights, as well as energy and carbon costs for buildings. It also considers potential operating cost savings compared to business as usual (BAU).

5.1 BUILDING CAPITAL COST

The preliminary capital cost estimation includes the equipment costs as well as the installation costs for installing RTU ASHP, split ASHP, installing solar PV on the rooftops of existing buildings, and installing additional solar systems needed to achieve net-zero emissions by 2050. Building retrofits involve the installation of ASHPs and LED lighting retrofits, while solar retrofits encompass both rooftop solar installations and additional solar systems. Table 9 below listed the estimated capital cost for the planned retrofit activities needed to achieve net zero by 2050.

Table 9: Town of Bracebridge Building Retrofits Capital Cost Estimation

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2025	Birds Mill Mews	$46,000	$119,000	$165,000
2026	Bracebridge Municipal Office	$265,000	$1,276,000	$1,541,000
2027	Bracebridge Public Works Garage	$71,000	$3,814,000	$3,885,000
2028	Bracebridge Fire Station 1	$89,000	$1,302,000	$1,391,000
2029	Oakley Village Square	$27,000	$154,000	$181,000
2030	Kerr Park Chalet	$17,000	$93,000	$110,000
2031	Bracebridge Sportsplex	$-	$6,487,000	$6,487,000
2032	Additional Solar 1	$-	$2,609,000	$2,609,000
2033	Additional Solar 2	$-	$2,609,000	$2,609,000
2034	Additional Solar 3	$-	$2,609,000	$2,609,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2035	Additional Solar 4	$-	$2,609,000	$2,609,000
2036	Additional Solar 5	$-	$2,609,000	$2,609,000
2037	Additional Solar 6	$-	$2,609,000	$2,609,000
2038	Additional Solar 7	$-	$2,609,000	$2,609,000
2039	Additional Solar 8	$-	$2,609,000	$2,609,000
2040	Additional Solar 9	$-	$2,609,000	$2,609,000
2041	Additional Solar 10	$-	$2,609,000	$2,609,000
2042	Additional Solar 11	$-	$3,465,000	$3,465,000
	Total	**$515,000**	**$42,800,000**	**$43,315,000**

5.2 OPERATING AND CARBON COSTS

The operating and carbon costs below were calculated according to the implementation planning shown in Table 7. The energy use was calculated for the buildings that are recommended to be retrofitted. The projected population growth and its impact on the fuel consumption is also included in this analysis. The detailed projected operating cost estimates are included in Table 10 below and is compared to the BAU scenario.

Table 10: Town of Bracebridge Detailed Building Energy Cost Comparison

YEAR	TOTAL BUILDING ENERGY AND CARBON COST- BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST – NET-ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (2024 DOLLARS) NOTE 1
2018	$442,000	$442,000	$-
2019	$455,000	$455,000	$-
2020	$517,000	$517,000	$-

YEAR	TOTAL BUILDING ENERGY AND CARBON COST- BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST – NET-ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (2024 DOLLARS) NOTE 1
2021	$536,000	$536,000	$-
2022	$545,000	$545,000	$-
2023	$557,000	$557,000	$-
2024	$482,000	$482,000	$-
2025	$495,000	$493,000	$2,000
2026	$507,000	$477,000	$30,000
2027	$525,000	$385,000	$140,000
2028	$539,000	$365,000	$174,000
2029	$553,000	$375,000	$178,000
2030	$568,000	$385,000	$183,000
2031	$579,000	$205,000	$374,000
2032	$591,000	$124,000	$467,000
2033	$603,000	$43,000	$560,000
2034	$616,000	$(39,000)	$655,000
2035	$629,000	$(120,000)	$749,000
2036	$643,000	$(199,000)	$842,000
2037	$656,000	$(280,000)	$936,000
2038	$670,000	$(360,000)	$1,030,000
2039	$684,000	$(439,000)	$1,123,000
2040	$699,000	$(518,000)	$1,217,000

YEAR	TOTAL BUILDING ENERGY AND CARBON COST- BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST – NET-ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (2024 DOLLARS) NOTE 1
2041	$715,000	$(596,000)	$1,311,000
2042	$732,000	$(673,000)	$1,405,000
2043	$749,000	$(657,000)	$1,406,000
2044	$767,000	$(640,000)	$1,407,000
2045	$787,000	$(623,000)	$1,410,000
2046	$807,000	$(605,000)	$1,412,000
2047	$827,000	$(586,000)	$1,413,000
2048	$849,000	$(566,000)	$1,415,000
2049	$872,000	$(546,000)	$1,418,000
2050	$895,000	$(524,000)	$1,419,000

Note 1: a positive number in a year means potential savings for the Town in that year compared to BAU and a negative number means a potential cost for the Town in that year.

As the buildings are implementing solar retrofits and transitioning to more energy efficient systems and alternative fuels, they start to generate revenue due to additional electricity production capacity and projected higher cost of electricity compared to other fuels. A breakpoint is estimated to happen in 2034 where the revenue generated from solar systems will surpass the cost of fuels for the buildings. As the fuel cost, carbon cost and electricity cost increases and as the additional solar PV systems are installed, the revenue generation potential increases significantly for Bracebridge.

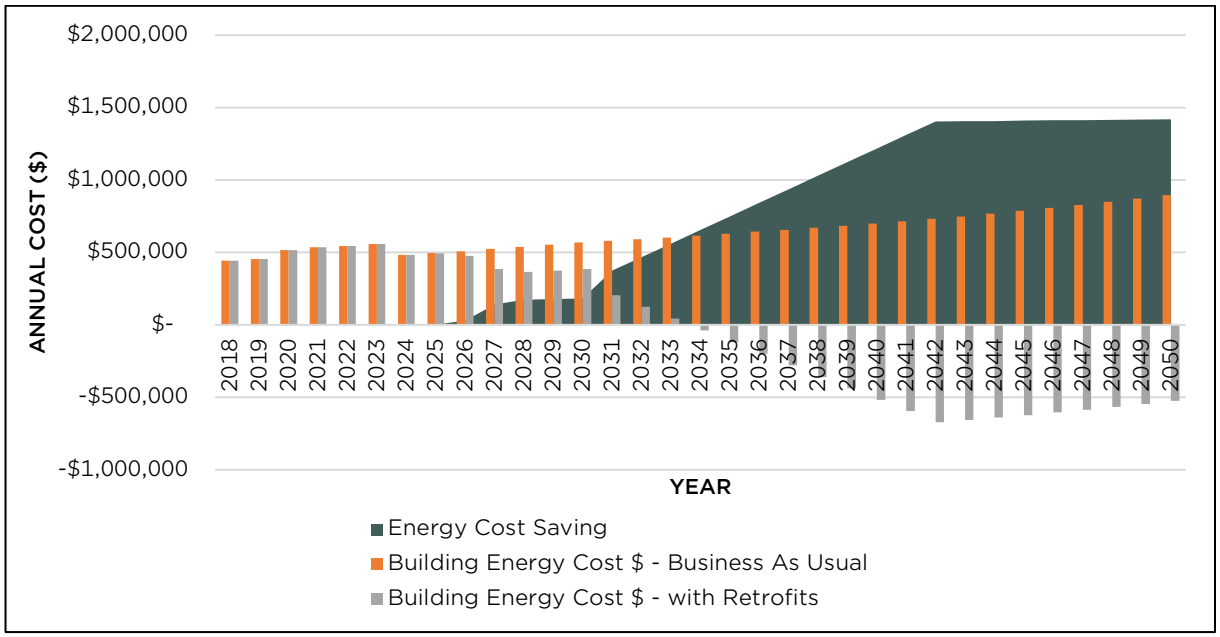

Figure 9. Town of Bracebridge Building Retrofit Cost Saving

Figure 9 above shows projected financial impact of energy cost savings over time, spanning from 2018 to 2050. The dark green area represents the energy cost saving achieved each year, which start to increase gradually and become significant over time. The grey bar shows the building energy costs with retrofits, with the installation of air source heat pumps (ASHP) and solar systems. The graph effectively highlights the financial benefits of implementing retrofitting measures to achieve net-zero emissions by 2050.

5.3 FLEET EV TRANSITION COST

The estimated capital cost to electrify Bracebridge fleet and transition to EV/ZEV vehicles is displayed in Table 11 below. The cost estimate is broken into two milestones, 2030 and 2050 to determine the required investment needed for Bracebridge to reach the GHG reduction targets identified in this plan. Bracebridge will conduct a detailed assessment to identify suitable candidates for electrification based on usage patterns, mileage/vehicle age, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs. The vehicles will ideally be replaced with EV/ZEV alternatives once they are close to their end of life.

Table 11: Town of Bracebridge Estimated Capital Cost of Fleet Electrification

VEHICLE TYPES	NO. OF VEHICLES			ESTIMATED CAPITAL COST OF FLEET ELECTRIFICATION (2024 DOLLARS)		
	2018 Baseline	2030 Retrofits	2050 Retrofits	Per Vehicle	2030 Cost	2050 Cost
Heavy Duty Vehicle	13	5	8	$400,000	$1,820,000	$3,380,000
Medium Duty Vehicle	1	1	0	$130,000	$130,000	$-
Light Duty Vehicle	8	8	0	$105,000	$836,000	$-
Industrial/ Commercial Equipment	14	3	11	$146,000	$438,000	$1,604,000
Tractors and Combine	1	0	1	$140,000	$-	$140,000
Passenger Car	1	1	0	$105,000	$105,000	$-
Total	**38**	**18**	**20**	**$-**	**$3,223,000**	**$5,124,000**

The cost estimate of level II EV charging stations needed to support the Bracebridge EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is estimated that Bracebridge will need to install 9 charging stations in their corporate buildings to support the fleet electrification plan. However, further investment in charging infrastructure may not be necessary, as it is expected that broad public charging infrastructure will be available. Table 12 displays the estimated cost for EV charging stations.

Table 12: Town of Bracebridge Estimated Capital Investment Cost for EV Charging Stations

NO. OF BUILDINGS	NO. OF EV FLEET		NO. OF LEVEL 2 CHARGING INFRASTRUCTURE		CAPITAL COST (2024 DOLLARS)	
	2030	2050	2030	2050	2030	2050
8	18	38	9	0	$32,000	$-

5.4 LED CONVERSION COST

Based on the review of the cost of LED conversion projects completed by municipalities such as the Town of Huntsville (in 2015) and the City of Barrie (in 2015), the material and labour costs to convert existing streetlights to LED ranges from approximately $700 to $1,200 per streetlight, depending on the wattage.

As presented in Table 13, estimated capital cost to replace all remaining non-LED streetlights (approximately 467 streetlights) to LED ranges from $326,900 (assuming lower wattage bulbs) to $560,400 (assuming high wattage bulbs).

Table 13: Town of Bracebridge Estimated Capital Cost of LED Streetlights

NO. OF STREETLIGHTS	CAPITAL COST (2024 DOLLARS)	
	Low Estimate	High Estimate
467	$326,900	$560,400

TATHAM ENGINEERING

Climate Change Mitigation Plan

Town of Gravenhurst

GRAVENHURST
GATEWAY TO MUSKOKA

1 Gravenhurst Corporate Baseline Energy and GHG Inventory

This section provides a comprehensive overview of the Town of Gravenhurst (Gravenhurst) energy consumption and GHG emissions.

1.1 CORPORATE ASSETS

The corporate assets included in the RCCMP for the Gravenhurst for the 2018 baseline year are presented below.

1.1.1 Buildings

In 2018, there were 25 corporate buildings in operation, with the largest being the Centennial Centre (Arena) with a total building area of 3,909 m^2. Buildings use electricity, natural gas, fuel oil, and propane for internal lighting, heating, cooling, ventilation, domestic hot water and other building functions.

Gravenhurst currently has no rooftop solar PV systems installed on their corporate buildings. Table 14 presents an overview of the corporate buildings included in the energy and GHG emissions inventory. Further details regarding the building profiles are included in Appendix D.

Table 14: Town of Gravenhurst Building Profile

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m^2)	YEAR BUILT
Administration	4	2,034	1900-2017
Arena	1	3,909	1977-2011
Cemetery Operations & Mortuary	1	261	1980-2000
Community Centre	1	978	1991-2002
Fire Hall	3	1,757	1964-1974
Pavilion	1	426	1993
Performing Arts	1	1,288	1901-1995
Public Library	1	743	2000

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m^2)	YEAR BUILT
Recreation Centre	1	2,606	1977-2011
Service Building	3	2,694	1971-2018
Storage Facilities	5	2,116	1919-2000
Washroom	3	140	1971-2006
Total	**25**	**18,952**	**-**

1.1.2 Fleet

In 2018, there were approximately 74 corporate fleet in operation, with the majority of fleet being heavy duty vehicles or construction equipment. All corporate fleet are fueled by diesel or gasoline. Table 15 presents an overview of the corporate fleet included in the baseline inventory. See Appendix D for vehicle details.

Table 15: Town of Gravenhurst Fleet Profile

FLEET TYPE	# OF FLEET
Passenger Car	4
Light Duty Vehicle	20
Heavy Duty Vehicle	17
Industrial/Commercial Equipment	23
Lawn and Garden Equipment	3
Ships and Boats	1
Tractor and Combines	3
Other Types (Roller & Steamer)	3
Total	**74**

1.1.3 Streetlights

In 2018, Gravenhurst operated streetlights at 43 streets and consumed a total of 452,838 kWh of electricity. In 2015, there were approximately 800 streetlights. From Gravenhurst's Investment Grade Audit dated February 2015, it is assumed that all streetlights were upgraded to LED in 2015. Table 16 presents an overview of the corporate streetlights included in the baseline inventory.

Table 16: Town of Gravenhurst Streetlight Profile

BULB WATTAGE	# OF STREETLIGHTS GROUPS	TYPE OF BULB
133	43	Unknown

1.2 BASELINE ENERGY CONSUMPTION

In 2018, the total energy consumption in Gravenhurst was 38,021 gigajoules (GJ). Gravenhurst used 29,916 GJ of energy (79% of total energy consumption) of energy across their corporate buildings, 6,475 GJ (17%) across their corporate fleets and 1,630 GJ (4%) across their corporate streetlights. Figure 10 provides the total energy consumption of the buildings, fleet and streetlights by energy source. The energy consumption inventory for corporate buildings is provided in Appendix C.

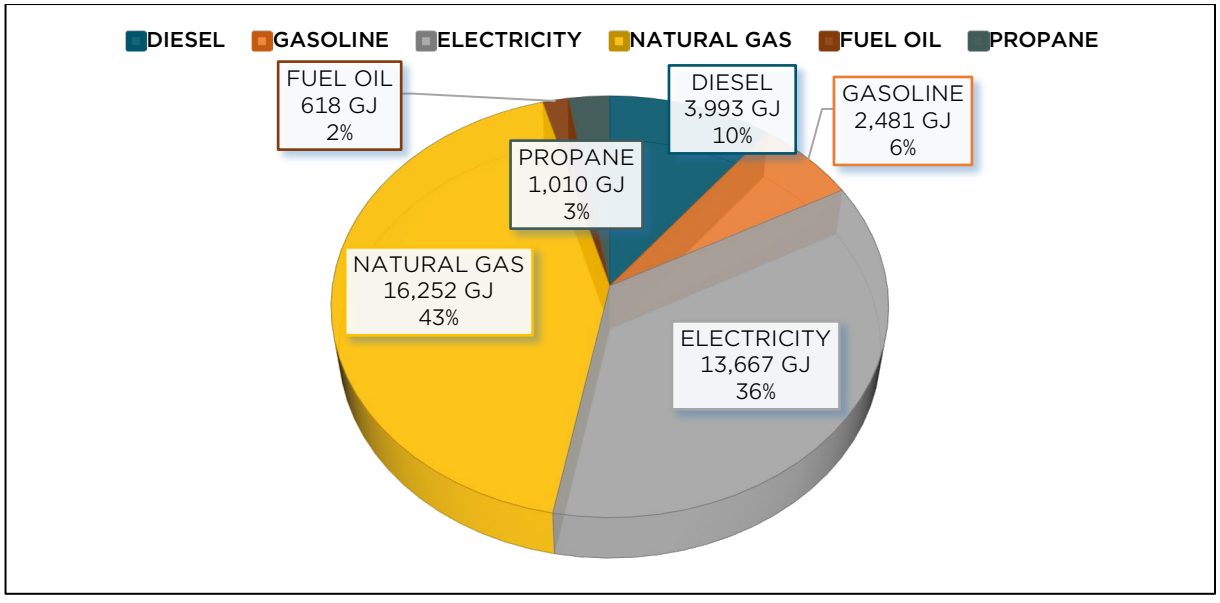

Figure 10. Town of Gravenhurst Total Energy Consumption in 2018

1.3 BASELINE GHG EMISSIONS

In 2018, Gravenhurst produced 1,025 tCO_2e of GHG emissions (69%) from their corporate buildings, 447 tCO_2e (30%) from their corporate fleet and 13 tCO_2e (1%) from their corporate streetlights. Figure 11 provides the baseline GHG emissions emitted in total by the buildings, fleet and streetlights.

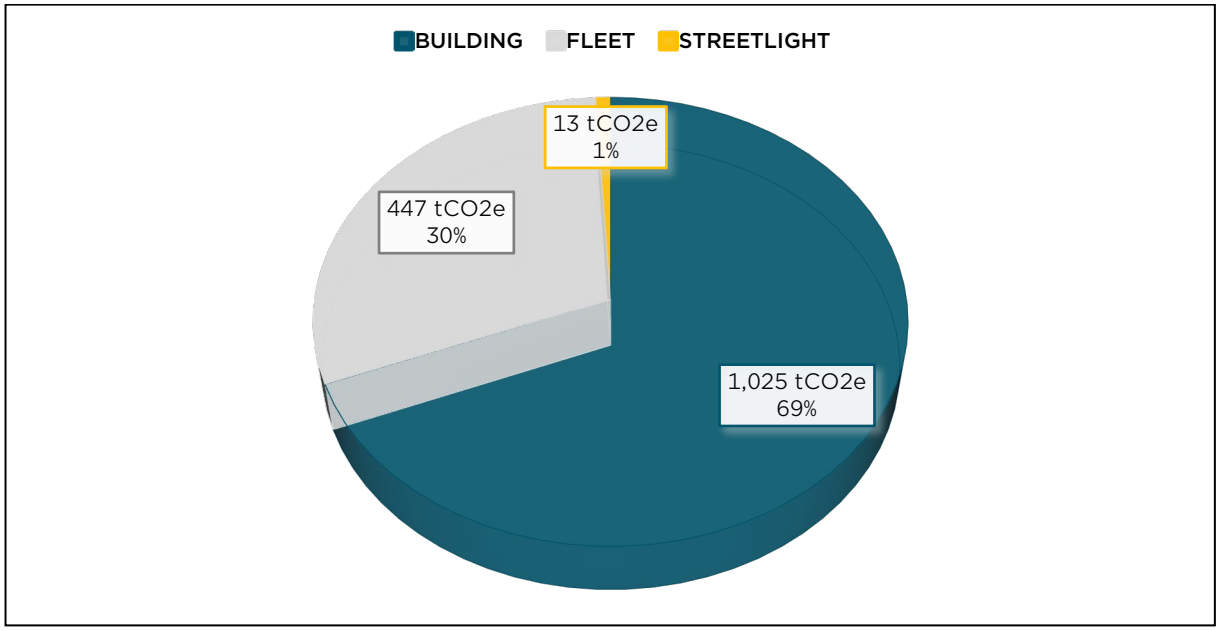

Figure 11. Town of Gravenhurst Total GHG Emissions in 2018

Figure 12 presents the GHG emissions produced from the corporate buildings categorized by operation type. The recreational centres and arenas are the two major operations producing the highest GHG emissions (61% of total). These facilities also account for 34% of the floor area of the corporate assets and has more energy consuming operations.

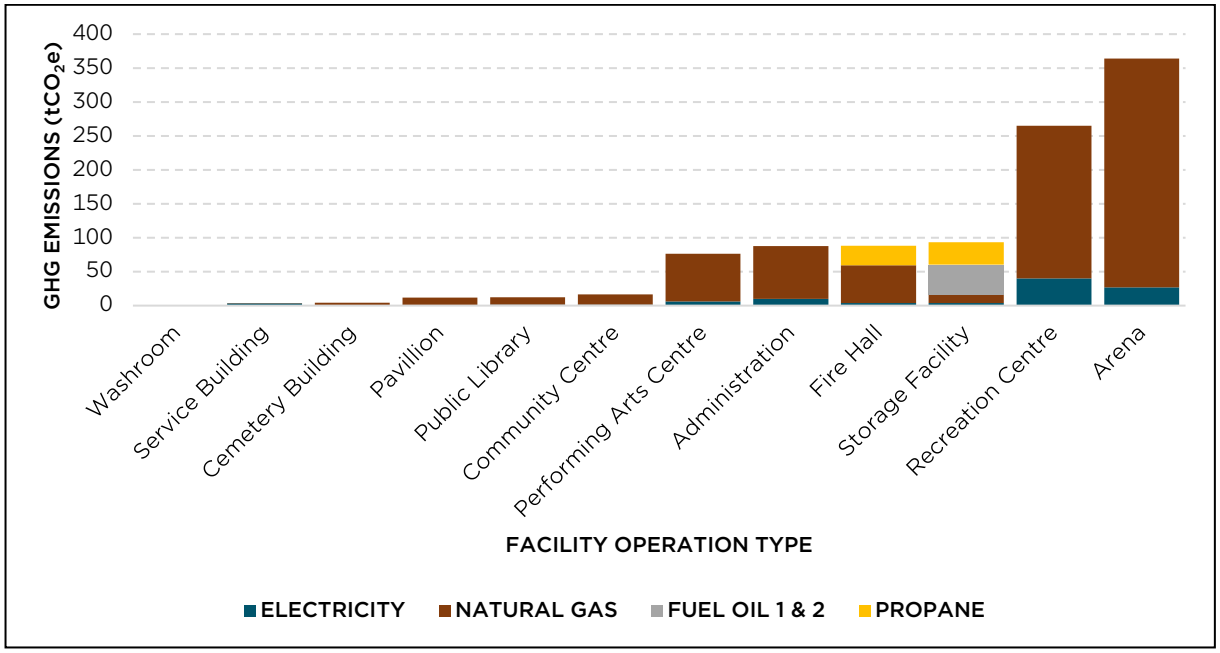

Figure 12. Town of Gravenhurst Building GHG Emissions in 2018 by Operation Type

The GHG emission intensity (Figure 13) shows the facilities GHG emissions per m^2 of the floor area. Facilities will lower GHG emission intensity are either using fuels with lower GHG emissions or are more energy efficient. Gravenhurst YMCA has the highest GHG emission intensity.

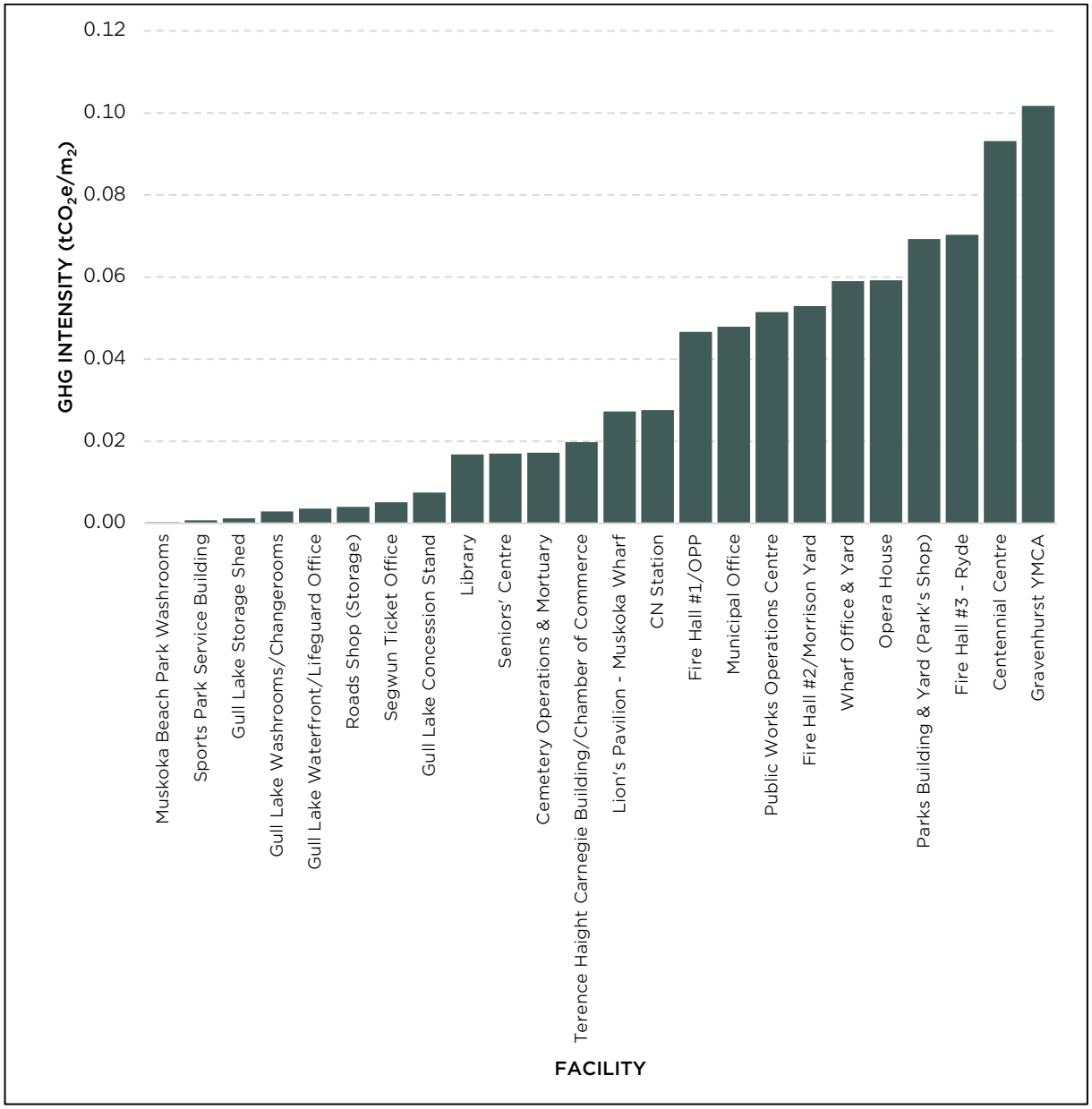

Figure 13. Town of Gravenhurst GHG Intensity by Facility

Figure 14 presents the GHG emissions produced from corporate fleet categorized by fuel type. Diesel vehicles generated more than half of the GHG emissions while gasoline vehicles generated the remaining half.

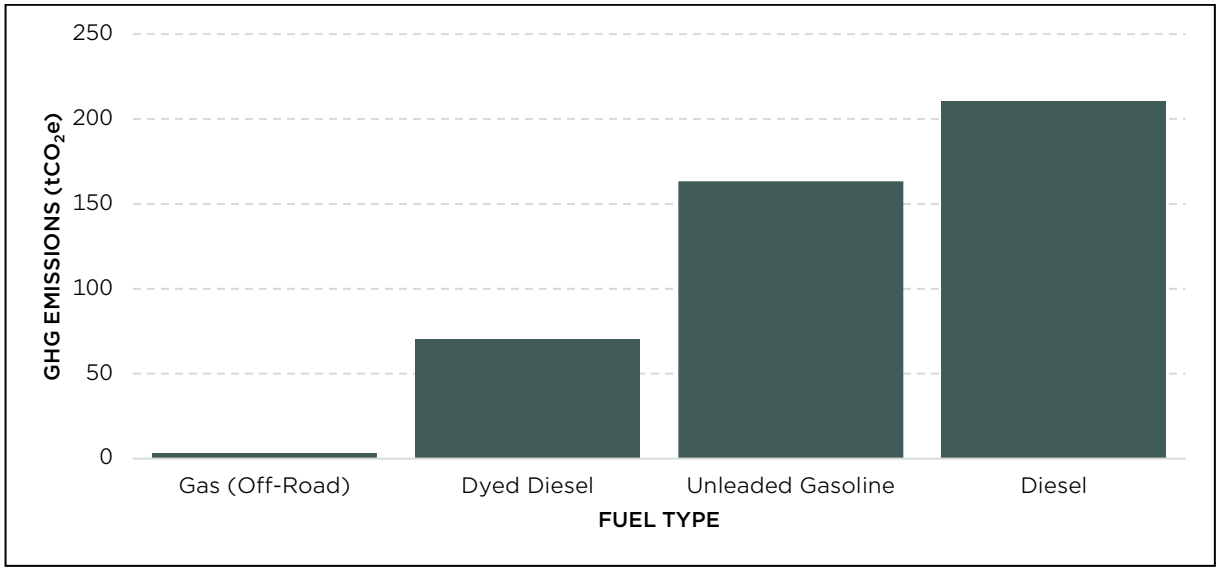

Figure 14. Town of Gravenhurst Fleet GHG Emission in 2018 by Fuel Type

Full GHG emissions inventory for corporate assets is provided in Appendix D.

2 Gravenhurst GHG Emission Forecasting for BAU by 2050

The GHG emissions for Gravenhurst was projected to the year 2050 based on the GHG emissions from the 2018 baseline year, permanent population and housing projection information from the District of Muskoka Growth Strategy 2024, and projected climatic data changes from the ECCC.

Based on the Growth Strategy report, the population in Gravenhurst is projected to grow from 13,042 in 2018 to 15,831 by 2030, and to 20,833 by 2050, and the permanent housing is projected to increase from 5,211 in 2018 to 6,647 by 2030, and to 9,051 by 2050.

Table 17 summarizes the projected population and housing units based on provided information from the Growth Strategy report to determine the forecasted GHG emissions.

Table 17: Town of Gravenhurst Projected Population and Housing Units

COMPONENT	2018	2030		2050	
	Baseline Year Value	Projected Value	Change from Baseline	Projected Value	Change from Baseline
Projected Population	13,042	15,831	19%	20,833	50%
Projected Housing Units	5,211	6,647	25%	9,051	56%

Table 18 summaries the assumptions made, and modelling completed to determine the forecasted GHG emissions.

Table 18: Town of Gravenhurst BAU Forecasting

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
Building	Change due to population growth	1,226	20%	1,597	56%

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
	Change due to global warming	976	-5%	893	-13%
	Total	1,178	15%	1,465	43%
Fleet	Change due to population growth and new roads	470	5%	511	14%
Streetlight	Change due to population growth, new subdivisions, new roads	34	5%	60	11%

Figure 15 provides the BAU forecasting to the year 2050 along with the estimated fuel costs including cost of carbon.

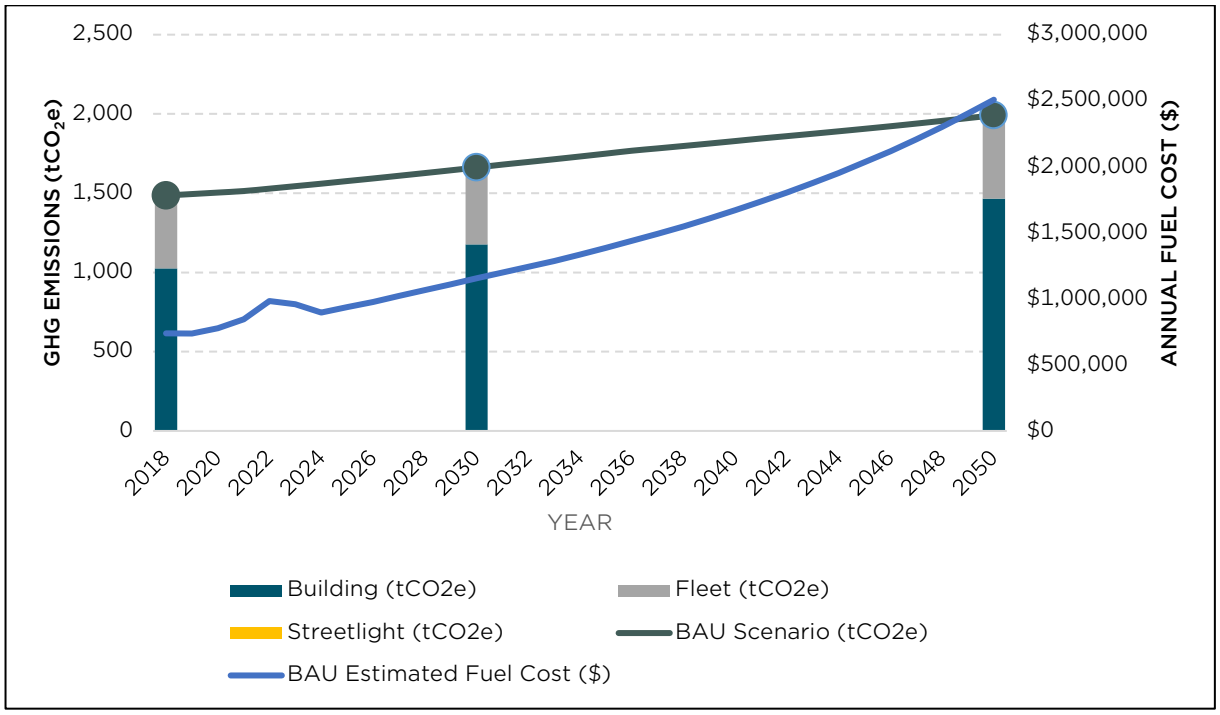

Figure 15. Town of Gravenhurst GHG Emissions BAU Forecasting to 2050

Two milestones (2030 and 2050) were shown in the above forecasting figure to reiterate the importance of taking immediate actions to prevent the GHG emission increase and deviation from the set reduction targets. The above figure indicates that under the BAU scenario by year 2030 Gravenhurst's annual GHG emissions will increase 13% above the baseline year 2018. This increase will be 37% or 551 tCO_2e by year 2050.

The increase in the energy costs will be more significant than the GHG emission increase due to rapidly increasing cost of carbon. Under the BAU scenario by year 2030 Gravenhurst's annual energy costs (including the carbon costs) will increase 68% above the baseline year 2018. By year 2050, Gravenhurst's energy costs will be more than 3.7 times of the energy costs of the 2018 baseline year. Gravenhurst understands the importance of taking rapid actions. This is shown in their short-term (2030) reduction target and the retrofit plans to meet those targets.

3 Gravenhurst GHG Emission Reduction Target

3.1 SHORT TERM (2030 PLAN)

All AMs aim to achieve 30-45% reductions in corporate GHG emissions from 2018 levels by 2030 to meet the federal and provincial ambitious targets. The short-term target for Gravenhurst was determined based on the engineering review of the buildings, fleet and streetlight profile and their available potential to decarbonize the assets in a feasible way. Based on this assessment, the short-term target for Gravenhurst was determined to be 45% reduction below 2018 levels.

3.2 LONG TERM (2050 PLAN)

Gravenhurst aims to reduce corporate GHG emissions to net-zero by 2050 to be in line with the international agreements and federal and provincial plans.

4 Gravenhurst Climate Change Mitigation Plan

The details of the climate change mitigation plan for Gravenhurst corporate assets are listed below. Buildings that are decommissioned since 2018 are excluded from the following assessment.

4.1 BUILDINGS

4.1.1 Short Term 2030 Plan

To achieve the short-term 2030 corporate GHG reduction target, Gravenhurst plans to implement the following building retrofits before 2030:

1. Replace the Rooftop RTU units with an air source heat pump (ASHP) with backup heating coils at the following buildings:
    - Gravenhurst YMCA
    - Centennial Centre
2. Replace the furnace with a split ASHP with backup heating coils at the following building:
    - CN Station
3. Replace the tube heaters and unit heaters with a split with backup heating coils at the following buildings:
    - Parks Building & Yard (Park's Shop)
    - Wharf Office & Yard
4. Replace the condensing boiler and all associated terminal units with an ASHP with backup heating coils at the following building:
    - Opera House
5. Install rooftop solar PV on the above-mentioned buildings.
6. Replace all the internal lighting to the LED lights for the above-mentioned buildings.

The rooftop solar PV for corporate buildings is scheduled to be implemented at the same year that the building mechanical systems are retrofitted.

4.1.2 Long Term 2050 Plan

To achieve the long-term 2050 corporate GHG reduction target, Gravenhurst plans to implement the following building retrofits:

7. Replace the Rooftop RTU units with an ASHP at the following building:
    - Fire Hall #1/OPP
8. Replace the furnace and condensing boiler with a split ASHP and backup furnace at the following buildings:
    - Fire Hall #2/Morrison Yard
    - Seniors' Centre
    - Library
    - Public Works Operations Centre
    - Lion's Pavilion – Muskoka Wharf
    - Fire Hall #3 – Ryde
    - Terence Haight Carnegie Building/Chamber of Commerce
    - Cemetery Operations & Mortuary
9. Replace the condensing boiler with an ASHP with backup heating coils at the following building:
    - Municipal Office
10. Install rooftop solar PV on the above-mentioned buildings.
11. Replace all the internal lighting to the LED lights for the above-mentioned buildings.
12. GHG Offset: Install additional solar PVs to offset the remaining GHG emissions and achieve net-zero by 2050. The total solar PV capacity needed to offset the GHG emissions for Gravenhurst corporate assets is estimated to be 11,500 kWp. For this estimation we assumed that any major building additions or new buildings will be net-zero GHG going forward. Therefore, the projected growth will not add to the corporate GHG profile. For Gravenhurst the additional solar PV installations or purchase agreements will be phased starting 2041 and will be installed in ten (10) phases. The phasing plan is shown in Table 19. The additional solar PVs can be installed on corporate assets (ground-mount solar PVs) where possible or investments will be made for the installations in other community areas or alternatively clean electricity purchase agreements will be signed. Gravenhurst will review

the feasibility of these alternatives before 2041. For the purpose of this assessment and costing we assumed that additional ground-mount solar PVs will be installed in corporate assets.

Information regarding building mechanical systems is not available for the following buildings:

- Gull Lake Waterfront/Lifeguard Office
- Gull Lake Concession Stand
- Gull Lake Storage Shed
- Gull Lake Washrooms/Changerooms
- Muskoka Beach Park Washrooms
- Washrooms/Janitorial Room-Muskoka Bay Park
- Sports Park Service Building
- Segwun Ticket Office
- Roads Shop (Storage)

These buildings generate low GHG emissions, and building retrofits for these buildings will not significantly affect the corporate GHG emission reductions. As a result, they are excluded from the retrofit plan.

The proposed implementation planning for building retrofits and additional solar PV are listed in the following table. As mentioned earlier, EUI and equipment lifespan was considered when determining the phasing plan for building retrofits

Table 19: Town of Gravenhurst Building Retrofit and Solar PV System Phasing

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP and LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2025	Gravenhurst YMCA	235	
2026	Parks Building & Yard (Park's Shop)	13	
2027	Wharf Office & Yard	0	

YEAR	IMPLEMENTATION PLAN			
	Proposed Buildings to be Retrofitted with ASHP and LED	Solar PV Array Rated Size (kW_p)		
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions	
2028	CN Station	46		
2029	Centennial Centre	356		
2030	Opera House	71		
2031	Fire Hall #2/Morrison Yard	48		
2032	Seniors' Centre	71		
2033	Library	44		
2034	Fire Hall #1/OPP	108		
2035	Public Works Operations Centre	119		
2036	Municipal Office	153		
2037	Lion's Pavilion - Muskoka Wharf	59		
2038	Fire Hall #3 - Ryde	14		
2039	Terence Haight Carnegie Building/Chamber of Commerce	18		
2040	Cemetery Operations & Mortuary	7		
2041	Additional Solar 1		✓	1150
2042	Additional Solar 2		✓	1150
2043	Additional Solar 3		✓	1150
2044	Additional Solar 4		✓	1150

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP and LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2045	Additional Solar 5	✓	1150
2046	Additional Solar 6	✓	1150
2047	Additional Solar 7	✓	1150
2048	Additional Solar 8	✓	1150
2049	Additional Solar 9	✓	1150
2050	Additional Solar 10	✓	1150

By implementing the building retrofits and solar PV rooftop retrofits Gravenhurst's building emissions will be reduced to 599 tCO_2e (42% reduction from 2018 baseline) by 2030 and will be reduced to 346 tCO_2e (66% reduction from 2018 baseline) by 2050. Implementing the additional solar PV offset projects will reduce the corporate GHG emissions to net-zero by 2050. The following figure shows the reductions.

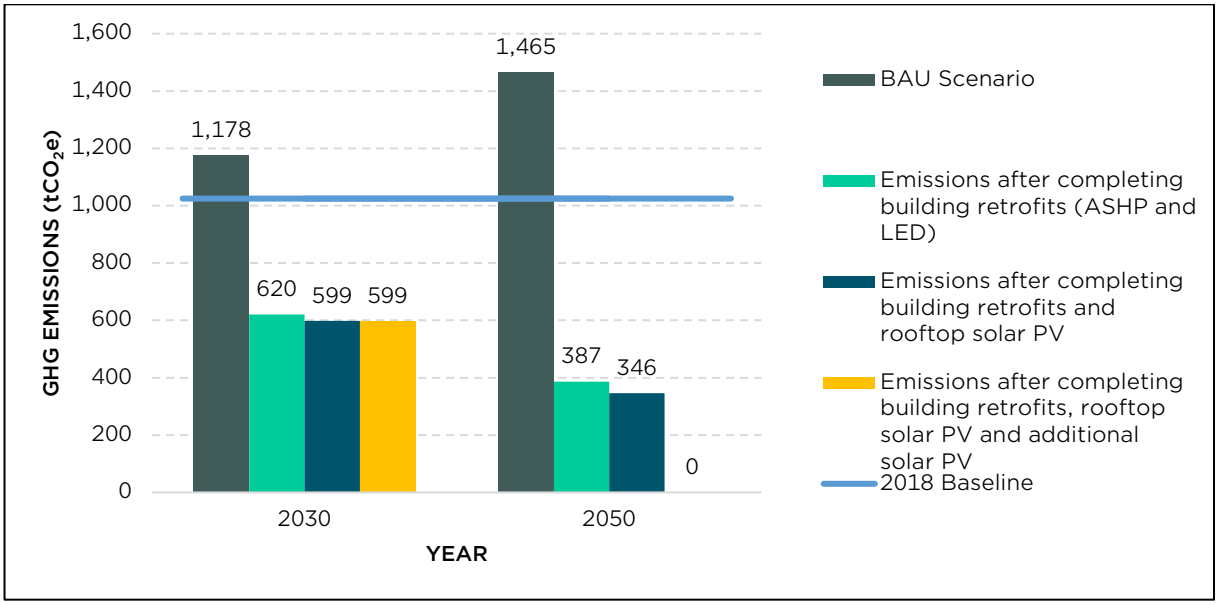

Figure 16. Town of Gravenhurst GHG Emissions Reduction Comparison

4.2 FLEET

4.2.1 Short Term 2030 Plan

To achieve the short term 2030 corporate GHG reduction target Gravenhurst plans to implement the following changes to the fleet:

1. Replace all passenger car, light, and medium duty vehicle with EVs (24 vehicles)
2. Replace 35% of heavy-duty vehicles with EV or ZEV (6 vehicles)
3. Replace 23% of heavy equipment with EV or ZEV alternatives (7 vehicles)
4. Install 18 # EV charging stations in municipal buildings to accommodate the increased EV vehicles

4.2.2 Long Term 2050 Plan

To achieve the long term 2050 corporate GHG reduction target Gravenhurst plans to implement the following changes to the fleet:

5. Replace 100% of heavy-duty vehicles with EV or ZEV (11 vehicles)
6. Replace all heavy equipment with EV or ZEV alternatives (23 vehicles)

Gravenhurst won't need additional EV or ZEV charging infrastructure beyond 2030 as it is anticipated that sufficient publicly available EV/ZEV charging stations will be developed by 2050. Table 20 below shows the transition plan of EV and ZEV, with Figure 17 showing the trend and compared against BAU case.

Table 20: Town of Gravenhurst Fleet EV/ZEV Phasing and GHG Emissions

YEAR	% ELECTRIC FLEET RETROFITS			GHG EMISSIONS (tCO_2e)			
	Light and Medium EV	Heavy Duty EV	Equipment	Light and Medium	Heavy Duty	Equipment	Total GHG Emission
2030	100%	35%	23%	0	161	85	247
2050	100%	100%	100%	0	0	0	0

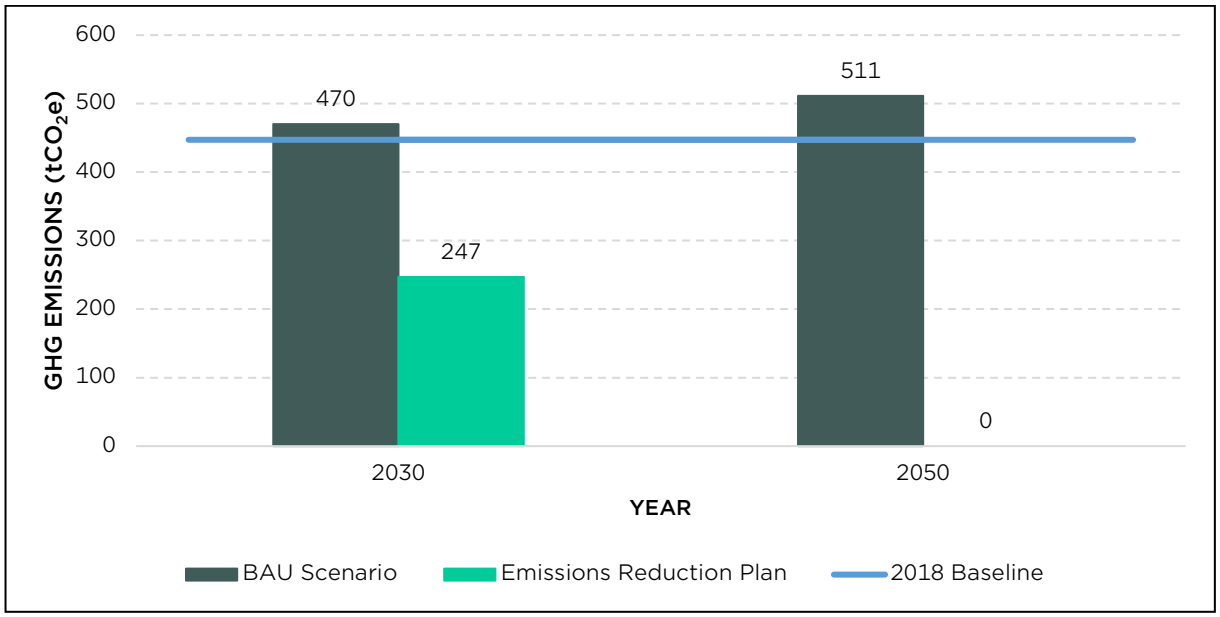

Figure 17. Town of Gravenhurst Fleet EV/ZEV GHG Emissions

By implementing the above-mentioned measures Gravenhurst's fleet emissions will be reduced to 247 tCO_2e (45% reduction from 2018 baseline) by 2030 and will reach net-zero by 2050. Gravenhurst will prepare a detailed fleet electrification strategy to identify suitable candidates for EV/ZEV transition based on usage patterns, age and mileage, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs/ZEVs, prioritizing high-emission and urban vehicles first.

4.3 STREETLIGHTS

Gravenhurst will convert all non-LED streetlights to LED streetlights when they reach their end of life. An LED conversion plan will be developed based on the life expectancy of the equipment and the available funding opportunities.

4.4 FUTURE ADDITIONS AND NEW BUILDINGS

To achieve the short term and long term targets any future developments and future equipment/fleet purchases should be net-zero, where possible. Gravenhurst will develop a net-zero new building policy and net-zero new fleet policy. Additionally, any future streetlight purchases/installations should be LED, where possible. Gravenhurst will develop a progressive LED conversion for existing streetlights to support the plan.

5 Gravenhurst Cost of Implementation

The details of the cost of implementation for Gravenhurst are listed below. The assessment includes installation costs for buildings, fleet, and streetlights, as well as energy and carbon costs for buildings. It also considers potential operating cost savings compared to business as usual (BAU).

5.1 BUILDING CAPITAL COST

The preliminary capital cost estimation includes the equipment costs as well as the installation cost for installing RTU ASHP, split ASHP, installing solar PV on the rooftops of existing buildings, and installing additional solar systems needed to achieve net-zero emissions by 2050. Building retrofits involve the installation of ASHPs and LED lighting retrofits, while solar retrofits encompass both rooftop solar installations and additional solar systems. Table 21 below listed the estimated capital cost for the planned retrofit activities needed to achieve net zero by 2050.

Table 21: Town of Gravenhurst Building Retrofit Capital Cost Estimation

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2025	Gravenhurst YMCA	$468,000	$1,030,000	$1,498,000
2026	Parks Building & Yard (Park's Shop)	$12,000	$57,000	$69,000
2027	Wharf Office & Yard	$10,000	$-	$10,000
2028	CN Station	$24,000	$202,000	$226,000
2029	Centennial Centre	$1,167,000	$1,561,000	$2,728,000
2030	Opera House	$232,000	$312,000	$544,000
2031	Fire Hall #2/Morrison Yard	$14,000	$211,000	$225,000
2032	Seniors' Centre	$44,000	$312,000	$356,000
2033	Library	$34,000	$193,000	$227,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2034	Fire Hall #1/OPP	$152,000	$474,000	$626,000
2035	Public Works Operations Centre	$124,000	$522,000	$646,000
2036	Municipal Office	$440,000	$671,000	$1,111,000
2037	Lion's Pavilion - Muskoka Wharf	$41,000	$259,000	$300,000
2038	Fire Hall #3 - Ryde	$30,000	$62,000	$92,000
2039	Terence Haight Carnegie Building/Chamber of Commerce	$27,000	$79,000	$106,000
2040	Cemetery Operations & Mortuary	$17,000	$31,000	$48,000
2041	Additional Solar 1	$-	$4,282,000	$4,282,000
2042	Additional Solar 2	$-	$4,282,000	$4,282,000
2043	Additional Solar 3	$-	$4,282,000	$4,282,000
2044	Additional Solar 4	$-	$4,282,000	$4,282,000
2045	Additional Solar 5	$-	$4,282,000	$4,282,000
2046	Additional Solar 6	$-	$4,282,000	$4,282,000
2047	Additional Solar 7	$-	$4,282,000	$4,282,000
2048	Additional Solar 8	$-	$4,282,000	$4,282,000
2049	Additional Solar 9	$-	$4,282,000	$4,282,000
2050	Additional Solar 10	$-	$4,282,000	$4,282,000
	Total	**$2,836,000**	**$48,796,000**	**$51,632,000**

5.2 OPERATING AND CARBON COSTS

The operating and carbon costs were calculated according to the implementation planning shown in Table 19. The energy use was calculated for buildings that are completing the retrofits. The projected population growth and its impact on the fuel consumption is also included in this analysis. The detailed projected operating cost estimates are included in Table 22 below and is compared to the BAU scenario.

Table 22: Town of Gravenhurst Detailed Building Energy Cost Comparison

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2018	$461,000	$461,000	$-
2019	$471,000	$471,000	$-
2020	$533,000	$533,000	$-
2021	$553,000	$553,000	$-
2022	$568,000	$568,000	$-
2023	$589,000	$589,000	$-
2024	$522,000	$522,000	$-
2025	$543,000	$570,000	$(27,000)
2026	$565,000	$597,000	$(32,000)
2027	$592,000	$625,000	$(33,000)
2028	$615,000	$645,000	$(30,000)
2029	$639,000	$659,000	$(20,000)
2030	$663,000	$696,000	$(33,000)
2031	$681,000	$708,000	$(27,000)
2032	$699,000	$717,000	$(18,000)

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2033	$718,000	$729,000	$(11,000)
2034	$738,000	$735,000	$3,000
2035	$758,000	$741,000	$17,000
2036	$780,000	$748,000	$32,000
2037	$801,000	$759,000	$42,000
2038	$823,000	$774,000	$49,000
2039	$846,000	$790,000	$56,000
2040	$871,000	$807,000	$64,000
2041	$897,000	$678,000	$219,000
2042	$923,000	$550,000	$373,000
2043	$950,000	$422,000	$528,000
2044	$979,000	$296,000	$683,000
2045	$1,010,000	$170,000	$840,000
2046	$1,042,000	$46,000	$996,000
2047	$1,076,000	$(77,000)	$1,153,000
2048	$1,113,000	$(198,000)	$1,311,000
2049	$1,151,000	$(318,000)	$1,469,000
2050	$1,191,000	$(436,000)	$1,627,000

Note 1: a positive number in a year means potential savings for the Town in that year compared to BAU and a negative number means a potential cost for the Town in that year.

As the buildings are implementing solar retrofits and transitioning to a more energy efficient systems and alternative fuels, they start to generate revenue due to additional electricity

production capacity and projected higher cost of electricity compared to other fuels. A breakpoint is estimated to happen in 2047 where the revenue generated from solar systems will surpass the cost of fuels for the buildings. As the fuel cost, carbon cost and electricity cost increases and as the additional solar PV systems are installed, the revenue generation potential increases significantly for Gravenhurst.

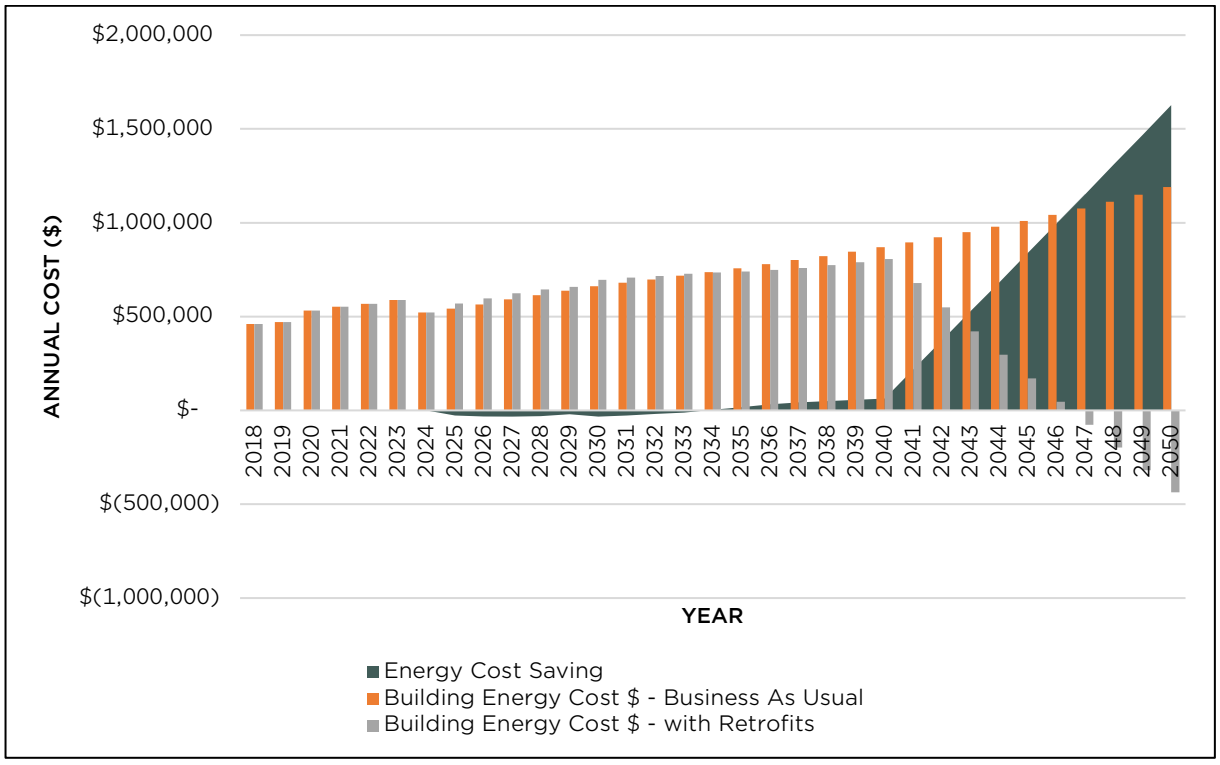

Figure 18. Town of Gravenhurst Building Retrofit Energy Cost Comparison

Figure 18 above shows projected financial impact of energy cost savings over time, spanning from 2018 to 2050. The dark green area represents the energy cost saving achieved each year, which start to increase gradually and become significant over time. The grey bar shows the building energy costs with retrofits, with the installation of air source heat pumps (ASHP) and solar systems. The graph effectively highlights the financial benefits of implementing retrofitting measures to achieve net-zero emissions by 2050.

5.3 FLEET EV TRANSITION COST

The estimated capital cost to electrify Gravenhurst fleet and transition to EV/ZEV vehicles is displayed in Table 23 below. The cost estimate is broken into two milestones, 2030 and 2050 to determine the required investment needed for Gravenhurst to reach the GHG reduction targets identified in this plan. Gravenhurst will conduct a detailed assessment to identify suitable

candidates for electrification based on usage patterns, mileage/vehicle age, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs. The vehicles will ideally be replaced with EV/ZEV alternatives once they are close to their end of life.

Table 23: Town of Gravenhurst Estimated Capital Cost of Fleet Electrification

VEHICLE TYPES	NO. OF VEHICLES			PER VEHICLE		
	2018 Baseline	Per Vehicle	2050 Retrofits	Per Vehicle	2030 Retrofits	2050 Retrofits
Heavy Duty Vehicle	17	6	11	$400,000	$2,380,000	$4,420,000
Medium Duty Vehicle	0	0	0	$130,000	$-	$-
Light Duty Vehicle	20	20	0	$105,000	$2,090,000	$-
Industrial/ Commercial Equipment	23	5	18	$146,000	$729,000	$2,624,000
Tractors and Combine	3	1	2	$140,000	$140,000	$280,000
Lawn and Garden Equipment	3	1	2	$146,000	$146,000	$292,000
Ships and Boats	1	0	1	$146,000	$-	$146,000
Passenger Car	4	4	0	$105,000	$418,000	$-
Total	**71**	**37**	**34**	**$-**	**$5,339,000**	**$7,324,000**

The cost estimate of level II EV charging stations needed to support the Gravenhurst EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is estimated that Gravenhurst will need to install 18 charging stations in their corporate buildings to support the fleet electrification plan. However, further investment in charging infrastructure may not be necessary, as it is expected that broad public charging infrastructure will be available. Table 24 displays the estimated cost for EV charging stations.

Table 24: Town of Gravenhurst Estimated Capital Cost for Charging Stations

NO. OF BUILDINGS	NO. OF EV FLEET		NO. OF LEVEL 2 CHARGING INFRASTRUCTURE		CAPITAL COST (2024 DOLLARS)	
	2030	2050	2030	2050	2030	2050
25	37	71	18	0	$67,000	$-

5.4 LED CONVERSION COST

Based on the review of the cost of LED conversion projects completed by municipalities such as the Town of Huntsville (in 2015) and the City of Barrie (in 2015), the material and labour costs to convert existing streetlights to LED ranges from approximately $700 to $1,200 per streetlight, depending on the wattage.

Based on Gravenhurst's Investment Grade Audit dated February 2015, all or most existing streetlights have been already converted to LED.

TATHAM ENGINEERING

Climate Change Mitigation Plan

Town of Huntsville

TOWN OF HUNTSVILLE
Muskoka

1 Huntsville Corporate Baseline Energy and GHG Inventory

This section provides a comprehensive overview of the Town of Huntsville (Huntsville) energy consumption and GHG emissions.

1.1 CORPORATE ASSETS

The corporate assets included in the RCCMP for the Huntsville for the 2018 baseline year are presented below.

1.1.1 Buildings

In 2018, there were 18 corporate buildings in operation, with the largest being the Canada Summit Centre (recreation centre) with a total building area of 17,187 m^2. Buildings use electricity, natural gas, and/or propane for internal lighting, heating, cooling, ventilation, domestic hot water and other building functions.

Rooftop solar PV systems rated at 10 kW are installed on six corporate buildings: Civic Centre, Public Library, Madill Yard, Huntsville Fire Hall, Port Sydney Fire Hall and Port Sydney Community Hall. These PV systems were installed in 2013-2014 and has been generating electricity since.

Table 25 presents an overview of the corporate buildings included in the energy and GHG emissions inventory. Further details regarding the building profiles are included in Appendix E.

Table 25: Town of Huntsville Building Profile

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m²)	YEAR BUILT
Administration	4	9,814	1995 – 2000
Community Centre	3	934	1971 – 1972
Cultural Centre	3	1,000	1978 – 1999
Fire Hall	2	1,777	1995
Public Library	2	1,245	1995
Public Works	3	694	2001
Recreation Centre	1	17,187	1986
Total	**18**	**32,651**	**1971 - 2001**

1.1.2 Fleet

In 2018, there were approximately 36 corporate fleet in operation, with the majority of fleet being heavy duty vehicles or construction equipment. All corporate fleet are fueled by diesel or gasoline. Table 26 presents an overview of the corporate fleet included in the baseline inventory. See Appendix E for vehicle details.

Table 26: Town of Huntsville Fleet Profile

FLEET TYPE		# OF FLEET
Vehicle	Light Duty	9
	Medium Duty	3
	Heavy Duty	13
Equipment		11
Total		**36**

1.1.3 Streetlights

In 2018, there were approximately 851 streetlights and decorative lights in Huntsville. In 2015, Huntsville converted the majority of their High-Pressure Sodium streetlights to LED streetlights.

Table 27 presents an overview of the corporate streetlights and decorative lights included in the baseline inventory.

Table 27: Town of Huntsville Streetlight Profile

BULB WATTAGE	# OF STREETLIGHTS / DECORATIVE LIGHTS	TYPE OF BULB
50	296	LED
70	3	LED
80	127	LED
100	4	LED
100	328	High Pressure Sodium
115	64	LED
130	3	High Pressure Sodium
175	13	High Pressure Sodium
250	13	High Pressure Sodium
Total	**851**	

1.2 BASELINE ENERGY CONSUMPTION

In 2018, the total energy consumption in Huntsville was 35,575 gigajoules (GJ). Huntsville used 26,303 GJ (74% of total energy consumption) of energy across their corporate buildings, 8,103 GJ (23%) across their corporate fleets and 1,169 GJ (3%) across their corporate streetlights. Figure 19 provides the total energy consumption of the buildings, fleet and streetlights by energy source. The energy consumption inventory for corporate buildings is provided in Appendix E.

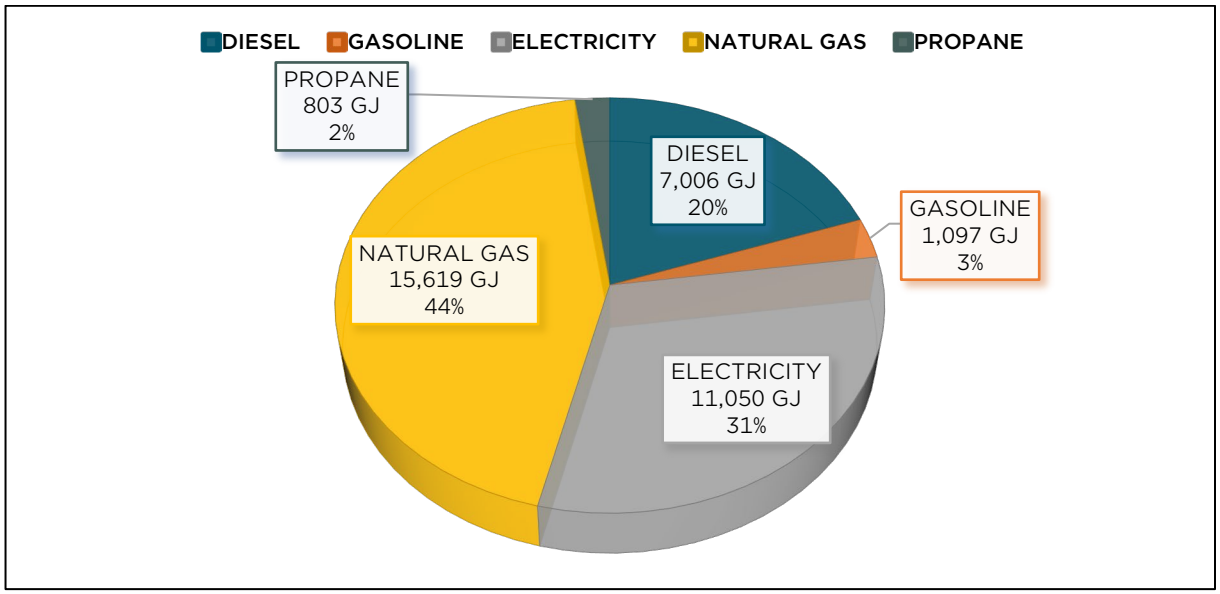

Figure 19: Town of Huntsville Total Energy Consumption in 2018

1.3 BASELINE GHG EMISSIONS

In 2018, Huntsville produced 919 tCO_2e of GHG emissions (62%) from their corporate buildings, 538 tCO_2e (37%) from their corporate fleet and 10 tCO_2e (1%) from their corporate streetlights. Figure 20 provides the baseline GHG emissions emitted in total by the buildings, fleet and streetlights.

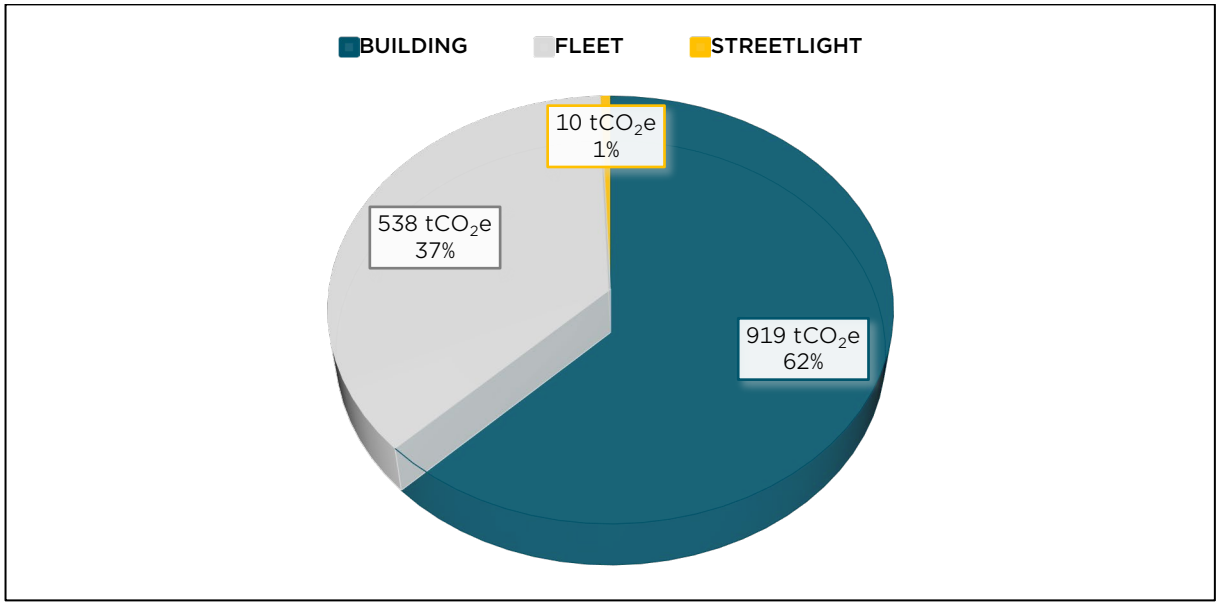

Figure 20: Town of Huntsville Total GHG Emissions in 2018

Figure 21 presents the GHG emissions produced from the corporate buildings categorized by operation type. The recreation centres and administration buildings are the two major operations producing the highest GHG emissions (79% of total). These facilities also account for 83% of the floor area of the corporate assets and has more energy consuming operations like pools and arenas.

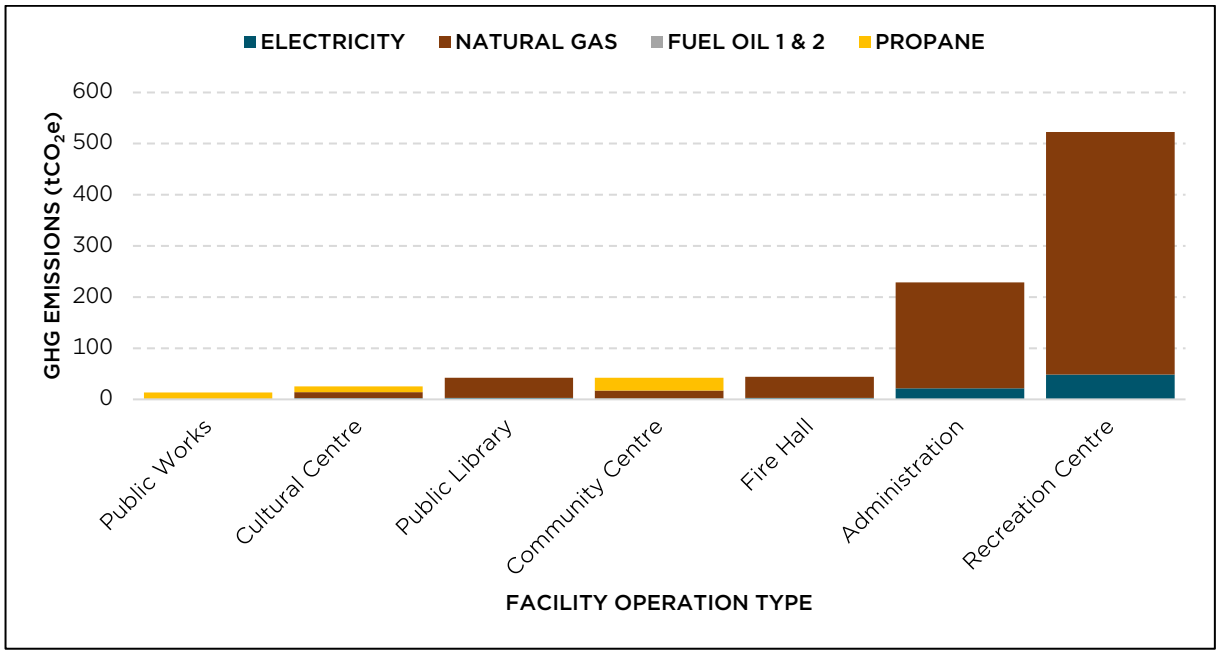

Figure 21: Town of Huntsville Building GHG Emissions in 2018 by Operation Type

The GHG emission intensity (Figure 22) shows the facilities GHG emissions per m^2 of the floor area. Facilities will lower GHG emission intensity are either using fuels with lower GHG emissions or are more energy efficient. Aspdin Community Centre has the highest GHG emission intensity.

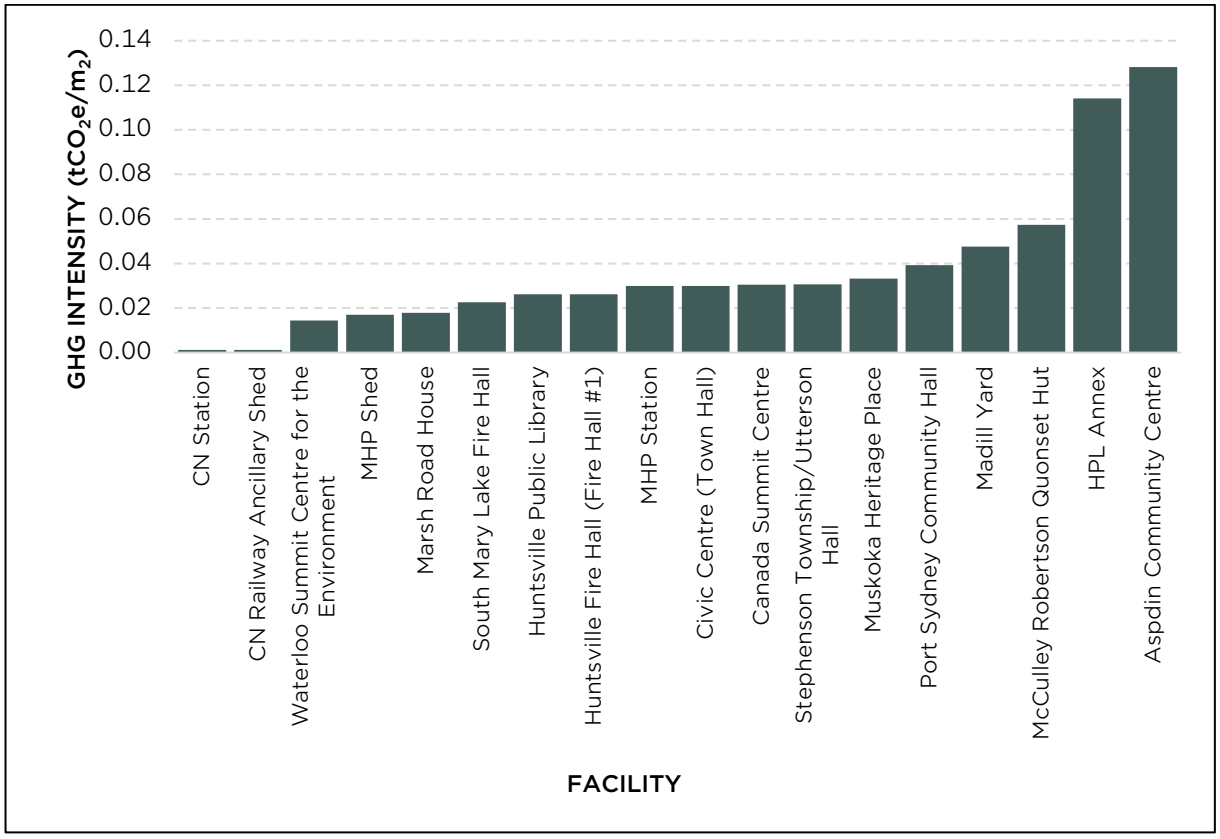

Figure 22. Town of Huntsville GHG Intensity by Facility

Figure 23 presents the GHG emissions produced from the corporate fleet categorized by type (light-, medium- or heavy-duty and/or equipment). Heavy duty vehicles generated about half of the GHG emissions while equipment, light-duty, and medium-duty vehicles generated the other half.

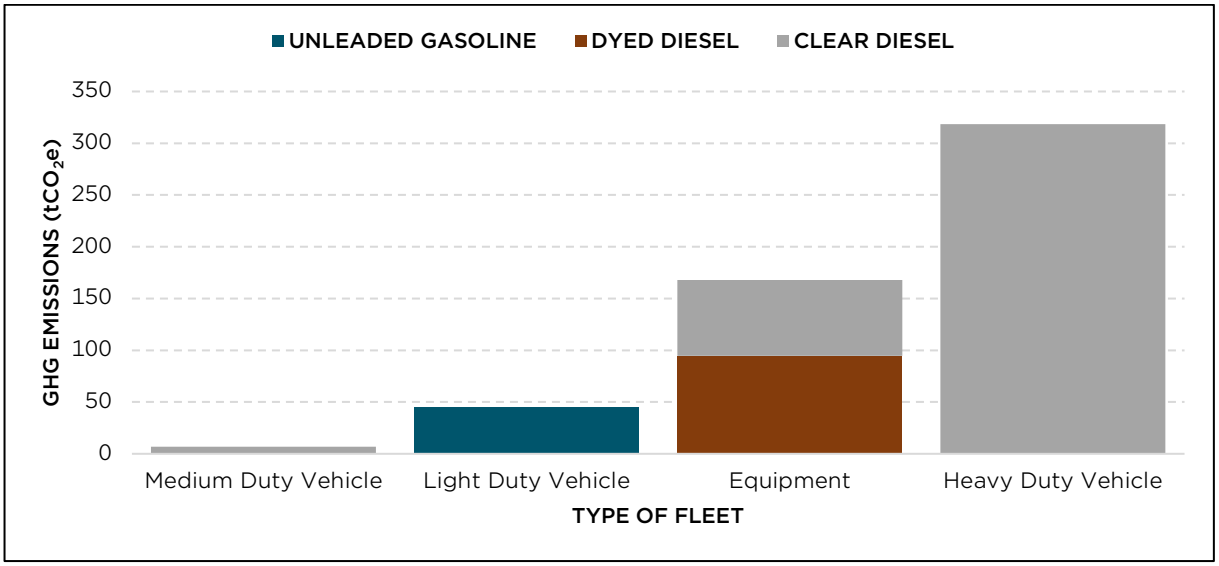

Figure 23: Town of Huntsville Fleet GHG Emissions in 2018 by Fleet Type

Full GHG emissions inventory for corporate assets is provided in Appendix E.

2 Huntsville GHG Emission Forecasting for BAU by 2050

The GHG emissions for Huntsville was projected to the year 2050 based on the GHG emissions from the 2018 baseline year, permanent population and housing projection information from the District of Muskoka Growth Strategy 2024, and projected climatic data changes from ECCC.

Based on the Growth Strategy report, the population in Huntsville is projected to grow from 21,040 in 2018 to 24,850 by 2030, and to 30,315 by 2050, and the permanent housing is projected to increase from 8,391 in 2018 to 10,439 by 2030, and to 13,627 by 2050.

Table 28 summarizes the projected population and housing units based on provided information from the Growth Strategy report to determine the forecasted GHG emissions.

Table 28: Town of Huntsville Projected Population and Housing Units

COMPONENT	2018	2030		2050	
	Baseline Year Value	Projected Value	Change from Baseline	Projected Value	Change from Baseline
Projected Population	21,040	24,850	+17%	30,315	+37%
Projected Housing Units	8,391	10,439	+22%	13,627	+49%

Table 29 summarizes the assumptions made and modelling completed to determine the forecasted GHG emissions.

Table 29: Town of Huntsville BAU Forecasting

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
Building	Change due to population growth	1,123	22%	1,410	54%
	Change due to global warming	875	-5%	801	-13%
	Total	1,080	18%	1,293	41%
Fleet	Change due to population growth and new roads	562	4%	596	11%
Streetlight	Change due to population growth, new subdivisions, new roads	10	8%	11	20%

Figure 24 provides the BAU forecasting to the year 2050 along with the estimated fuel costs including cost of carbon.

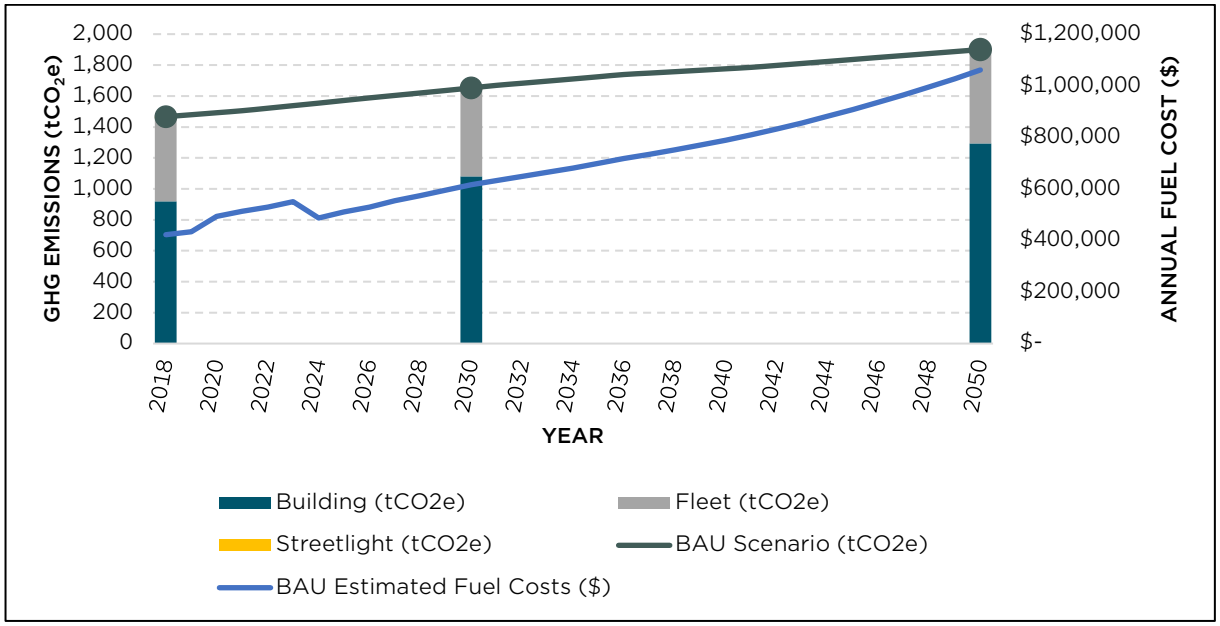

Figure 24: Town of Huntsville GHG Emissions BAU Forecasting to 2050

Two milestones (2030 and 2050) were shown in the above forecasting figure to reiterate the importance of taking immediate actions to prevent the GHG emission increase and deviation from the set reduction targets. The above figure indicates that under the BAU scenario by year 2030 Huntsville's annual GHG emissions will increase 13% above the baseline year 2018. This increase will be 30% or 434 tCO_2e by year 2050.

The increase in the energy costs will be more significant than the GHG emission increase due to rapidly increasing cost of carbon. Under the BAU scenario by year 2030 Huntsville's annual energy costs (including the carbon costs) will increase 46% above the baseline year 2018. By year 2050, Huntsville's energy costs will be more than 2.5 times of the energy costs of the 2018 baseline year. Huntsville understands the importance of taking rapid actions. This is shown in their short-term (2030) reduction target and the retrofit plans to meet those targets.

3 Huntsville GHG Emission Reduction Target

3.1 SHORT TERM (2030 PLAN)

All AMs aim to achieve 30-45% reductions in corporate GHG emissions from 2018 levels by 2030 to meet the federal and provincial ambitious targets. The short-term target for Huntsville was determined based on the engineering review of the buildings, fleet and streetlight profile and their available potential to decarbonize the assets in a feasible way. Based on this assessment, the short-term target for Huntsville was determined to be 45% reduction below 2018 levels.

3.2 LONG TERM (2050 PLAN)

Huntsville aims to reduce corporate GHG emissions to net-zero by 2050 to be in line with the international agreements and federal and provincial plans.

4 Huntsville Climate Change Mitigation Plan

The details of the climate change mitigation plan for Huntsville corporate assets are listed below. Buildings that are decommissioned since 2018 are excluded from the following assessment.

4.1 BUILDINGS

4.1.1 Short Term 2030 Plan

To achieve the short-term 2030 corporate GHG reduction target, Huntsville plans to implement the following building retrofits before 2030:

1. Replace the Rooftop RTU units with an air source heat pump (ASHP) with backup heating coils at the following buildings:
    - Canada Summit Centre
    - HPL Annex
    - Civic Centre (Town Hall)
2. Replace the furnace with a split ASHP with backup heating coils at the following buildings:
    - McCulley Robertson Quonset Hut
    - Aspdin Community Centre
3. Install rooftop solar PV on the above-mentioned buildings.
4. Replace all the internal lighting to the LED lights for the above-mentioned buildings.

The rooftop solar PV for corporate buildings is scheduled to be implemented at the same year that the building mechanical systems are retrofitted.

4.1.2 Long Term 2050 Plan

To achieve the long-term 2050 corporate GHG reduction target, Huntsville plans to implement the following building retrofits:

5. Replace the Rooftop RTU units with an ASHP with backup heating coils at the following building:
    - Huntsville Fire Hall (Fire Hall #1)
6. Replace the furnace with a split ASHP with backup heating coils at the following buildings:

- MHP Station
- Muskoka Heritage Place
- Stephenson Township/Utterson Hall
- South Mary Lake Fire Hall
- Port Sydney Community Hall
- Huntsville Public Library

7. Replace the gas radiant tube heaters with a split ASHP with backup heating coils at the following building:
    - Madill Yard
8. Install rooftop solar PV on the above-mentioned buildings.
9. Replace all the internal lighting to the LED lights for the above-mentioned buildings.
10. GHG Offset: Install additional solar PVs to offset the remaining GHG emissions and achieve net-zero by 2050. The total solar PV capacity needed to offset the GHG emissions for Huntsville corporate assets is estimated to be 8621 kWp. For this estimation we assumed that any major building additions or new buildings will be net-zero GHG going forward. Therefore, the projected growth will not add to the corporate GHG profile. For Huntsville the additional solar PV installations or purchase agreements will be phased starting 2038 and will be installed in eleven (11) phases. The phasing plan is shown in Table 30. The additional solar PVs can be installed on corporate assets (ground-mount solar PVs) where possible or investments will be made for the installations in other community areas or alternatively clean electricity purchase agreements will be signed. Huntsville will review the feasibility of these alternatives before 2038. For the purpose of this assessment and costing we assumed that additional ground-mount solar PVs will be installed in corporate assets.

Information regarding building mechanical systems is not available for the following buildings:

- MHP Shed

This building generates low GHG emissions, and building retrofits for this building will not significantly affect the corporate GHG emission reductions. As a result, it is excluded from the retrofit plan.

In addition, the following buildings are not in service as of 2023 and are excluded from the retrofit plan:

- CN Railway Ancillary Shed

- CN Station
- Marsh Road House
- Waterloo Summit Centre for the Environment

The proposed implementation planning for building retrofits is listed in the following table.

Table 30: Town of Huntsville Building Retrofit and Solar PV System Phasing

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted	Solar PV Array Rated Size (kW_P)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2025	Aspdin Community Centre	17	
2026	HPL Annex	12	
2027	McCulley Robertson Quonset Hut	8	
2028	Civic Centre (Town Hall)	62	
2029	Canada Summit Centre	1,170	
2030	No Scheduled Activity		
2031	No Scheduled Activity		
2032	South Mary Lake Fire Hall	83	
2033	Muskoka Heritage Place	0	
2034	Port Sydney Community Hall	44	
2035	Madill Yard	65	
2036	Stephenson Township/Utterson Hall	47	
2037	Huntsville Fire Hall (Fire Hall #1)	78	
2038	Additional Solar 1		✓ 800

YEAR	IMPLEMENTATION PLAN			
	Proposed Buildings to be Retrofitted	Solar PV Array Rated Size (kW_p)		
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions	
2039	Additional Solar 2		✓	800
2040	Huntsville Public Library	134		
2041	Additional Solar 3		✓	800
2042	Additional Solar 4		✓	800
2043	Additional Solar 5		✓	800
2044	Additional Solar 6		✓	800
2045	MHP Station	23		
2046	Additional Solar 7		✓	800
2047	Additional Solar 8		✓	800
2048	Additional Solar 9		✓	800
2049	Additional Solar 10		✓	800
2050	Additional Solar 11		✓	621

A feasibility assessment of installing RTU ASHP or split ASHP was completed for all corporate buildings. By implementing the building retrofits and solar PV rooftop retrofits Huntsville's building emissions will be reduced to 382 tCO_2e (58% reduction from 2018 baseline) by 2030 and will be reduced to 259 tCO_2e (72% reduction from 2018 baseline) by 2050. Implementing the additional solar PV offset projects will reduce the corporate GHG emissions to net-zero by 2050. The following figure shows the reductions.

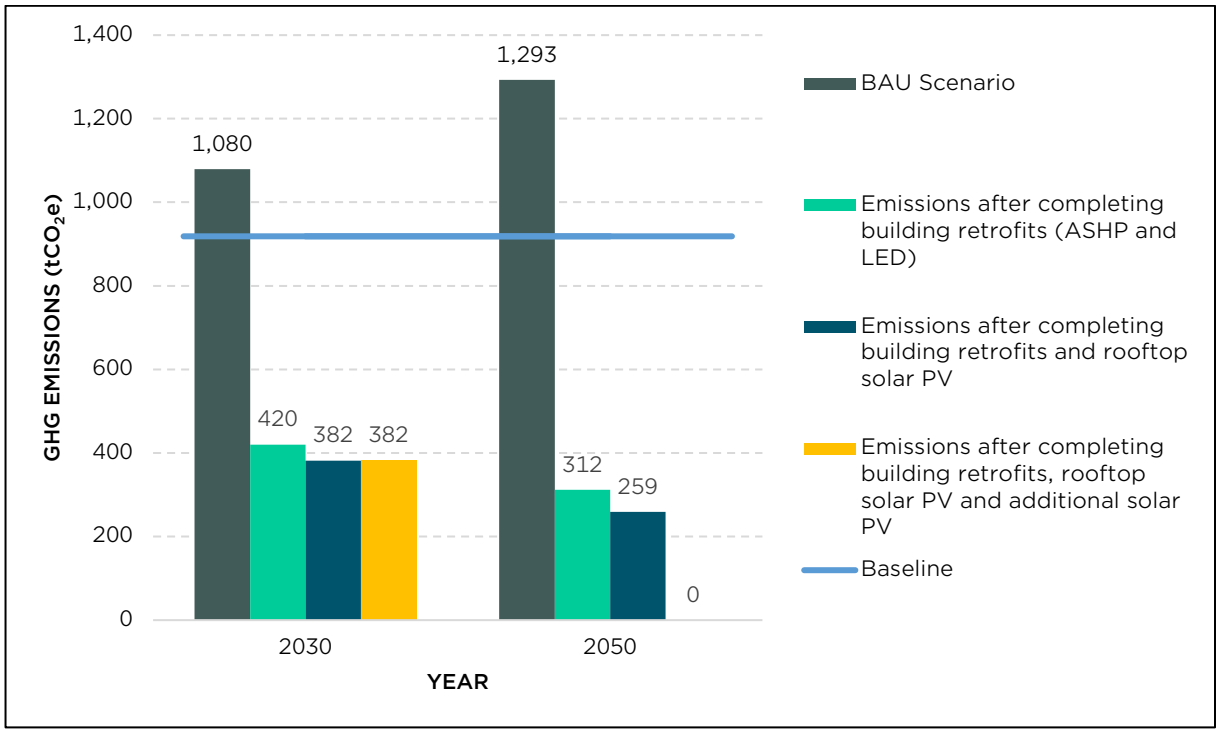

Figure 25. Town of Huntsville Building GHG Emissions Reduction Comparison

4.2 FLEET

4.2.1 Short Term 2030 Plan

To achieve the short term 2030 corporate GHG reduction target Huntsville plans to implement the following changes to the fleet:

1. Replace all light and medium duty vehicle with EVs (12 vehicles)
2. Replace 35% of heavy-duty vehicles with EV or ZEV (5 vehicles)
3. Replace 23% of industrial/commercial equipment with EV or ZEV (3 vehicles)
4. Install 10 EV charging stations in municipal buildings to accommodate the increased EV vehicles

4.2.2 Long Term 2050 Plan

To achieve the long term 2050 corporate GHG reduction target Huntsville plans to implement the following changes to the fleet:

5. Replace 100% of heavy-duty vehicles with EV or ZEV (8 vehicles)
6. Replace all heavy equipment with EV or ZEV alternatives (8 vehicles)

Huntsville won't need additional EV or ZEV charging infrastructure beyond 2030 as it is anticipated that sufficient publicly available EV/ZEV charging stations will be developed by 2050. Table 31 below shows the transition plan of EV and ZEV, with Figure 26 shows the trend and compared against BAU case.

Table 31: Town of Huntsville Fleet EV/ZEV Phasing and GHG Emissions

YEAR	% ELECTRIC FLEET RETROFITS			GHG EMISSIONS (tCO_2e)			
	Light and Medium EV	Heavy Duty EV	Equipment	Light and Medium EV	Heavy Duty EV	Equipment	Total GHG Emission
2030	100%	35%	23%	0	207	129	336
2050	100%	100%	100%	0	0	0	0

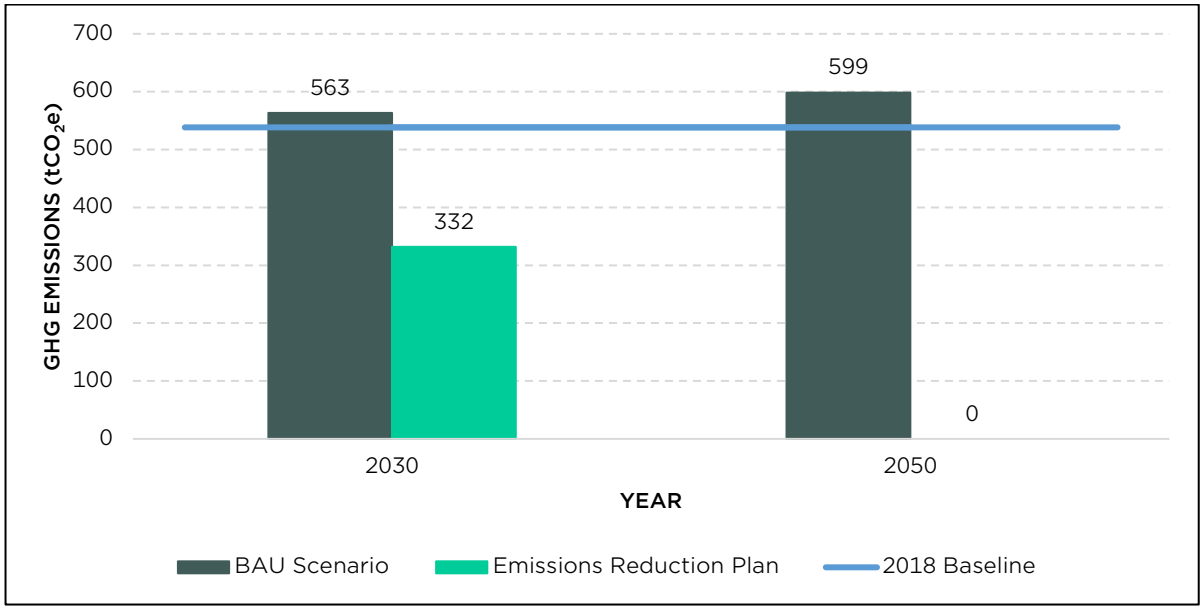

Figure 26. Town of Huntsville Fleet EV/ZEV GHG Emissions

By implementing the above-mentioned measures Huntsville's fleet emissions will be reduced to 332 tCO_2e (38% reduction from 2018 baseline) by 2030 and will reach net-zero by 2050. Huntsville will prepare a detailed fleet electrification strategy to identify suitable candidates for EV/ZEV transition based on usage patterns, age and mileage, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs/ZEVs, prioritizing high-emission and urban vehicles first.

4.3 STREETLIGHTS

Huntsville will convert all non-LED streetlights to LED streetlights when they reach their end of life. An LED conversion plan will be developed based on the life expectancy of the equipment and the available funding opportunities.

4.4 FUTURE ADDITIONS AND NEW BUILDINGS

To achieve the short term and long term targets any future developments and future equipment/fleet purchases should be net-zero, where possible. Huntsville will develop a net-zero new building policy and net-zero new fleet policy. Additionally, any future streetlight purchases/installations should be LED, where possible. Huntsville will develop a progressive LED conversion for existing streetlights to support the plan.

5 Huntsville Cost of Implementation

The details of the cost of implementation for Huntsville are listed below. The assessment includes installation costs for buildings, fleet, and streetlights, as well as energy and carbon costs for buildings. It also considers potential operating cost savings compared to business as usual (BAU).

5.1 BUILDING CAPITAL COST

The preliminary capital cost estimation includes the equipment costs as well as the installation costs for installing RTU ASHP, split ASHP, installing solar PV on the rooftops of existing buildings, and installing additional solar systems needed to achieve net-zero emissions by 2050. Building retrofits involve the installation of ASHPs and LED lighting retrofits, while solar retrofits encompass both rooftop solar installations and additional solar systems. Table 32 below listed the estimated capital cost for the planned retrofit activities needed to achieve net zero by 2050.

Table 32: Town of Huntsville Building Retrofits Capital Cost Estimation

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2025	Aspdin Community Centre	$10,000	$65,000	$75,000
2026	HPL Annex	$20,000	$46,000	$66,000
2027	McCulley Robertson Quonset Hut	$21,000	$31,000	$52,000
2028	Civic Centre (Town Hall)	$345,000	$208,000	$553,000
2029	Canada Summit Centre	$3,084,000	$4,462,000	$7,546,000
2032	South Mary Lake Fire Hall	$62,000	$288,000	$350,000
2033	Muskoka Heritage Place	$33,000	$-	$33,000
2034	Port Sydney Community Hall	$36,000	$139,000	$175,000
2035	Madill Yard	$75,000	$219,000	$294,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2036	Stephenson Township/Utterson Hall	$39,000	$180,000	$219,000
2037	Huntsville Fire Hall (Fire Hall #1)	$195,000	$269,000	$464,000
2038	Additional Solar 1	$-	$2,981,000	$2,981,000
2039	Additional Solar 2	$-	$2,981,000	$2,981,000
2040	Huntsville Public Library	$102,000	$482,000	$584,000
2041	Additional Solar 3	$-	$2,981,000	$2,981,000
2042	Additional Solar 4	$-	$2,981,000	$2,981,000
2043	Additional Solar 5	$-	$2,981,000	$2,981,000
2044	Additional Solar 6	$-	$2,981,000	$2,981,000
2045	MHP Station	$20,000	$88,000	$108,000
2046	Additional Solar 7	$-	$2,981,000	$2,981,000
2047	Additional Solar 8	$-	$2,981,000	$2,981,000
2048	Additional Solar 9	$-	$2,981,000	$2,981,000
2049	Additional Solar 10	$-	$2,981,000	$2,981,000
2050	Additional Solar 11	$-	$2,313,000	$2,313,000
	Total	**$4,042,000**	**$38,600,000**	**$42,642,000**

5.2 OPERATING AND CARBON COSTS

The operating and carbon costs were calculated according to the implementation planning shown in Table 32. The energy use was calculated for buildings that are completing the retrofits. The projected population growth and its impact on the fuel consumption is also included in this

analysis. The detailed projected operating cost estimates are included in Table 33 below and is compared to the BAU scenario.

Table 33: Town of Huntsville Detailed Building Energy Cost Comparison

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2018	$380,000	$380,000	$-
2019	$390,000	$390,000	$-
2020	$444,000	$444,000	$-
2021	$463,000	$463,000	$-
2022	$478,000	$478,000	$-
2023	$497,000	$497,000	$-
2024	$443,000	$443,000	$-
2025	$463,000	$464,000	$(1,000)
2026	$484,000	$485,000	$(1,000)
2027	$508,000	$511,000	$(3,000)
2028	$529,000	$545,000	$(16,000)
2029	$550,000	$509,000	$41,000
2030	$572,000	$525,000	$47,000
2031	$588,000	$537,000	$51,000
2032	$604,000	$540,000	$64,000
2033	$619,000	$555,000	$64,000
2034	$636,000	$563,000	$73,000
2035	$654,000	$571,000	$83,000

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2036	$672,000	$580,000	$92,000
2037	$688,000	$583,000	$105,000
2038	$706,000	$492,000	$214,000
2039	$724,000	$401,000	$323,000
2040	$743,000	$398,000	$345,000
2041	$763,000	$308,000	$455,000
2042	$785,000	$220,000	$565,000
2043	$809,000	$133,000	$676,000
2044	$834,000	$47,000	$787,000
2045	$860,000	$62,000	$798,000
2046	$888,000	$(23,000)	$911,000
2047	$917,000	$(107,000)	$1,024,000
2048	$947,000	$(190,000)	$1,137,000
2049	$979,000	$(272,000)	$1,251,000
2050	$1,012,000	$(330,000)	$1,342,000

Note 1: a positive number in a year means potential savings for the Town in that year compared to BAU and a negative number means a potential cost for the Town in that year.

As the buildings are implementing solar retrofits and transitioning to a more energy efficient systems and alternative fuels, they start to generate revenue due to additional electricity production capacity and projected higher cost of electricity compared to other fuels. A breakpoint is estimated to happen in 2046 where the revenue generated from solar systems will surpass the cost of fuels for the buildings. As the fuel cost, carbon cost and electricity cost

increases and as the additional solar PV systems are installed, the revenue generation potential increases significantly for Huntsville.

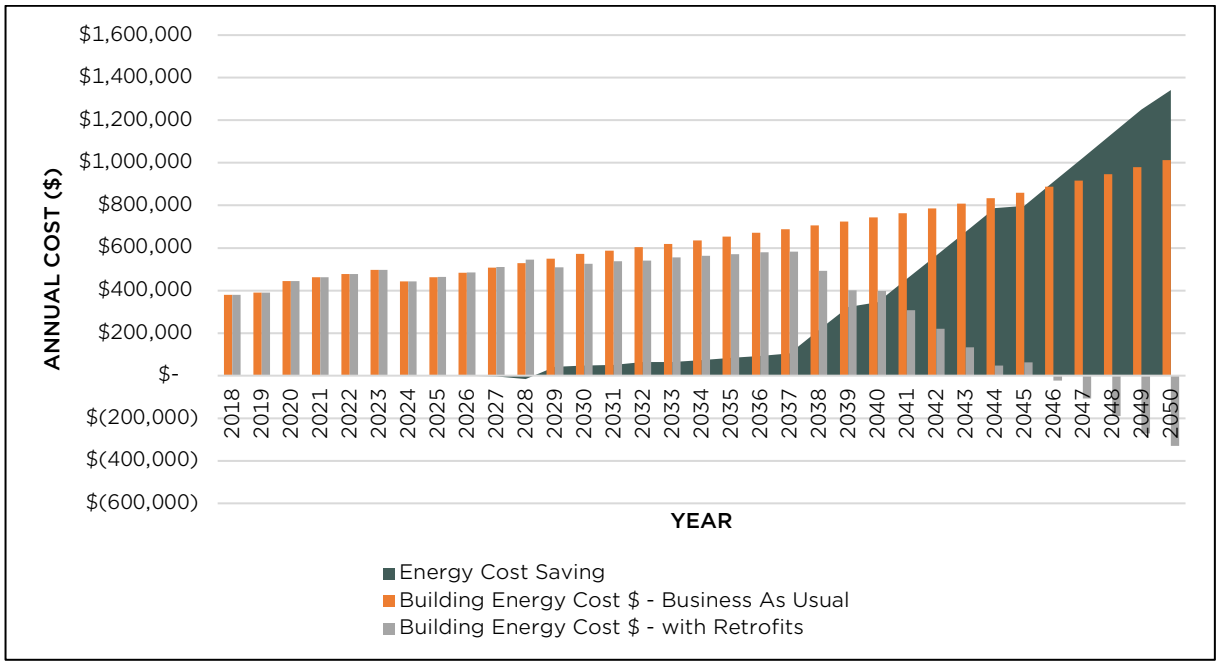

Figure 27. Town of Huntsville Retrofit Cost Saving

Figure 27 shows projected financial impact of energy cost savings over time, spanning from 2018 to 2050. The blue bars represent the energy cost saving achieved each year, which start to increase gradually and become significant over time. The grey line shows the building energy costs with retrofits, with the installation of air source heat pumps (ASHP) and solar systems. The graph effectively highlights the financial benefits of implementing retrofitting measures to achieve net-zero emissions by 2050.

5.3 FLEET TRANSITION COST

The estimated capital cost to electrify Huntsville fleet and transition to EV/ZEV vehicles is displayed in Table 34 below. The cost estimate is broken into two milestones, 2030 and 2050 to determine the required investment needed for Huntsville to reach the GHG reduction targets identified in this plan. Huntsville will conduct a detailed assessment to identify suitable candidates for electrification based on usage patterns, mileage/vehicle age, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs. The vehicles will ideally be replaced with EV/ZEV alternatives once they are close to their end of life.

Table 34: Town of Huntsville Estimated Capital Cost of Fleet Electrification

VEHICLE TYPES	NO. OF VEHICLES			ESTIMATED CAPITAL COST OF FLEET ELECTRIFICATION (2024 DOLLARS)		
	2018 Baseline	2030 Retrofits	2050 Retrofits	Per Vehicle	2030 Retrofits	2050 Retrofits
Heavy Duty Vehicle	13	5	8	$400,000	$2,000,000	$3,200,000
Medium Duty Vehicle	3	3	0	$130,000	$390,000	$-
Light Duty Vehicle	9	9	0	$105,000	$941,000	$-
Industrial/ Commercial Equipment	10	3	7	$146,000	$438,000	$1,021,000
Tractors and Combine	1	0	1	$140,000	$-	$140,000
Total	**36**	**20**	**16**	**$-**	**$3,767,000**	**$4,361,000**

The cost of level II EV charging stations needed to support the Huntsville EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is estimated that Huntsville will need to install 10 charging stations in their corporate buildings to support the fleet electrification plan. However, further investment in charging infrastructure may not be necessary, as it is expected that broad public charging infrastructure will be available. Table 35 displays the estimated cost for EV charging stations.

Table 35: Town of Huntsville Estimated Capital Cost for EV Charging Stations

NO. OF BUILDINGS	NO. OF EV FLEET		NO. OF LEVEL 2 CHARGING INFRASTRUCTURE		CAPITAL COST (2024 DOLLARS)	
	2030	2050	2030	2050	2030	2050
13	19	17	10	0	$35,000	$-

5.4 LED CONVERSION COST

Based on the review of the cost of LED conversion projects completed by municipalities such as the Town of Huntsville (in 2015) and the City of Barrie (in 2015), the material and labour costs to

convert existing streetlights to LED ranges from approximately $700 to $1,200 per streetlight, depending on the wattage.

As presented in Table 36, the estimated capital cost to replace all remaining non-LED streetlights or decorative lights (approximately 357) to LED ranges from $249,900 (assuming lower wattage bulbs) to $428,400 (assuming high wattage bulbs).

Table 36: Town of Huntsville Estimated Capital Cost of LED Streetlights

NO. OF STREETLIGHTS / DECORATIVE LIGHTS	CAPITAL COST (2024 DOLLARS)	
	Low Estimate	High Estimate
357	$249,900	$428,400

TATHAM ENGINEERING

Climate Change Mitigation Plan
Township of Georgian Bay

TOWNSHIP OF GEORGIAN BAY

1 Georgian Bay Corporate Baseline Energy and GHG Inventory

This section provides a comprehensive overview of the Township of Georgian Bay (Georgian Bay) energy consumption and GHG emissions.

1.1 CORPORATE ASSETS

The corporate assets included in the RCCMP for Georgian Bay for the 2018 baseline year are presented below.

1.1.1 Buildings

In 2018, there were 12 corporate buildings in operation, with the largest being the MacTier Arena (Arena) with a total building area of 2,294m^2. Buildings use electricity and propane for internal lighting, heating, cooling, ventilation, domestic hot water and other building functions.

Georgian Bay currently has no rooftop solar PV systems installed on their corporate buildings.

Table 37 presents an overview of the corporate buildings included in the energy and GHG emissions inventory. Further details regarding the building profiles are included in Appendix F.

Table 37: Township of Georgian Bay Building Profile

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m^2)
Administration	2	986
Arena	1	2294
Community Centre	1	817
Cultural Facilities	1	153
Fire Hall	3	1104
Public Library	2	403
Recreation Facility	1	106
Storage Facility	1	371
Total	**12**	**6,234**

1.1.2 Fleet

In 2018, there were approximately 30 corporate fleet in operation, with the majority of fleet being heavy duty vehicles or equipment. All corporate fleet are fueled by diesel or gasoline. Table 38 presents an overview of the corporate fleet included in the baseline inventory. See Appendix F for vehicle details.

Table 38: Township of Georgian Bay Fleet Profile

DEPARTMENT	FLEET TYPE		# OF FLEET
Admin	Vehicle	Passenger Car	2
Other	Vehicle	Light Duty	7
		Heavy Duty	8
	Equipment	Industrial/Commercial	5
		Lawn and Garden	2
		Tractor and Combines	6
Total			**30**

1.1.3 Streetlights

In 2018, Georgian Bay streetlight assets consumed 17,071 kWh of energy. Table 39 presents an overview of the corporate streetlights included in the baseline inventory.

Table 39: Township of Georgian Bay Streetlight Profile

STREETLIGHT ENERGY CONSUMPTION (kWh)	TYPE OF BULB
17,071	Unknown

1.2 BASELINE ENERGY CONSUMPTION

In 2018, the total energy consumption in Georgian Bay was 9,630 gigajoules (GJ). Georgian Bay used 5,995 GJ of energy (62% of total energy consumption) across their corporate buildings, 3,573 GJ (37%) across their corporate fleets and 61 GJ (1%) across their corporate streetlights. Figure 28 provides the total energy consumption of the buildings, fleet and streetlights by energy source. The energy consumption inventory for corporate buildings is provided in Appendix F.

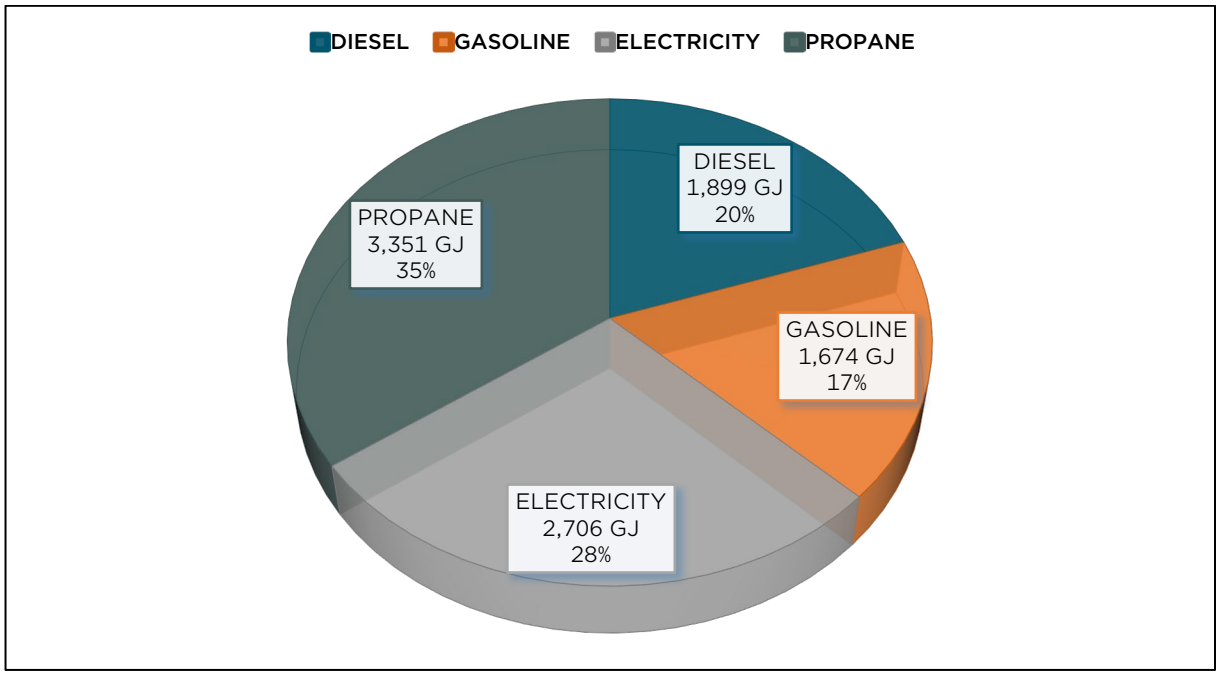

Figure 28. Township of Georgian Bay Total Energy Consumption in 2018

1.3 BASELINE GHG EMISSIONS

In 2018, Georgian Bay produced 226 tCO_2e (44%) of GHG emissions from their corporate buildings, 293 tCO_2e (56%) from their corporate fleet and 1 tCO_2e (less than 1%) from their corporate streetlights. Figure 29 provides the baseline GHG emissions emitted in total by the buildings, fleet and streetlights.

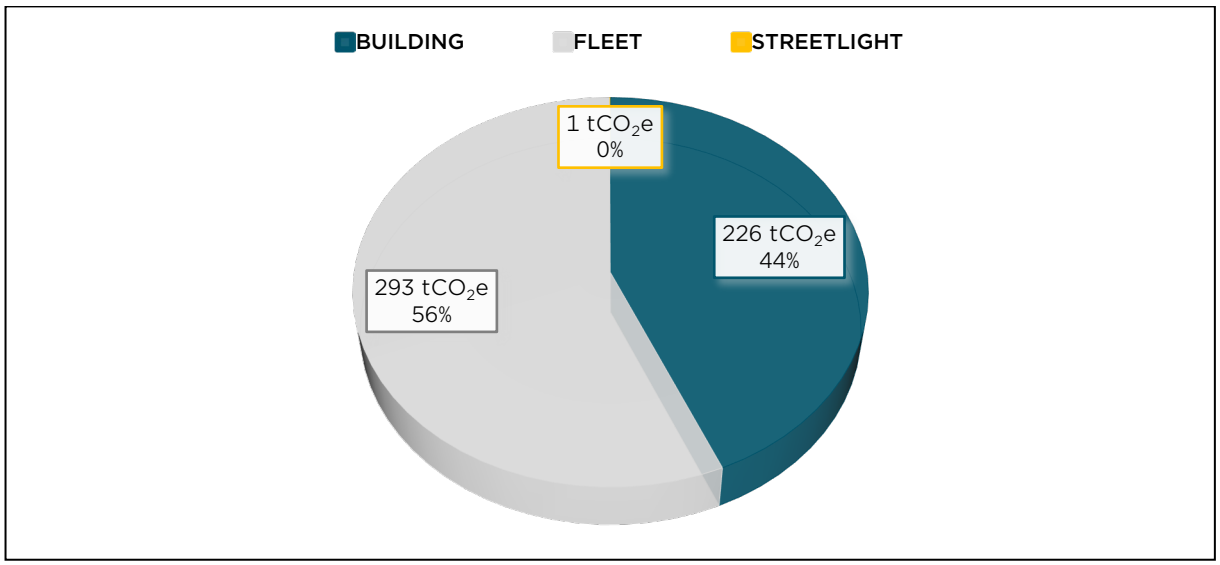

Figure 29. Township of Georgian Bay Total GHG Emissions in 2018

Figure 30 presents the GHG emissions produced from the corporate buildings categorized by operation type. The fire hall and community centres are the two major operations producing the highest GHG emissions (41% of total). These facilities also account for 55% of the floor area of the corporate assets.

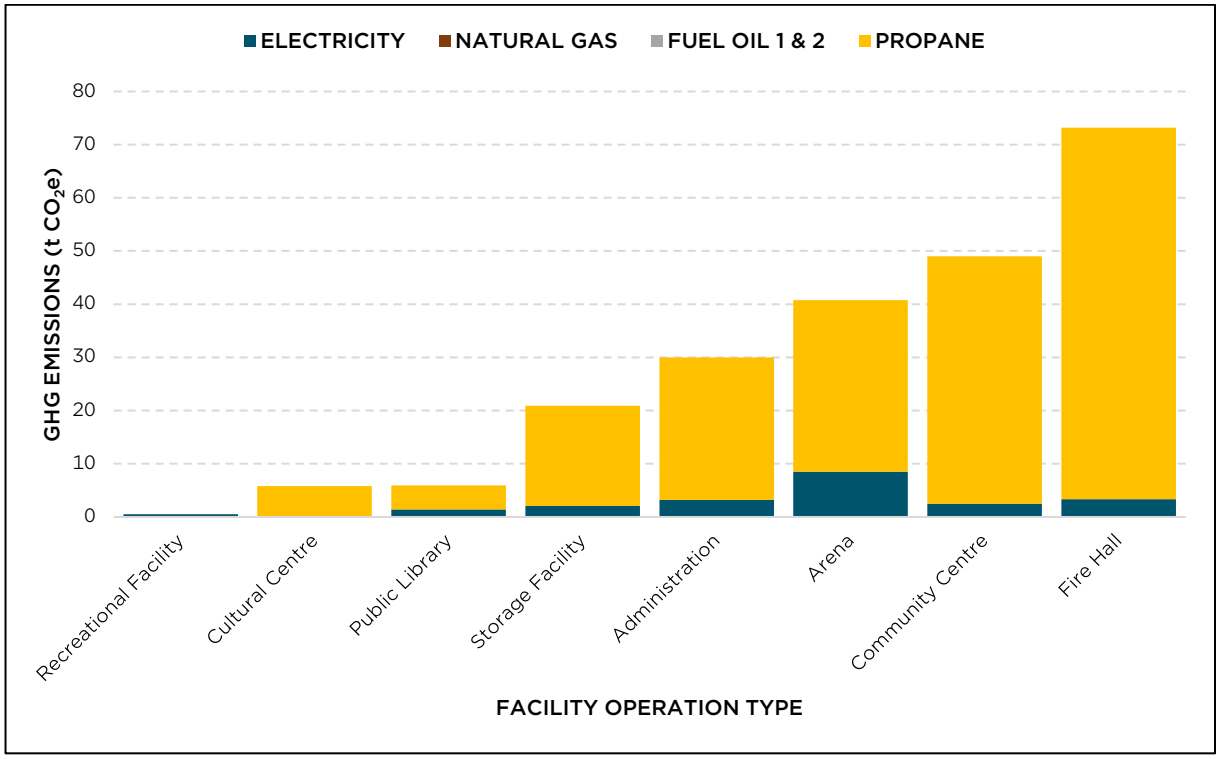

Figure 30. Township of Georgian Bay Building GHG Emissions in 2018 by Operations

The GHG emission intensity (Figure 31) shows the facilities GHG emissions per m^2 of the floor area. Facilities will lower GHG emission intensity are either using fuels with lower GHG emissions or are more energy efficient. Honey Harbour Fire Hall has the highest GHG emission intensity.

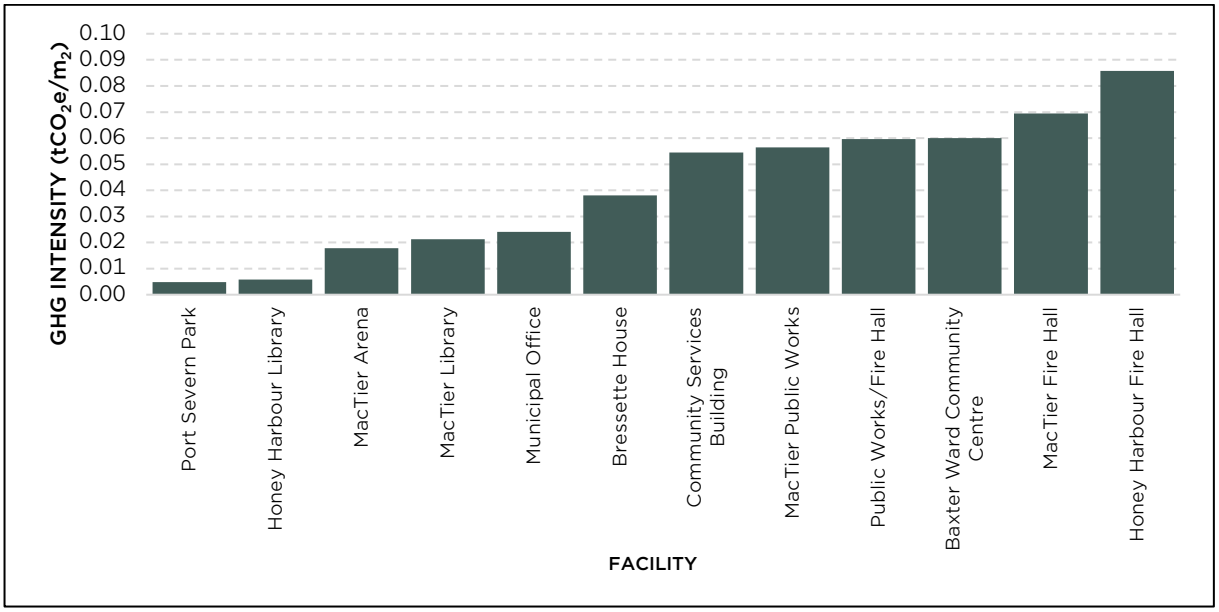

Figure 31. Township of Georgian Bay GHG Intensity by Facility

Figure 32 presents the GHG emissions produced from the corporate fleet categorized by fuel type. Diesel vehicles generated more than half of the GHG emissions while gasoline vehicles generated the remaining half.

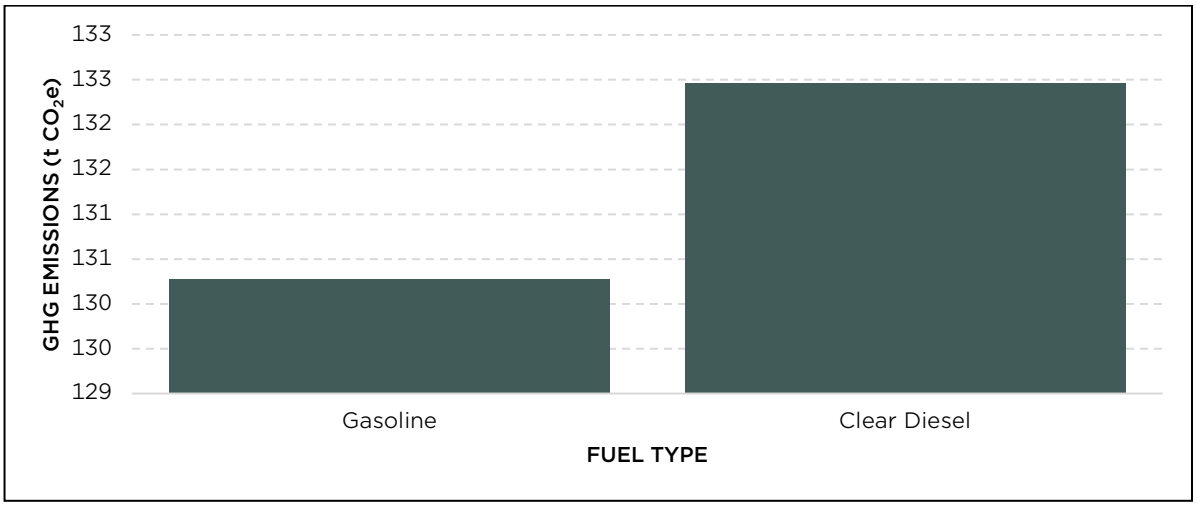

Figure 32. Township of Georgian Bay Fleet GHG Emissions in 2018 by Fuel Type

Full GHG emissions inventory for corporate assets is provided in Appendix F.

2 Georgian Bay GHG Emission Forecasting for BAU by 2050

The GHG emissions for the Georgian Bay was projected to the year 2050 based on the GHG emissions from the 2018 baseline year, permanent population and housing projection information from the District of Muskoka Growth Strategy-2024, and projected climatic data changes from ECCC.

Based on the Growth Strategy report, the population in Georgian Bay is projected to grow from 2,948 in 2018 to 4,417 by 2030, and to 5,918 by 2050, and the permanent housing is projected to increase from 1,325 in 2018 to 2,051 by 2030, and to 2,837 by 2050.

Table 40 summarizes the projected population and housing units based on provided information from the Growth Strategy report to determine the forecasted GHG emissions.

Table 40: Township of Georgian Bay Projected Population and Housing Units

COMPONENT	2018	2030		2050	
	Baseline Year Value	Projected Value	Change from Baseline	Projected Value	Change from Baseline
Projected Population	2,948	4,417	40%	5,918	70%
Projected Housing Units	1,325	2,051	47%	2,837	78%

Table 41 summarizes the assumptions made and modelling completed to determine the forecasted GHG emissions.

Table 41: Township of Georgian Bay BAU Forecasting

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
Building	Change due to population growth	357	58%	493	118%
	Change due to global warming	215	-5%	197	-13%
	Total	345	53%	464	105%
Fleet	Change due to population growth and new roads	297	13%	332	26%
Streetlight	Change due to population growth, new subdivisions, new roads	0.8	51%	0.9	88%

Figure 33 provides the BAU forecasting to the year 2050 along with the estimated fuel costs including cost of carbon.

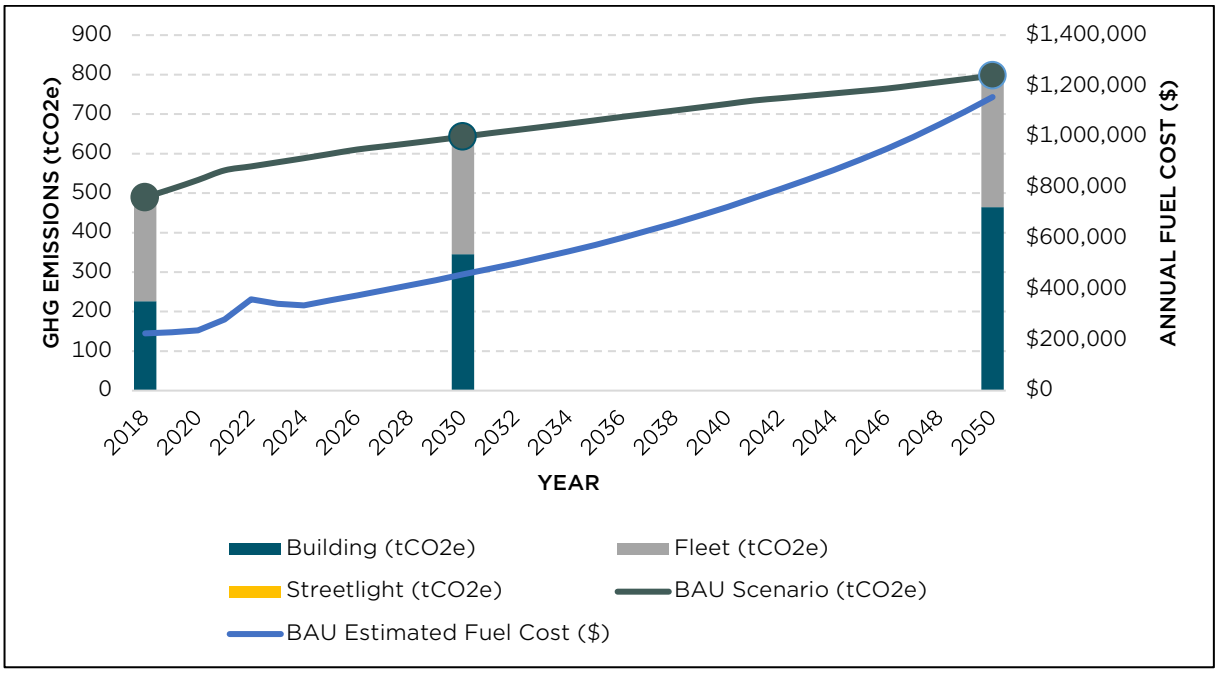

Figure 33. Township of Georgian Bay GHG Emissions BAU Forecasting to 2050

Two milestones (2030 and 2050) were shown in the above forecasting figure to reiterate the importance of taking immediate actions to prevent the GHG emission increase and deviation from the set reduction targets. The above figure indicates that under the BAU scenario by year 2030 Georgian Bay's annual GHG emissions will increase 31% above the baseline year 2018. This increase will be 61% or 308 tCO_2e by year 2050.

The increase in the energy costs will be more significant than the GHG emission increase due to rapidly increasing cost of carbon. Under the BAU scenario by year 2030 Georgian Bay's annual energy costs (including the carbon costs) will increase 51% above the baseline year 2018. By year 2050, Bracebridge's energy costs will be more than 5 times of the energy costs of the 2018 baseline year. Georgian Bay understands the importance of taking rapid actions. This is shown in their short-term (2030) reduction target and the retrofit plans to meet those targets.

3 Georgian Bay GHG Emission Reduction Target

3.1 SHORT TERM (2030 PLAN)

All AMs aim to achieve 30-45% reductions in corporate GHG emissions from 2018 levels by 2030 to meet the federal and provincial ambitious targets. The short-term target for Georgian Bay was determined based on the engineering review of the buildings, fleet and streetlight profile and their available potential to decarbonize the assets in a feasible way. Based on this assessment, the short-term target for Georgian Bay was determined to be 45% reduction below 2018 levels.

3.2 LONG TERM (2050 PLAN)

Georgian Bay aims to reduce corporate GHG emissions to net-zero by 2050 to be in line with the international agreements and federal and provincial plans.

4 Georgian Bay Climate Change Mitigation Plan

The details of the climate change mitigation plan for Georgian Bay corporate assets are listed below. Buildings that are decommissioned since 2018 are excluded from the following assessment.

4.1 BUILDINGS

4.1.1 Short Term 2030 Plan

To achieve the short-term 2030 corporate GHG reduction target, Georgian Bay plans to implement the following building retrofits before 2030:

1. Replace the electric baseboards or unit heaters with a split air source heat pump (ASHP) with backup heating coils at the following buildings:
    - Honey Harbour Library
    - Honey Harbour Fire Hall
    - MacTier Fire Hall
    - MacTier Public Works
2. Replace the furnace with a split ASHP with backup heating coils at the following buildings:
    - Baxter Ward Community Centre
    - MacTier Arena
3. Install rooftop solar PV on the above-mentioned buildings.
4. Replace all the internal lighting to the LED lights for the above-mentioned buildings.

The rooftop solar PV for corporate buildings is scheduled to be implemented at the same year that the building mechanical systems are retrofitted.

4.1.2 Long Term 2050 Plan

To achieve the long-term 2050 corporate GHG reduction target, Georgian Bay plans to implement the following building retrofits:

5. Replace the Rooftop RTU units with an ASHP with backup heating coils at the following buildings:

- Municipal Office
- Community Services Building
- Public Works/Fire Hall
- MacTier Library

6. Install rooftop solar PV on the above-mentioned buildings
    - Port Severn Park
7. Replace all the internal lighting to the LED lights for the above-mentioned buildings.
8. GHG Offset: Install additional solar PVs to offset the remaining GHG emissions and achieve net-zero by 2050. The total solar PV capacity needed to offset the GHG emissions for Bracebridge corporate assets is estimated to be 1735 kWp. For this estimation we assumed that any major building additions or new buildings will be net-zero GHG going forward. Therefore, the projected growth will not add to the corporate GHG profile. For Georgian Bay the additional solar PV installations or purchase agreements will be phased starting 2037 and will be installed in eleven (11) phases. The phasing plan is shown in Table 42. The additional solar PVs can be installed on corporate assets (ground-mount solar PVs) where possible or investments will be made for the installations in other community areas or alternatively clean electricity purchase agreements will be signed. Georgian Bay will review the feasibility of these alternatives before 2037. For the purpose of this assessment and costing we assumed that additional ground-mount solar PVs will be installed in corporate assets.

The proposed implementation planning for building retrofits and additional solar PV are listed in the following table. As mentioned earlier, EUI and equipment lifespan was considered when determining the phasing plan for building retrofits.

Table 42: Township of Georgian Bay Building Retrofit and Solar PV System Phasing

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP and LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2025	Honey Harbour Library	37	
2026	Honey Harbour Fire Hall	22	

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP and LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2027	Baxter Ward Community Centre	82	
2028	MacTier Public Works	38	
2029	MacTier Arena	194	
2030	MacTier Fire Hall	24	
2031	Municipal Office	81	
2032	Community Services Building	35	
2033	Public Works/Fire Hall	65	
2034	MacTier Library	35	
2035	Port Severn Park	18	
2037	Additional Solar 1		✓ 150
2038	Additional Solar 2		✓ 150
2039	Additional Solar 3		✓ 150
2040	Additional Solar 4		✓ 150
2041	Additional Solar 5		✓ 150
2042	Additional Solar 6		✓ 150
2043	Additional Solar 7		✓ 150
2044	Additional Solar 8		✓ 150
2045	Additional Solar 9		✓ 150
2046	Additional Solar 10		✓ 150

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP and LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2047	Additional Solar 11	✓	235

A feasibility assessment of installing RTU ASHP or split ASHP was completed for all corporate buildings. Bressette House, being a heritage building, was excluded from the retrofit planning and assessment. By implementing the building retrofits and solar PV rooftop retrofits Georgian Bay's building emissions will be reduced to 114 tCO_2e (50 % reduction from 2018 baseline) by 2030 and will be reduced to 52 tCO_2e (77 % reduction from 2018 baseline) by 2050. Implementing the additional solar PV offset projects will reduce the corporate GHG emissions to net-zero by 2050. The following figure shows the reductions.

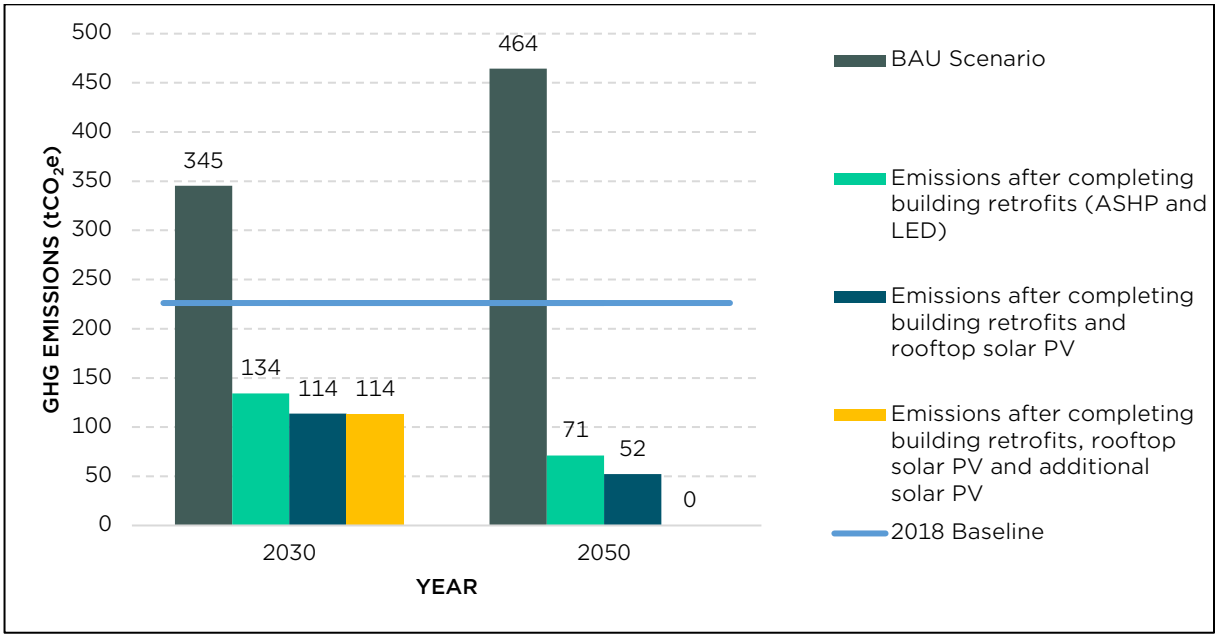

Figure 34. Township of Georgian Bay Building GHG Emissions Reduction Comparison

4.2 FLEET

4.2.1 Short Term 2030 Plan

To achieve the short term 2030 corporate GHG reduction target Georgian Bay plans to implement the following changes to the fleet:

1. Replace all passenger car, light, and medium duty vehicle with EVs (9 vehicles)
2. Replace 35% of heavy-duty vehicles with EV or ZEV (3 vehicles)
3. Replace 23% of industrial/commercial equipment with EV or ZEV (2 vehicles)
4. Install 7 EV charging stations in municipal buildings to accommodate the increased EV vehicles

4.2.2 Long Term 2050 Plan

To achieve the long term 2050 corporate GHG reduction target Georgian Bay plans to implement the following changes to the fleet:

5. Replace 100% of heavy-duty vehicles with EV or ZEV (5 vehicles)
6. Replace all heavy equipment with EV or ZEV alternatives (11 of vehicles)

Georgian Bay won't need additional EV or ZEV charging infrastructure beyond 2030 as it is anticipated that sufficient publicly available EV/ZEV charging stations will be developed by 2050. Table 43 below shows the transition plan of EV and ZEV, with Figure 35 shows the trend and compared against BAU case.

Table 43: Township of Georgian Bay Fleet EV/ZEV Phasing and GHG Emissions

YEAR	% ELECTRIC FLEET			GHG EMISSIONS (tCO_2e)			
	Light and Medium EV	Heavy Duty EV	Equipment	Light and Medium EV	Heavy Duty EV	Equipment	Total GHG Emission
2030	100%	35%	23%	0	90	12	102
2050	100%	100%	100%	0	0	0	0

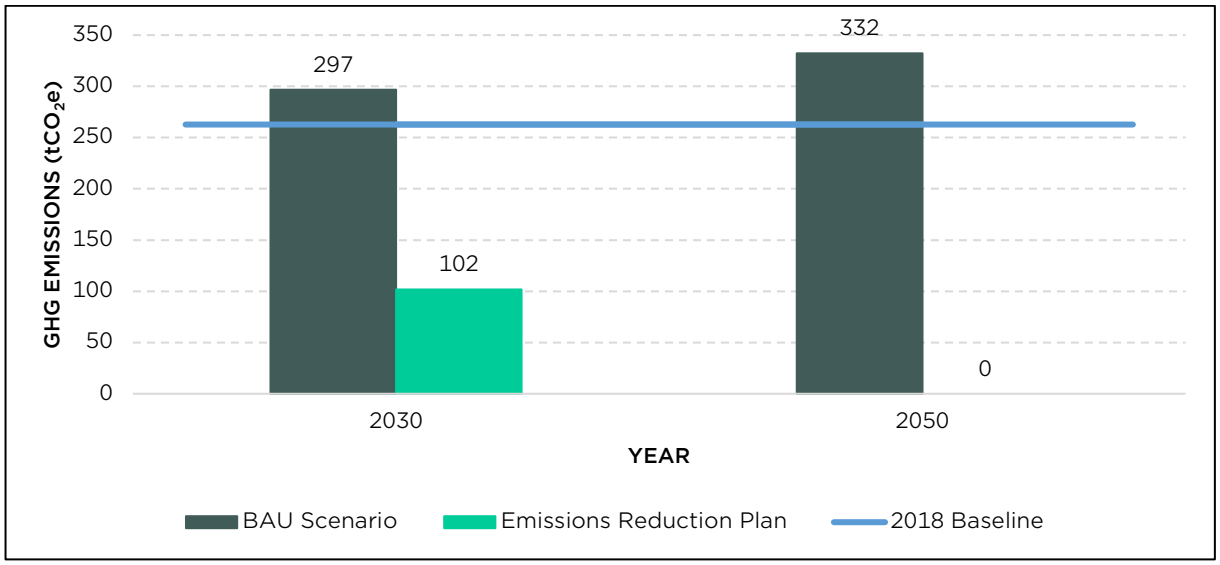

Figure 35. Township of Georgian Bay Fleet EV/ZEV GHG Emissions

By implementing the above-mentioned measures Georgian Bay's fleet emissions will be reduced to 102 tCO2e (61 % reduction from 2018 baseline) by 2030 and will reach net-zero by 2050. Georgian Bay will prepare a detailed fleet electrification strategy to identify suitable candidates for EV/ZEV transition based on usage patterns, age and mileage, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs/ZEVs, prioritizing high-emission and urban vehicles first.

4.3 STREETLIGHTS

Georgian Bay will convert all non-LED streetlights to LED streetlights when they reach their end of life. An LED conversion plan will be developed based on the life expectancy of the equipment and the available funding opportunities.

4.4 FUTURE ADDITIONS AND NEW BUILDINGS

To achieve the short term and long term targets any future developments and future equipment/fleet purchases should be net-zero, where possible. Georgian Bay will develop a net-zero new building policy and net-zero new fleet policy. Additionally, any future streetlight purchases/installations should be LED, where possible. Georgian Bay will develop a progressive LED conversion for existing streetlights to support the plan.

5 Georgian Bay Cost of Implementations

The details of the cost of implementation for Georgian Bay are listed below. The assessment includes installation costs for buildings, fleet, and streetlights, as well as energy and carbon costs for buildings. It also considers potential operating cost savings compared to business as usual (BAU).

5.1 BUILDING CAPITAL COST

The preliminary capital cost estimation includes the equipment costs as well as the installation costs for installing RTU ASHP, split ASHP, installing solar PV on the rooftops of existing buildings, and installing additional solar systems needed to achieve net-zero emissions by 2050. Building retrofits involve the installation of ASHPs and LED lighting retrofits, while solar retrofits encompass both rooftop solar installations and additional solar systems. Table 44 below listed the estimated capital cost for the planned retrofit activities needed to achieve net zero by 2050.

Table 44: Township of Georgian Bay Building Retrofits Capital Cost Estimation

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2025	Honey Harbour Library	$16,000	$163,000	$179,000
2026	Honey Harbour Fire Hall	$19,000	$97,000	$116,000
2027	Baxter Ward Community Centre	$147,000	$360,000	$507,000
2028	MacTier Public Works	$34,000	$167,000	$201,000
2029	MacTier Arena	$206,000	$851,000	$1,057,000
2030	MacTier Fire Hall	$19,000	$106,000	$125,000
2031	Municipal Office	$140,000	$356,000	$496,000
2032	Community Services Building	$37,000	$154,000	$191,000
2033	Public Works/Fire Hall	$125,000	$285,000	$410,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2034	MacTier Library	$42,000	$154,000	$196,000
2035	Port Severn Park	$10,000	$79,000	$89,000
2037	Additional Solar 1	$-	$559,000	$559,000
2038	Additional Solar 2	$-	$559,000	$559,000
2039	Additional Solar 3	$-	$559,000	$559,000
2040	Additional Solar 4	$-	$559,000	$559,000
2041	Additional Solar 5	$-	$559,000	$559,000
2042	Additional Solar 6	$-	$559,000	$559,000
2043	Additional Solar 7	$-	$559,000	$559,000
2044	Additional Solar 8	$-	$559,000	$559,000
2045	Additional Solar 9	$-	$559,000	$559,000
2046	Additional Solar 10	$-	$559,000	$559,000
2047	Additional Solar 11	$-	$500,000	$500,000
	Total	**$795,000**	**$8,862,000**	**$9,657,000**

5.2 OPERATING AND CARBON COSTS

The operating and carbon costs were calculated according to the implementation planning shown in Table 42. The energy use was calculated for buildings that are completing the retrofits. The projected population growth and its impact on the fuel consumption is also included in this analysis. The detailed projected operating cost estimates are included in Table 45 below and is compared to the BAU scenario.

Table 45: Township of Georgian Bay Detailed Building Energy Cost Comparison

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2018	$102,000	$102,000	$-
2019	$111,000	$111,000	$-
2020	$133,000	$133,000	$-
2021	$147,000	$147,000	$-
2022	$153,000	$153,000	$-
2023	$162,000	$162,000	$-
2024	$146,000	$146,000	$-
2025	$154,000	$148,000	$6,000
2026	$162,000	$156,000	$6,000
2027	$171,000	$160,000	$11,000
2028	$179,000	$164,000	$15,000
2029	$187,000	$149,000	$38,000
2030	$195,000	$154,000	$41,000
2031	$201,000	$150,000	$51,000
2032	$208,000	$152,000	$56,000
2033	$215,000	$151,000	$64,000
2034	$222,000	$153,000	$69,000
2035	$229,000	$156,000	$73,000
2036	$237,000	$162,000	$75,000

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2037	$245,000	$148,000	$97,000
2038	$253,000	$134,000	$119,000
2039	$262,000	$120,000	$142,000
2040	$271,000	$107,000	$164,000
2041	$280,000	$94,000	$186,000
2042	$289,000	$80,000	$209,000
2043	$298,000	$67,000	$231,000
2044	$307,000	$53,000	$254,000
2045	$317,000	$40,000	$277,000
2046	$328,000	$28,000	$300,000
2047	$340,000	$16,000	$324,000
2048	$353,000	$26,000	$327,000
2049	$366,000	$36,000	$330,000
2050	$380,000	$47,000	$333,000

Note 1: a positive number in a year means potential savings for the Township in that year compared to BAU and a negative number means a potential cost for the Township in that year.

As the buildings are implementing solar retrofits and transitioning to a more energy efficient systems and alternative fuels, the fuel costs will reduce due to additional electricity production capacity and projected higher cost of electricity compared to other fuels.

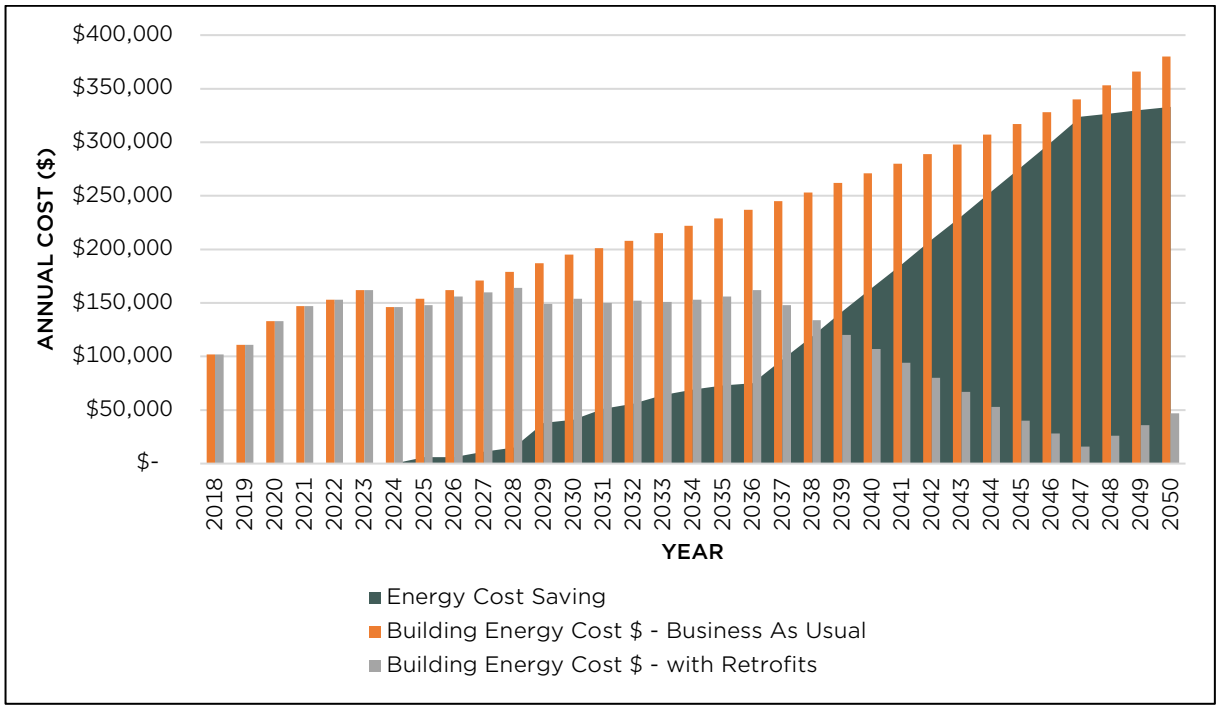

Figure 36. Township of Georgian Bay Building Retrofit Cost Saving

Figure 36 above shows projected financial impact of energy cost savings over time, spanning from 2018 to 2050. The dark green area represents the energy cost saving achieved each year, which start to increase gradually and become significant over time. The grey bar shows the building energy costs with retrofits, with the installation of air source heat pumps (ASHP) and solar systems. The graph effectively highlights the financial benefits of implementing retrofitting measures to achieve net-zero emissions by 2050.

5.3 FLEET EV TRANSITION COST

The estimated capital cost to electrify Georgian Bay fleet and transition to EV/ZEV vehicles is displayed in Table 46 below. The cost estimate is broken into two milestones, 2030 and 2050 to determine the required investment needed for Georgian Bay to reach the GHG reduction targets identified in this plan. Georgian Bay will conduct a detailed assessment to identify suitable candidates for electrification based on usage patterns, mileage/vehicle age, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs. The vehicles will ideally be replaced with EV/ZEV alternatives once they are close to their end of life.

Table 46: Township of Georgian Bay Estimated Capital Cost of Fleet Electrification

VEHICLE TYPES	NO. OF VEHICLES			ESTIMATED CAPITAL COST OF FLEET ELECTRIFICATION (2024 DOLLARS)		
	2018 Baseline	2030 Retrofits	2050 Retrofits	Per Vehicle	2030 Retrofits	2050 Retrofits
Heavy Duty Vehicle	8	3	5	$400,000	$1,120,000	$2,080,000
Medium Duty Vehicle	0	0	0	$130,000	$-	$-
Light Duty Vehicle	7	7	0	$105,000	$732,000	$-
Industrial/ Commercial Equipment	5	1	4	$146,000	$146,000	$584,000
Tractors and Combine	6	1	5	$140,000	$140,000	$700,000
Lawn and Garden Equipment	2	0	2	$140,000	$-	$280,000
Passenger Car	2	2	0	$105,000	$209,000	$-
Total	**30**	**14**	**16**	**$-**	**$2,138,000**	**$3,363,000**

The cost estimate of level II EV charging stations needed to support the Georgian Bay EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is estimated that Georgian Bay will need to install 7 charging stations in their corporate buildings to support the fleet electrification plan. However, further investment in charging infrastructure may not be necessary, as it is expected that broad public charging infrastructure will be available. Table 47 below displays the estimated cost for EV charging stations.

Table 47: Township of Georgian Bay Estimated Capital Cost for Charging Stations

NO. OF BUILDINGS	NO. OF EV FLEET		NO. OF LEVEL 2 CHARGING INFRASTRUCTURE		CAPITAL COST (2024 DOLLARS)	
	2030	2050	2030	2050	2030	2050
12	14	30	7	0	$25,000	$-

5.4 LED CONVERSION COST

Based on the review of the cost of LED conversion projects completed by municipalities such as the Town of Huntsville (in 2015) and the City of Barrie (in 2015), the material and labour costs to convert existing streetlights to LED ranges from approximately $700 to $1,200 per streetlight, depending on the wattage.

Based on the streetlight asset age of 6.3 years from Georgian Bay's 2020 Asset Management Plan, it is assumed that most of the streetlights in Georgian Bay have been replaced recently with LED streetlights.

TATHAM ENGINEERING

Climate Change Mitigation Plan

Township of Lake of Bays

LAKE OF BAYS • MUSKOKA •

1 Lake of Bays Corporate Baseline Energy and GHG Inventory

This section provides a comprehensive overview of the Township of Lake of Bays (Lake of Bays) energy consumption and GHG emissions.

1.1 CORPORATE ASSETS

The corporate assets included in the RCCMP for the Lake of Bays for the 2018 baseline year are presented below.

1.1.1 Buildings

In 2018, there were 19 corporate buildings in operation, with the largest being the Baysville Arena, Library and Community Centre (Arena) with a total building area of 2,769 m^2. Buildings use electricity, fuel oil, and propane for internal lighting, heating, cooling, ventilation, domestic hot water and other building functions.

Lake of Bays currently has no rooftop solar PV systems installed on their corporate buildings.

Table 48 presents an overview of the corporate buildings included in the energy and GHG emissions inventory. Further details regarding the building profiles are included in Appendix G.

Table 48: Township of Lake of Bays Building Profile

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m^2)
Administration	2	585
Arena	1	2,769
Community Centre	6	1,716
Fire Hall	4	786
Public Library	2	610
Storage Facility	4	954
Total	**19**	**7,420**

1.1.2 Fleet

In 2018, there were approximately 103 corporate fleet in operation, with the majority of fleet being heavy duty vehicles or equipment. All corporate fleet are fueled by diesel or gasoline. Table 49 presents an overview of the corporate fleet included in the baseline inventory. See Appendix G for vehicle details.

Table 49: Township of Lake of Bays Fleet Profile

DEPARTMENT	FLEET TYPE		# OF FLEET
Building	Vehicle	Ships and Boats	1
By-Law	Vehicle	Light Duty	1
Fire	Vehicle	Light Duty	3
	Vehicle	Medium Duty	5
		Heavy Duty	7
		Ships and Boats	2
	Equipment	Industrial/Commercial	36
Parks	Vehicle	Light Duty	6
		Medium Duty	3
		Tractor and Combines	1
	Equipment	Industrial/Commercial	5
Public Works	Vehicle	Light Duty	5
		Medium Duty	3
		Heavy Duty	12
	Equipment	Industrial/Commercial	11
Other	Equipment	Industrial/Commercial	1
Total			**103**

1.1.3 Streetlights

In 2018, there were approximately 133 streetlights in Lake of Bays. Table 50 presents an overview of the corporate streetlights included in the baseline inventory.

Table 50: Township of Lake of Bays Streetlight Profile

TYPE OF BULB	# OF STREETLIGHTS
LED	4
Non-LED	129
Total	**133**

1.2 BASELINE ENERGY CONSUMPTION

In 2018, the total energy consumption in Lake of Bays was 12,238 gigajoules (GJ). Lake of Bays used 5,299 GJ of energy (43% of total energy consumption) across their corporate buildings, 4,928 GJ (40%) across their corporate fleets and 2,011 GJ (16%) across their corporate streetlights. Figure 37 provides the total energy consumption of the buildings, fleet and streetlights by energy source. The energy consumption inventory for corporate buildings is provided in Appendix G.

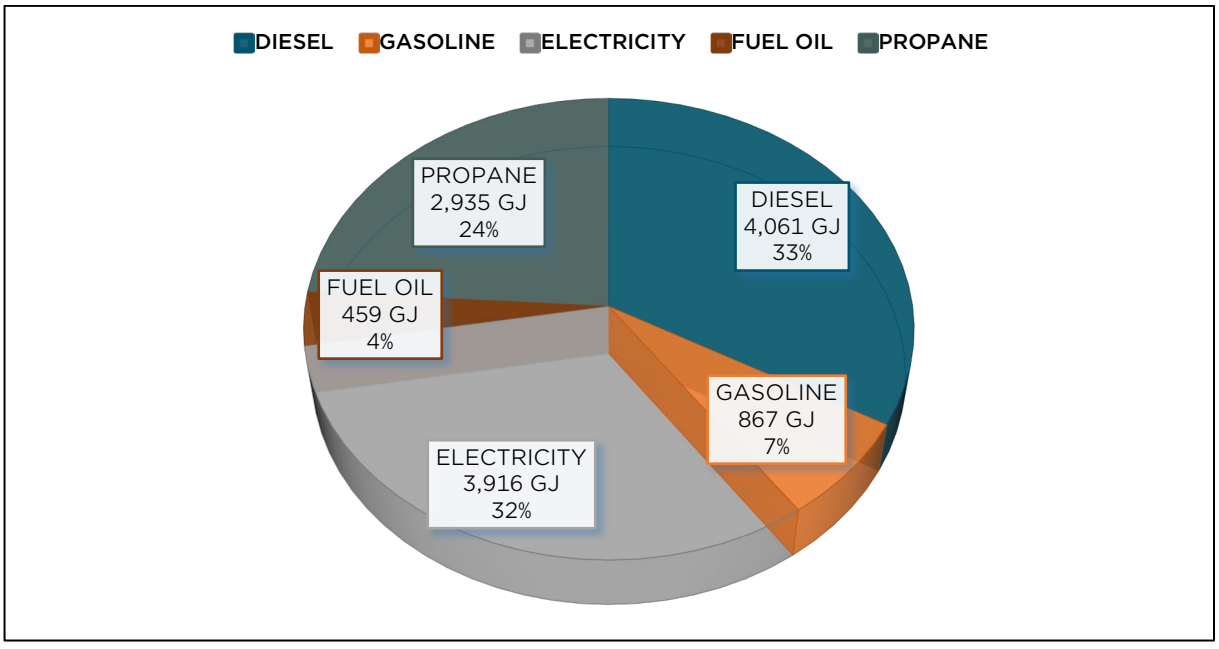

Figure 37. Township of Lake of Bays Total Energy Consumption in 2018

1.3 BASELINE GHG EMISSIONS

In 2018, Lake of Bays produced 227 tCO_2e (38%) of GHG emissions from their corporate buildings, 348 tCO_2e (59%) from their corporate fleet and 17 tCO_2e (3%) from their corporate streetlights. Figure 38 provides the baseline GHG emissions emitted in total by the buildings, fleet and streetlights.

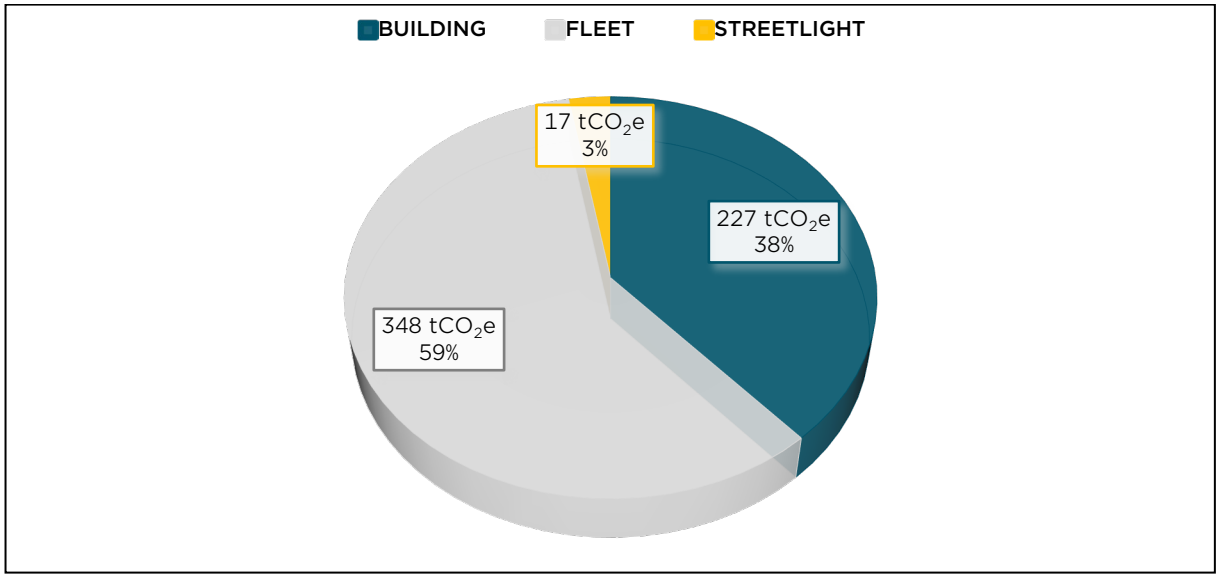

Figure 38. Township of Lake of Bays Total GHG Emissions in 2018

Figure 39 presents the GHG emissions produced from the corporate buildings categorized by operation type. The community centres and storage facilities are the two major operations producing the highest GHG emissions (62% of total). These facilities also account for 36% of the floor area of the corporate assets and has more energy consuming operations.

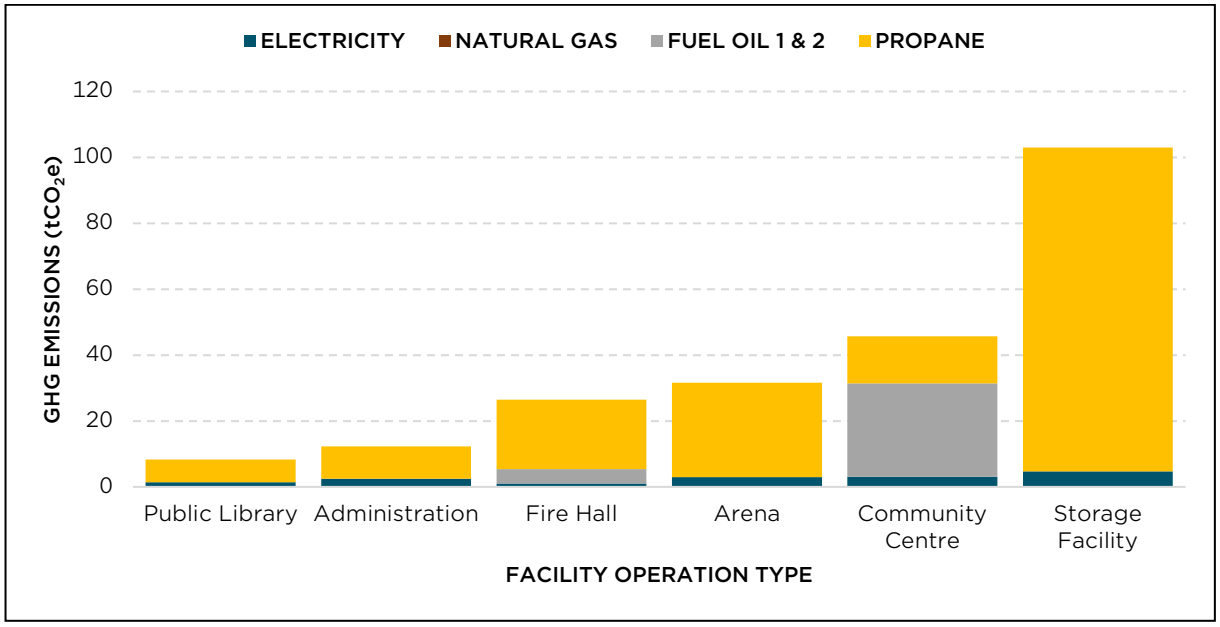

Figure 39. Township of Lake of Bays Building GHG Emissions in 2018 by Operations

The GHG emission intensity (Figure 40) shows the facilities GHG emissions per m^2 of the floor area. Facilities will lower GHG emission intensity are either using fuels with lower GHG emissions or are more energy efficient. Public Work Garage #2 has the highest GHG emission intensity.

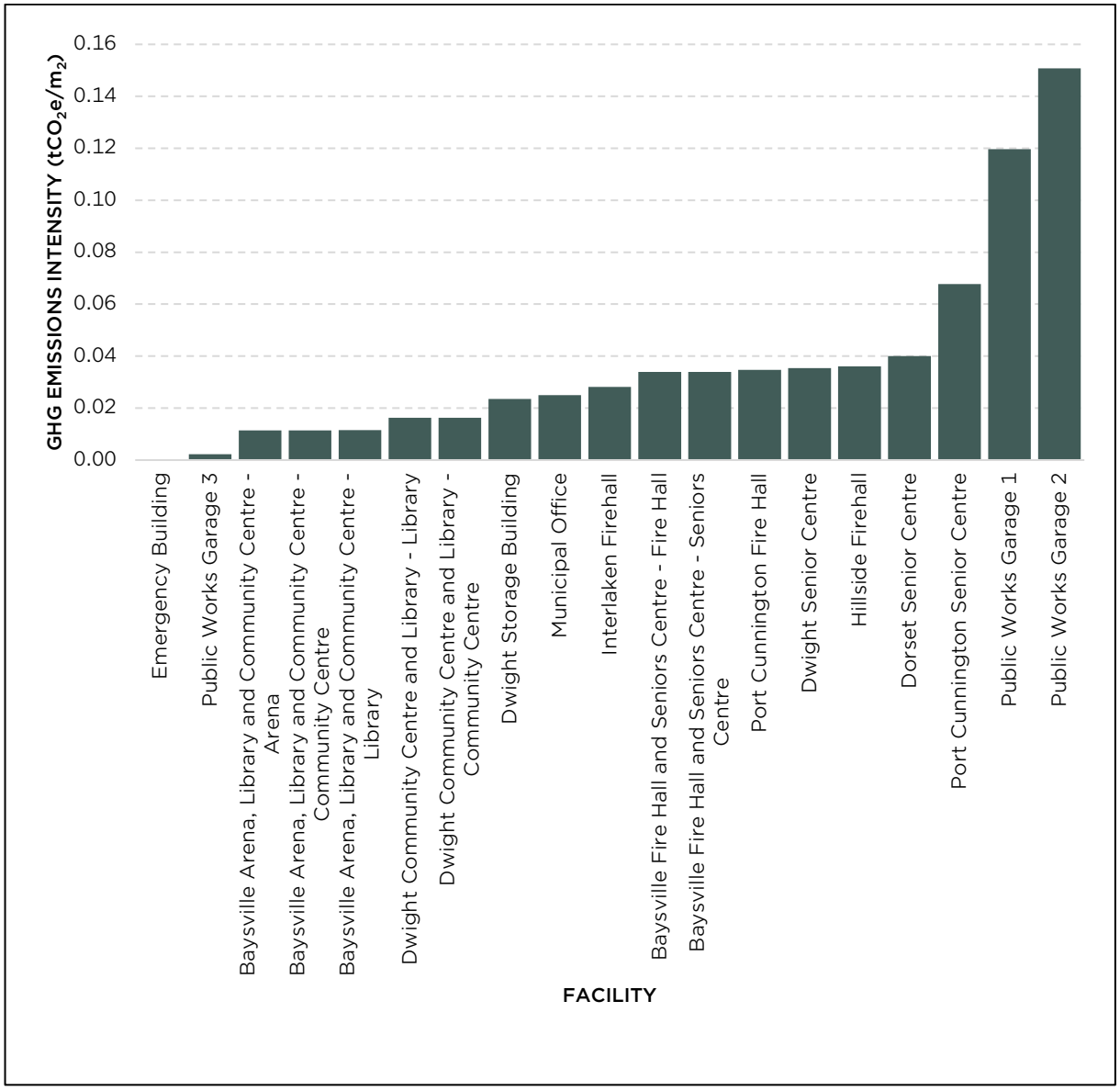

Figure 40. Township of Lake of Bays GHG Intensity by Facility

Figure 41 presents the GHG emissions produced from the corporate fleet categorized by fuel types. Diesel vehicles generated the majority of the GHG emissions.

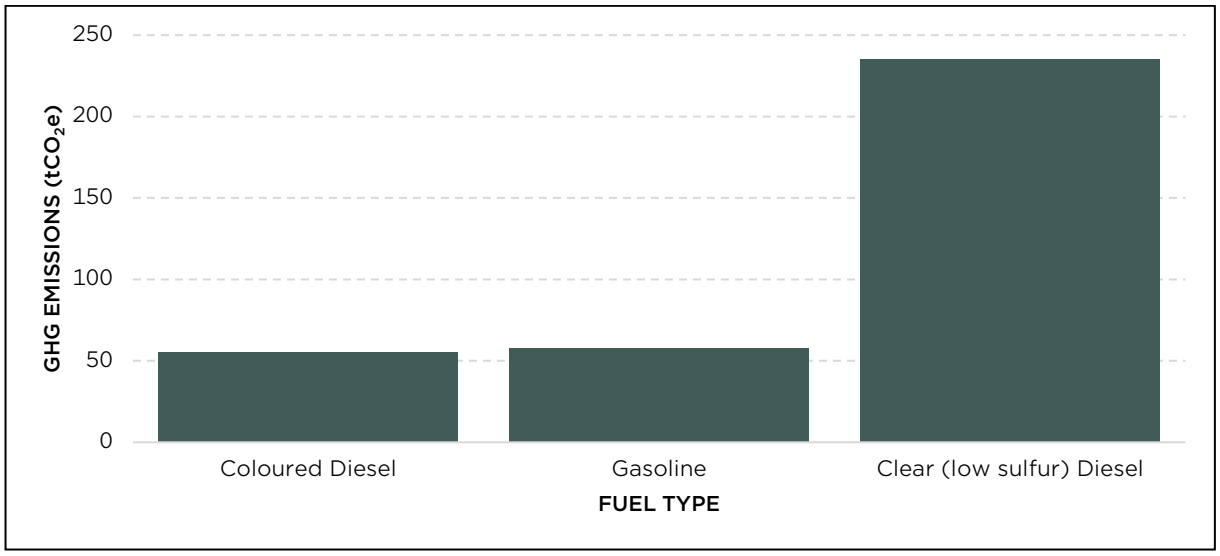

Figure 41. Township of Lake of Bays Fleet GHG Emissions in 2018 by Fuel Type

Full GHG emissions inventory for corporate assets is provided in Appendix G.

2 Lake of Bays GHG Emission Forecasting for BAU by 2050

The GHG emissions for the Lake of Bays was projected to the year 2050 based on the GHG emissions from the 2018 baseline year, permanent population and housing projection information from the District of Muskoka Growth Strategy - 2024, and projected climatic data changes from the ECCC.

Based on the Growth Strategy report, the population in Lake of Bays is projected to grow from 3,534 in 2018 to 4,617 by 2030, and to 6,118 by 2050, and the permanent housing is projected to increase from 1,580 in 2018 to 2,156 by 2030, and to 2,887 by 2050.

Table 51 summarizes the projected population and housing units based on provided information from the Growth Strategy report and climatic data to determine the forecasted GHG emissions.

Table 51: Township of Lake of Bays Projected Population and Housing Units

COMPONENT	2018	2030		2050	
	Baseline Year Value	Projected Value	Change from Baseline	Projected Value	Change from Baseline
Projected Population	3,534	4,617	28%	6,118	56%
Projected Housing Units	1,580	2,156	32%	2,887	61%

Table 52 summarizes the assumptions made and modelling completed to determine the forecasted GHG emissions.

Table 52: Township of Lake of Bays BAU Forecasting

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
Building	Change due to population growth	313	37%	429	89%
	Change due to global warming	216	-5%	216	-5%
	Total	302	33%	418	84%
Fleet	Change due to population growth and new roads	391	12%	450	29%
Streetlight	Change due to population growth, new subdivisions, new roads	20	20%	23	39%

Figure 42 provides the BAU forecasting to the year 2050 along with the estimated fuel costs including cost of carbon.

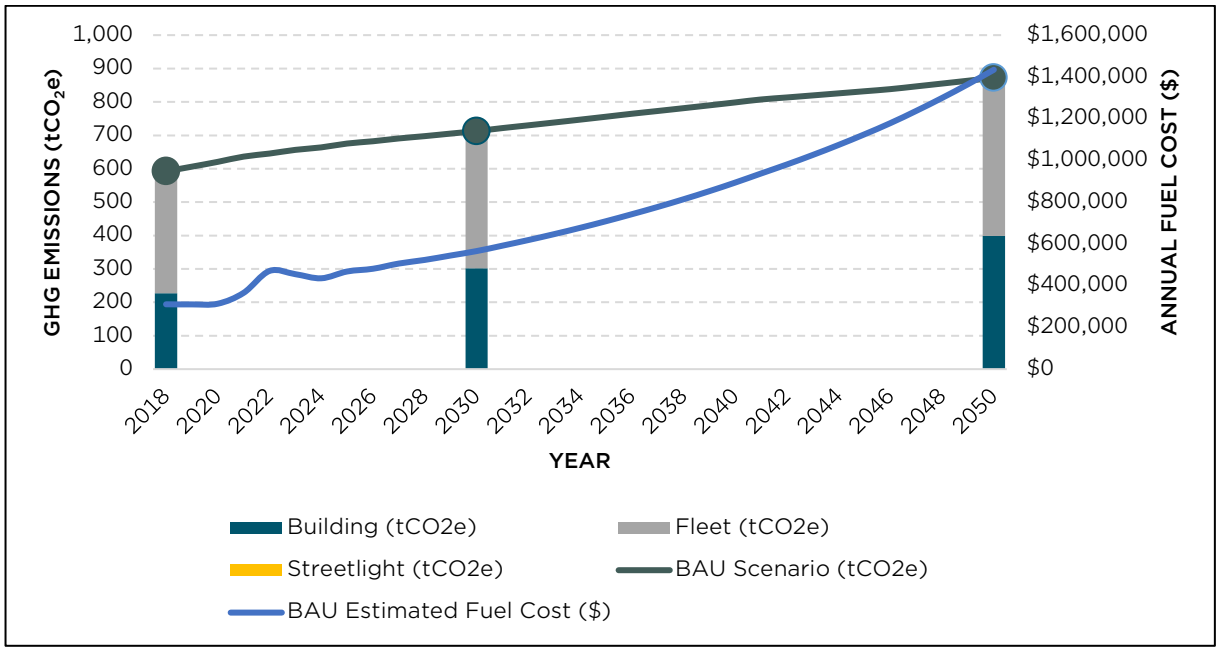

Figure 42. Township of Lake of Bays GHG Emissions BAU Forecasting to 2050

Two milestones (2030 and 2050) were shown in the above forecasting figure to reiterate the importance of taking immediate actions to prevent the GHG emission increase and deviation from the set reduction targets. The above figure indicates that under the BAU scenario by year 2030 Lake of Bay's annual GHG emissions will increase 20% above the baseline year 2018. This increase will be 47% or 280 tCO_2e by year 2050.

The increase in the energy costs will be more significant than the GHG emission increase due to rapidly increasing cost of carbon. Under the BAU scenario by year 2030 Lake of Bay's annual energy costs (including the carbon costs) will increase 82% above the baseline year 2018. By year 2050, Lake of Bay's energy costs will be more than 4.6 times of the energy costs of the 2018 baseline year. Lake of Bay understands the importance of taking rapid actions. This is shown in their short-term (2030) reduction target and the retrofit plans to meet those targets.

3 Lake of Bays GHG Emission Reduction Target

3.1 SHORT TERM (2030 PLAN)

All AMs aim to achieve 30-45% reductions in corporate GHG emissions from 2018 levels by 2030 to meet the federal and provincial ambitious targets. The short-term target for Lake of Bays was determined based on the engineering review of the buildings, fleet and streetlight profile and their available potential to decarbonize the assets in a feasible way. Based on this assessment, the short-term target for Lake of Bays was determined to be 45% reduction below 2018 levels.

3.2 LONG TERM (2050 PLAN)

Lake of Bays aims to reduce corporate GHG emissions to net-zero by 2050 to be in line with the international agreements and federal and provincial plans.

4 Lake of Bays Climate Change Mitigation Plan

The details of the climate change mitigation plan for Lake of Bays corporate assets are listed below. Buildings that are decommissioned since 2018 are excluded from the following assessment.

4.1 BUILDINGS

4.1.1 Short Term 2030 Plan

To achieve the short-term 2030 corporate GHG reduction target, Lake of Bays plans to implement the following building retrofits before 2030:

1. Replace the tube heaters with a split air source heat pump (ASHP) with backup heating coils at the following buildings:
    - Public Works Garage 1
    - Public Works Garage 2
    - Public Works Garage 3
2. Replace the furnace with a split ASHP with backup heating coils at the following buildings:
    - Port Cunnington Senior Centre
    - Public Works Garage 3
    - Municipal Office
    - Dwight Senior Centre (incl. baseboard heaters)
3. Install rooftop solar PV on the above-mentioned buildings.
4. Replace all non-LED internal lighting to LED for the above-mentioned buildings.

The rooftop solar PV for corporate buildings is scheduled to be implemented at the same year that the building mechanical systems are retrofitted.

4.1.2 Long Term 2050 Plan

To achieve the long-term 2050 corporate GHG reduction target, Lake of Bays plans to implement the following building retrofits:

5. Replace the tube heaters with a split ASHP with backup heating coils at the following buildings:
    - Port Cunnington Fire Hall
    - Hillside Firehall
    - Baysville Fire Hall and Seniors Centre – Fire Hall (incl. baseboard heaters)
6. Replace the Rooftop RTU units with an ASHP with backup heating coils at the following buildings:
    - Baysville Arena, Library and Community Centre – Community Centre
    - Baysville Arena, Library and Community Centre – Library
    - Baysville Arena, Library and Community Centre – Arena
    - Dwight Community Centre and Library – Community Centre
7. Replace the furnace with a split ASHP with backup heating coils at the following buildings:
    - Dwight Community Centre and Library – Library
    - Baysville Fire Hall and Seniors Centre – Seniors Centre
8. Install rooftop solar PV on the above-mentioned buildings, and at the following buildings:
    - Dwight Storage Building
9. Continue to replace all non-LED internal lighting to LED for the above-mentioned buildings. The process has been already begun.
10. GHG Offset: Install additional solar PVs to offset the remaining GHG emissions and achieve net-zero by 2050. The total solar PV capacity needed to offset the GHG emissions for Lake of Bays corporate assets is estimated to be 1003 kWp. For this estimation we assumed that any major building additions or new buildings will be net-zero GHG going forward. Therefore, the projected growth will not add to the corporate GHG profile. For Lake of Bays the additional solar PV installations or purchase agreements will be phased starting 2041 and will be installed in six (6) phases. The phasing plan is shown in Table 53. The additional solar PVs can be installed on corporate assets (ground-mount solar PVs) where possible or investments will be made for the installations in other community areas or alternatively clean electricity purchase agreements will be signed. Lake of Bays will review the feasibility of these alternatives before 2041. For the purpose of this assessment and costing we assumed that additional ground-mount solar PVs will be installed in corporate assets.

Information regarding building mechanical systems is not available for the following buildings:

- Emergency Building

This building is decommissioned. As a result, it is excluded from the retrofit plan.

In addition, the following buildings are not in service as of 2024 and are excluded from the retrofit plan:

- Dorset Senior Centre
- Interlaken Fire Hall

The implementation planning for building retrofits and additional solar PV are listed in the following table. As mentioned earlier, EUI and equipment lifespan was considered when determining the phasing plan for building retrofits.

Table 53: Township of Lake of Bays Building Retrofit and Solar PV System Phasing

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP And LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2025	Public Works Garage 2	29	
2026	Public Works Garage 1	142	
2027	Port Cunnington Senior Centre	18	
2028	Municipal Office	88	
2029	Dwight Senior Centre	22	
2030	Public Works Garage 3	12	
2031	Baysville Arena, Library and Community Centre - Library	306	
2032	Baysville Fire Hall and Seniors Centre - Seniors Centre	29	
2033	Port Cunnington Fire Hall	28	

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted with ASHP And LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2034	Baysville Arena, Library and Community Centre - Community Centre	0	
2035	Hillside Firehall	23	
2036	Dwight Community Centre and Library - Library	29	
2037	Dwight Community Centre and Library - Community Centre	53	
2038	Baysville Arena, Library and Community Centre - Arena	0	
2039	Baysville Fire Hall and Seniors Centre - Fire Hall	31	
2040	Dwight Storage Building	11	
2041	Additional Solar 1		✓ 150
2042	Additional Solar 2		✓ 150
2043	Additional Solar 3		✓ 150
2044	Additional Solar 4		✓ 150
2045	Additional Solar 5		✓ 150
2046	Additional Solar 6		✓ 253

A feasibility assessment of installing RTU ASHP or split ASHP was completed for all corporate buildings. By implementing the building retrofits and solar PV rooftop retrofits Lake of Bay's building emissions will be reduced to 95 tCO_2e (58 % reduction from 2018 baseline) by 2030 and will be reduced to 30 tCO_2e (87% reduction from 2018 baseline) by 2050. Implementing the additional solar PV offset projects will reduce the corporate GHG emissions to net-zero by 2050. The following figure shows the reductions.

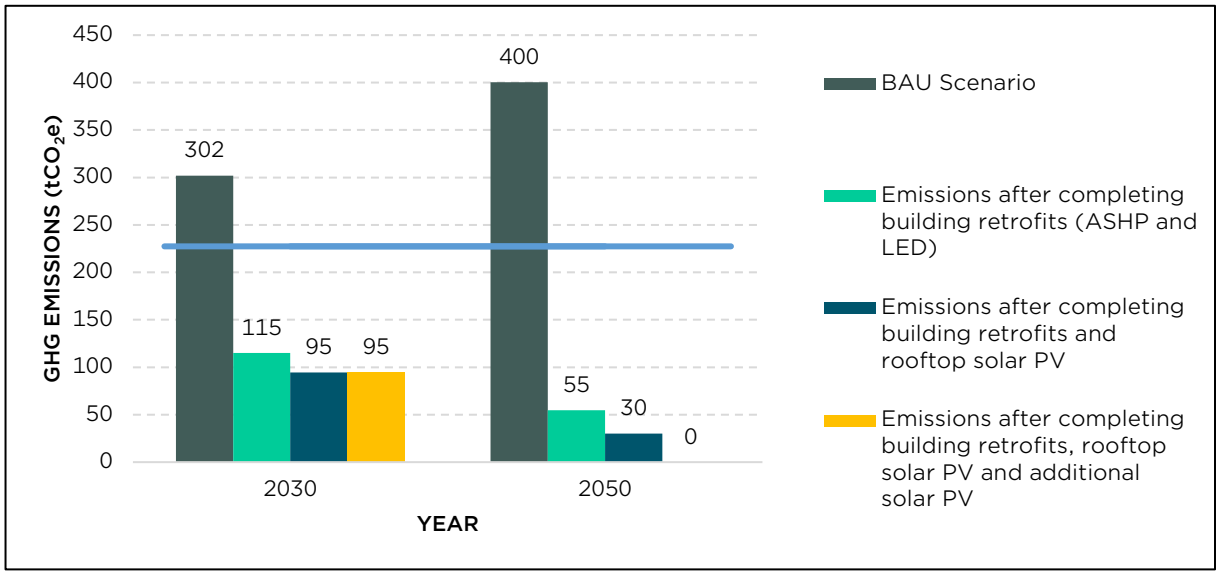

Figure 43. Township of Lake of Bays Building GHG Emission Reduction Comparison

4.2 FLEET

4.2.1 Short Term 2030 Plan

To achieve the short term 2030 corporate GHG reduction target Lake of Bays plans to implement the following changes to the fleet:

1. Replace all light and medium duty vehicle with EVs.
2. Replace 35% of heavy-duty vehicles with EV or ZEV.
3. Install 9 EV charging stations in municipal buildings to accommodate the increased EV vehicles

4.2.2 Long Term 2050 Plan

To achieve the long term 2050 corporate GHG reduction target Lake of Bays plans to implement the following changes to the fleet:

4. Replace 100% of heavy-duty vehicles with EV or ZEV.
5. Replace all heavy equipment with EV or ZEV alternatives.

Lake of Bays won't need additional EV or ZEV charging infrastructure beyond 2030 as it is anticipated that sufficient publicly available EV/ZEV charging stations will be developed by 2050.

4.3 STREETLIGHTS

Lake of Bays will convert all non-LED streetlights to LED streetlights when they reach their end of life. An LED conversion plan will be developed based on the life expectancy of the equipment and the available funding opportunities.

4.4 FUTURE ADDITIONS AND NEW BUILDINGS

To achieve the short term and long term targets any future developments and future equipment/fleet purchases should be net-zero, where possible. Lake of Bays will develop a net-zero new building policy and net-zero new fleet policy. Additionally, any future streetlight purchases/installations should be LED, where possible. Lake of Bays will develop a progressive LED conversion for existing streetlights to support the plan.

5 Lake of Bays Cost of Implementation

The details of the cost of implementation for Lake of Bays are listed below. The assessment includes installation costs for buildings, fleet, and streetlights, as well as energy and carbon costs for buildings. It also considers potential operating cost savings compared to business as usual (BAU).

5.1 BUILDING CAPITAL COST

Capital costs include the equipment costs for purchasing air source heat pumps (ASHP), adding solar PV panels to the rooftops of existing buildings, and installing additional solar systems needed to achieve net-zero emissions by 2050. Building retrofits involve the installation of ASHPs, while solar retrofits encompass both rooftop solar installations and additional solar systems. Table 54 below listed the estimated capital cost for the planned retrofit activities needed to achieve net zero by 2050.

Table 54: Township of Lake of Bays Building Retrofits Capital Cost Estimation

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2025	Public Works Garage 2	$25,000	$128,000	$153,000
2026	Public Works Garage 1	$45,000	$623,000	$668,000
2027	Port Cunnington Senior Centre	$14,000	$79,000	$93,000
2028	Municipal Office	$44,000	$386,000	$430,000
2029	Dwight Senior Centre	$24,000	$97,000	$121,000
2030	Public Works Garage 3	$10,000	$53,000	$63,000
2031	Baysville Arena, Library and Community Centre - Library	$30,000	$1,342,000	$1,372,000
2032	Baysville Fire Hall and Seniors Centre - Seniors Centre	$21,000	$128,000	$149,000
2033	Port Cunnington Fire Hall	$42,000	$123,000	$165,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2034	Baysville Arena, Library and Community Centre - Community Centre	$86,000	$-	$86,000
2035	Hillside Firehall	$17,000	$101,000	$118,000
2036	Dwight Community Centre and Library - Library	$26,000	$128,000	$154,000
2037	Dwight Community Centre and Library - Community Centre	$42,000	$233,000	$275,000
2038	Baysville Arena, Library and Community Centre - Arena	$249,000	$-	$249,000
2039	Baysville Fire Hall and Seniors Centre - Fire Hall	$22,000	$136,000	$158,000
2040	Dwight Storage Building	$-	$49,000	$49,000
2041	Additional Solar 1	$-	$559,000	$559,000
2042	Additional Solar 2	$-	$559,000	$559,000
2043	Additional Solar 3	$-	$559,000	$559,000
2044	Additional Solar 4	$-	$559,000	$559,000
2045	Additional Solar 5	$-	$559,000	$559,000
2046	Additional Solar 6	$-	$944,000	$944,000
	Total	**$697,000**	**$7,345,000**	**$8,042,000**

5.2 OPERATING AND CARBON COSTS

The operating and carbon costs were calculated according to the implementation planning shown in Table 53. The energy use was calculated for buildings that are completing the retrofits. The projected population growth and its impact on the fuel consumption is also included in this analysis. The detailed projected operating cost estimates are included in Table 55 below and is compared to the BAU scenario.

Table 55: Township of Lake of Bays Detailed Building Energy Cost Comparison

YEAR	TOTAL BUILDING ENERGY AND CARBON COST- ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST – ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2018	$75,000	$75,000	$-
2019	$78,000	$78,000	$-
2020	$92,000	$92,000	$-
2021	$99,000	$99,000	$-
2022	$103,000	$103,000	$-
2023	$109,000	$109,000	$-
2024	$99,000	$99,000	$-
2025	$105,000	$105,000	$-
2026	$111,000	$98,000	$13,000
2027	$117,000	$101,000	$16,000
2028	$123,000	$95,000	$28,000
2029	$130,000	$98,000	$32,000
2030	$136,000	$101,000	$35,000
2031	$141,000	$65,000	$76,000
2032	$146,000	$65,000	$81,000
2033	$151,000	$66,000	$85,000
2034	$157,000	$70,000	$87,000
2035	$162,000	$72,000	$90,000
2036	$168,000	$72,000	$96,000

YEAR	TOTAL BUILDING ENERGY AND CARBON COST- ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST – ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2037	$174,000	$70,000	$104,000
2038	$181,000	$75,000	$106,000
2039	$188,000	$75,000	$113,000
2040	$195,000	$78,000	$117,000
2041	$203,000	$62,000	$141,000
2042	$209,000	$44,000	$165,000
2043	$217,000	$27,000	$190,000
2044	$224,000	$10,000	$214,000
2045	$232,000	$(8,000)	$240,000
2046	$241,000	$(25,000)	$266,000
2047	$251,000	$(19,000)	$270,000
2048	$261,000	$(13,000)	$274,000
2049	$272,000	$(6,000)	$278,000
2050	$284,000	$2,000	$282,000

Note 1: a positive number in a year means potential savings for the Township in that year compared to BAU and a negative number means a potential cost for the Township in that year.

As the buildings are implementing solar retrofits and transitioning to a more energy efficient systems and alternative fuels, the fuel cost will reduce significantly due to additional electricity production capacity and projected higher cost of electricity compared to other fuels. As the fuel cost, carbon cost and electricity cost increases and as the additional solar PV systems are installed some revenue might be generated for Lake of Bays.

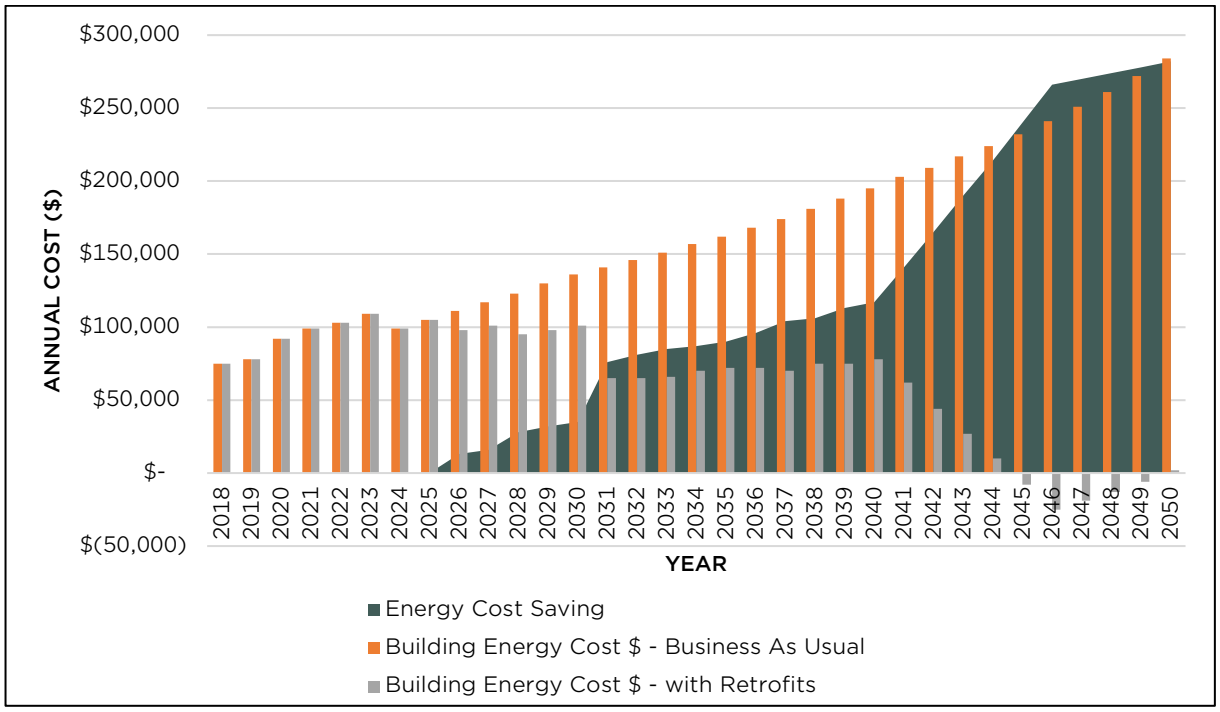

Figure 44. Township of Lake of Bays Building Retrofit Cost Saving

Figure 44 above shows projected financial impact of energy cost savings over time, spanning from 2018 to 2050. The dark green area represents the energy cost saving achieved each year, which start to increase gradually and become significant over time. The grey bar shows the building energy costs with retrofits, with the installation of air source heat pumps (ASHP) and solar systems. The graph effectively highlights the financial benefits of implementing retrofitting measures to achieve net-zero emissions by 2050.

5.3 FLEET EV TRANSITION COST

The estimated capital cost to electrify Lake of Bays fleet and transition to EV/ZEV vehicles is displayed in Table 56 below. The cost estimate is broken into two milestones, 2030 and 2050 to determine the required investment needed for Lake of Bays to reach the GHG reduction targets identified in this plan. Lake of Bays will conduct a detailed assessment to identify suitable candidates for electrification based on usage patterns, mileage/vehicle age, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs. The vehicles will ideally be replaced with EV/ZEV alternatives once they are close to their end of life.

Table 56: Township of Lake of Bays Estimated Capital Cost of Fleet Electrification

VEHICLE TYPES	NO. OF VEHICLES			ESTIMATED CAPITAL COST OF FLEET ELECTRIFICATION (2024 DOLLARS)		
	2018 Baseline	2030 Retrofits	2050 Retrofits	Per Vehicle	2030 Retrofits	2050 Retrofits
Heavy Duty Vehicle	19	7	12	$400,000	$2,660,000	$4,940,000
Medium Duty Vehicle	11	11	0	$130,000	$1,428,000	$-
Light Duty Vehicle	15	15	0	$105,000	$1,568,000	$-
Industrial/ Commercial Equipment	53	12	41	$146,000	$1,750,000	$5,976,000
Tractors and Combine	1	0	1	$140,000	$-	$140,000
Lawn and Garden Equipment	0	0	0	$146,000	$-	$-
Ships and Boats	4	1	3	$146,000	$146,000	$438,000
Passenger Car	0	0	0	$105,000	$-	$-
Total	**103**	**46**	**57**	**$-**	**$7,404,000**	**$11,056,000**

The cost estimate of level II EV charging stations needed to support the Lake of Bays EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is estimated that Lake of Bays will need to install 23 charging stations in their corporate buildings to support the fleet electrification plan. However, further investment in charging infrastructure may not be necessary, as it is expected that broad public charging infrastructure will be available. Table 57 displays the estimated cost for EV charging stations.

Table 57: Township of Lake of Bays Estimated Capital Cost for Charging Stations

NO. OF BUILDINGS	NO. OF EV FLEET		NO. OF LEVEL 2 CHARGING INFRASTRUCTURE		CAPITAL COST (2024 DOLLARS)	
	2030	2050	2030	2050	2030	2050
19	46	103	23	0	$83,000	$-

5.4 LED CONVERSION COST

Based on the review of the cost of LED conversion projects completed by municipalities such as the Town of Huntsville (in 2015) and the City of Barrie (in 2015), the material and labour costs to convert existing streetlights to LED ranges from approximately $700 to $1,200 per streetlight, depending on the wattage.

As presented in Table 58, the estimated capital cost to replace all remaining non-LED streetlights (approximately 129 streetlights) to LED ranges from $90,300 (assuming lower wattage bulbs) to $154,800 (assuming high wattage bulbs).

Table 58: Township of Lake of Bays Estimated Capital Cost of LED Streetlights

NO. OF STREETLIGHTS	CAPITAL COST (2024 DOLLARS)	
	Low Estimate	High Estimate
129	$90,300	$154,800

Climate Change Mitigation Plan
Township of Muskoka Lakes

TOWNSHIP OF
MUSKOKA
Lakes™

1 Muskoka Lakes Corporate Baseline Energy and GHG Inventory

This section provides a comprehensive overview of the Township of Muskoka Lakes (Muskoka Lakes) energy consumption and GHG emissions.

1.1 CORPORATE ASSETS

The corporate assets included in the RCCMP for the Muskoka Lakes for the 2018 baseline year are presented below.

1.1.1 Buildings

In 2018, there were 30 corporate buildings in operation, with the largest being the Port Carling Arena (Arena) with a total building area of 2,580 m^2. Buildings use electricity, propane, fuel oil for internal lighting, heating, cooling, ventilation, domestic hot water and other building functions.

Muskoka Lakes currently has no rooftop solar PV systems installed on their corporate buildings.

Table 59 presents an overview of the corporate buildings included in the energy and GHG emissions inventory. Further details regarding the building profiles are included in Appendix H.

Table 59: Township of Muskoka Lakes Building Profile

OPERATION TYPE	# OF BUILDINGS	TOTAL AREA (m^2)	YEAR BUILT
Administration	2	1,772	1973-2009
Arena	2	4,779	1973
Community Centre	13	6,359	1912-2000
Fire Hall	9	3,021	1978-2008
Public Library	1	697	2000
Public Works Yard	3	1,168	1977-1991
Total	**30**	**17,796**	**-**

1.1.2 Fleet

In 2023, there were approximately 98 corporate fleet in operation, with the majority of fleet being heavy duty vehicles or equipment. All corporate fleet are fueled by diesel or gasoline. Table 60 presents an overview of the corporate fleet included in the baseline inventory. See Appendix H for vehicle details.

Table 60: Township of Muskoka Lakes Fleet Profile

DEPARTMENT	FLEET TYPE		# OF FLEET
Building	Vehicle	Light Duty	8
	Vehicle	Medium Duty	1
	Vehicle	Equipment	2
Fire	Vehicle	Light Duty	6
	Vehicle	Medium Duty	4
	Vehicle	Heavy Duty	21
	Equipment	Equipment	7
Public Works	Vehicle	Light Duty	8
	Vehicle	Medium Duty	3
	Vehicle	Heavy Duty	17
	Equipment	Equipment	19
	Equipment	Tractor and Combine	1
	Equipment	Lawn and Garden	1
Total			**98**

1.1.3 Streetlights

From Muskoka Lakes' streetlights asset list, there are approximately 487 streetlights, all installed between 2018 and 2022. The electricity usage of the streetlights in Muskoka Lakes are categorized into eight groups by location. In 2018, the electricity consumption of the streetlights

in Muskoka Lakes was 227,437 kWh. Table 61 presents an overview of the corporate streetlights included in the baseline inventory.

Table 61: Township of Muskoka Lakes Streetlight Profile

STREETLIGHTS ASSET GROUPS	ANNUAL ENERGY CONSUMPTION (kWh)	TYPE OF BULB
8	227,437	Unknown

1.2 BASELINE ENERGY CONSUMPTION

In 2018, the total energy consumption in Muskoka Lakes was 23,863 gigajoules (GJ). Muskoka Lakes used 11,491 GJ of energy (48 % of total energy consumption) of energy across their corporate buildings, 11,373 GJ (48%) across their corporate fleets and 999 GJ (4%) across their corporate streetlights. Figure 45 provides the total energy consumption of the buildings, fleet and streetlights by energy source. The energy consumption inventory for corporate buildings is provided in Appendix H.

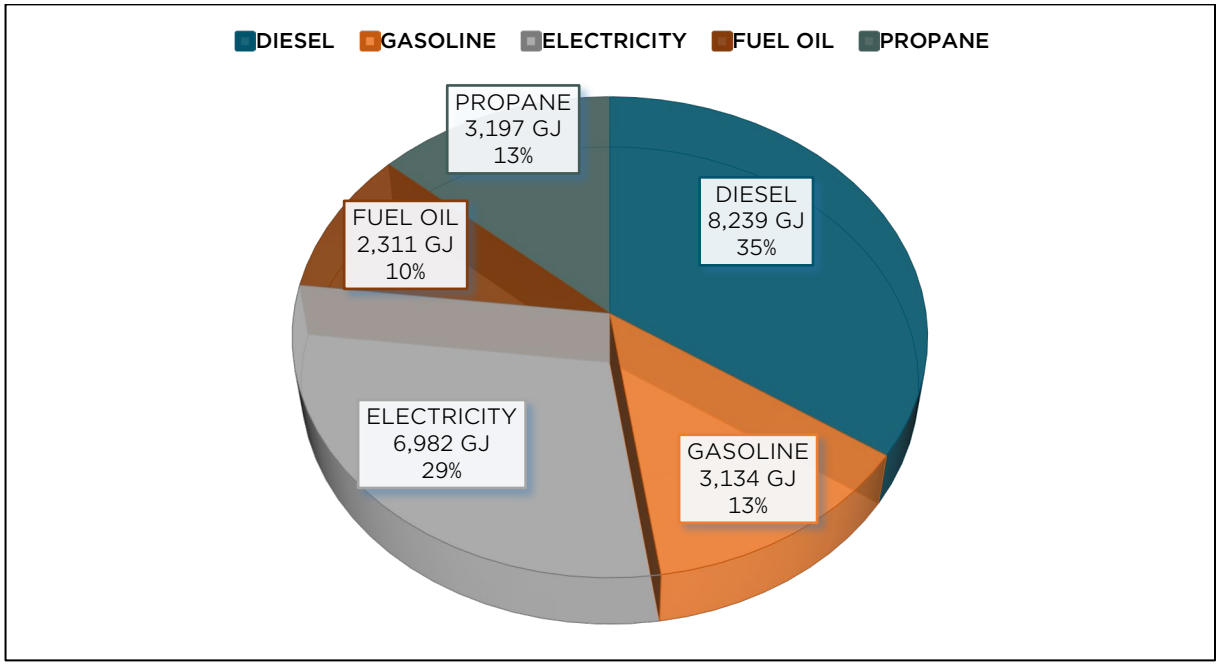

Figure 45: Township of Muskoka Lakes Total Energy Consumption in 2018

1.3 BASELINE GHG EMISSIONS

In 2018, Muskoka Lakes produced 409 tCO_2e of GHG emissions (34%) from their corporate buildings, 789 tCO_2e (65%) from their corporate fleet and 8 tCO_2e (1%) from their corporate

streetlights. Figure 46 provides the baseline GHG emissions emitted in total by the buildings, fleet and streetlights.

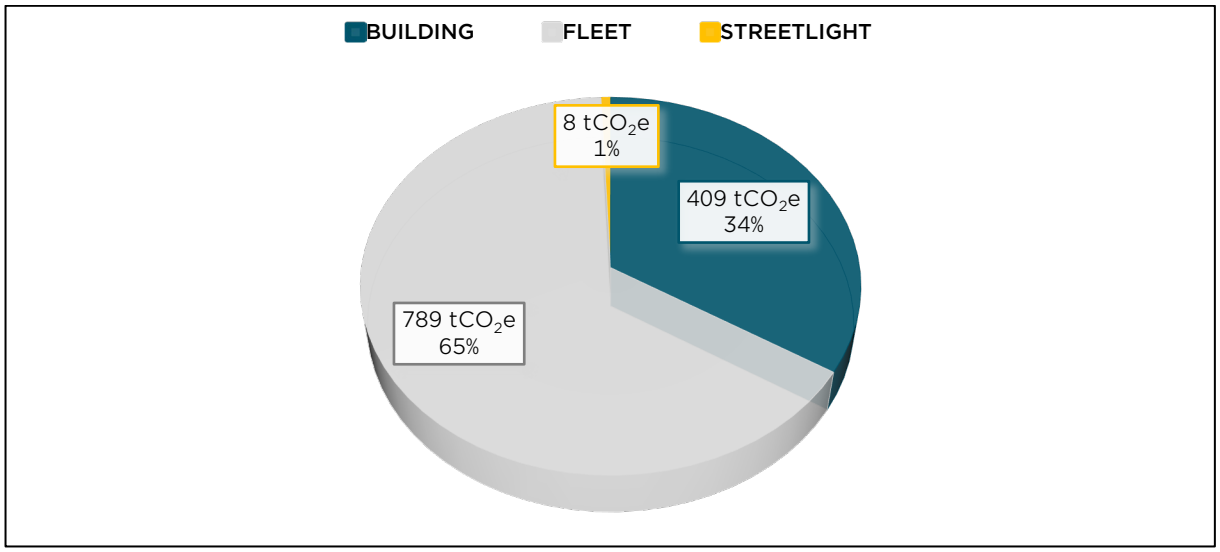

Figure 46. Township of Muskoka Lakes Total GHG Emissions in 2018

Figure 47 presents the GHG emissions produced from the corporate buildings categorized by operation type. The community centre and public works yard are the two major operations producing the highest GHG emissions (59% of total). These facilities also account for 40% of the floor area of the corporate assets and has more energy consuming operations.

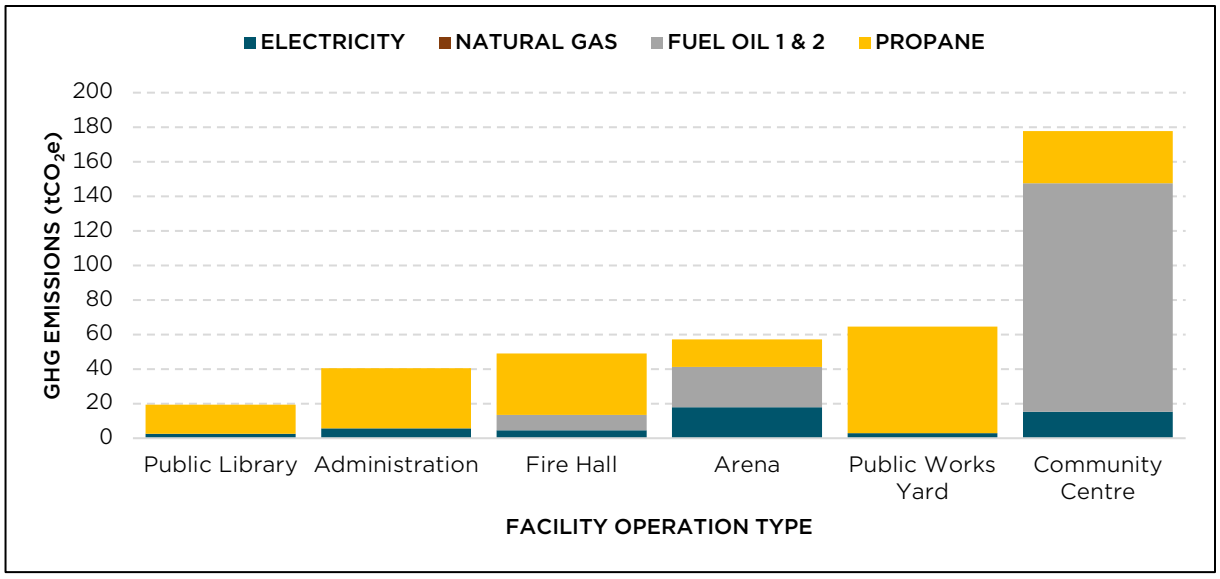

Figure 47. Township of Muskoka Lakes Building GHG Emissions in 2018 by Operations

The GHG emission intensity (Figure 48) shows the facilities GHG emissions per m^2 of the floor area. Facilities will lower GHG emission intensity are either using fuels with lower GHG emissions or are more energy efficient. Ranwood Public Works Yard has the highest GHG emission intensity.

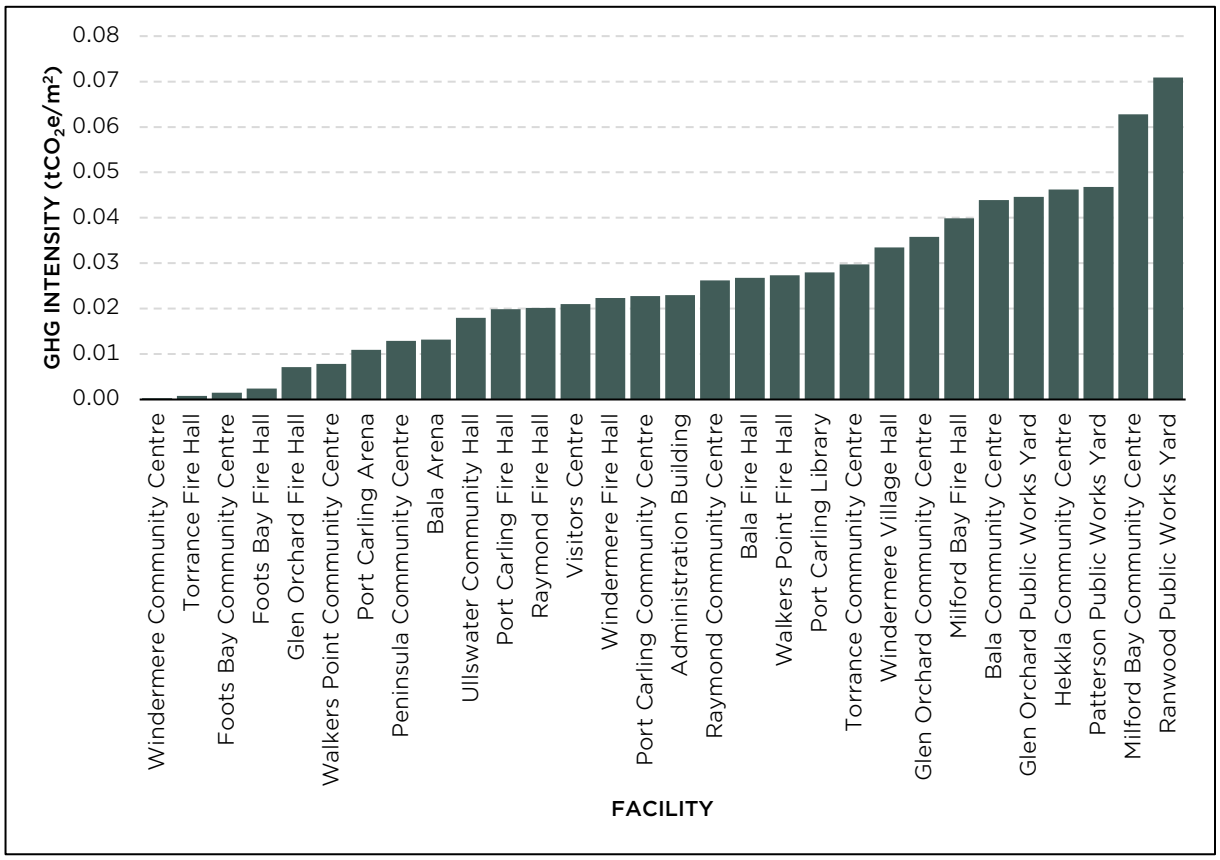

Figure 48. Township of Muskoka Lake GHG Intensity by Facility

Figure 49 presents the GHG emissions produced from the corporate fleet categorized by departments. Public Works department generated the majority of the GHG emissions.

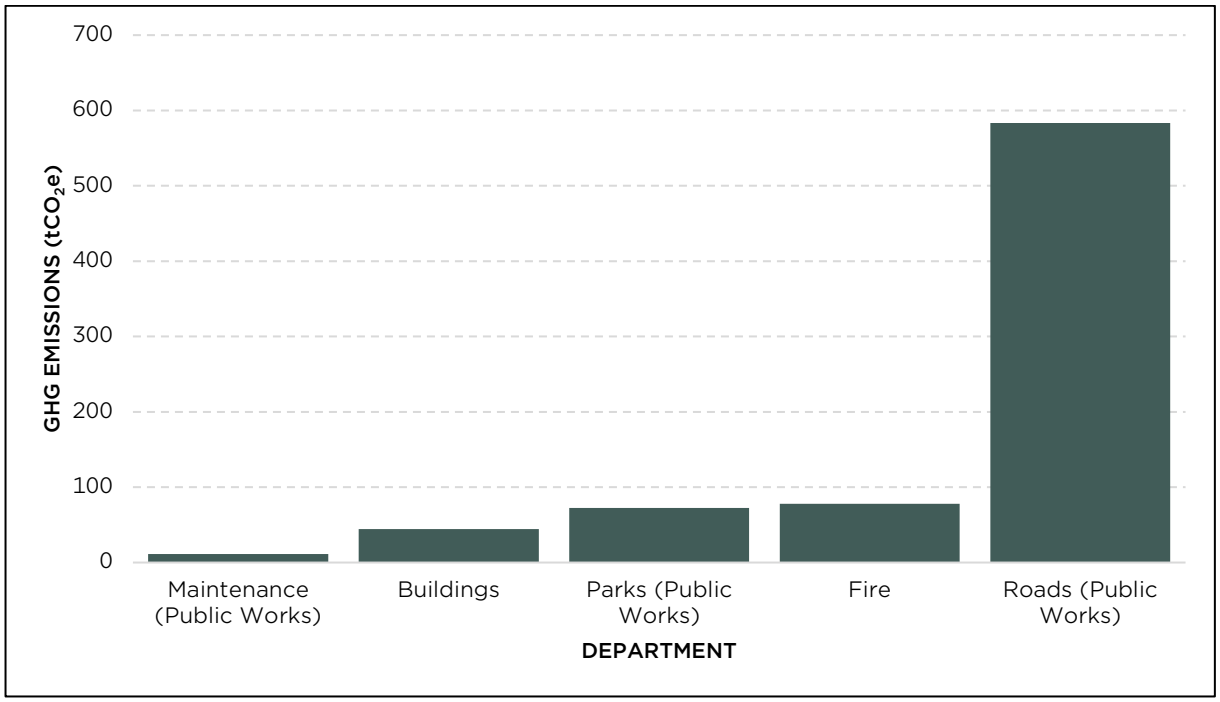

Figure 49. Township of Muskoka Lakes Fleet GHG Emissions in 2018 by Department

Full GHG emissions inventory for corporate assets is provided in Appendix H.

2 Muskoka Lakes GHG Emission Forecasting for BAU by 2050

The GHG emissions for the Town of Muskoka Lakes was projected to the year 2050 based on the GHG emissions from the 2018 baseline year, permanent population and housing projection information from the District of Muskoka Growth Strategy - 2024, and projected climatic data changes from the ECCC.

Based on the Growth Strategy report, the population in Muskoka Lakes is projected to grow from 7,220 in 2018 to 8,898 by 2030, and to 10,519 by 2050, and the permanent housing is projected to increase from 3,154 in 2018 to 4,100 by 2030, and to 5,085 by 2050.

Table 62 summarizes the projected population and housing units based on provided information from the Growth Strategy report to determine the forecasted GHG emissions.

Table 62: Township of Muskoka Lakes Projected Population and Housing Units

COMPONENT	2018	2030		2050	
	Baseline Year Value	Projected Value	Change from Baseline	Projected Value	Change from Baseline
Projected Population	7,220	8,898	21%	10,519	38%
Projected Housing Units	3,154	4,100	27%	5,085	48%

Table 63 summarizes the assumptions made to determine the forecasted GHG emissions.

Table 63: Township of Muskoka Lakes BAU Forecasting

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
Building	Change due to population growth	522	28%	633	55%

COMPONENT	DESCRIPTION	GHG EMISSIONS			
		2030		2050	
		Projected Value (tCO_2e)	Change from Baseline (%)	Projected Value (tCO_2e)	Change from Baseline (%)
	Change due to global warming	390	-5%	357	-13%
	Total	504	23%	581	42%
Fleet	Change due to population growth and new roads	812	3%	833	6%
Streetlight	Change due to population growth, new subdivisions, new roads	9	10%	9	14%

Figure 50 provides the BAU forecasting to the year 2050 along with the estimated fuel costs including cost of carbon.

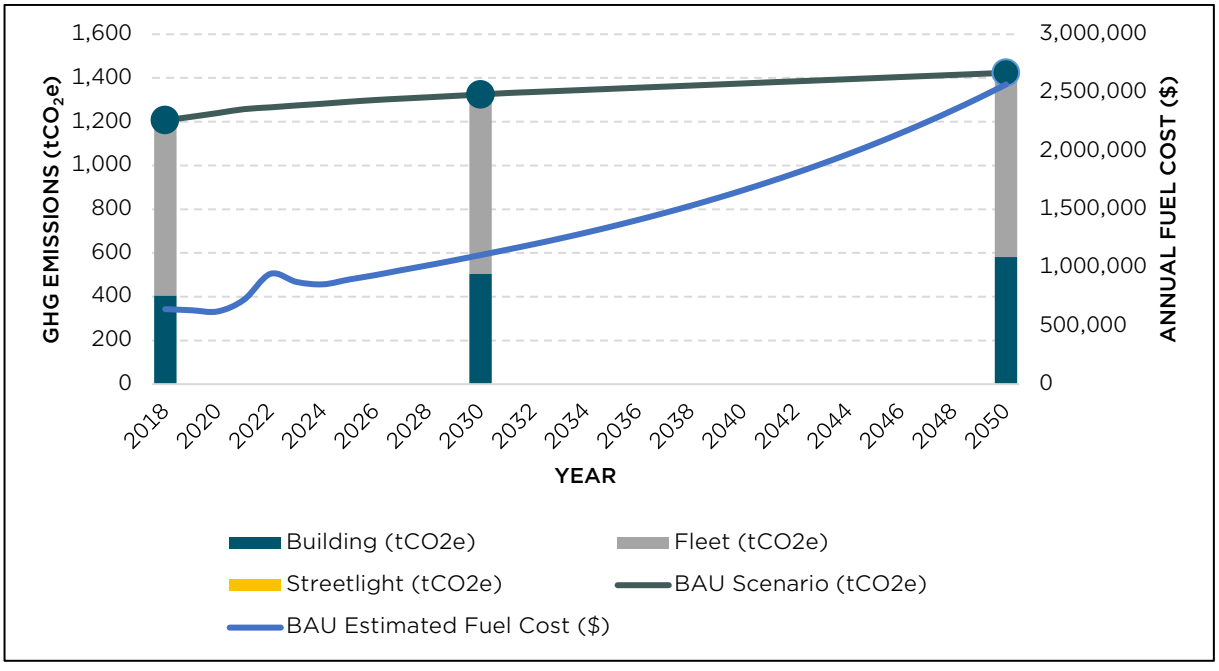

Figure 50. Township of Muskoka Lakes GHG Emissions BAU Forecasting to 2050

Two milestones (2030 and 2050) were shown in the above forecasting figure to reiterate the importance of taking immediate actions to prevent the GHG emission increase and deviation from

the set reduction targets. The above figure indicates that under the BAU scenario by year 2030 Muskoka Lakes' annual GHG emissions will increase 10% above the baseline year 2018. This increase will be 18% or 220 tCO_2e by year 2050.

The increase in the energy costs will be more significant than the GHG emission increase due to rapidly increasing cost of carbon. Under the BAU scenario by year 2030 Muskoka Lakes' annual energy costs (including the carbon costs) will increase 72% above the baseline year 2018. By year 2050, Muskoka Lakes' energy costs will be close to 3 times of the energy costs of the 2018 baseline year. Muskoka Lakes' understands the importance of taking rapid actions. This is shown in their short-term (2030) reduction target and the retrofit plans to meet those targets.

3 Muskoka Lakes GHG Emission Reduction Target

3.1 SHORT TERM (2030 PLAN)

All AMs aim to achieve 30-45% reductions in corporate GHG emissions from 2018 levels by 2030 to meet the federal and provincial ambitious targets. The short-term target for Muskoka Lakes was determined based on the engineering review of the buildings, fleet and streetlight profile and their available potential to decarbonize the assets in a feasible way. Based on this assessment, the short-term target for Muskoka Lakes was determined to be 45% reduction below 2018 levels.

3.2 LONG TERM (2050 PLAN)

Muskoka Lakes aims to reduce corporate GHG emissions to net-zero by 2050 to be in line with the international agreements and, federal and provincial plans.

4 Muskoka Lakes Climate Change Mitigation Plan

The details of the climate change mitigation plan for Muskoka Lakes corporate assets are listed below. Buildings that are decommissioned since 2018 are excluded from the following assessment.

4.1 BUILDINGS

4.1.1 Short Term 2030 Plan

To achieve the short-term 2030 corporate GHG reduction target, Muskoka Lakes plans to implement the following building retrofits before 2030:

1. Replace the Rooftop RTU units with an air source heat pump (ASHP) with backup heating coils at the following buildings:
    - Administration Building
    - Port Carling Arena
    - Port Carling Community Centre
2. Replace the furnace with a split ASHP with backup heating coils at the following buildings:
    - Administration Building
    - Port Carling Arena
    - Milford Bay Community Centre (see text after Table 61)
    - Bala Community Centre
    - Bala Fire Hall (incl. electric heater)
3. Replace the boiler and hydronic heaters with a split ASHP with backup heating coils at the following building:
    - Port Carling Library
4. Replace the tube heaters with a split ASHP with backup heating coils at the following building:
    - Ranwood Public Works Yard
5. Install rooftop solar PV on the above-mentioned buildings.

6. Replace all the internal lighting to the LED lights for the above-mentioned buildings.

The rooftop solar PV for corporate buildings is scheduled to be implemented at the same year that the building mechanical systems are retrofitted.

4.1.2 Long Term 2050 Plan

To achieve the long-term 2050 corporate GHG reduction target, Muskoka Lakes plans to implement the following building retrofits:

7. Replace the Rooftop RTU units with an ASHP with backup heating coils at the following buildings:
    - Port Carling Fire Hall
8. Replace the furnace with a split ASHP with backup heating coils at the following buildings:
    - Port Carling Fire Hall
    - Torrance Community Centre
    - Torrance Fire Hall
    - Patterson Public Works Yard
    - Peninsula Community Centre
    - Milford Bay Fire Hall
    - Windermere Village Hall
    - Hekkla Community Centre
    - Raymond Fire Hall
    - Windermere Fire Hall (incl. tube heaters)
    - Ullswater Community Hall
    - Glen Orchard Community Centre
    - Raymond Community Centre
    - Walkers Point Fire Hall (incl. tube heaters)
9. Replace the electric heat units with a split ASHP with backup heating coils at the following buildings:
    - Foots Bay Fire Hall
    - Foots Bay Community Centre

- Windermere Community Centre
- Glen Orchard Fire Hall
- Glen Orchard Public Works Yard (incl. propane unit heaters)
- Walkers Point Community Centre
- Torrance Community Centre
- Patterson Public Works Yard
- Peninsula Community Centre

10. Replace the boiler units with a split ASHP with backup heating coils at the following buildings:
    - Bala Arena
11. Install rooftop solar PV on the above-mentioned buildings.
12. Replace all the internal lighting to the LED lights for the above-mentioned buildings.
13. GHG Offset: Install additional solar PVs to offset the remaining GHG emissions and achieve net-zero by 2050. The total solar PV capacity needed to offset the GHG emissions for Muskoka Lakes corporate assets is estimated to be 1622 kWp. For this estimation we assumed that any major building additions or new buildings will be net-zero GHG going forward. Therefore, the projected growth will not add to the corporate GHG profile. For Muskoka Lakes the additional solar PV installations or purchase agreements will be phased starting 2040 and will be installed in eleven (11) phases. The phasing plan is shown in Table 63. The additional solar PVs can be installed on corporate assets (ground-mount solar PVs) where possible or investments will be made for the installations in other community areas or alternatively clean electricity purchase agreements will be signed. Muskoka Lakes will review the feasibility of these alternatives before 2040. For the purpose of this assessment and costing we assumed that additional ground-mount solar PVs will be installed in corporate assets.

Information regarding building mechanical systems is not available for the following buildings:

- Visitors Centre

This building generates low GHG emissions, and building retrofits for this building will not significantly affect the corporate GHG emission reductions. As a result, it is excluded from the retrofit plan.

The implementation planning for building retrofits and additional solar PV are listed in the following table. As mentioned earlier, EUI and equipment lifespan was considered when determining the phasing plan for building retrofits.

Table 64: Township of Muskoka Lakes Building Retrofit and Solar PV System Phasing

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted With ASHP and LED	Solar PV Array Rated Size (kW_P)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2025	Milford Bay Community Centre	59	
2026	Administration Building	97	
2027	Bala Community Centre	59	
2027	Bala Fire Hall	36	
2028	Port Carling Arena	274	
2028	Port Carling Community Centre	64	
2029	Port Carling Library	53	
2030	Ranwood Public Works Yard	54	
2031	Torrance Community Centre	35	
2031	Torrance Fire Hall	36	
2032	Patterson Public Works Yard	35	
2033	Foots Bay Fire Hall	31	
2034	Foots Bay Community Centre	16	
2034	Windermere Community Centre	23	
2035	Glen Orchard Public Works Yard	48	

YEAR	IMPLEMENTATION PLAN			
	Proposed Buildings to be Retrofitted With ASHP and LED	Solar PV Array Rated Size (kW_p)		
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions	
2036	Walkers Point Community Centre	63		
2037	Peninsula Community Centre	45		
2038	Milford Bay Fire Hall	31		
2039	Windermere Village Hall	7		
2040	Hekkla Community Centre	7		
2041	Raymond Fire Hall	22		
2042	Glen Orchard Fire Hall	70		
2043	Port Carling Fire Hall	65		
2044	Windermere Fire Hall	30		
2045	Ullswater Community Hall	19		
2046	Glen Orchard Community Centre	19		
2047	Raymond Community Centre	39		
2048	Walkers Point Fire Hall	32		
2049	Bala Arena	230		
2040	Additional Solar 1		✓	150
2041	Additional Solar 2		✓	150
2042	Additional Solar 3		✓	150
2043	Additional Solar 4		✓	150
2044	Additional Solar 5		✓	150

YEAR	IMPLEMENTATION PLAN		
	Proposed Buildings to be Retrofitted With ASHP and LED	Solar PV Array Rated Size (kW_p)	
		Rooftop Solar PV to be Installed on Retrofitted Buildings	Additional Solar PV to be Installed to Offset Remaining GHG Emissions
2045	Additional Solar 6	✓	150
2046	Additional Solar 7	✓	150
2047	Additional Solar 8	✓	150
2048	Additional Solar 9	✓	150
2049	Additional Solar 10	✓	150
2050	Additional Solar 11	✓	122

A feasibility assessment of installing RTU ASHP or split ASHP was completed for all corporate buildings. Additionally, a detailed GHG reduction pathway study was completed for Milford Bay Community Centre. The study proposed four potential energy conservation measures, including air source heat pump, ground source heat pump, high condensing boiler and envelope upgrade. Based on this assessment, the Township has decided to proceed with option 3, replacing the existing space heating source with high condensing boiler. This modification is not reflected in the above table. A more detailed assessment can be completed for this change to further analyze the impact of this decision in Muskoka's plan to reduce GHG.

By implementing the building retrofits and solar PV rooftop retrofits Muskoka Lakes building emissions will be reduced to 197 tCO_2e (52% reduction from 2018 baseline) by 2030 and will be reduced to 49 tCO_2e (88% reduction from 2018 baseline) by 2050. Implementing the additional solar PV offset projects will reduce the corporate GHG emissions to net-zero by 2050. The following figure shows the reductions.

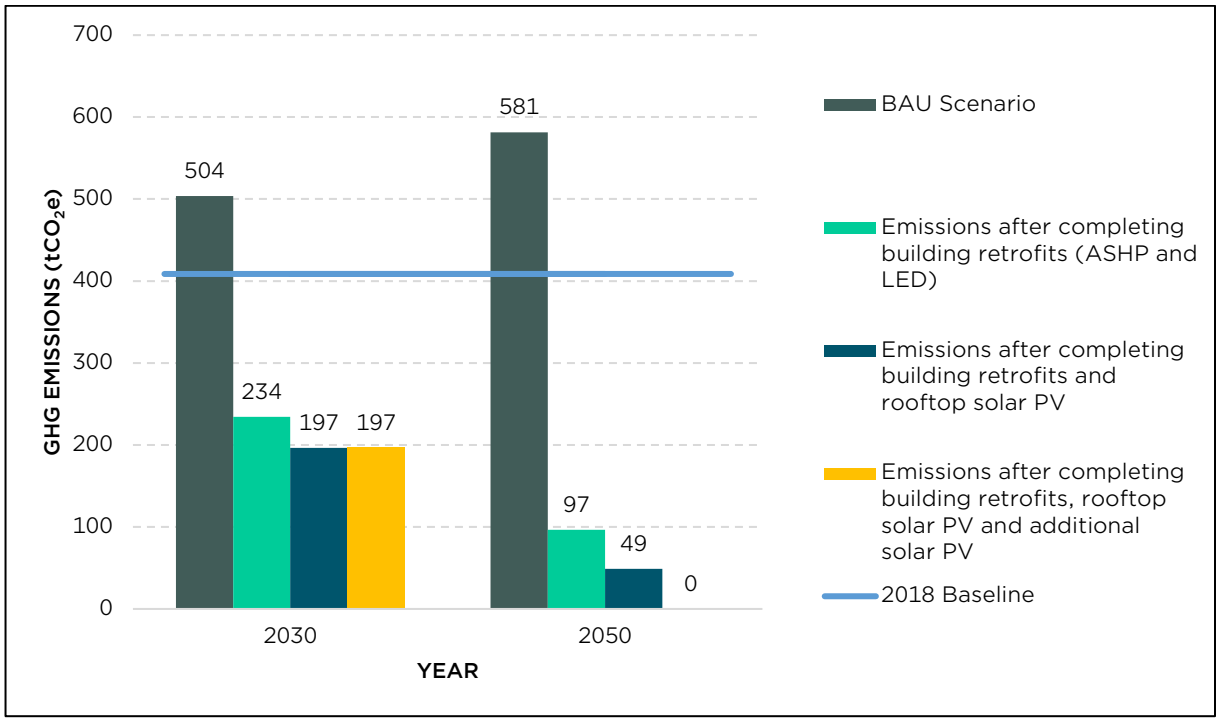

Figure 51. Township of Muskoka Lakes Building GHG Emissions Reduction Comparison

4.2 FLEET

4.2.1 Short Term 2030 Plan

To achieve the short term 2030 corporate GHG reduction target Muskoka Lakes plans to implement the following changes to the fleet:

1. Replace all light and medium duty vehicle with EVs (30 vehicles)
2. Replace 35% of heavy-duty vehicles with EV or ZEV (13 vehicles)
3. Replace 23% of industrial/commercial equipment with EV or ZEV (6 vehicles)
4. Install 25 # EV charging stations in municipal buildings to accommodate the increased EV vehicles

4.2.2 Long Term 2050 Plan

To achieve the long term 2050 corporate GHG reduction target Muskoka Lakes plans to implement the following changes to the fleet:

5. Replace 100% of heavy-duty vehicles with EV or ZEV (25 vehicles)
6. Replace all heavy equipment with EV or ZEV alternatives (24 vehicles)

Muskoka Lakes won't need additional EV or ZEV charging infrastructure beyond 2030 as it is anticipated that sufficient publicly available EV/ZEV charging stations will be developed by 2050. Table 65 below shows the transition plan of EV and ZEV, with Figure 52 shows the trend and compared against BAU case.

Table 65: Township of Muskoka Lakes Fleet EV/ZEV Phasing and GHG Emissions

YEAR	% ELECTRIC FLEET RETROFITS			GHG EMISSIONS (tCO_2e)			
	Light and Medium EV	Heavy Duty EV	Equipment	Light and Medium EV	Heavy Duty EV	Equipment	Total GHG Emission
2030	100%	35%	23%	0	307	124	431
2050	100%	100%	100%	0	0	0	0

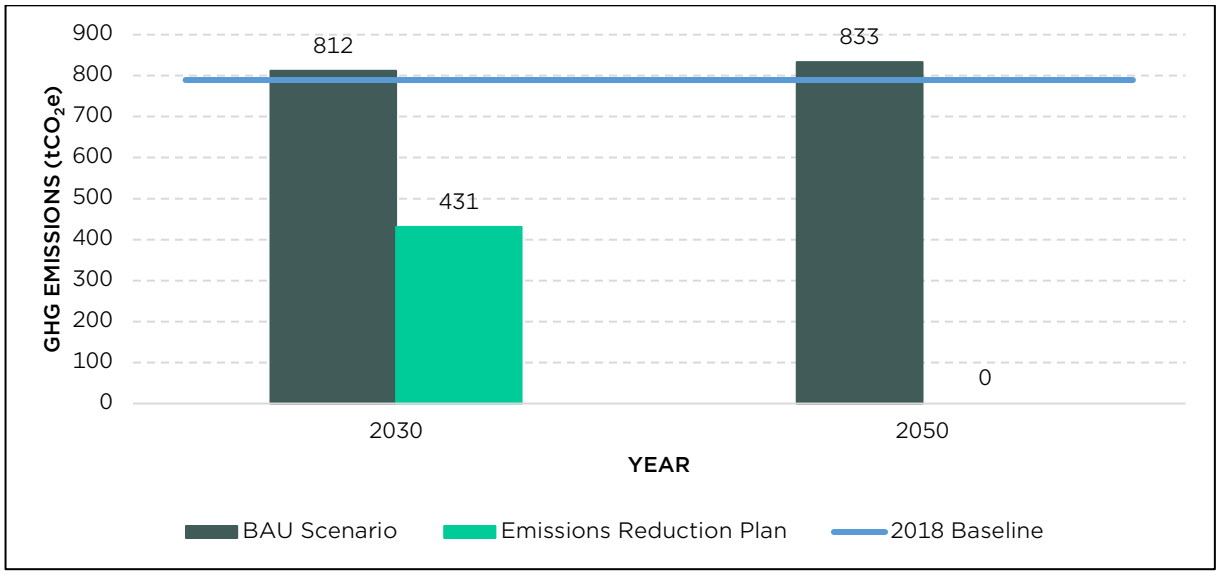

Figure 52. Township of Muskoka Lakes Fleet EV/ZEV GHG Emissions

By implementing the above-mentioned measures Muskoka Lakes fleet emissions will be reduced to 431 tCO_2e (45% reduction from 2018 baseline) by 2030 and will reach net-zero by 2050. Muskoka Lakes will prepare a detailed fleet electrification strategy to identify suitable candidates for EV/ZEV transition based on usage patterns, age and mileage, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs/ZEVs, prioritizing high-emission and urban vehicles first.

4.3 STREETLIGHTS

Muskoka Lakes will convert all non-LED streetlights to LED streetlights when they reach their end of life. An LED conversion plan will be developed based on the life expectancy of the equipment and the available funding opportunities.

4.4 FUTURE ADDITIONS AND NEW BUILDINGS

To achieve the short term and long term targets any future developments and future equipment/fleet purchases should be net-zero, where possible. Muskoka Lakes will develop a net-zero new building policy and net-zero new fleet policy. Additionally, any future streetlight purchases/installations should be LED, where possible. Muskoka Lakes will develop a progressive LED conversion for existing streetlights to support the plan.

5 Muskoka Lakes Cost of Implementation

The details of the cost of implementation for Muskoka Lakes are listed below. The assessment includes installation costs for buildings, fleet, and streetlights, as well as energy and carbon costs for buildings. It also considers potential operating cost savings compared to business as usual (BAU).

5.1 BUILDING CAPITAL COST

Capital costs include the equipment costs for purchasing air source heat pumps (ASHP), adding solar PV panels to the rooftops of existing buildings, and installing additional solar systems needed to achieve net-zero emissions by 2050. Building retrofits involve the installation of ASHPs, while solar retrofits encompass both rooftop solar installations and additional solar systems. Table 66 below listed the estimated capital cost for the planned retrofit activities needed to achieve net zero by 2050.

Table 66: Township of Muskoka Lakes Building Retrofits Capital Cost Estimation

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2025	Milford Bay Community Centre	$93,000	$259,000	$352,000
2026	Administration Building	$147,000	$426,000	$573,000
2027	Bala Community Centre	$45,000	$259,000	$304,000
2027	Bala Fire Hall	$27,000	$158,000	$185,000
2028	Port Carling Arena	$463,000	$1,201,000	$1,664,000
2028	Port Carling Community Centre	$147,000	$281,000	$428,000
2029	Port Carling Library	$126,000	$233,000	$359,000
2030	Ranwood Public Works Yard	$41,000	$237,000	$278,000
2031	Torrance Community Centre	$51,000	$154,000	$205,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2031	Torrance Fire Hall	$65,000	$158,000	$223,000
2032	Patterson Public Works Yard	$28,000	$154,000	$182,000
2033	Foots Bay Fire Hall	$23,000	$136,000	$159,000
2034	Foots Bay Community Centre	$47,000	$71,000	$118,000
2034	Windermere Community Centre	$30,000	$101,000	$131,000
2035	Glen Orchard Public Works Yard	$37,000	$211,000	$248,000
2036	Walkers Point Community Centre	$43,000	$277,000	$320,000
2037	Peninsula Community Centre	$73,000	$198,000	$271,000
2038	Milford Bay Fire Hall	$22,000	$136,000	$158,000
2039	Windermere Village Hall	$11,000	$31,000	$42,000
2040	Hekkla Community Centre	$14,000	$31,000	$45,000
2041	Raymond Fire Hall	$15,000	$97,000	$112,000
2042	Glen Orchard Fire Hall	$18,000	$307,000	$325,000
2043	Port Carling Fire Hall	$102,000	$285,000	$387,000
2044	Windermere Fire Hall	$29,000	$132,000	$161,000
2045	Ullswater Community Hall	$30,000	$84,000	$114,000
2046	Glen Orchard Community Centre	$26,000	$84,000	$110,000
2047	Raymond Community Centre	$43,000	$171,000	$214,000
2048	Walkers Point Fire Hall	$26,000	$141,000	$167,000

YEAR	BUILDING RETROFITS IMPLEMENTATION	BUILDING ASHP/LED LIGHTING RETROFIT COST (2024 DOLLARS)	SOLAR PV RETROFIT COST (2024 DOLLARS)	TOTAL COST (2024 DOLLARS)
2049	Bala Arena	$395,000	$1,009,000	$1,404,000
2040	Additional Solar 1	$-	$559,000	$559,000
2041	Additional Solar 2	$-	$559,000	$559,000
2042	Additional Solar 3	$-	$559,000	$559,000
2043	Additional Solar 4	$-	$559,000	$559,000
2044	Additional Solar 5	$-	$559,000	$559,000
2045	Additional Solar 6	$-	$559,000	$559,000
2046	Additional Solar 7	$-	$559,000	$559,000
2047	Additional Solar 8	$-	$559,000	$559,000
2048	Additional Solar 9	$-	$559,000	$559,000
2049	Additional Solar 10	$-	$559,000	$559,000
2050	Additional Solar 11	$-	$455,000	$455,000
	Total	**$2,217,000**	**$13,067,000**	**$15,284,000**

5.2 OPERATING AND CARBON COSTS

The operating and carbon costs were calculated according to the implementation planning shown in Table 63. The energy use was calculated for buildings that are completing the retrofits. The projected population growth and its impact on the fuel consumption is also included in this analysis. The detailed projected operating cost estimates are included in Table 67 below and is compared to the BAU scenario.

Table 67: Township of Muskoka Lakes Detailed Building Energy Cost Comparison

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2018	$227,000	$227,000	$-
2019	$238,000	$238,000	$-
2020	$275,000	$275,000	$-
2021	$291,000	$291,000	$-
2022	$298,000	$298,000	$-
2023	$309,000	$309,000	$-
2024	$271,000	$271,000	$-
2025	$281,000	$280,000	$1,000
2026	$291,000	$279,000	$12,000
2027	$303,000	$280,000	$23,000
2028	$312,000	$247,000	$65,000
2029	$322,000	$248,000	$74,000
2030	$332,000	$249,000	$83,000
2031	$339,000	$245,000	$94,000
2032	$345,000	$246,000	$99,000
2033	$352,000	$245,000	$107,000
2034	$359,000	$235,000	$124,000
2035	$366,000	$235,000	$131,000
2036	$374,000	$221,000	$153,000

YEAR	TOTAL BUILDING ENERGY AND CARBON COST ($) BAU (2024 DOLLARS)	TOTAL BUILDING ENERGY AND CARBON COST ($) WITH RETROFITS NET ZERO PLAN (2024 DOLLARS)	ENERGY AND CARBON COST DIFFERENCE BETWEEN NET-ZERO AND BAU SCENARIOS (+SAVING) (2024 DOLLARS) NOTE 1
2037	$382,000	$220,000	$162,000
2038	$390,000	$221,000	$169,000
2039	$398,000	$224,000	$174,000
2040	$407,000	$209,000	$198,000
2041	$417,000	$192,000	$225,000
2042	$426,000	$165,000	$261,000
2043	$437,000	$142,000	$295,000
2044	$447,000	$124,000	$323,000
2045	$458,000	$107,000	$351,000
2046	$470,000	$90,000	$380,000
2047	$482,000	$70,000	$412,000
2048	$495,000	$52,000	$443,000
2049	$508,000	$6,000	$502,000
2050	$523,000	($5,000)	$528,000

Note 1: a positive number in a year means potential savings for the Township in that year compared to BAU and a negative number means a potential cost for the Township in that year.

As the buildings are implementing solar retrofits and transitioning to a more energy efficient systems and alternative fuels, operating and fuel costs reduce significantly due to additional electricity production capacity and projected higher cost of electricity compared to other fuels. As the fuel cost, carbon cost and electricity cost increases and as the additional solar PV systems are installed, some revenue generation potential is available for Muskoka Lakes.

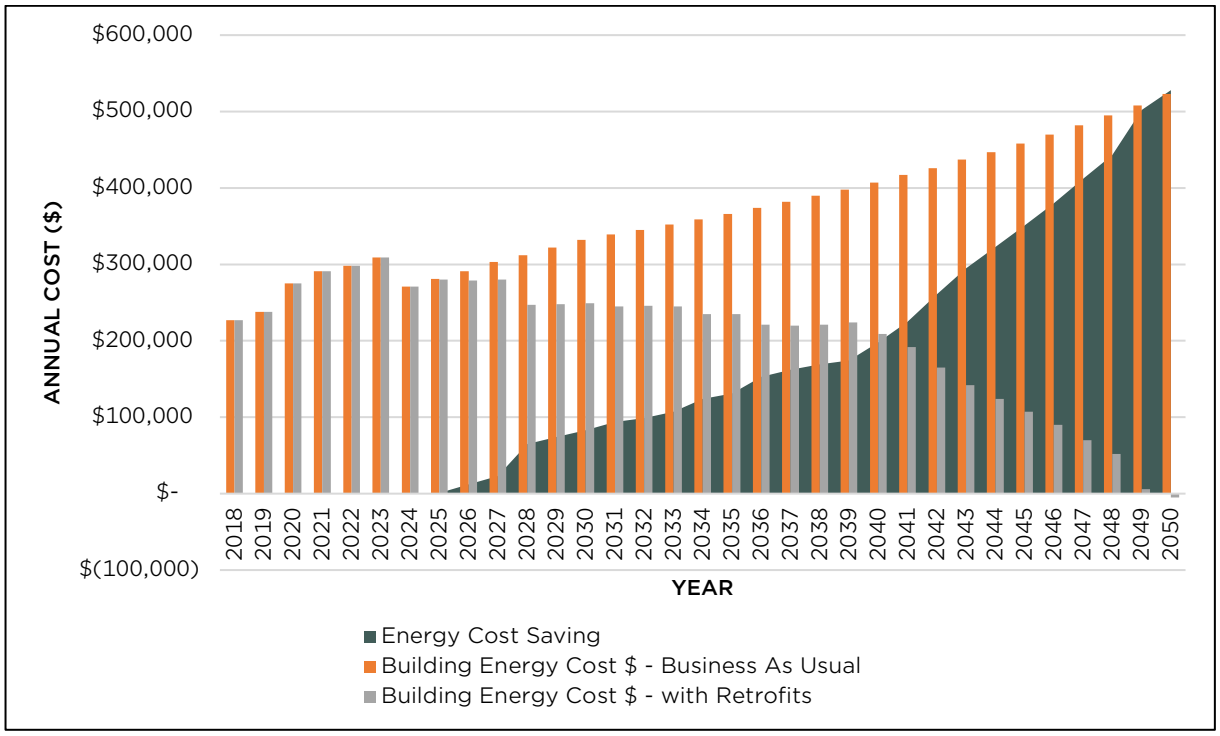

Figure 53. Township of Muskoka Lakes Building Retrofit Cost Saving

Figure 53 above shows projected financial impact of energy cost savings over time, spanning from 2018 to 2050. The dark green area represents the energy cost saving achieved each year, which start to increase gradually and become significant over time. The grey line shows the building energy costs with retrofits, with the installation of air source heat pumps (ASHP) and solar systems. The graph effectively highlights the financial benefits of implementing retrofitting measures to achieve net-zero emissions by 2050.

5.3 FLEET EV TRANSITION COST

The estimated capital cost to electrify Muskoka Lakes fleet and transition to EV/ZEV vehicles is displayed in Table 68 below. The cost estimate is broken into two milestones, 2030 and 2050 to determine the required investment needed for Muskoka Lakes to reach the GHG reduction targets identified in this plan. Muskoka Lakes will conduct a detailed assessment to identify suitable candidates for electrification based on usage patterns, mileage/vehicle age, and vehicle type and will develop a phased roadmap for transitioning the fleet to EVs. The vehicles will ideally be replaced with EV/ZEV alternatives once they are close to their end of life.

Table 68: Township of Muskoka Lakes Estimated Capital Cost of Fleet Electrification

VEHICLE TYPES	NO. OF VEHICLES			ESTIMATED CAPITAL COST OF FLEET ELECTRIFICATION (2024 DOLLARS)		
	2018 Baseline	2030 Retrofits	2050 Retrofits	Per Vehicle	2030 Retrofits	2050 Retrofits
Heavy Duty Vehicle	38	13	25	$400,000	$5,320,000	$9,880,000
Medium Duty Vehicle	8	8	0	$130,000	$1,038,000	$-
Light Duty Vehicle	18	18	0	$105,000	$1,881,000	$-
Industrial/ Commercial Equipment	28	6	22	$146,000	$875,000	$3,207,000
Tractors and Combine	1	0	1	$140,000	$-	$140,000
Lawn and Garden Equipment	1	0	1	$146,000	$-	$146,000
Passenger Car	4	4	0	$105,000	$418,000	$-
Total	**98**	**49**	**49**	**$-**	**$9,114,000**	**$13,227,000**

The cost estimate of level II EV charging stations needed to support the Muskoka Lakes EV fleet retrofits were also included in the fleet cost assessments for the year 2030 target. It is estimated that Muskoka Lakes will need to install 25 charging stations in their corporate buildings to support the fleet electrification plan. However, further investment in charging infrastructure may not be necessary, as it is expected that broad public charging infrastructure will be available. Table 69 displays the estimated cost for EV charging stations.

Table 69: Township of Muskoka Lakes Estimated Capital Cost for EV Charging Stations

NO. OF BUILDINGS	NO. OF EV FLEET		NO. OF LEVEL 2 CHARGING INFRASTRUCTURE		CAPITAL COST (2024 DOLLARS)	
	2030	2050	2030	2050	2030	2050
30	49	98	25	0	$89,000	$-

5.4 LED CONVERSION COST

Based on the review of the cost of LED conversion projects completed by municipalities such as the Town of Huntsville (in 2015) and the City of Barrie (in 2015), the material and labour costs to convert existing streetlights to LED ranges from approximately $700 to $1,200 per streetlight, depending on the wattage.

As presented in Table 70, the estimated capital cost to replace all remaining non-LED streetlights (approximately 20 streetlights) to LED ranges from $14,000 (assuming lower wattage bulbs) to $24,000 (assuming high wattage bulbs).

Table 70: Township of Muskoka Lakes Estimated Capital Cost of LED Streetlights

NO. OF STREETLIGHTS	CAPITAL COST (2024 DOLLARS)	
	Low Estimate	High Estimate
20	$14,000	$24,000

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Appendix A: Municipal Plans and Information Sources

APPENDIX A – MUNICIPAL PLANS AND INFORMATION SOURCES

The following reports, in conjunction with Excel spreadsheets and/or PDF and Word files containing energy consumption and equipment information for buildings, fleets and streetlights were used in the preparation of this report:

The District Municipality of Muskoka

Reports

- District of Muskoka Growth Strategy, Phase 1 – Growth Projections and Area Municipal Allocations report, Watson & Associates, February 1, 2024.
- Muskoka Community Energy and Emissions Reduction Plan, LURA Consulting and ICLEI Canada, February 28, 2024.
- Regional Climate Change Adaptation Plan (ReCAP), District Municipality of Muskoka, 2023.

Town of Bracebridge

Reports

- Asset Management Plan, Town of Bracebridge, 2022.
- Building Condition Assessment for Bird Mill Mews Building, Nadine International Inc., December 8, 2015.
- Building Condition Assessment for Chapel Gallery, Tulloch, November 2021.
- Building Condition Assessment for Sportsplex, Stephenson Engineering, December 10, 2018.
- Building Condition Assessment for Woodchester Villa, Stephenson Engineering, December 20, 2018.
- Building Condition Report and Recommendations for Oakley Village Centre, Osburn Associates Architects Inc., September 30, 2014.
- Energy Conservation and Demand Management Plan, Town of Bracebridge, November 29, 2019.
- Official Plan, Town of Bracebridge, October 21, 2013.
- Operation and Maintenance Manual for Bird Mill Mews Renovation, Les Bertram & Sons, 2019.
- Property Condition Assessment Report for Municipal Office, Stantec Consulting Ltd., March 16, 2018.
- Recreation, Parks, and Trails Master Plan – Accessibility and Building Condition Overview, WGD Architects Inc., June 2017.

Spreadsheets

- 2018 Equipment List.
- Bracebridge Facility Asset List.
- Facility Energy Usage 2018 Workbook.
- Vehicle and Equipment Asset List

Drawings

- Mechanical As-Built Drawings for Sportsplex, Stantec, 2005.
- Original Construction Drawings for Bird Mill Mews, Three Phase Engineering, March 1993.
- Renovation Drawings for Municipal Offices, TSH Engineers, June 20, 2003.

Town of Gravenhurst

Reports

- Building & Property Assessment for Gravenhurst Centennial Centre, CCI Group, September 25, 2015.
- Building & Property Assessment for Gravenhurst Library, CCI Group, September 25, 2015.
- Building & Property Assessment for Gravenhurst Opera House, CCI Group, October 7, 2015
- Building Condition Assessment for Gravenhurst Fire Department, Remy Consulting Engineers Ltd., November 25, 2013.
- Building Condition Assessment for Senior's Centre, CCI Group, August 15, 2014.
- Condition Analysis Report for Centennial Centre, IRC Building Sciences Group Inc., November 18, 2014.
- Gravenhurst Public Works Operation Centre, The Mitchel Partnership Inc., May 15, 2013.
- Hazardous Building Materials Assessment Lion's Pavilion, Pinchin Environmental, January 9, 2012.
- Hazardous Building Materials Assessment Mickle Mortuary Chapel, Pinchin Environmental, January 4, 2012.
- Hazardous Building Materials Assessment Muskoka Wharf Field House, Pinchin Environmental, January 4, 2012.
- Official Plan, Town of Gravenhurst, 2016.
- Opera House HVAC Upgrade, Town of Gravenhurst, April 14, 2015.

Spreadsheets

- 2018 BPS Submission 2 with Propane.

- 2018 Equipment List.
- 2018 (Streetlight Hydro Information).
- COPE 2022 Schedule – Property – Gravenhurst.
- Equipment Fuel Mileage Comparison
- Fleet Equipment and Vehicle Capital Purchases 2014 – 2024.
- Green House Gas 2024.
- Rebate List.
- Town Facilities 2023.

Drawings

- Addition and Renovation for Seniors Club, Duncan Ross Architect, December 18, 2001.
- As-Built Drawings for Municipal Offices, Evans Bertrand Hill Wheeler Architecture, March 26, 2010.
- Gravenhurst Arena, Amersco Consulting, May 23, 2015.
- Heritage Centre, Town of Gravenhurst, September 8, 2003.
- Structural, Mechanical and Electrical Drawings for Health Unit, Smith Architect Inc., 2002.

Other PDF Files

- Equipment Inventory 2024 – Benchmark.
- Facility Asset List 2018.
- Facility Asset List 2023.
- Gravenhurst Arena – YMCA.
- Gravenhurst FD Audit All-in 13-Aug-18.
- Gravenhurst Opera House Audit 4-Feb-19.
- Gravenhurst Town Hall – Main – Count.
- Muskoka Discovery Ctr. (Grace & Speed) Count.
- Town of Gravenhurst James Street Streetlight Upgrades.
- Town of Gravenhurst Light Upgrade (Investment Grade Audit February 2015).

Town of Huntsville

Reports

- Active Transportation and Public Transit Committee Implementation Plan Staff Report, Town of Huntsville, February 12, 2024.
- Building Condition Assessment for 169 Madill Church Road, Tulloch, May 2022.
- Asset Management Plan, PSD Research Consulting Software, July 27, 2020.
- Capital Asset Management Plan – Budget Deviation – Dectron (Humidity Control and Air Handling) Canada Summit Centre Pool Staff Report, Town of Huntsville, May 9, 2016.
- Capital Plan Update Staff Report, Town of Huntsville, October 24, 2017.
- Climate Emergency Declaration and Action Staff Report, Town of Huntsville, June 28, 2021.
- Community Services Master Plan and Waterfront Strategy Committee Implementation Plan Staff Report, Town of Huntsville, February 15, 2024.
- Environment and Climate Change Committee Implementation Plan Staff Report, Town of Huntsville, February 13, 2024.
- LED Lighting Retrofit Staff Report, Town of Huntsville, May 30, 2018.
- Official Plan, Town of Huntsville, March 2019.
- Sustainability Report, Town of Huntsville, 2015.
- Space Assessment and Recommendations for Huntsville Public Library, Mitchell Jensen Architects, January 2019.
- Town Draft 2022 Consolidated Budget Staff Report, Town of Huntsville, December 15, 2021.
- Town Hall Working Group – Final Recommendations Staff Report, Town of Huntsville, March 1, 2022,
- Unity Plan: Huntsville's Guide to a Sustainable Future, Town of Huntsville and Lura Consulting, September 3, 2010.
- Update to Report WG-2022-1, Town Hall Energy Assessment Report and Accessibility Update, Town of Huntsville, April 26, 2023.
- Updated Energy Conservation and Demand Management (CDM) Plan Staff Report, Town of Huntsville, June 24, 2019.

Spreadsheets

- 2018 Fleet Mileage.
- 2018 – 2019 Huntsville Energy Use and Greenhouse Gas Emissions for the Broader Public Sector.

- 2023 Nov Fuel Usage.
- Building Listing (Citywide Export)
- Fleet Listing (Citywide Export).
- Streetlight Information (Citywide Export).

Drawings

- Summit Centre Works, Pinestone Engineering, 2009.

Other PDF Files

- Building Permit – Seniors' Facility, June 4, 2010.
- Form of Agreement – LED Streetlight Conversion, June 29, 2015.
- Transaction Detail (Cardlock), 2018.

Township of Georgian Bay

Reports

- Asset Management Plan, PSD Citywide, 2020,
- Climate Action Roadmap for Administration Building, Efficiency Engineering, January 2024.
- Climate Action Roadmap for Baxter Ward Community Centre, Efficiency Engineering, January 2024.
- Climate Action Roadmap for Bressette Homestead, Efficiency Engineering, March 2024.
- Climate Action Roadmap for Community Services Building, Efficiency Engineering, February 2024.
- Climate Action Roadmap for Honey Harbour Fire Station 2, Efficiency Engineering, February 2024.
- Climate Action Roadmap for Old Honey Harbour School, Efficiency Engineering, January 2024.
- Climate Action Roadmap for MacTier Fire Station 2, Efficiency Engineering, February 2024.
- Climate Action Roadmap for MacTier Public Library, Efficiency Engineering, March 2024.
- Climate Action Roadmap for MacTier Public Works, Efficiency Engineering, March 2024.
- Climate Action Roadmap for MacTier Memorial Arena, Efficiency Engineering, February 2024.
- Climate Action Roadmap for Fire Station 3, Efficiency Engineering, February 2024.
- Climate Action Roadmap for Park Facility & Splash Pad, Efficiency Engineering, November 2022.
- Georgian Bay's Climate Change Action Plan, Sustainable Severn Sound and the Sustainability Committee, 2019.
- Official Plan, Township of Georgian Bay, March 2, 2021.

Spreadsheets

- 2018 Energy Consumption and Greenhouse Gas Emissions.
- 2018 Fleet Diesel Usage Citywide Export.
- 2018 Fleet Gas Usage Citywide Export.
- Georgian Bay Facility BPS Data 2011 to 2020.
- Georgian Bay M1 Corporate Inventory Submission.

Township of Lake of Bays

Reports

- Asset Management Plan, R. J. Burnside, December 4, 2023.
- Climate Change – Lake of Bays Proposed Approach Staff Report, Township of Lake of Bays, July 6, 2021.
- Energy Management Plan, Township of Lake of Bays, April 2019.
- Official Plan, Township of Lake of Bays, January 12, 2016.

Spreadsheets

- LAS EPT Annual Consumption Report 2018.
- Energy Consumption and Greenhouse Gas Emissions Reporting for 2018.
- Lake of Bays 2023 AMP Assets and Strategy.

Drawings

- Building Permit to Construct Addition to Municipal Office with Septic, Duncan Ross Architect, December 8, 2017.
- Building Permit to Construct Public Works Garage 1 and Administration Office, S. Burnett & Associates Limited, May 13, 2016.
- Building Permit No. 2019-022 – Building Plans for Industrial Building, Kieffer Engineering, January 21, 2019.

Other PDF Files

- Updated List of Retrofits in the Township.

Township of Muskoka Lakes

Reports

- Asset Management Plan, Muskoka Lakes Public Works Department, 2022.

- Official Plan, Township of Muskoka Lakes, November 2, 2023.
- Township of Muskoka Lakes Strategic Plan, Township of Muskoka Lakes, December 2020.

Spreadsheets

- 2018 Fuel Transactions.
- Fleet – Consolidated.
- Building Equipment Information:
  - Admin Buildings 2023 Pam Edits.
  - Arenas 2023 Pam Edits.
  - Community Centres 2023 Pam Edits.
  - Fire Halls 2023 Pam Edits.
  - Parks Buildings 2023 Pam Edits.
  - Public Works Buildings 2023 Pam Edits.
- Streetlights.
- Township Equipment List.
- Township of Muskoka Lakes Energy Reporting 2018.

Other PDF or Word Files

- 2018 Fuel Usage (contains odometer reading and fuel type and amount of fuel used in 2018).
- Facility Portfolio (contains general building information).
- Streetlight Hydro Bills:
  - Bala St. Lts - 200126418047.
  - Milford Bay Dock Lts – 200084161817.
  - Milford Bay St Lts – 200107366035.
  - Port Carling St. Lts – 200104024888.
  - Port Carling St. Lts – 200116847985.
  - Torrance St. Lts – 200099823273.
  - Watt Dock Lts (Skeleton Bay) – 200117692188.
  - Windermere St. Lts – 200040032574.

Appendix B: Funding Opportunities

Appendix B - Funding Opportunities

ORGANIZATION	NAME OF FUNDING		LINK TO OFFICIAL WEBSITE
A Program of Federation of Canadian Municipalities (FCM)	Green Municipal Fund	Capital Project - Net-Zero Transformation	https://greenmunicipalfund.ca/funding/capital-project-net-zero-transformation
		Capital Project - Construction of New Sustainable Municipal and Community Buildings	https://greenmunicipalfund.ca/funding/capital-project-construction-new-sustainable-municipal-community-buildings
		Study - Municipal Fleet Electrification	https://greenmunicipalfund.ca/funding/study-municipal-fleet-electrification
		Capital Project - Municipal Fleet Electrification	https://greenmunicipalfund.ca/funding/capital-project-municipal-fleet-electrification
		Study - GHG Reduction Pathway Feasibility	https://greenmunicipalfund.ca/funding/study-ghg-reduction-pathway-feasibility
		Capital Project - GHG Reduction Pathway Retrofit	https://greenmunicipalfund.ca/funding/capital-project-ghg-reduction-pathway-retrofit
		Study - Retrofit Pathway for Municipal Buildings	https://greenmunicipalfund.ca/funding/study-retrofit-pathway-municipal-buildings
		Study - New Construction of Municipal and Community Buildings	https://greenmunicipalfund.ca/funding/study-new-construction-municipal-and-community-buildings
		Capital Project - Retrofit of Existing Municipal Buildings	https://greenmunicipalfund.ca/funding/capital-project-retrofit-existing-municipal-buildings
		Capital Project: GHG Impact Retrofit	https://greenmunicipalfund.ca/funding/capital-project-ghg-impact-retrofit
Enbridge		Fixed Incentive Program	https://www.enbridgegas.com/ontario/business-industrial/incentives-conservation/programs-and-incentives/equipment-upgrades/fixed-incentive-program
Save on Energy		Retrofit Program	https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Retrofit-Program
		Energy Performance Program	https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Energy-Performance-Program
		Instant Discounts Program	https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Instant-Discounts-Program
Ministry of Tourism, Culture and Gaming and Ministry of Sport		Community Sport and Recreation Infrastructure Fund	https://www.ontario.ca/document/community-sport-and-recreation-infrastructure-fund
Natural Resources Canada	Green Construction through Wood (GCWood) Program - Applications are now closed as of June 20, 2024, however, additional funding projects may be made available by Natural Resources Canada in the future.		https://natural-resources.canada.ca/science-and-data/funding-partnerships/opportunities/forest-sector/green-construction-through-wood-gcwood-program/20046
Environment and Natural Resources	No funding opportunities are accepting new applications. Active funding opportunities will be posted on the official website.		https://www.canada.ca/en/environment-climate-change/services/environmental-funding.html

Appendix C: Town of Bracebridge Energy and GHG Data

Appendix C - Town of Bracebridge
Building Data

Year: **2018**

BUILDING INFORMATION					FUEL AND ENERGY CONSUMPTION				ENERGY RELATED GHG EMISSIONS (t CO_2e)				TOTAL GHG EMISSIONS				EXISTING MECHANICAL				
Facility Name	Operation Type	Total Floor Area (m^2)	Year Built	In Service in 2024? (Y / N)	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil 1 & 2 (L)	Propane (L)	Electricity GHG Emissions	Natural Gas GHG Emissions	Fuel Oil 1 & 2 GHG Emissions	Propane GHG Emissions	Total GHG Emissions (tCO_2e)	GHG Intensity (tCO_2e /m^2)	Energy Intensity (ekWh/m^2)	Energy Intensity (GJ/m^2)	Existing Heating Source	Existing Heating Source Efficiency	Heating Source Installed Year	Energy Use Index (EUI) (ekBTU/ft^2)	Energy Star Typical EUI (ekBTU/ft^2)
Bracebridge Municipal Office	Administration	1,475	1987	Y	343,458.92	24,542.00			10.15	47.40	0.00	0.00	57.55	0.0390	409.78	1.48	RTU	80%	2006	128.0	52.9 (Office)
Birds Mill Mews	Administration and Restaurant	505	1918	Y	120,937.65	4,728.42			3.57	9.13	0.00	0.00	12.71	0.0251	338.73	1.22	Gas Furnaces	85%	1994	106.3	56.1 (Social/Meeting Hall)
Bracebridge Arena - Ice Rink (Note 1)	Arena	3,116	1949	N	627,109.95	66,781.06			18.53	128.97	0.00	0.00	147.50	0.0473	429.08	1.54	N/A	N/A	N/A	133.64	-
Chapel Gallery/Woodchester Villa	Community Centre	205	1882	Y	33,810.01	4,224.33			1.00	8.16	0.00	0.00	9.16	0.0447	384.38	1.38	Gas Furnaces	95%	2017	119.6	56.1 (Social/Meeting Hall)
Oakley Village Square	Community Centre	300	1959	Y	7,214.72			5,239.20	0.21	0.00	0.00	8.09	8.30	0.0276	146.66	0.53	Propane Furnaces	95%	N/A	43.4	56.1 (Social/Meeting Hall)
Bracebridge Fire Station 1	Fire Hall	492	2018	Y	16,471.96	16,305.99			0.49	31.49	0.00	0.00	31.98	0.0649	385.41	1.39	RTU	80%	2017	118.5	63.5 (Fire Station)
Bracebridge Fire Station 2 (Note 2)	Fire Hall	164	1982	Y	15,098.17			2,027.80	0.45	0.00	0.00	3.13	3.58	0.0219	179.53	0.65	N/A	N/A	N/A	54.7	63.5 (Fire Station)
Bracebridge Library (Note 1)	Public Library	833	1908	Y	105,188.86	10,438.79			3.11	20.16	0.00	0.00	23.27	0.0279	259.41	0.93	N/A	N/A	N/A	80.8	-
Bracebridge Arena - Auditorium (Note 1)	Recreation Centre	199	1949	N	40,028.29	4,262.62			1.18	8.23	0.00	0.00	9.42	0.0472	428.00	1.54	N/A	N/A	N/A	133.3	-
Bracebridge Sportsplex (includes Swimming Pool, Gymnasium and Auditorium)	Recreation Centre	6,410	2006	Y	1,762,323.42	118,339.14			52.07	228.55	0.00	0.00	280.62	0.0438	471.12	1.70	Boiler	90%	2022	147.3	50.8 (Ice/Curling Rink)
Kerr Park Chalet	Recreation Centre	184	1957	Y	6,691.72	182.64			0.20	0.35	0.00	0.00	0.55	0.0030	47.03	0.17	Electric baseboards	100%	2018	14.8	56.1 (Social/Meeting Hall)
Bracebridge Public Works Garage	Storage Facility	790	1987	Y in 2021	184,939.42	13,214.92			5.46	25.52	0.00	0.00	30.99	0.0392	412.05	1.48	Gas Tube Heaters	80%	2009	128.8	47.9 (Repair Services)

Note:
1. The Bracebridge Arena (Memorial Arena) and Library has been replaced by the Muskoka Lumber Community Centre (2024). The new communicty centre features a multi-sport field house, which includes a double-sized gymnasium with a track. The existing arena has been demolished and the library will change use to administration.
2. To be closed and to be relocated to Uffington, announced in 2022

Appendix C - Town of Bracebridge
Fleet Data

Year: **2018**

FLEET GENERAL								OPERATIONS			ANNUAL TOTAL GHG EMISSIONS ($t CO_2e$)
Segment (Vehicle or Equipment)	Type	Department	Unit Number	Description	Make	Model	Year	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	
Vehicle	Light Duty Vehicle	Public Works - Licensed	15-19	1/2 Ton	Chevrolet	Silverado	2015	18,727	Gas	3,541	8.2
Vehicle	Light Duty Vehicle	Public Works - Licensed	16-21	1/2 Ton	Chevrolet	Silverado	2016	48,858	Gas	4,847	11.3
Vehicle	Light Duty Vehicle	Public Works - Licensed	15-22	1/2 Ton	Chevrolet	Silverado	2015	44,056	Gas	3,906	9.1
Vehicle	Light Duty Vehicle	Public Works - Licensed	11-20	1/2 Ton	Chevrolet	1500	2011	13,246	Gas	2,959	6.9
Vehicle	Light Duty Vehicle	Public Works - Licensed	15-23	1/2 Ton	Chevrolet	Silverado	2015	30,844	Gas	5,113	11.9
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	75-24	1 Ton Dump	Ford	F350	2000	11,996	Gas	2,273	5.6
Vehicle	Medium Duty Vehicle	Public Works - Licensed	13-25	1/2 Ton	GMC	Sierra	2013	27,982	Gas	2,736	6.4
Vehicle	Light Duty Vehicle	Public Works - Licensed	13-25	1/2/ Ton	Chevrolet	Silverado	2013	27,982	Gas	2,736	6.4
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	18-27	T/A Dump/Sander/Plo	Western Star	4711	2018	5,906	Diesel	1,052	2.9
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	18-28	S/A Dump/Sander/Plo	Dodge Ram	5500	2018	10,513	Diesel	3,337	9.1
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	99-29	S/A Dump	Freightliner	5500	2008	7,195	Diesel	2,038	5.5
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	79-31	S/A Dump/Sander/Plo	Western Star	4900 FA	2010	6,353	Diesel	6,006	16.2
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	11-32	T/A Dump/Sander/Plo	Western Star	4900 FA	2012	15,200	Diesel	11,673	31.6
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	75-33	T/A Dump/Sander/Plo	Western Star	4700	2008	11,023	Diesel	8,104	21.9
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	77-34	T/A Dump/Sander/Plo	Western Star	4900 FA	2010	21,222	Diesel	1,397	3.9
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	78-35	T/A Dump/Sander/Plo	Western Star	4900FA	2011	19,847	Diesel	13,286	36.0
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	76-36	S/A Dump/Sander/Plo	Western Star	4700	2019	6,429	Diesel	4,702	12.7
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	10-38	T/A Dump/Sander/Plo	Western Star	4900 SA	2011	11,930	Diesel	9,586	25.9
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	12-39	T/A Dump/Sander/Plo	Western Star	4700 SF	2013	34,777	Diesel	12,701	34.5
Vehicle	Heavy Duty Vehicle	Public Works - Licensed	79-37	T/A Dump/Sander/Plo	Western Star	4900	2009	17,828	Diesel	2,761	7.6
Vehicle	-	Public Works - Licensed	93-72	Float Trailer (20 Ton)	TJ	200	1994	-	-	-	-

FLEET GENERAL								OPERATIONS			ANNUAL TOTAL GHG EMISSIONS ($t CO_2e$)
Segment (Vehicle or Equipment)	Type	Department	Unit Number	Description	Make	Model	Year	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	
Vehicle	-	Public Works - Licensed	15-74	Flatbed Trailer	Action Trailer	5000 lb.	2015	-	-	-	-
Vehicle	-	Public Works - Licensed	88-80	Boat Trailer	EZ Loader	6-STCB 16 - 17	2006	-	-	-	-
Vehicle	-	Public Works - Licensed		Snowmobile	Yamaha	VK1	2016	-	Gas	-	-
Vehicle	-	Public Works - Licensed		Snowmobile	Yamaha	VK1	2016	-	Gas	-	-
Vehicle	Passenger Car	By-Law	17-02	SUV	Chevrolet	Equinox	2017	26,084	Gas	3,274	7.6
Vehicle	Light Duty Vehicle	Recreation	REC	1/2 Ton	Chevrolet	Silverado	2016	9,090	Gas	1,110	2.6
Vehicle	Light Duty Vehicle	Planning & Development Services		1/2 Ton	Ford	Ranger	2011	10,613	Gas	5,223	12.1
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	77-41	Road Grader	CAT	140	2020	-	Dyed Diesel	18,343	50.3
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	13-44	Wheel Loader	John Deere	524K	2013	-	Dyed Diesel	3,636	10.0
Equipment	Tractor and Combines	Public Works - Unlicensed	99-45	Tractor/Loader	Kubota	K50	2009	-	Dyed Diesel	344	1.0
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	10-46	Loader/Backhoe	Case	580 M	2010	-	Dyed Diesel	821	2.3
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	76-54	Sidewalk Plow / Blower Sander /	Trackless	MT6	2009	-	Dyed Diesel	712	2.0
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	11-55	Sidewalk Plow / Blower Sander /	Trackless	MT5	2011	-	Dyed Diesel	2,107	5.8
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	14-56	Sidewalk Plow / Blower Sander /	Trackless	MT6	2014	-	Dyed Diesel	2,798	7.7
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	18-49	Sidewalk Plow / Blower Sander /	Trackless	MT7	2018	-	Dyed Diesel	2,564	7.0
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	10-68	Steamer	Thompson		2011	-	-	-	-
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	88-80	Boat	Stanley	16′ Flatty	2006	-	-	-	-
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	88-80	Outboard Motor	Yamaha	25MLH	2006	-	-	-	-
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	77-81	Manlift	JLG	T350	2008	-	-	-	-
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	19-02	Asphalt Trailer	Spalding	2TRS	2019	-	-	-	-
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	22-46	Tractor/Loader/Backhoe	Cat	420XE	2022	-	Dyed Diesel	-	-
Equipment	Industrial/Commercial Equipment	Public Works - Unlicensed	ESG-1	Generator	Kohler	40ROZJ		-	Dyed Diesel	-	-

Appendix C - Town of Bracebridge
Streetlight Data

Year: **2018**

GENERAL				OPERATIONS AND CONSUMPTION				
Asset Name	Bulb Type	Install Year	Light Quanitiy	Wattage (W)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO2e)	COMMENTS
saveONenergy Retrofit Program	LED	2015	933	54	4,500	226,719.00	6.70	Energy Conservation and Demand Management Plan Appendix 'B' Municipal Energy Saving Projects. Wattage based on email from Hydro company provided by the Town (lights vary in ranges from 36w, 54w, 80w and 133w).
Existing Non LED Light Bulbs	INC	< 2015	467	133	4,500	279,499.50	8.26	

Note:

1. Assumed based on sunset/sunrise during the summer and winter months

Appendix D: Town of Gravenhurst Energy and GHG Data

TATHAM ENGINEERING

Appendix D - Town of Gravenhurst
Building Data

Year: **2018**

BUILDING INFORMATION					FUEL AND ENERGY CONSUMPTION				ENERGY RELATED GHG EMISSIONS (t CO_2e)				TOTAL GHG EMISSIONS				EXISTING MECHANICAL			
Facility Name	Operation Type	Total Floor Area (m^2)	Year Built	In Service in 2024? (Y / N)	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil 1 & 2 (L)	Propane (L)	Electricity GHG Emissions	Natural Gas GHG Emissions	Fuel Oil 1 & 2 GHG Emissions	Propane GHG Emissions	Total GHG Emissions (tCO_2e)	GHG Intensity (tCO_2e /m^2)	Energy Intensity (ekWh/m^2)	Energy Intensity (GJ/m^2)	Existing Heating Source (Note 1)	Existing Heating Source Efficiency	Energy Use Index (EUI) (ekBTU/ft^2)	Energy Star Typical EUI (ekBTU/ft^2)
Gull Lake Waterfront/Lifeguard Office	Administration	71	1900/2005/2017	Y	8,528.00				0.25	0.00	0.00	0.00	0.3	0.00355	120.31	0.43	N/A	N/A	38	N/A
Terence Haight Carnegie Building/Chamber of Commerce	Administration	279	1923/1975/2013	Y	44,760.00	2,175.00			1.32	4.20	0.00	0.00	5.5	0.01979	243.21	0.88	Gas Furnace	95%	71	56.1 (Social/Meeting Hall)
Wharf Office & Yard	Administration	111	2010	Y	11,030.00	3,236.00			0.33	6.25	0.00	0.00	6.6	0.05898	407.43	1.47	Gas Unit Heater	80%	126	47.9 (Repair Services)
Municipal Office	Administration	1,573	2003/2010	Y	278,001.00	34,774.00			8.21	67.16	0.00	0.00	75.4	0.04792	411.69	1.48	Condensing Boiler	90%	82	52.9 (Office)
Centennial Centre	Arena	3,909	1977/2011	Y	906,004.00	174,717.00			26.77	337.43	0.00	0.00	364.2	0.09317	706.79	2.54	RTU's + Tube Heaters	80%	132	50.8 (Ice/Curling Rink)
Cemetery Operations & Mortuary	Cemetery Building	261	2000 / 1980	Y	5,424.00	2,241.00			0.16	4.33	0.00	0.00	4.5	0.01721	112.09	0.40	Gas Furnace	95%	50	47.9 (Repair Services)
Seniors' Centre	Community Centre	978	1991/2002	Y	42,637.00	7,948.00			1.26	15.35	0.00	0.00	16.6	0.01699	130.02	0.47	Gas Furnace	95%	82	56.1 (Social/Meeting Hall)
Fire Hall #3 - Ryde	Fire Hall	164	1964	Y	12,735.00			7,245.25	0.38	0.00	0.00	11.19	11.6	0.07033	387.22	1.39	Propane Furnace	95%	57	63.5 (Fire Station)
Fire Hall #2/Morrison Yard	Fire Hall	356	1974	Y	45,217.00			11,317.50	1.34	0.00	0.00	17.48	18.8	0.05290	350.88	1.26	Propane furnace and tube heaters	95%	247	63.5 (Fire Station)
Fire Hall #1/OPP	Fire Hall	1,237	1969	Y	76,979.00	28,689.00			2.27	55.41	0.00	0.00	57.7	0.04665	308.83	1.11	RTU's	80%	139	63.5 (Fire Station)
Lion's Pavilion - Muskoka Wharf	Pavillion	426	1993	Y	27,240.00	5,604.00			0.80	10.82	0.00	0.00	11.6	0.02727	203.59	0.73	Gas Furnace	95%	59	56.1 (Social/Meeting Hall)
Opera House	Performing Arts Centre	1,288	1901/1995	Y	212,530.00	36,262.00			6.28	70.03	0.00	0.00	76.3	0.05923	464.05	1.67	Condensing Boiler	90%	144	56.2 (Movie Theater)
Library	Public Library	743	2000	Y	55,198.00	5,615.00			1.63	10.84	0.00	0.00	12.5	0.01679	154.56	0.56	Gas Furnace	95%	96	71.6 (Library)
Gravenhurst YMCA	Recreation Centre	2,606	1977/2011	Y	1,359,007.00	116,478.00			40.16	224.96	0.00	0.00	265.1	0.10173	996.51	3.59	Boiler + MUA + RTU	85%	311	50.8 (Other Recreation)
Gull Lake Concession Stand	Service Building	37	1971/2018	Unclear	9,469.00				0.28	0.00	0.00	0.00	0.3	0.00753	254.81	0.92	N/A	N/A	N/A	N/A
Sports Park Service Building	Service Building	2,285	N/A	Y	38,962.00	300.00			1.15	0.58	0.00	0.00	1.7	0.00076	18.44	0.07	N/A	N/A	N/A	N/A
Segwun Ticket Office	Service Building	372	1992	Y	64,563.00				1.91	0.00	0.00	0.00	1.9	0.00513	173.74	0.63	N/A	N/A	56	N/A
Gull Lake Storage Shed	Storage Facility	60	N/A	Unclear	2,521.00				0.07	0.00	0.00	0.00	0.1	0.00123	41.75	0.15	N/A	N/A	N/A	N/A
Roads Shop (Storage)	Storage Facility	42	N/A	Unclear	5,702.00				0.17	0.00	0.00	0.00	0.2	0.00403	136.39	0.49	N/A	N/A	N/A	N/A
Parks Building & Yard (Park's Shop)	Storage Facility	111	2000	Y	1,972.00			4,964.35	0.06	0.00	0.00	7.67	7.7	0.06929	330.76	1.19	Propane Tube Heater	80%	83	47.9 (Repair Services)
CN Station	Storage Facility	521	1919	Y	46,621.00	6,727.00			1.38	12.99	0.00	0.00	14.4	0.02760	226.87	0.82	Gas Furnace	95%	138	56.2 (Museum)
Public Works Operations Centre	Storage Facility	1,382	1965/1980/2015	Unclear	64,223.00		15,933.00	16,359.50	1.90	0.00	44.01	25.26	71.2	0.05150	253.98	0.91	Propane Furnace + Unit/Tube Heaters	92%	79	47.9 (Repair Services)
Muskoka Beach Park Washrooms	Washroom	84	2006	Y	604.00				0.02	0.00	0.00	0.00	0.0	0.00021	7.18	0.03	N/A	N/A	5	N/A
Gull Lake Washrooms/Changerooms	Washroom	56	1971/2019	Y	5,452.00				0.16	0.00	0.00	0.00	0.2	0.00289	97.81	0.35	N/A	N/A	N/A	N/A
Washrooms/Janitorial Room-Muskoka Bay Park	Washroom	N/A	2003	Y	18,099.00				0.53	0.00	0.00	0.00	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note:

1. N/A - Information for building mechanical equipment is not available and the building is excluded from our assessment. These buildings also generate low GHG emissions.

Appendix D - Town of Gravenhurst
Fleet Data

Year: **2018**

FLEET GENERAL					OPERATIONS			
Licensed Vehicle, Unlicensed Vehicle, Off Road Equipment/Vehicle	Type	Description	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Licensed	Light Duty Vehicle	1/2 ton 4x4	Chev	K1500	35,964	Unleaded	2,010	4.68
Licensed	Passenger Car	SUV	Chev	Equinox	16,957	Unleaded	1,533	3.56
Licensed	Passenger Car	SUV	Hyundai	Tuscon	19,622	Unleaded	2,132	4.96
Licensed	Light Duty Vehicle	1/4 ton 4x4	Ford	Ranger	10,301	Unleaded	1,141	2.66
Licensed	Passenger Car	Sedan	Chrysler	Sebring	4,145	Unleaded	499	1.16
Licensed	Passenger Car	SUV	Chev	Equinox	26,940	Unleaded	3,470	8.07
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	14,995	Unleaded	2,059	4.79
Licensed	Light Duty Vehicle	1/2 ton 4x4	Chev	K1500	61,794	Unleaded	8,680	20.16
Licensed	Light Duty Vehicle	1/4 ton 4x4	Ford	Ranger	13,069	Unleaded	1,882	4.38
Licensed	Light Duty Vehicle	1/2 ton pickup	Chev	C1500	8,341	Unleaded	1,272	2.96
Licensed	Heavy Duty Vehicle	1 ton dump	Ford	F350	23,192	Unleaded	3,558	8.28
Licensed	Light Duty Vehicle	1/2 ton 4x4	Chev	K1500	26,089	Unleaded	4,172	9.69
Licensed	Light Duty Vehicle	1/2 Ton Pickup	Chevrolet	Silverado	5,414	Unleaded	885	2.05
Licensed	Light Duty Vehicle	1/4 ton 4x4	Ford	Ranger	3,735	Unleaded	607	1.43
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	20,785	Unleaded	3,447	8.01
Licensed	Light Duty Vehicle	1/2 ton pickup	Chev	C1500	5,130	Unleaded	929	2.16
Licensed	Light Duty Vehicle	1/2 ton pickup	Chev	C1500	2,521	Unleaded	469	1.09
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	13,557	Unleaded	2,690	6.26
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	8,535	Unleaded	1,713	3.98
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	11,458	Unleaded	2,442	5.67

FLEET GENERAL					OPERATIONS			
Licensed Vehicle, Unlicensed Vehicle, Off Road Equipment/Vehicle	Type	Description	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	8,757	Unleaded	1,902	4.42
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	6,510	Unleaded	1,430	3.32
Licensed	Light Duty Vehicle	1/2 ton pickup	Ford	F150	9,612	Unleaded	2,562	5.95
Licensed	Light Duty Vehicle	1/2 ton pickup	Chev	C1500	6,619	Unleaded	1,912	4.44
Licensed	Heavy Duty Vehicle	1 ton dump	Ford	F350	11,253	Unleaded	3,370	7.83
Licensed	Heavy Duty Vehicle	1 ton dump	GMC	C3500	12,946	Unleaded	3,994	9.32
Licensed	Light Duty Vehicle	1/2 ton pickup	Chev	C1500	16,009	Unleaded	5,241	12.17
Licensed	Heavy Duty Vehicle	Single Axle Plow	International	TA005	2,327	Diesel	658	1.79
Licensed	Heavy Duty Vehicle	1 ton dump	Dodge	3500	9,604	Unleaded	3,300	7.67
Licensed	Heavy Duty Vehicle	Single Axle Plow	Freightliner	108SD	17,233	Diesel	6,788	18.43
Licensed	Heavy Duty Vehicle	Single Axle Plow	Sterling	L9500	12,452	Diesel	7,176	19.45
Licensed	Heavy Duty Vehicle	Single Axle Plow	Freightliner	M2 112HD	5,686	Diesel	3,387	9.14
Licensed	Heavy Duty Vehicle	Tandem Axle Plow	Freightliner	M2 112HD	13,799	Diesel	8,297	22.48
Licensed	Heavy Duty Vehicle	Tandem Axle Plow	Western Star	4700SB	15,997	Diesel	9,733	26.37
Licensed	Heavy Duty Vehicle	Single Axle Plow	Sterling	L9500	6,618	Diesel	4,045	10.92
Licensed	Heavy Duty Vehicle	Tandem Axle Plow	International	7600	18,354	Diesel	11,656	31.57
Licensed	Heavy Duty Vehicle	Single Axle Plow	Sterling	L9500	7,655	Diesel	4,869	13.19
Licensed	Heavy Duty Vehicle	Single Axle Plow	International	Workstar 7500	8,345	Diesel	5,684	15.39
Licensed	Heavy Duty Vehicle	Tandem Axle Plow	Sterling	L9500	10,830	Diesel	7,508	20.26
Licensed	Heavy Duty Vehicle	Tandem Axle Plow	Sterling	L9500	7,298	Diesel	5,248	14.16
Licensed	Heavy Duty Vehicle	Quad ATV	Honda	400	0	Unleaded	0	0.00
Unlicensed	Industrial/Commercial Equipment	Equipment Trailer	Billy Goat	Debris Blower	N/A	Unleaded	N/A	0.00
Unlicensed	N/A	Roller	Super-Pac	540	N/A	Dyed Diesel	N/A	0.00
Unlicensed	N/A	Steamer	Thompson	A	N/A	Propane	N/A	0.00

FLEET GENERAL					OPERATIONS			
Licensed Vehicle, Unlicensed Vehicle, Off Road Equipment/Vehicle	Type	Description	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Unlicensed	N/A	Steamer	Thompson	N/A	N/A	Propane	N/A	0.00
Off Road	Industrial/Commercial Equipment	Rental Welder	N/A	N/A	N/A	Gas	2	0.00
Off Road	Industrial/Commercial Equipment	Generator	N/A	N/A	N/A	Gas	12	0.03
Off Road	Industrial/Commercial Equipment	Snowblower	N/A	N/A	N/A	Gas	12	0.03
Off Road	Industrial/Commercial Equipment	Water Pump	N/A	N/A	N/A	Gas	14	0.03
Off Road	Industrial/Commercial Equipment	Kubota2	N/A	N/A	N/A	Gas	21	0.05
Off Road	Industrial/Commercial Equipment	Back Pack Blower	N/A	N/A	N/A	Gas	51	0.12
Unlicensed	Industrial/Commercial Equipment	Wood Chipper	Morbark	2012-D	N/A	Dyed Diesel	50	0.14
Off Road	Industrial/Commercial Equipment	Chainsaw	N/A	N/A	N/A	Gas	71	0.17
Unlicensed	Lawn and Garden Equipment	Lawn Tractor	Ferris	N/A	N/A	Unleaded	121	0.29
Unlicensed	Lawn and Garden Equipment	Lawn Tractor	Ferris	N/A	N/A	Unleaded	150	0.36
Unlicensed	Industrial/Commercial Equipment	Pressure Washer	Hotsy	795SS	N/A	Dyed Diesel	139	0.38
Unlicensed	Ships and Boats	Boat	Legend	16 Extreme	N/A	Unleaded	164	0.39
Licensed	Industrial/Commercial Equipment	Side by side	Gator	XUV 620i	N/A	Unleaded	184	0.44
Off Road	Industrial/Commercial Equipment	Rental Sidewalk	N/A	N/A	N/A	Dyed Diesel	207	0.57
Unlicensed	Lawn and Garden Equipment	Lawn Tractor	Ferris	5900533	N/A	Unleaded	273	0.65
Off Road	Industrial/Commercial Equipment	Grasswhipper	N/A	N/A	N/A	Gas	474	1.14
Off Road	Industrial/Commercial Equipment	Mowers	N/A	N/A	N/A	Gas	744	1.79
Unlicensed	Tractor and Combines	Compact Tractor	Kubota	F3680	N/A	Dyed Diesel	905	2.52
Unlicensed	Tractor and Combines	Compact Tractor	Kubota	F3680	N/A	Dyed Diesel	905	2.52
Unlicensed	Industrial/Commercial Equipment	Street Sweeper	Eligin	Pelican	N/A	N/A	999	2.74
Unlicensed	Industrial/Commercial Equipment	Sidewalk machine	Trackless	MT5	N/A	Dyed Diesel	1,015	2.78
Unlicensed	Tractor and Combines	Tractor	Mahindra	2638SH	N/A	Dyed Diesel	1,095	3.05
Unlicensed	Industrial/Commercial Equipment	Backhoe	Case	590 Super M Series 2	N/A	Dyed Diesel	1,385	3.80

FLEET GENERAL					OPERATIONS			
Licensed Vehicle, Unlicensed Vehicle, Off Road Equipment/Vehicle	Type	Description	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Unlicensed	Industrial/Commercial Equipment	Street Sweeper	Eligin	Pelican	N/A	N/A	1,670	4.58
Unlicensed	Industrial/Commercial Equipment	Sidewalk machine	MacLean	MV2	N/A	Dyed Diesel	2,582	7.08
Unlicensed	Industrial/Commercial Equipment	Sidewalk machine	MacLean	MV4	N/A	Dyed Diesel	3,752	10.29
Unlicensed	Industrial/Commercial Equipment	Backhoe	Case	590 Super N	N/A	Dyed Diesel	4,274	11.72
Unlicensed	Industrial/Commercial Equipment	Wheeled Excavator	Doosan	DX140W-3	N/A	Dyed Diesel	4,580	12.56
Unlicensed	Industrial/Commercial Equipment	Loader	John Deere	524K	N/A	Dyed Diesel	4,630	12.70

Appendix D - Town of Gravenhurst Streetlight Data

Year: **2018**

GENERAL			
Asset Name	Asset Location	ANNUAL ELECTRICITY CONSUMPTION (kWh)	GHG EMISSIONS (t CO_2e)
06000046-00	SHARPE ST E	466	0.01
06000105-00	SHARPE ST W	456	0.01
06000135-00	110 HOTCHKISS ST	286	0.01
06000180-00	175 MUSKOKA RD N	0	0.00
06000181-00	175 MUSKOKA RD N	0	0.00
06000190-00	175 BROWN ST - POLE	13	0.00
06000204-00	CHURCH ST	672	0.02
06000223-00	239 BROCK ST	3,806	0.11
06000230-00	290 ROYAL ST	1,198	0.04
06000233-00	FIRST ST N - POLE	0	0.00
06000249-00	BAY & JOHN ST N	3,452	0.10
06000292-00	1260 MUSKOKA RD S	221	0.01
06000437-00	BAY & SARAH ST N	4,606	0.14
06000438-00	615 BAY ST	2,182	0.06
06000441-00	GREAVETTE & HUGHSON	559	0.02
06000442-00	750 BAY ST	3,246	0.10
06000444-00	800 BAY ST	150	0.00
06000568-00	MUSKOKA RD - ST LIGHTS-953 LIGHTS	318,025	9.40
06000577-00	280 CHURCH ST-SIGN	0	0.00
06000578-00	280 CHURCH ST-SIGN	0	0.00
06000579-00	SARAH ST & BAY ST	1,376	0.04
06001706-00	MUSKOKA BAY PARK	18,099	0.53
06005774-00	125 JONES RD	50	0.00
06005779-00	310 JAMES ST W	156	0.00
06005780-00	310 JAMES ST W	0	0.00
06005781-00	310 JAMES ST W	168	0.00
06005783-00	MUSKOKA RD & BROWN ST	1,684	0.05
06006065-00	JAMES ST - BALL PARK	3,301	0.10
06006066-00	STREET/TRAFFIC/BOARDWALK-WHARF	11,513	0.34
06006075-00	STREET LIGHTS-WHARF	12,570	0.37
06006076-00	STREET/PARK LOT LIGHTS-WHARF	10,402	0.31
06006090-00	STREET/TRAFFIC LIGHTS-WHARF	9,985	0.30
97028483-00	STREETLIGHTS-910 MUSKOKA RD S	2,304	0.07
97028612-00	STREETLIGHTS-890 MUSKOKA RD S	6,560	0.19
97028623-00	STREETLIGHTS-840 MUSKOKA RD S	2,741	0.08
97028624-00	STREETLIGHTS-480 MUSKOKA RD S	4,492	0.13
97028632-00	STREETLIGHTS-1255 MUSKOKA RD S	2,349	0.07
97026272-03	295 STEAMSHIP BAY RD - WHARF MARINA	1,377	0.04

Asset Name	GENERAL Asset Location	ANNUAL ELECTRICITY CONSUMPTION (kWh)	GHG EMISSIONS ($t CO_2e$)
97035732-00	831 BAY ST PARK/STREET LIGHTS	108	0.00
97036743-00	MUSKOKA RD S-HOTCHKISS LIGHT	11,533	0.34
97039461-00	1050 MUSKOKA RD S	6,305	0.19
97039462-00	1023 N MULDREW LK RD POLE	5,445	0.16
97043465-00	PINE STREET LIGHTS	983	0.03

Appendix E: Town of Huntsville Energy and GHG Data

TATHAM ENGINEERING

Appendix E - Town of Huntsville
Building Data

Year: **2018**

BUILDING INFORMATION					FUEL AND ENERGY CONSUMPTION					ENERGY RELATED GHG EMISSIONS (t CO_2e)				TOTAL GHG EMISSIONS				EXISTING MECHANICAL				
Facility Name	Operation Type	Building Total Area (m^2)	Year Built	In Service in 2023? (Y / N)	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil 1 & 2 (L)	Fuel Oil 4 & 6 (L)	Propane (L)	Electricity GHG Emissions	Natural Gas GHG Emissions	Fuel Oil 1 & 2 GHG Emissions	Propane GHG Emissions	Total GHG Emissions (tCO_2e)	GHG Intensity (tCO_2e /m^2)	Energy Intensity (ekWh/m^2)	Energy Intensity (GJ/m^2)	Existing Heating Source (Note 1)	Existing Heating Source Efficiency	Heating Source Installed Year	Energy Use Index (EUI) (ekBTU/ft^2)	Energy Star Typical EUI (ekBTU/ft^2)
Civic Centre (Town Hall)	Administration	3,844	1995	Y	498,111.00	51,835.58			0.00	14.72	100.11	0.00	0.00	114.83	0.0299	272.89	0.98	6 NG RTU and 2 NG Furnaces	95%	2005	85	52.9 (Office)
Madill Yard	Administration	832	2000	Y	106,432.90	18,885.60			0.00	3.14	36.47	0.00	0.00	39.62	0.0476	369.16	1.33	NG Radiant Tube Heaters	81%	2018	115	47.9 (Repair Services)
Marsh Road House	Administration	121	N/A	N	966.00	1,101.59			0.00	0.03	2.13	0.00	0.00	2.16	0.0178	104.74	0.38	N/A	N/A	N/A	N/A	N/A
Waterloo Summit Centre for the Environment	Administration	5,017	N/A	N	136,948.60	35,094.86			0.00	4.05	67.78	0.00	0.00	71.83	0.0143	101.64	0.37	N/A	N/A	N/A	N/A	N/A
Aspdin Community Centre	Community Centre	103	1971	Y	4,457.84	0.00			8,463.00	0.13	0.00	0.00	13.07	13.20	0.1282	620.95	2.24	Propane Furnace	95%	2011	182	56.1 (Social/Meeting Hall)
Port Sydney Community Hall	Community Centre	401	1972	Y	11,825.24	7,981.43			0.00	0.35	15.41	0.00	0.00	15.76	0.0393	241.02	0.87	NG Furnace	95%	2012	74	56.1 (Social/Meeting Hall)
Stephenson Township/Utterson Hall	Community Centre	430	1972	Y	36,878.02	0.00			7,831.40	1.09	0.00	0.00	12.09	13.18	0.0307	213.81	0.77	Propane Furnace	95%	2015	65	56.1 (Social/Meeting Hall)
MHP Shed	Cultural Centre	418	1978	Y	40,944.48	3,056.69			0.00	1.21	5.90	0.00	0.00	7.11	0.0170	175.67	0.63	N/A	N/A	N/A	N/A	N/A
MHP Station	Cultural Centre	218	1999	Y	20,472.24	3,056.69			0.00	0.60	5.90	0.00	0.00	6.51	0.0299	242.93	0.87	Propane Furnace (Another HVAC unit listed)	95%	2022	75	56.2 (Museum)
Muskoka Heritage Place	Cultural Centre	364	1978	Y	21,660.00	0.00			7,402.30	0.64	0.00	0.00	11.43	12.07	0.0332	202.48	0.73	Propane Furnace	95%	2010	61	56.2 (Museum)
Huntsville Fire Hall (Fire Hall #1)	Fire Hall	1,086	1995	Y	71,201.00	13,616.88			0.00	2.10	26.30	0.00	0.00	28.40	0.0262	198.82	0.72	NG RTU's and Supplementary Heaters	81%	2018	62	63.5 (Fire Station)
South Mary Lake Fire Hall	Fire Hall	691	N/A	Y	19,729.00	7,766.77			0.00	0.58	15.00	0.00	0.00	15.58	0.0226	148.01	0.53	NG Furnace	95%	2009	46	63.5 (Fire Station)
HPL Annex	Public Library	109	N/A	Y	11,741.00	6,261.92			0.00	0.35	12.09	0.00	0.00	12.44	0.1141	718.27	2.59	NG Fired RTU	81%	2016	221	71.6 (Library)
Huntsville Public Library	Public Library	1,136	1995	Y	87,533.00	14,020.24			0.00	2.59	27.08	0.00	0.00	29.66	0.0261	208.22	0.75	3 NG Furnaces	95%	2017	65	71.6 (Library)
CN Railway Ancillary Shed	Public Works	193	N/A	N	7,862.16	0.00			0.00	0.23	0.00	0.00	0.00	0.23	0.0012	40.74	0.15	N/A	N/A	N/A	N/A	N/A
CN Station	Public Works	278	N/A	N	11,313.84	0.00			0.00	0.33	0.00	0.00	0.00	0.33	0.0012	40.70	0.15	N/A	N/A	N/A	N/A	N/A
McCulley Robertson Quonset Hut	Public Works	223	2001	Y	12,079.92	0.00			8,042.00	0.36	0.00	0.00	12.42	12.78	0.0573	307.71	1.11	NG Furnace	95%	2001	91	47.9 (Repair Services)
Canada Summit Centre	Recreation Centre	17,187	1986	Y	1,644,603.00	245,553.90			0.00	48.59	474.24	0.00	0.00	522.84	0.0304	247.53	0.89	Natural Gas Rooftop Units, Radiant Heaters. Boiler (100F RWT)	95%	2010	77	50.7 (Ice/Curling Rink)

Note:

1. N/A - Information for building mechanical equipment is not available and the building is excluded from our assessment.

Appendix E - Town of Huntsville
Fleet Data

Year: **2018**

FLEET GENERAL							OPERATIONS			
Segment (Vehicle or Equipment)	Type	Department	Unit Name	Make	Model	Model Year	Tatham Calculated Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Vehicle	Heavy Duty Vehicle	Fleet	5 Ton Truck - Freightliner FL-	N/A	N/A	2000 or 2005	12,701	Clear Diesel	10,215	27.6
Vehicle	Heavy Duty Vehicle	Fleet	Western Star	N/A	N/A	> 2007	1,542	Clear Diesel	1,655	4.5
Vehicle	Heavy Duty Vehicle	Fleet	Tandem Truck -	N/A	N/A	> 2007	2,346	Clear Diesel	2,387	6.5
Vehicle	Heavy Duty Vehicle	Fleet	Sweeper - Elgin Eagle sweeper	N/A	N/A	> 2007	2,819	Clear Diesel	2,820	7.6
Vehicle	Heavy Duty Vehicle	Fleet	3 Ton Truck - FORD F450 2X4 CR	N/A	N/A	> 2007	16,804	Clear Diesel	6,760	18.4
Vehicle	Heavy Duty Vehicle	Fleet	Tandem Trucks - Sterling MBE 4	N/A	N/A	> 2007	9,362	Clear Diesel	8,899	24.1
Vehicle	Heavy Duty Vehicle	Fleet	Tandem Trucks - Western Star	N/A	N/A	> 2007	17,499	Clear Diesel	16,905	45.7
Equipment	Industrial/Commercial Equipment	Construction	Grader - John Deere Grader 772	N/A	N/A	> 2007	2,055	Dyed Diesel	N/A	N/A
Equipment	Industrial/Commercial Equipment	Lawn Mower	Trackless Sidewalk Plow MT6	N/A	N/A	> 2007	N/A	Dyed Diesel	47	0.1
Equipment	Industrial/Commercial Equipment	Construction	Chipper	N/A	N/A	> 2007	1,285	Clear Diesel	797	2.2
Equipment	Industrial/Commercial Equipment	N/A	Sidewalk Plow/Trackless - Trac	N/A	N/A	> 2007	219	Dyed Diesel	2,787	7.6
Equipment	Industrial/Commercial Equipment	Construction	Doosan Loader DL250	N/A	N/A	> 2007	N/A	Dyed Diesel	3,365	9.2
Equipment	Industrial/Commercial Equipment	Construction	BackHoe/Loader - CASE 590 SN 4	N/A	N/A	> 2007	857	Dyed Diesel	4,895	13.4
Equipment	Industrial/Commercial Equipment	N/A	Grader - Volvo G740B	N/A	N/A	> 2007	500	Dyed Diesel	9,491	26.0
Equipment	Industrial/Commercial Equipment	Construction	BackHoe/Loader - John Deere Lo	N/A	N/A	> 2007	1,057	Dyed Diesel	12,495	34.3
Equipment	Industrial/Commercial Equipment	N/A	Volvo Grader 976	N/A	N/A	> 2007	19,868	Clear Diesel	16,998	46.6
Vehicle	Medium Duty Vehicle	N/A	3/4 Ton Truck - FORD F450	N/A	N/A	> 2007	3,990	Clear Diesel	1,867	5.1
Equipment	Tractor and Combines	N/A	McCormick Tractor	N/A	N/A	> 2007	15,311	Clear Diesel	8,782	24.4
Vehicle	Light Duty Vehicle	Fleet	1/2 Ton Truck - CHEVY SILVERAD	Chevrolet	1500 SIL	2010	9,014	Unleaded Gasoline	1,977	4.6
Vehicle	Medium Duty Vehicle	Fleet	Red 2015 Ford F450 Plow truck	Ford	F450	2015	16,343	Clear Diesel	560	1.8

FLEET GENERAL							OPERATIONS			
Segment (Vehicle or Equipment)	Type	Department	Unit Name	Make	Model	Model Year	Tatham Calculated Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Vehicle	Heavy Duty Vehicle	Fleet	2018 Ford F550	Ford	F550 DRW	2018	N/A	Clear Diesel	3,216	8.7
Vehicle	Heavy Duty Vehicle	Fleet	Western Star Plow Truck	Western Star	CNV	2017	22,184	Clear Diesel	15,959	43.2
Vehicle	Light Duty Vehicle	Fleet	2014 RAM 1500 RED	Dodge	RAM 1500	2014	15,969	Unleaded Gasoline	1,737	4.0
Vehicle	Light Duty Vehicle	Fleet	2014 Foed F150 RED	Ford	F150 COF	2014	26,057	Unleaded Gasoline	3,792	8.8
Vehicle	Light Duty Vehicle	Fleet	2014 RAM 1500 RED	Dodge	RAM 1500	2014	23,924	Unleaded Gasoline	4,560	10.6
Vehicle	Medium Duty Vehicle	Fleet	Single Axel RAM 2500 4x4	Dodge	RAM 2500	2014	11,566	Unleaded Gasoline	2,467	0.0
Vehicle	Heavy Duty Vehicle	Fleet	Single Axel Trucks - Western S	Western Star	CNV	2013	10,385	Clear Diesel	7,727	20.9
Vehicle	Light Duty Vehicle	Fire	1/2 Ton Truck - 2014 RAM 1500	Dodge	RAM 1500	2013	38,654	Unleaded Gasoline	7,439	17.3
Vehicle	Heavy Duty Vehicle	Fleet	Sand Truck - Western Star - Ye	Western Star	64S	2013	22,994	Clear Diesel	14,290	38.7
Vehicle	Heavy Duty Vehicle	Fleet	Western Star T/A Dump/Snow/Pl0	Western Star	CNV	2010	18,703	Clear Diesel	12,624	34.2
Vehicle	Heavy Duty Vehicle	Fleet	Tandem Trucks - Western Star	Western Star	CNV	2010	17,321	Clear Diesel	14,153	38.3
Equipment	Industrial/Commercial Equipment	N/A	2005 Trackless Sidewalk Plow	N/A	N/A	2005	0	Dyed Diesel	1,432	3.9
Vehicle	Light Duty Vehicle	N/A	1/2 Ton Truck - JEEP PATRIOT	N/A	N/A	N/A	N/A	Unleaded Gasoline	26	0.1
Vehicle	Light Duty Vehicle	N/A	1/2 Ton Truck - RAM 1500 4x4	N/A	N/A	N/A	15,380	Unleaded Gasoline	2,955	8.1
Vehicle	Light Duty Vehicle	N/A	1/2 Ton Truck - RAM 1500 4X4	N/A	N/A	N/A	25,299	Unleaded Gasoline	4,415	12.1
Vehicle	Light Duty Vehicle	N/A	Ford F150	N/A	N/A	N/A	7,798	Unleaded Gasoline	2,295	6.3
N/A	N/A	N/A	Rentals	N/A	N/A	N/A	N/A	N/A	751	2.1

Appendix E - Town of Huntsville Streetlight Data

Year: **2018**

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0046	BRUNEL RD	Decorative	175	4,500	788	0.023
ST0050	CAROLINE ST W	Decorative	250	4,500	1125	0.033
ST0016	CENTRE ST S	Decorative	175	4,500	788	0.023
ST0037	CENTRE ST S	Decorative	175	4,500	788	0.023
ST0016	CENTRE ST S	Decorative	175	4,500	788	0.023
ST0037	CENTRE ST S	Decorative	175	4,500	788	0.023
ST0670	CHAFFEY TOWNSHIP RD	Decorative	130	4,500	585	0.017
ST0679	CHAFFEY TOWNSHIP RD	Decorative	100	4,500	450	0.013
ST0680	CLARKES LN	Decorative	100	4,500	450	0.013
ST0519	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0521	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0523	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0524	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0525	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0526	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0527	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0530	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0531	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0534	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0536	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0539	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0541	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0544	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0547	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0589	CLUBHOUSE DR	Decorative - Coach Style	100	4,500	450	0.013
ST0521	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0519	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0523	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0524	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0525	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0526	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0527	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0530	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0531	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0534	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0536	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0539	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0541	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0544	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0547	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0589	CLUBHOUSE DR	Decorative	100	4,500	450	0.013
ST0049	DAIRY LN	Decorative	250	4,500	1125	0.033
ST0673	DAIRY LN	Decorative	100	4,500	450	0.013
ST0449	DEER LK RD	Decorative	50	4,500	225	0.007
ST0573	DEERHURST HIGHLANDS DR	Decorative - Coach Style	100	4,500	450	0.013
ST0584	DEERHURST HIGHLANDS DR	Decorative - Coach Style	100	4,500	450	0.013
ST0588	DEERHURST HIGHLANDS DR	Decorative - Coach Style	100	4,500	450	0.013
ST0595	DEERHURST HIGHLANDS DR	Lights	100	4,500	450	0.013
ST0603	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013
ST0573	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0580	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013
ST0584	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013
ST0588	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013
ST0595	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013
ST0603	DEERHURST HIGHLANDS DR	Decorative	100	4,500	450	0.013
ST0663	FORBES HILL DR	Decorative	100	4,500	450	0.013
ST0663	FORBES HILL DR	Decorative	100	4,500	450	0.013
ST0063	FOREST VIEW DR	Decorative	250	4,500	1125	0.033
ST0623	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0624	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0625	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0626	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0629	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0630	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0635	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0636	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0637	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0642	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0645	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0647	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0649	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0653	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0623	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0624	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0625	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0626	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0629	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0630	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0635	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0636	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0637	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0642	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0645	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0647	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0649	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0653	GLENWOOD DR	Decorative	100	4,500	450	0.013
ST0627	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0633	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0638	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0639	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0644	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0646	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0627	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0633	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0638	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0639	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0644	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0646	GRANDVIEW DR	Decorative	100	4,500	450	0.013
ST0561	GRANDVIEW DR N	Decorative	100	4,500	450	0.013
ST0568	GRANDVIEW DR N	Decorative - Coach Style	100	4,500	450	0.013
ST0561	GRANDVIEW DR N	Decorative	100	4,500	450	0.013
ST0567	GRANDVIEW DR N	Decorative	100	4,500	450	0.013
ST0568	GRANDVIEW DR N	Decorative	100	4,500	450	0.013
ST0672	HIBBARD RD	Decorative	100	4,500	450	0.013
ST0587	HOMESTEAD LN	Decorative - Coach Style	100	4,500	450	0.013

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0592	HOMESTEAD LN	Lights	100	4,500	450	0.013
ST0593	HOMESTEAD LN	Lights	100	4,500	450	0.013
ST0594	HOMESTEAD LN	Lights	100	4,500	450	0.013
ST0597	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0598	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0599	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0619	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0587	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0592	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0593	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0594	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0597	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0598	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0599	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0619	HOMESTEAD LN	Decorative	100	4,500	450	0.013
ST0005	JOHN ST	Decorative	175	4,500	788	0.023
ST0005	JOHN ST	Decorative	175	4,500	788	0.023
ST0655	KENDRA CR	Decorative	100	4,500	450	0.013
ST0656	KENDRA CR	Decorative	100	4,500	450	0.013
ST0655	KENDRA CR	Decorative	100	4,500	450	0.013
ST0656	KENDRA CR	Decorative	100	4,500	450	0.013
ST0030	KING ST	Decorative	100	4,500	450	0.013
ST0030	KING ST	Decorative	100	4,500	450	0.013
ST0657	KIRBYS WAY	Decorative	100	4,500	450	0.013
ST0657	KIRBYS WAY	Decorative	100	4,500	450	0.013
ST0059	LAKE DR	Decorative	250	4,500	1125	0.033
ST0060	LAKE DR	Decorative	175	4,500	788	0.023
ST0061	LAKE DR	Decorative	250	4,500	1125	0.033
ST0019	LORNE ST S	Decorative	175	4,500	788	0.023
ST0032	LORNE ST S	Decorative	175	4,500	788	0.023
ST0019	LORNE ST S	Decorative	175	4,500	788	0.023
ST0032	LORNE ST S	Crosswalk	175	4,500	788	0.023
ST0008	MAIN ST E	Decorative	70	4,500	315	0.009
ST0008	MAIN ST E	Decorative	70	4,500	315	0.009
ST0047	MAIN ST E	Decorative - Coach Style	70	4,500	315	0.009
ST0033	MAIN ST W	Decorative	175	4,500	788	0.023
ST0051	MAIN ST W	Decorative	250	4,500	1125	0.033
ST0033	MAIN ST W	Decorative	250	4,500	1125	0.033
ST0668	MAIN ST WEST	Decorative	130	4,500	585	0.017
ST0669	MAIN ST WEST	Decorative	130	4,500	585	0.017
ST0048	MARY ST E	Decorative	250	4,500	1125	0.033
ST0631	MAWHINEY CT	Decorative	100	4,500	450	0.013
ST0634	MAWHINEY CT	Decorative	100	4,500	450	0.013
ST0650	MAWHINEY CT	Decorative	100	4,500	450	0.013
ST0631	MAWHINEY CT	Decorative	100	4,500	450	0.013
ST0650	MAWHINEY CT	Decorative	100	4,500	450	0.013
ST0634	MAWHINEY CT	Decorative	100	4,500	450	0.013
ST0062	MEADOW PARK DR	Decorative	250	4,500	1125	0.033
ST0554	MILLWOOD COURT	Decorative	100	4,500	450	0.013
ST0554	MILLWOOD COURT	Decorative	100	4,500	450	0.013
ST0628	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0632	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0640	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0641	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0643	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0648	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0651	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0652	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0654	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0628	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0632	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0640	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0641	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0643	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0648	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0651	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0652	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0654	MORGAN HEIGHTS DR	Decorative	100	4,500	450	0.013
ST0065	MOUNTVIEW AV	Decorative	250	4,500	1125	0.033
ST0610	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0611	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0613	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0617	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0621	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0622	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0661	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0681	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0682	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0611	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0613	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0617	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0661	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0681	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0610	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0621	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0622	MUSKOKA RD 10	Decorative	100	4,500	450	0.013
ST0662	MUSKOKA RD 3	Decorative	100	4,500	450	0.013
ST0662	MUSKOKA RD 3	Decorative	100	4,500	450	0.013
ST0066	RICE LN	Decorative	250	4,500	1125	0.033
ST0549	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0551	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0552	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0553	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0555	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0556	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0558	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0549	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0551	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0552	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0553	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0555	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0556	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0558	ROGERS COVE DR	Decorative	100	4,500	450	0.013
ST0675	SOUTH MARY LK RD	Decorative	100	4,500	450	0.013
ST0676	SOUTH MARY LK RD	Decorative	100	4,500	450	0.013
ST0677	SOUTH MARY LK RD	Decorative	100	4,500	450	0.013
ST0520	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0522	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0529	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0532	ST ANDREWS CL	Decorative	100	4,500	450	0.013

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0535	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0537	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0543	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0546	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0548	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0520	ST ANDREWS CL	Decorative - Coach Style	100	4,500	450	0.013
ST0522	ST ANDREWS CL	Decorative - Coach Style	100	4,500	450	0.013
ST0529	ST ANDREWS CL	Decorative - Coach Style	100	4,500	450	0.013
ST0532	ST ANDREWS CL	Decorative - Coach Style	100	4,500	450	0.013
ST0535	ST ANDREWS CL	Lights	100	4,500	450	0.013
ST0537	ST ANDREWS CL	Lights	100	4,500	450	0.013
ST0543	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0546	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0548	ST ANDREWS CL	Decorative	100	4,500	450	0.013
ST0528	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0533	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0538	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0540	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0542	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0545	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0528	ST GEORGE CT	Decorative - Coach Style	100	4,500	450	0.013
ST0533	ST GEORGE CT	Lights	100	4,500	450	0.013
ST0538	ST GEORGE CT	Lights	100	4,500	450	0.013
ST0540	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0542	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0545	ST GEORGE CT	Decorative	100	4,500	450	0.013
ST0058	WEST ST N	Decorative	250	4,500	1125	0.033
ST0550	WOODSTREAM DR	Decorative	100	4,500	450	0.013
ST0557	WOODSTREAM DR	Crosswalk	100	4,500	450	0.013
ST0550	WOODSTREAM DR	Decorative	100	4,500	450	0.013
ST0557	WOODSTREAM DR	Decorative	100	4,500	450	0.013
ST0053	YONGE ST S	Decorative	250	4,500	1125	0.033
ST0094	ANTHONY CT	Decorative	50	4,500	225	0.007
ST0095	ANTHONY CT	Decorative	50	4,500	225	0.007
ST0096	ANTHONY CT	Decorative	50	4,500	225	0.007
ST0370	BELLVIEW AV	Decorative	50	4,500	225	0.007
ST0355	BRIDGEDALE CR	Decorative	50	4,500	225	0.007
ST0379	BRIDGEDALE CR	Decorative	50	4,500	225	0.007
ST0393	BRIDGEDALE CR	Decorative	50	4,500	225	0.007
ST0397	BRIDGEDALE CR	Decorative	50	4,500	225	0.007
ST0432	BRIDGEDALE CR	Decorative	50	4,500	225	0.007
ST0397	BRIDGEDALE CR	Decorative	50	4,500	225	0.007
ST0356	BRIDGEDALE RD	Decorative	50	4,500	225	0.007
ST0362	BRIDGEDALE RD	Decorative	50	4,500	225	0.007
ST0378	BRIDGEDALE RD	Decorative	50	4,500	225	0.007
ST0385	BRIDGEDALE RD	Decorative	50	4,500	225	0.007
ST0392	BRIDGEDALE RD	Decorative	50	4,500	225	0.007
ST0435	BRIDGEDALE RD	Decorative	50	4,500	225	0.007
ST0116	BRUNEL RD	Decorative	80	4,500	360	0.011
ST0117	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0118	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0133	BRUNEL RD	Decorative	115	4,500	518	0.015
ST0134	BRUNEL RD	Decorative	115	4,500	518	0.015
ST0137	BRUNEL RD	Decorative	115	4,500	518	0.015
ST0138	BRUNEL RD	Decorative	115	4,500	518	0.015

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0140	BRUNEL RD	Decorative	80	4,500	360	0.011
ST0141	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0142	BRUNEL RD	Decorative	115	4,500	518	0.015
ST0143	BRUNEL RD	Decorative	115	4,500	518	0.015
ST0144	BRUNEL RD	Decorative	115	4,500	518	0.015
ST0191	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0192	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0386	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0387	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0407	BRUNEL RD	Decorative - Coach Style	50	4,500	225	0.007
ST0408	BRUNEL RD	Decorative - Coach Style	50	4,500	225	0.007
ST0411	BRUNEL RD	Decorative - Coach Style	50	4,500	225	0.007
ST0444	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0445	BRUNEL RD	Decorative	50	4,500	225	0.007
ST0485	BRUNEL RD	Decorative	80	4,500	360	0.011
ST0252	BURROW PIT LN	Decorative	115	4,500	518	0.015
ST0340	BURROW PIT LN	Decorative	115	4,500	518	0.015
ST0135	CAMP KITCHEN RD	Decorative	80	4,500	360	0.011
ST0136	CAMP KITCHEN RD	Decorative	50	4,500	225	0.007
ST0246	CANN ST	Decorative	50	4,500	225	0.007
ST0247	CANN ST	Decorative	50	4,500	225	0.007
ST0248	CANN ST	Decorative	50	4,500	225	0.007
ST0327	CAROLINE ST W	Decorative	80	4,500	360	0.011
ST0328	CAROLINE ST W	Decorative	50	4,500	225	0.007
ST0329	CAROLINE ST W	Decorative	50	4,500	225	0.007
ST0257	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0258	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0259	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0260	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0261	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0262	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0265	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0431	CENTRE ST N	Decorative	50	4,500	225	0.007
ST0477	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0507	CENTRE ST N	Decorative	80	4,500	360	0.011
ST0097	CENTRE ST S	Decorative	50	4,500	225	0.007
ST0156	CENTRE ST S	Decorative	50	4,500	225	0.007
ST0157	CENTRE ST S	Decorative	50	4,500	225	0.007
ST0194	CENTRE ST S	Decorative	115	4,500	518	0.015
ST0195	CENTRE ST S	Decorative	80	4,500	360	0.011
ST0350	CENTRE ST S	Decorative	50	4,500	225	0.007
ST0302	CHAFFEY ST	Decorative	115	4,500	518	0.015
ST0303	CHAFFEY ST	Decorative	50	4,500	225	0.007
ST0429	CHAFFEY TOWNSHIP RD	Decorative	50	4,500	225	0.007
ST0218	CHURCH ST	Decorative	50	4,500	225	0.007
ST0219	CHURCH ST	Decorative	50	4,500	225	0.007
ST0220	CHURCH ST	Decorative	50	4,500	225	0.007
ST0272	CHURCH ST	Decorative	115	4,500	518	0.015
ST0311	CHURCH ST	Decorative	80	4,500	360	0.011
ST0342	CHURCH ST	Decorative	50	4,500	225	0.007
ST0352	CLEARWATER LK RD	Decorative	50	4,500	225	0.007
ST0182	CLIFF AVE	Decorative	50	4,500	225	0.007
ST0183	CLIFF AVE	Decorative	50	4,500	225	0.007
ST0184	CLIFF AVE	Decorative	50	4,500	225	0.007
ST0187	CLIFF AVE	Decorative	50	4,500	225	0.007

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0101	CORA ST E	Decorative	50	4,500	225	0.007
ST0102	CORA ST E	Decorative	50	4,500	225	0.007
ST0147	CORA ST E	Decorative	50	4,500	225	0.007
ST0148	CORA ST E	Decorative	50	4,500	225	0.007
ST0100	CORA ST W	Decorative	50	4,500	225	0.007
ST0394	COVESIDE DR	Decorative	50	4,500	225	0.007
ST0251	DAIRY LN	Decorative	115	4,500	518	0.015
ST0339	DAIRY LN	Decorative	50	4,500	225	0.007
ST0383	DAIRY LN	Decorative	50	4,500	225	0.007
ST0361	DEER LK RD	Decorative	50	4,500	225	0.007
ST0372	DEER LK RD	Decorative	50	4,500	225	0.007
ST0469	DEER LK RD	Decorative	80	4,500	360	0.011
ST0469	DEER LK RD	Decorative	50	4,500	225	0.007
ST0153	DUNCAN ST E	Decorative	50	4,500	225	0.007
ST0154	DUNCAN ST E	Decorative	50	4,500	225	0.007
ST0155	DUNCAN ST E	Decorative	50	4,500	225	0.007
ST0158	DUNCAN ST W	Decorative	50	4,500	225	0.007
ST0161	DUNCAN ST W	Decorative	50	4,500	225	0.007
ST0162	Duncan St W	Decorative	50	4,500	225	0.007
ST0071	EAST ELLIOTT ST	Decorative	50	4,500	225	0.007
ST0078	EAST ELLIOTT ST	Decorative	50	4,500	225	0.007
ST0122	ELM ST	Decorative	50	4,500	225	0.007
ST0123	ELM ST	Decorative	50	4,500	225	0.007
ST0127	ELM ST	Decorative	50	4,500	225	0.007
ST0221	FAIRY AV	Decorative	50	4,500	225	0.007
ST0222	FAIRY AV	Decorative	50	4,500	225	0.007
ST0223	FAIRY AV	Decorative	50	4,500	225	0.007
ST0273	FAIRY AV	Decorative	115	4,500	518	0.015
ST0336	FAIRY AV	Decorative	80	4,500	360	0.011
ST0091	FLORENCE ST E	Decorative	50	4,500	225	0.007
ST0092	FLORENCE ST E	Decorative	50	4,500	225	0.007
ST0093	FLORENCE ST E	Decorative	50	4,500	225	0.007
ST0083	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0084	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0086	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0087	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0088	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0089	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0090	FLORENCE ST W	Decorative	50	4,500	225	0.007
ST0456	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0461	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0463	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0480	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0486	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0494	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0498	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0503	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0461	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0463	FORBES HILL DR	Decorative	80	4,500	360	0.011
ST0128	FOREST VIEW DR	Decorative	50	4,500	225	0.007
ST0129	FOREST VIEW DR	Decorative	50	4,500	225	0.007
ST0164	FREDERICK ST	Decorative	50	4,500	225	0.007
ST0232	GEORGE ST	Decorative	50	4,500	225	0.007
ST0236	GEORGE ST	Decorative	50	4,500	225	0.007
ST0344	GEORGE ST	Decorative	50	4,500	225	0.007

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0380	GOLDEN PHEASANT DR	Decorative	50	4,500	225	0.007
ST0390	GOLDEN PHEASANT DR	Decorative	50	4,500	225	0.007
ST0414	GOLDEN PHEASANT DR	Lights	50	4,500	225	0.007
ST0454	GOULDIE ST	Decorative	80	4,500	360	0.011
ST0475	GREER RD	Decorative	80	4,500	360	0.011
ST0476	GREER RD	Decorative	80	4,500	360	0.011
ST0360	HANES RD	Decorative	50	4,500	225	0.007
ST0381	HANES RD	Decorative	50	4,500	225	0.007
ST0421	HANES RD	Decorative	50	4,500	225	0.007
ST0459	HANES RD	Decorative	80	4,500	360	0.011
ST0464	HANES RD	Decorative	80	4,500	360	0.011
ST0465	HANES RD	Decorative	80	4,500	360	0.011
ST0468	HANES RD	Decorative	80	4,500	360	0.011
ST0186	HANES ST	Decorative	50	4,500	225	0.007
ST0188	HANES ST	Decorative	50	4,500	225	0.007
ST0190	HANES ST	Decorative	50	4,500	225	0.007
ST0275	HANES ST	Decorative	115	4,500	518	0.015
ST0337	HELEN ST	Decorative	50	4,500	225	0.007
ST0085	HENRY ST	Decorative	50	4,500	225	0.007
ST0233	HENRY ST	Decorative	50	4,500	225	0.007
ST0235	HENRY ST	Decorative	50	4,500	225	0.007
ST0267	HENRY ST	Decorative	115	4,500	518	0.015
ST0335	HENRY ST	Decorative	50	4,500	225	0.007
ST0109	HERMAN AV	Decorative	50	4,500	225	0.007
ST0110	HERMAN AV	Decorative	50	4,500	225	0.007
ST0111	Herman Ave	Decorative	50	4,500	225	0.007
ST0348	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0354	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0364	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0365	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0404	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0416	HIAWATHA DR	Lights	50	4,500	225	0.007
ST0426	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0427	HIAWATHA DR	Decorative	50	4,500	225	0.007
ST0139	HIGH ST	Decorative	50	4,500	225	0.007
ST0149	HIGH ST	Decorative	115	4,500	518	0.015
ST0150	HIGH ST	Decorative	115	4,500	518	0.015
ST0167	HIGH ST	Decorative	50	4,500	225	0.007
ST0193	HIGH ST	Decorative	50	4,500	225	0.007
ST0467	Hoths Lane	Decorative	80	4,500	360	0.011
ST0467	Hoths Lane	Decorative	80	4,500	360	0.011
ST0509	HOWLAND DR	Decorative	100	4,500	450	0.013
ST0510	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0511	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0512	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0514	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0515	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0516	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0517	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0509	HOWLAND DR	Decorative	115	4,500	518	0.015

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0510	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0511	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0512	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0514	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0515	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0516	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0517	HOWLAND DR	Decorative	115	4,500	518	0.015
ST0447	HUNTERS BAY DR	Decorative	50	4,500	225	0.007
ST0496	HUTCHESON BEACH RD	Decorative	80	4,500	360	0.011
ST0423	HWY 141	Decorative	50	4,500	225	0.007
ST0069	IRENE ST	Decorative	50	4,500	225	0.007
ST0073	Irene St	Decorative	50	4,500	225	0.007
ST0074	IRENE ST	Decorative	50	4,500	225	0.007
ST0076	IRENE ST	Decorative	50	4,500	225	0.007
ST0227	IRENE ST	Decorative	50	4,500	225	0.007
ST0398	IRIS ST	Decorative	50	4,500	225	0.007
ST0428	JENNER CT	Decorative	50	4,500	225	0.007
ST0080	JOHANNA ST	Decorative	50	4,500	225	0.007
ST0081	Johanna St	Decorative	50	4,500	225	0.007
ST0082	Johanna St	Decorative	50	4,500	225	0.007
ST0249	JOHN ST	Decorative	50	4,500	225	0.007
ST0309	JOHN ST	Decorative	80	4,500	360	0.011
ST0471	KENDRA CR	Decorative	80	4,500	360	0.011
ST0474	KENDRA CR	Decorative	80	4,500	360	0.011
ST0471	KENDRA CR	Decorative	80	4,500	360	0.011
ST0474	KENDRA CR	Decorative	80	4,500	360	0.011
ST0241	KING CR	Decorative	50	4,500	225	0.007
ST0242	KING CR	Decorative	50	4,500	225	0.007
ST0238	KING ST	Decorative	50	4,500	225	0.007
ST0239	KING ST	Decorative	50	4,500	225	0.007
ST0245	KING ST	Decorative	50	4,500	225	0.007
ST0216	KING WILLIAM ST	Decorative	50	4,500	225	0.007
ST0274	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0276	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0277	KING WILLIAM ST	Decorative	80	4,500	360	0.011
ST0278	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0280	KING WILLIAM ST	Decorative	50	4,500	225	0.007
ST0281	KING WILLIAM ST	Decorative	80	4,500	360	0.011
ST0282	KING WILLIAM ST	Decorative	80	4,500	360	0.011
ST0283	KING WILLIAM ST	Decorative	50	4,500	225	0.007
ST0284	KING WILLIAM ST	Decorative	80	4,500	360	0.011
ST0285	KING WILLIAM ST	Crosswalk	50	4,500	225	0.007
ST0286	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0289	KING WILLIAM ST	Decorative - Coach Style	80	4,500	360	0.011
ST0304	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0312	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0313	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0491	KING WILLIAM ST	Decorative	80	4,500	360	0.011
ST0276	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0277	KING WILLIAM ST	Crosswalk	115	4,500	518	0.015
ST0278	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0280	KING WILLIAM ST	Decorative	115	4,500	518	0.015
ST0282	KING WILLIAM ST	Decorative - Coach Style	115	4,500	518	0.015
ST0283	KING WILLIAM ST	Decorative - Coach Style	115	4,500	518	0.015

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0284	KING WILLIAM ST	Decorative - Coach Style	115	4,500	518	0.015
ST0285	KING WILLIAM ST	Decorative - Coach Style	115	4,500	518	0.015
ST0286	KING WILLIAM ST	Decorative - Coach Style	115	4,500	518	0.015
ST0289	KING WILLIAM ST	Decorative - Coach Style	115	4,500	518	0.015
ST0304	KING WILLIAM ST	Lights	115	4,500	518	0.015
ST0312	KING WILLIAM ST	Lights	115	4,500	518	0.015
ST0313	KING WILLIAM ST	Lights	115	4,500	518	0.015
ST0451	KINGWILLIAM ST	Decorative	80	4,500	360	0.011
ST0451	KINGWILLIAM ST	Decorative	80	4,500	360	0.011
ST0452	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0458	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0460	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0479	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0483	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0487	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0501	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0452	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0458	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0460	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0479	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0483	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0487	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0501	KIRBYS WAY	Decorative	80	4,500	360	0.011
ST0347	KITCHEN RD N	Decorative	50	4,500	225	0.007
ST0457	LAGOON TRAILER PK RD	Decorative	80	4,500	360	0.011
ST0170	LAKE DR	Decorative - Coach Style	50	4,500	225	0.007
ST0178	LAKE DR	Lights	50	4,500	225	0.007
ST0179	LAKE DR	Lights	50	4,500	225	0.007
ST0180	LAKE DR	Decorative	50	4,500	225	0.007
ST0181	LAKE DR	Decorative	50	4,500	225	0.007
ST0165	LANSDOWNE ST W	Decorative	50	4,500	225	0.007
ST0166	LANSDOWNE ST W	Crosswalk	50	4,500	225	0.007
ST0196	LANSDOWNE ST W	Decorative	50	4,500	225	0.007
ST0159	LORNE ST S	Decorative	50	4,500	225	0.007
ST0160	LORNE ST S	Decorative	50	4,500	225	0.007
ST0203	LORNE ST S	Decorative	50	4,500	225	0.007
ST0204	LORNE ST S	Decorative	50	4,500	225	0.007
ST0269	LORNE ST S	Decorative	80	4,500	360	0.011
ST0254	MAIN ST W	Decorative	115	4,500	518	0.015
ST0256	MAIN ST W	Decorative	115	4,500	518	0.015
ST0264	MAIN ST W	Decorative	80	4,500	360	0.011
ST0266	MAIN ST W	Decorative	115	4,500	518	0.015
ST0268	MAIN ST W	Decorative	115	4,500	518	0.015
ST0290	Main St W	Decorative - Coach Style	80	4,500	360	0.011
ST0291	MAIN ST W	Decorative - Coach Style	80	4,500	360	0.011
ST0293	MAIN ST W	Decorative - Coach Style	115	4,500	518	0.015
ST0294	MAIN ST W	Decorative - Coach Style	80	4,500	360	0.011
ST0295	MAIN ST W	Lights	100	4,500	450	0.013
ST0296	MAIN ST W	Lights	80	4,500	360	0.011
ST0297	Main St W	Lights	80	4,500	360	0.011
ST0298	MAIN ST W	Lights	80	4,500	360	0.011
ST0301	MAIN ST W	Decorative	80	4,500	360	0.011
ST0322	MAIN ST W	Decorative	80	4,500	360	0.011
ST0323	MAIN ST W	Decorative	115	4,500	518	0.015
ST0324	MAIN ST W	Decorative	80	4,500	360	0.011

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0330	MAIN ST W	Decorative	80	4,500	360	0.011
ST0332	MAIN ST W	Decorative	80	4,500	360	0.011
ST0333	MAIN ST W	Decorative	80	4,500	360	0.011
ST0341	MAIN ST W	Decorative	80	4,500	360	0.011
ST0481	MAIN ST W	Decorative	80	4,500	360	0.011
ST0504	MAIN ST W	Decorative	80	4,500	360	0.011
ST0112	Manominee St	Decorative	50	4,500	225	0.007
ST0113	MANOMINEE ST	Decorative	50	4,500	225	0.007
ST0115	MANOMINEE ST	Decorative	50	4,500	225	0.007
ST0124	MANOMINEE ST	Decorative	50	4,500	225	0.007
ST0125	MANOMINEE ST	Decorative	50	4,500	225	0.007
ST0305	MANOMINEE ST	Decorative	80	4,500	360	0.011
ST0310	MANOMINEE ST	Decorative	80	4,500	360	0.011
ST0126	MAPLE AV	Decorative	50	4,500	225	0.007
ST0508	MARSH RD	Decorative	100	4,500	450	0.013
ST0200	MARY ST W	Decorative	50	4,500	225	0.007
ST0205	MARY ST W	Decorative	50	4,500	225	0.007
ST0206	MARY ST W	Decorative	80	4,500	360	0.011
ST0207	MARY ST W	Decorative	50	4,500	225	0.007
ST0250	MARY ST W	Decorative	80	4,500	360	0.011
ST0108	MAY LN	Decorative	50	4,500	225	0.007
ST0131	MEADOW PARK DR	Decorative	50	4,500	225	0.007
ST0168	MEADOW PARK DR	Decorative	50	4,500	225	0.007
ST0171	MEADOW PARK DR	Decorative - Coach Style	50	4,500	225	0.007
ST0172	MEADOW PARK DR	Decorative - Coach Style	50	4,500	225	0.007
ST0174	MEADOW PARK DR	Decorative - Coach Style	50	4,500	225	0.007
ST0175	MEADOW PARK DR	Decorative - Coach Style	50	4,500	225	0.007
ST0176	MEADOW PARK DR	Lights	50	4,500	225	0.007
ST0177	MEADOW PARK DR	Lights	50	4,500	225	0.007
ST0345	MILL ST	Decorative	50	4,500	225	0.007
ST0210	MINERVA ST E	Decorative	50	4,500	225	0.007
ST0211	MINERVA ST E	Decorative	50	4,500	225	0.007
ST0201	MINERVA ST W	Decorative	50	4,500	225	0.007
ST0208	MINERVA ST W	Decorative	50	4,500	225	0.007
ST0185	MORRIS AVE	Decorative	50	4,500	225	0.007
ST0189	MORRIS AVE	Decorative	50	4,500	225	0.007
ST0217	MOUNTVIEW AV	Decorative	50	4,500	225	0.007
ST0363	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0366	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0367	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0375	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0395	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0415	MUSKOKA RD 10	Lights	50	4,500	225	0.007
ST0417	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0418	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0424	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0425	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0440	MUSKOKA RD 10	Decorative	50	4,500	225	0.007
ST0462	MUSKOKA RD 10	Decorative	80	4,500	360	0.011
ST0499	MUSKOKA RD 10	Decorative	80	4,500	360	0.011
ST0403	MUSKOKA RD 3 N	Crosswalk	50	4,500	225	0.007
ST0422	MUSKOKA RD 3 N	Decorative	50	4,500	225	0.007
ST0436	MUSKOKA RD 3 N	Decorative	50	4,500	225	0.007
ST0453	MUSKOKA RD 3 N	Decorative	80	4,500	360	0.011
ST0492	MUSKOKA RD 3 N	Decorative	80	4,500	360	0.011

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0502	MUSKOKA RD 3 N	Decorative	80	4,500	360	0.011
ST0506	MUSKOKA RD 3 N	Decorative	80	4,500	360	0.011
ST0453	MUSKOKA RD 3 N	Decorative	80	4,500	360	0.011
ST0114	N FETTERLY ST	Decorative	50	4,500	225	0.007
ST0255	NAIN ST W	Decorative	115	4,500	518	0.015
ST0371	NEW HAVEN CT	Decorative	50	4,500	225	0.007
ST0376	NEW HAVEN CT	Decorative	50	4,500	225	0.007
ST0446	NEW HAVEN CT	Decorative	50	4,500	225	0.007
ST0371	NEW HAVEN CT	Decorative	50	4,500	225	0.007
ST0376	NEW HAVEN CT	Decorative	50	4,500	225	0.007
ST0446	NEW HAVEN CT	Decorative	50	4,500	225	0.007
ST0107	NORTH DUFFERIN ST	Decorative	50	4,500	225	0.007
ST0214	NORTH DUFFERIN ST	Decorative	50	4,500	225	0.007
ST0215	NORTH DUFFERIN ST	Decorative	50	4,500	225	0.007
ST0419	NORTHWOODS DR	Decorative	50	4,500	225	0.007
ST0391	OLD MUSKOKA RD	Decorative	50	4,500	225	0.007
ST0400	OLD MUSKOKA RD	Decorative	50	4,500	225	0.007
ST0405	OLD MUSKOKA RD	Decorative	50	4,500	225	0.007
ST0412	OLD MUSKOKA RD	Decorative - Coach Style	50	4,500	225	0.007
ST0437	OLD MUSKOKA RD	Decorative	50	4,500	225	0.007
ST0237	PAYNE DR	Decorative	100	4,500	450	0.013
ST0130	PLEASANT AV	Decorative	50	4,500	225	0.007
ST0132	PLEASANT AV	Decorative	50	4,500	225	0.007
ST0119	PRINCESS ST	Decorative	80	4,500	360	0.011
ST0151	PRINCESS ST	Decorative	50	4,500	225	0.007
ST0351	RAVENSCLIFFE RD	Decorative	50	4,500	225	0.007
ST0470	RAVENSCLIFFE RD	Decorative	80	4,500	360	0.011
ST0470	RAVENSCLIFFE RD	Decorative	80	4,500	360	0.011
ST0455	RAVENSGLEN COURT	Decorative	80	4,500	360	0.011
ST0120	RIVER ST	Decorative	50	4,500	225	0.007
ST0121	RIVER ST	Decorative	50	4,500	225	0.007
ST0410	RIVERSIDE DR	Decorative - Coach Style	50	4,500	225	0.007
ST0448	RIVERSIDE DR	Decorative	50	4,500	225	0.007
ST0482	RIVERSIDE DR	Decorative	80	4,500	360	0.011
ST0098	ROGERS RD	Decorative	50	4,500	225	0.007
ST0099	ROGERS RD	Decorative	50	4,500	225	0.007
ST0202	S DUFFERIN ST	Decorative	50	4,500	225	0.007
ST0349	SABRINA PARK DR	Decorative	50	4,500	225	0.007
ST0441	SABRINA PARK DR	Decorative	50	4,500	225	0.007
ST0443	SABRINA PARK DR	Decorative	50	4,500	225	0.007
ST0173	SCOTT ST	Decorative - Coach Style	50	4,500	225	0.007
ST0319	SHAY RD	Decorative	50	4,500	225	0.007
ST0433	SHAY RD	Decorative	50	4,500	225	0.007
ST0358	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0369	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0377	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0396	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0399	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0439	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0358	SILVER OAKS CR	Lights	50	4,500	225	0.007
ST0369	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0377	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0396	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0399	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0406	SILVER OAKS CR	Decorative	50	4,500	225	0.007

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0439	SILVER OAKS CR	Decorative	50	4,500	225	0.007
ST0374	SILVER ST	Decorative	50	4,500	225	0.007
ST0420	SILVER ST	Decorative	50	4,500	225	0.007
ST0357	SILVERWOOD DR	Decorative	50	4,500	225	0.007
ST0359	SILVERWOOD DR	Decorative	50	4,500	225	0.007
ST0373	SILVERWOOD DR	Decorative	50	4,500	225	0.007
ST0388	SILVERWOOD DR	Decorative	50	4,500	225	0.007
ST0466	SILVERWOOD DR	Decorative	80	4,500	360	0.011
ST0478	SILVERWOOD DR	Decorative	80	4,500	360	0.011
ST0466	SILVERWOOD DR	Decorative	80	4,500	360	0.011
ST0163	SOUTH DUFFERIN ST	Decorative	50	4,500	225	0.007
ST0413	SOUTH DUFFERIN ST	Lights	50	4,500	225	0.007
ST0382	SOUTH MARY LK RD	Decorative	50	4,500	225	0.007
ST0384	SOUTH MARY LK RD	Decorative	50	4,500	225	0.007
ST0409	SOUTHDALE DR	Decorative - Coach Style	50	4,500	225	0.007
ST0472	SOUTHDALE DR	Decorative	80	4,500	360	0.011
ST0353	SPRUCE DR	Decorative	50	4,500	225	0.007
ST0224	STATION RD	Decorative	50	4,500	225	0.007
ST0253	STATION RD	Decorative	115	4,500	518	0.015
ST0331	STATION RD	Decorative	80	4,500	360	0.011
ST0334	STATION RD	Decorative	80	4,500	360	0.011
ST0402	STEBCO	Decorative	50	4,500	225	0.007
ST0263	SUSAN ST E	Decorative	80	4,500	360	0.011
ST0346	SUSAN ST E	Decorative	50	4,500	225	0.007
ST0104	Susan St W	Decorative	50	4,500	225	0.007
ST0105	SUSAN ST W	Decorative	50	4,500	225	0.007
ST0106	SUSAN ST W	Decorative	50	4,500	225	0.007
ST0343	SUSAN ST W	Decorative	50	4,500	225	0.007
ST0079	TAIT ST	Decorative	50	4,500	225	0.007
ST0442	TIMBER TRAIL	Decorative	50	4,500	225	0.007
ST0430	TOWNSHIP HALL RD	Decorative	50	4,500	225	0.007
ST0103	VETERANS WAY	Decorative	50	4,500	225	0.007
ST0152	VETERANS WAY	Decorative	50	4,500	225	0.007
ST0197	VETERANS WAY	Decorative	50	4,500	225	0.007
ST0198	WALPOLE ST	Decorative	50	4,500	225	0.007
ST0199	WALPOLE ST	Decorative	50	4,500	225	0.007
ST0075	WALTER ST	Decorative	50	4,500	225	0.007
ST0077	WALTER ST	Decorative	50	4,500	225	0.007
ST0070	WEST ELLIOTT ST	Decorative	50	4,500	225	0.007
ST0279	WEST RD	Decorative	115	4,500	518	0.015
ST0287	WEST RD	Decorative	80	4,500	360	0.011
ST0306	WEST RD	Decorative	80	4,500	360	0.011
ST0307	WEST RD	Decorative	80	4,500	360	0.011
ST0308	WEST RD	Decorative	80	4,500	360	0.011
ST0450	WEST RD	Decorative	80	4,500	360	0.011
ST0488	WEST RD	Decorative	80	4,500	360	0.011
ST0495	WEST RD	Decorative	80	4,500	360	0.011
ST0497	WEST RD	Decorative	80	4,500	360	0.011
ST0505	WEST RD	Decorative	80	4,500	360	0.011
ST0513	WEST RD	Decorative	115	4,500	518	0.015
ST0490	WEST ST	Decorative	80	4,500	360	0.011
ST0493	WEST ST	Decorative	80	4,500	360	0.011
ST0240	WEST ST N	Decorative	50	4,500	225	0.007
ST0243	WEST ST N	Decorative	50	4,500	225	0.007
ST0244	WEST ST N	Decorative	50	4,500	225	0.007

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0314	WEST ST N	Decorative	80	4,500	360	0.011
ST0315	WEST ST N	Decorative	50	4,500	225	0.007
ST0317	WEST ST N	Decorative	50	4,500	225	0.007
ST0325	WEST ST N	Decorative	80	4,500	360	0.011
ST0326	WEST ST N	Decorative	80	4,500	360	0.011
ST0338	WEST ST N	Decorative	50	4,500	225	0.007
ST0145	WEST ST S	Decorative	50	4,500	225	0.007
ST0146	WEST ST S	Decorative	50	4,500	225	0.007
ST0321	WEST ST S	Decorative	50	4,500	225	0.007
ST0368	WEST ST S	Decorative	50	4,500	225	0.007
ST0489	WILLIAM ST	Decorative	80	4,500	360	0.011
ST0234	WILMOTT ST	Decorative	50	4,500	225	0.007
ST0292	WILMOTT ST	Decorative - Coach Style	50	4,500	225	0.007
ST0389	WINONA DR	Decorative	50	4,500	225	0.007
ST0438	WINONA DR	Decorative	50	4,500	225	0.007
ST0434	WOOD ST	Decorative	50	4,500	225	0.007
ST0225	YONGE ST N	Decorative	50	4,500	225	0.007
ST0226	YONGE ST NORTH	Decorative	50	4,500	225	0.007
ST0072	YONGE ST S	Decorative	50	4,500	225	0.007
ST0228	YONGE ST S	Decorative	50	4,500	225	0.007
ST0229	YONGE ST S	Decorative	50	4,500	225	0.007
ST0230	YONGE ST S	Decorative	50	4,500	225	0.007
ST0231	YONGE ST S	Decorative	50	4,500	225	0.007
ST0299	YONGE ST S	Decorative	80	4,500	360	0.011
ST0300	YONGE ST S	Decorative	115	4,500	518	0.015
TBD	Street Lights (1) Homestead Ln, LED	Decorative	50	4,500	225	0.007
TBD	Street Lights (2) Prestwick Dr, LED	Decorative	50	4,500	225	0.007
	Braeside Cres	Decorative	100	4,500	450	0.013
	Braeside Crescent	Lights	100	4,500	450	0.013
	Selkirk Drive	Lights	100	4,500	450	0.013
	Woodstream Drive	Lights	100	4,500	450	0.013
	Millwood Court	Lights	100	4,500	450	0.013
	Brookside Crossing Streetlights	Decorative - Coach Style	100	4,500	450	0.013
	Brookside Crossing Streetlights	Decorative - Coach Style	100	4,500	450	0.013
	Spalding Crescent Streetlights	Decorative - Coach Style	100	4,500	450	0.013
	Spalding Crescent Streetlights	Decorative - Coach Style	100	4,500	450	0.013
	Kelsey Madison Crt Streetlights	Decorative - Coach Style	100	4,500	450	0.013
	Kelsey Madison Crt Streetlights	Decorative - Coach Style	100	4,500	450	0.013
ST0006	Main St Bridge	Decorative	100	4,500	450	0.013
ST0006	Main St Bridge	Decorative	100	4,500	450	0.013
ST0007	Main St Bridge	Decorative	100	4,500	450	0.013
ST0007	Main St Bridge	Decorative	100	4,500	450	0.013
ST0024	Main St Bridge	Decorative	100	4,500	450	0.013
ST0024	Main St Bridge	Decorative	100	4,500	450	0.013
ST0025	Main St Bridge	Decorative	100	4,500	450	0.013
ST0025	Main St Bridge	Decorative	100	4,500	450	0.013
ST0017	Main St W	Decorative	100	4,500	450	0.013
ST0017	Main St W	Decorative	100	4,500	450	0.013
ST0036	Main St W	Decorative	100	4,500	450	0.013
ST0036	Main St W	Decorative	100	4,500	450	0.013
ST0064	Main St W	Decorative	100	4,500	450	0.013
ST0064	Main St W	Decorative	100	4,500	450	0.013
ST0212	Main St W	Decorative	100	4,500	450	0.013
ST0212	Main St W	Decorative	100	4,500	450	0.013
ST0057	Main St E	Decorative	100	4,500	450	0.013

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0057	Main St E	Decorative	100	4,500	450	0.013
ST0020	Main St W	Decorative	100	4,500	450	0.013
ST0020	Main St W	Decorative	100	4,500	450	0.013
ST0034	Main St W	Decorative	100	4,500	450	0.013
ST0034	Main St W	Decorative	100	4,500	450	0.013
ST0021	Main St E	Decorative	100	4,500	450	0.013
ST0021	Main St E	Decorative	100	4,500	450	0.013
ST0038	Main St E	Decorative	100	4,500	450	0.013
ST0038	Main St E	Decorative	100	4,500	450	0.013
ST0213	Main St E	Decorative	100	4,500	450	0.013
ST0213	Main St E	Decorative	100	4,500	450	0.013
ST0056	Main St W	Decorative	100	4,500	450	0.013
ST0056	Main St W	Decorative	100	4,500	450	0.013
ST0271	Main St W	Decorative	100	4,500	450	0.013
ST0271	Main St W	Decorative	100	4,500	450	0.013
ST0015	Main St E	Decorative	100	4,500	450	0.013
ST0015	Main St E	Decorative	100	4,500	450	0.013
ST0301	Main St E	Decorative	100	4,500	450	0.013
ST0301	Main St E	Decorative	100	4,500	450	0.013
ST0039	Main St E	Decorative	100	4,500	450	0.013
ST0039	Main St E	Decorative	100	4,500	450	0.013
ST0047	Main St E	Decorative	100	4,500	450	0.013
ST0047	Main St E	Decorative	100	4,500	450	0.013
ST0054	Main St E	Decorative	100	4,500	450	0.013
ST0054	Main St E	Decorative	100	4,500	450	0.013
ST0018	Main St W	Decorative	100	4,500	450	0.013
ST0018	Main St W	Decorative	100	4,500	450	0.013
ST0014	Main St E	Decorative	100	4,500	450	0.013
ST0014	Main St E	Decorative	100	4,500	450	0.013
ST0040	Main St E	Decorative	100	4,500	450	0.013
ST0040	Main St E	Decorative	100	4,500	450	0.013
ST0041	Main St E	Decorative	100	4,500	450	0.013
ST0041	Main St E	Decorative	100	4,500	450	0.013
ST0023	Main St E	Decorative	100	4,500	450	0.013
ST0023	Main St E	Decorative	100	4,500	450	0.013
ST0316	Main St E	Decorative	100	4,500	450	0.013
ST0316	Main St E	Decorative	100	4,500	450	0.013
ST0318	Main St E	Decorative	100	4,500	450	0.013
ST0318	Main St E	Decorative	100	4,500	450	0.013
ST0013	Main St E	Decorative	100	4,500	450	0.013
ST0013	Main St E	Decorative	100	4,500	450	0.013
ST0042	Main St E	Decorative	100	4,500	450	0.013
ST0042	Main St E	Decorative	100	4,500	450	0.013
ST0209	Main St W	Decorative	100	4,500	450	0.013
ST0209	Main St W	Decorative	100	4,500	450	0.013
ST0029	Main St E	Decorative	100	4,500	450	0.013
ST0029	Main St E	Decorative	100	4,500	450	0.013
ST0012	Main St E	Decorative	100	4,500	450	0.013
ST0012	Main St E	Decorative	100	4,500	450	0.013
ST0043	Main St E	Decorative	100	4,500	450	0.013
ST0043	Main St E	Decorative	100	4,500	450	0.013
ST0022	Main St E	Decorative	100	4,500	450	0.013
ST0022	Main St E	Decorative	100	4,500	450	0.013
ST0011	Main St E	Decorative	100	4,500	450	0.013
ST0011	Main St E	Decorative	100	4,500	450	0.013

GENERAL			OPERATIONS AND CONSUMPTION			
Asset Name	Asset Location	Model Number	Bulb Watt (Streetlights)	Annual Operating Hours (hrs) (Note 1)	Annual Electricity Consumption (kWh)	GHG EMISSIONS (t CO_2e)
ST0031	Main St E	Decorative	100	4,500	450	0.013
ST0031	Main St E	Decorative	100	4,500	450	0.013
ST0044	Main St E	Decorative	100	4,500	450	0.013
ST0044	Main St E	Decorative	100	4,500	450	0.013
ST0045	Main St E	Decorative	100	4,500	450	0.013
ST0045	Main St E	Decorative	100	4,500	450	0.013
ST0035	Main St W	Decorative	100	4,500	450	0.013
ST0035	Main St W	Decorative	100	4,500	450	0.013
ST0001	Main St E	Decorative	100	4,500	450	0.013
ST0001	Main St E	Decorative	100	4,500	450	0.013
ST0028	Main St E	Decorative	100	4,500	450	0.013
ST0028	Main St E	Decorative	100	4,500	450	0.013
ST0010	Main St E	Decorative	100	4,500	450	0.013
ST0010	Main St E	Decorative	100	4,500	450	0.013
ST0027	Main St E	Decorative	100	4,500	450	0.013
ST0009	Main St E	Decorative	100	4,500	450	0.013
ST0009	Main St E	Decorative	100	4,500	450	0.013
ST0026	Main St E	Decorative	100	4,500	450	0.013
ST0026	Main St E	Decorative	100	4,500	450	0.013
ST0270	Main St E	Decorative	100	4,500	450	0.013
ST0270	Main St E	Decorative	100	4,500	450	0.013
ST0002	Main St E	Decorative	100	4,500	450	0.013
ST0002	Main St E	Decorative	100	4,500	450	0.013
ST0003	Main St E	Decorative	100	4,500	450	0.013
ST0003	Main St E	Decorative	100	4,500	450	0.013
ST0004	Main St E	Decorative	100	4,500	450	0.013
ST0004	Main St E	Decorative	100	4,500	450	0.013
	Main St E	Crosswalk	100	4,500	450	0.013
	Kent Park	Decorative	100	4,500	450	0.013
	Kent Park	Decorative	100	4,500	450	0.013

Note:

1. Assumed based on sunset/sunrise during the summer and winter months.

Appendix F: Township of Georgian Bay Energy and GHG Data

TATHAM ENGINEERING

Appendix F - Township of Georgian Bay
Building Data

Year: **2018**

BUILDING INFORMATION				FUEL AND ENERGY CONSUMPTION				ENERGY RELATED GHG EMISSIONS (t CO_2e)				TOTAL GHG EMISSIONS				EXISTING MECHANICAL				
Facility Name	Operation Type	Total Floor Area (m^2)	In Service in 2024? (Y / N)	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil 1 & 2 (L)	Propane (L)	Electricity GHG Emissions	Natural Gas GHG Emissions	Fuel Oil 1 & 2 GHG Emissions	Propane GHG Emissions	Total GHG Emissions (tCO_2e)	GHG Intensity (tCO_2e /m^2)	Energy Intensity ($ekWh/m^2$)	Energy Intensity (GJ/m^2)	Existing Heating Source	Existing Heating Source Efficiency	Heating Source Installed Year	Energy Use Index (EUI) (ekBTU/sq.ft)	Energy Star Typical EUI (ekBTU/sq.ft)
Community Services Building	Administration	206	Y	23,344.41			6,828.00	0.69	0.00	0.00	10.54	11.23	0.05	346.35	1.25	Packaged RTU	81%	2010	104	52.9 (Office)
Municipal Office	Administration	780	Y	86,192.88			10,502.50	2.55	0.00	0.00	16.22	18.77	0.02	205.17	0.74	Packaged RTU	81%	2006	63	52.9 (Office)
MacTier Arena	Arena	2294	Y	288,800.00			20,861.40	8.53	0.00	0.00	32.22	40.75	0.02	189.83	0.68	Propane Furnaces	95%	2009	59	50.8 (Ice/Curling Rink)
Baxter Ward Community Centre	Community Centre	817	Y	85,256.07			30,115.80	2.52	0.00	0.00	46.51	49.03	0.06	363.51	1.31	Propane Furnaces + Cooling only RTU	95%	N/A	109	56.1 (Social/Meeting Hall)
Bressette House (Note 1)	Cultural Centre	153	Y	2,674.09			3,724.90	0.08	0.00	0.00	5.75	5.83	0.04	188.64	0.68	Propane Furnace	95%	N/A	56	N/A
Honey Harbour Fire Hall	Fire Hall	204	Y - Fire Station #1	27,304.83			10,807.80	0.81	0.00	0.00	16.69	17.50	0.09	506.32	1.82	Electric Baseboard/Propane tube heaters	85%	N/A	151	63.5 (Fire Station)
MacTier Fire Hall	Fire Hall	204	Y - Fire Station #2	30,162.35			8,599.40	0.89	0.00	0.00	13.28	14.17	0.07	444.22	1.60	Propane Tube Heaters/ Elec Baseboards	81%	N/A	133	63.5 (Fire Station)
Public Works/Fire Hall	Fire Hall	696	Unclear	55,130.00			25,826.70	1.63	0.00	0.00	39.88	41.51	0.06	340.09	1.22	Propane Tube Heaters + Packaged RTU	81%	N/A	101	55.7 (Avg. Fire & Social)
Honey Harbour Library	Public Library	171	Y	33,381.12			0.00	0.99	0.00	0.00	0.00	0.99	0.01	195.21	0.70	Electric Baseboards	100%	N/A	62	71.6 (Library)
MacTier Library	Public Library	232	Y	13,895.37			2,929.50	0.41	0.00	0.00	4.52	4.93	0.02	148.67	0.54	Packaged RTU	81%	2008	45	71.6 (Library)
Port Severn Park	Recreational Facility	106	Y	17,114.06			0.00	0.51	0.00	0.00	0.00	0.51	0.00	161.45	0.58	Electric Heaters	100%	N/A	51	N/A
MacTier Public Works	Storage Facility	371	Y	71,290.77			12,192.10	2.11	0.00	0.00	18.83	20.93	0.06	423.20	1.52	Propane Tube/Unit Heaters	81%	N/A	128	47.9 (Vehicle Repair Services)

Note:

1. Bressette House, being a heritage building, was excluded from the retrofit planning and assessment.

TATHAM ENGINEERING

Appendix F - Township of Georgian Bay Fleet Data

Year: **2018**

FLEET GENERAL					OPERATION	
Segment (Vehicle or Equipment)	Assumed Type	Model Year	Vehicle Year	Energy Source	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Equipment	Heavy Duty Vehicle	2003	1960-2006	Diesel	1,257	3.39
Equipment	Heavy Duty Vehicle	2010	2007-2020	Diesel	1,641	4.43
Equipment	Heavy Duty Vehicle	2011	2007-2020	Diesel	3,523	9.50
Equipment	Industrial/Commercial Equipment		2007-2020	Diesel	165	0.45
Equipment	Industrial/Commercial Equipment	2004	1960-2006	Diesel	1,811	4.88
Vehicle	Tractor and Combines	2010		Diesel	192	0.52
Vehicle	Heavy Duty Vehicle	2008		Diesel	3,914	10.56
Vehicle	Heavy Duty Vehicle	2010		Diesel	10,319	27.83
Vehicle	Heavy Duty Vehicle	2013		Diesel	10,161	27.41
Vehicle	Heavy Duty Vehicle	2016		Diesel	11,175	30.14
Vehicle	Heavy Duty Vehicle			Diesel	3,219	8.68
Vehicle	Tractor and Combines			Diesel	313	0.84
Vehicle	Tractor and Combines	2012		Diesel	518	1.40
Vehicle	Tractor and Combines			Diesel	357	0.96

FLEET GENERAL					OPERATION	ANNUAL TOTAL GHG EMISSIONS ($t CO_2e$)
Segment (Vehicle or Equipment)	Assumed Type	Model Year	Vehicle Year	Energy Source	Total Fuel Used (L)	
Vehicle	Tractor and Combines			Diesel	207	0.56
Vehicle	Tractor and Combines	2007		Diesel	332	0.90
Equipment	Industrial/Commercial Equipment		2018	Gasoline (Liquid)	38	0.10
Equipment	Industrial/Commercial Equipment		2018	Gasoline (Liquid)	24	0.06
Vehicle	Passenger Car		2018	Gasoline (Liquid)	213	0.57
Vehicle	Passenger Car		2018	Gasoline (Liquid)	823	2.22
Vehicle	Light Duty Vehicle	2014	2014	Gasoline (Liquid)	7,322	19.75
Equipment	Industrial/Commercial Equipment		4 stroke	Gasoline (Liquid)	12	0.03
Vehicle	Light Duty Vehicle	2016	2016	Gasoline (Liquid)	2,610	7.04
Vehicle	Lawn and Garden Equipment	2015	4 stroke	Gasoline (Liquid)	44	0.12
Vehicle	Lawn and Garden Equipment	2015	4 stroke	Gasoline (Liquid)	40	0.11
Vehicle	Light Duty Vehicle	2017	2017	Gasoline (Liquid)	5,572	15.03
Vehicle	Light Duty Vehicle	2012	2012	Gasoline (Liquid)	6,934	18.70
Vehicle	Light Duty Vehicle	2013	2013	Gasoline (Liquid)	5,093	13.74
Vehicle	Light Duty Vehicle	2014	2014	Gasoline (Liquid)	4,102	11.06
Vehicle	Light Duty Vehicle	2017	2017	Gasoline (Liquid)	15,467	41.72

Appendix F - Township of Georgian Bay Streetlight Data

Year: **2015**

GENERAL		OPERATIONS AND CONSUMPTION			
Asset Name	Bulb Watt (Streetlights)	Lamp Watts (Streetlights)	Annual Operating Hours (hrs)	Annual Electricity Consumption (kWh) (Note 1)	GHG EMISSIONS ($t CO_2e$)
Streetlights	N/A	N/A	N/A	17,071	0.504

Note:
1. The Township provided total annual electricity consumption data for the year 2015.

Appendix G: Township of Lake of Bays Energy and GHG Data

TATHAM ENGINEERING

Appendix G - Lake of Bays
Building Data

Year: **2018**

BUILDING INFORMATION					FUEL AND ENERGY CONSUMPTION				ENERGY RELATED GHG EMISSIONS (t CO_2e)				TOTAL GHG EMISSIONS				EXISTING MECHANICAL				
Facility Name	Operation Type	Total Floor Area (m^2)	Year Built	In Service in 2024? (Y / N)	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil 1 & 2 (L)	Fuel Oil 4 & 6 (L)	Propane (L)	Electricity GHG Emissions	Natural Gas GHG Emissions	Fuel Oil 1 & 2 GHG Emissions	Propane GHG Emissions	Total GHG Emissions (tCO_2e)	GHG Intensity (tCO_2e/m^2)	Energy Intensity ($ekWh/m^2$)	Energy Intensity (GJ/m^2)	Existing Heating Source (Note 3)	Existing Heating Source Efficiency	Heating Source Installed Year	Energy Use Index (EUI) (ekBTU/sq.ft)	Energy Star Typical EUI (ekBTU/sq.ft)
Emergency Building	Administration	95		N	0.0		0.0		0.0	0.00	0.00	0.00	0.00	0.00	0.0000	0.00	0.00	N/A	N/A	N/A	N/A	N/A
Municipal Office	Administration	490		Y	82,990.0		0.0		6,355.0	2.45	0.00	0.00	9.81	12.27	0.0250	260.55	0.94	Propane Furnace	95%	2017	80.30	52.9 (Office)
Baysville Arena, Library and Community Centre - Arena	Arena	2769		Y	100,606.0		0.0		18,544.3	2.97	0.00	0.00	28.64	31.61	0.0114	83.42	0.30	Heat Pumps/RTU's	80%	2009	25.26	50.8 (Ice/Curling Rink)
Baysville Arena, Library and Community Centre - Community Centre	Community Centre	478		Y	17,440.1		0.0		3,214.7	0.52	0.00	0.00	4.96	5.48	0.0115	83.77	0.30	Heat Pumps/RTU's	80%	2009	25.37	56.1 (Social/Meeting Hall)
Baysville Fire Hall and Seniors Centre - Seniors Centre	Community Centre	227		Y	6,897.0		1,477.7		2,218.2	0.20	0.00	4.08	3.43	7.71	0.0340	169.24	0.61	Oil fired furnace	80%	2010	52.06	56.1 (Social/Meeting Hall)
Dorset Senior Centre (Note 1)	Community Centre	131		N	2,741.0		1,871.0		0.0	0.08	0.00	5.17	0.00	5.25	0.0401	174.86	0.63	Oil fired furnace and baseboard heaters	80%	2000	55.73	56.1 (Social/Meeting Hall)
Dwight Community Centre and Library - Community Centre	Community Centre	464		Y	57,718.8		0.0		3,796.3	1.71	0.00	0.00	5.86	7.57	0.0163	181.92	0.65	RTU's	80%	2021	56.22	56.1 (Social/Meeting Hall)
Dwight Senior Centre	Community Centre	263	1925	Y	6,248.0		3,305.0		0.0	0.18	0.00	9.13	0.00	9.31	0.0354	159.20	0.57	Oil fired furnace and baseboard heaters	80%	1999	50.73	56.1 (Social/Meeting Hall)
Port Cunnington Senior Centre	Community Centre	153		Y	13,366.0		3,611.0		0.0	0.39	0.00	9.97	0.00	10.37	0.0678	341.73	1.23	Oil Furnace	80%	2002	108.82	56.1 (Social/Meeting Hall)
Baysville Fire Hall and Seniors Centre - Fire Hall	Fire Hall	242		Y	7,353.0		1,575.3		2,364.8	0.22	0.00	4.35	3.65	8.22	0.0340	169.24	0.61	Radiant tube heater, baseboard heaters	80%	2020	52.06	63.5 (Fire Station)
Hillside Firehall	Fire Hall	185		Y	12,230.0		0.0		4,091.0	0.36	0.00	0.00	6.32	6.68	0.0361	221.58	0.80	Radiant Tube Heaters	80%	1992	66.34	63.5 (Fire Station)
Interlaken Firehall (Note 2)	Fire Hall	129		N	5,134.0		0.0		2,251.0	0.15	0.00	0.00	3.48	3.63	0.0281	162.48	0.58	Radiant Tube Heaters	80%	2019	48.43	63.5 (Fire Station)
Port Cunnington Fire Hall	Fire Hall	230		Y	10,497.0		0.0		4,968.0	0.31	0.00	0.00	7.67	7.98	0.0347	197.50	0.71	Radiant Tube Heaters	80%	1995	58.80	63.5 (Fire Station)
Baysville Arena, Library and Community Centre - Library	Public Library	331		Y	12,104.0		0.0		2,231.1	0.36	0.00	0.00	3.45	3.80	0.0115	83.96	0.30	RTU's	80%	2009	25.42	71.6 (Library)
Dwight Community Centre and Library - Library	Public Library	279		Y	34,631.3		0.0		2,277.8	1.02	0.00	0.00	3.52	4.54	0.0163	181.53	0.65	Propane Furnace	95%	2013	56.10	71.6 (Library)
Dwight Storage Building	Storage Facility	74		Y	3,443.0		0.0		1,063.0	0.10	0.00	0.00	1.64	1.74	0.0236	147.52	0.53	Unit Heater	80%	2010	44.23	47.9 (Vehicle Repair Services)
Public Works Garage 1	Storage Facility	494		Y	107,703.0		0.0		36,199.0	3.18	0.00	0.00	55.90	59.08	0.1196	733.20	2.64	Radiant Tube Heaters	80%	2017	219.49	47.9 (Vehicle Repair Services)
Public Works Garage 2	Storage Facility	278		Y	39,997.0		0.0		26,374.0	1.18	0.00	0.00	40.73	41.91	0.1508	810.87	2.92	Radiant Tube Heaters	80%	2018	240.31	47.9 (Vehicle Repair Services)
Public Works Garage 3	Storage Facility	108		Y	8,102.0		0.0		0.0	0.24	0.00	0.00	0.00	0.24	0.0022	75.02	0.27	Radiant Tube Heaters and Propane Furnace	80%	2020	23.78	47.9 (Vehicle Repair Services)

Note:
1. Closed permanently as of 2023.
2. Closed - station covered by Hillside personnel.
3. N/A - Information for building mechanical equipment is not available and the building is excluded from our assessment.

Appendix G - Lake of Bays Fleet Data

Fleet List Year: **2023**
GHG Emissions Year: **2018**

FLEET GENERAL										OPERATIONS		
Segment (Vehicle or Equipment)	Type	Department	Asset ID	Township ID	Description	Make	Model	Make Year	Township Purchased Year	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Vehicle	Heavy Duty Vehicle	Fire	FD-1	291	Fire Truck	Freightliner	Pumper	2023	2023	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Fire	FD-2	391	Fire Truck	Freightliner	Pumper	2004	2004	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Fire	FD-3	491	Fire Truck	Freightliner	Pumper	2011	2022	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Fire	FD-4	492	Fire Truck	Freightliner	Pumper	2001	2001	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Fire	FD-5	281	Fire Truck	Ford	Light Rescue	2005	2005	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Fire	FD-6	381	Fire Truck	Ford	Light Rescue	2005	2005	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Fire	FD-7	481	Fire Truck	Ford	Light Rescue	2005	2005	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	19	114	Dump truck	Western Star	Conventional 4700	2013	2013	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	22	116	Dump truck	Western Star	Conventional 4700	2014	2014	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	25	124	Dump truck	Western Star	Conventional	2016	2016	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	28	131	Dump truck	Western Star	Conventional	2017	2018	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	29	134	Dump Truck	Western Star	Conventional 4700	2018	2019	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	31	139	Dump truck	Freightliner	114SD	2019	2019	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	33	138	Dump truck	Western Star	Conventional 4700	2020	2019	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works		147	Dump truck	Freightliner	114SD	2022	2022	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	26	125	One Ton	Ford	F350	2016	2016	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works	27	132	One Ton	Ram	5500	2018	2018	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works		146	One Ton	Chevrolet	3500	2022	2022	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Heavy Duty Vehicle	Public Works		148	One Ton	Chevrolet	3500	2023	2023	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Industrial/Commercial Equipment	Fire	FD-13	Marine2 Motor	Motor	Yamaha 200hp Motor	Yamaha 200hp Motor	2019	2019	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Industrial/Commercial Equipment	Fire	FD-14	Marine2 Motor	Motor	Yamaha 200hp Motor	Yamaha 200hp Motor	2019	2019	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Industrial/Commercial Equipment	Fire	FD-16	Marine4 Motor	N/A	Legend	F-19 90 HP	2023	2023	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Industrial/Commercial Equipment	Fire	FD-18	Marine3 Motor	Motor	Mercury 40hp Motor	Mercury 40hp Motor	2021	2021	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Industrial/Commercial Equipment	Public Works		104	N/A	Thompson	Model A	2007	2007	Clear (low sulfur) Diesel	N/A	N/A

TATHAM ENGINEERING

			FLEET GENERAL								OPERATIONS		ANNUAL TOTAL GHG EMISSIONS ($t\ CO_2e$)
Segment (Vehicle or Equipment)	Type	Department	Asset ID	Township ID	Description	Make	Model	Make Year	Township Purchased Year	Fuel Type	Total Fuel Used (L)		
Vehicle	Industrial/Commercial Equipment	Parks			Cab mower	Kubota	F2690	2020	2020	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Parks			Mower	Kubota	ZD331	2010	2010	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Parks			Mower	Kubota	F2880		2007	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Parks			Mower	Kubota	F2260		2003	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Parks			N/A	Olympia	Mellennium 120HP	2008	2008	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Public Works		119	Heavy equip	John Deere	870GP	2014	2014	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Public Works		128	Heavy equip	N/A	310SL	2016	2016	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Public Works		130	Heavy equip	N/A	624K	2016	2016	Coloured Diesel	N/A		N/A
Vehicle	Industrial/Commercial Equipment	Public Works		133	Heavy equip	N/A	624K	2018	2018	Coloured Diesel	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2010	2010	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2010	2010	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2010	2010	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2010	2010	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2010	2010	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2010	2010	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2021	2021	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2020	2020	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2021	2021	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2008	2008	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	1999	1999	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A		N/A

FLEET GENERAL										OPERATIONS		ANNUAL TOTAL GHG EMISSIONS ($t\ CO_2e$)
Segment (Vehicle or Equipment)	Type	Department	Asset ID	Township ID	Description	Make	Model	Make Year	Township Purchased Year	Fuel Type	Total Fuel Used (L)	
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2019	2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2021	2021	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	2021	2021	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Fire			N/A	N/A	N/A	1998	1998	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Unknown			N/A	N/A	N/A	2014	2014	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Public Works			N/A	Attachment	N/A		2019	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Public Works		195	N/A	N/A	N/A		2000	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Public Works		84	N/A	N/A	N/A	1994	1994	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Public Works		142	N/A	N/A	N/A	2021	2021	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Public Works			N/A	Attachment	N/A	2021	2021	N/A	N/A	N/A
Equipment	Industrial/Commercial Equipment	Public Works	Equipment	120	N/A	2035 gal	N/A	2012	2012	N/A	N/A	N/A
Vehicle	Light Duty Vehicle	Fire	FD-8	ATV3	ATV	Bombardier ATV/w trax	Bombardier ATV/w trax	2001	2001	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Light Duty Vehicle	Fire	FD-10	ATV4	ATV	Polaris ATV/w trax	Polaris ATV/w trax	2007	2007	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Light Duty Vehicle	Fire	FD-17	Marine3	Boat	Starcraft Boat	Starcraft Boat	2001	2001	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Light Duty Vehicle	Parks			2up	Artic Cat	550		2008	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Light Duty Vehicle	ByLaw	BL-1		SUV	Jeep	Patriot		2015	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Parks	PR-13	137	Pickup Truck	Dodge	Utility Truck		2005	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Parks	PR-16	115	Pickup Truck	GMC	Sierra 2500		2013	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Parks	23	129	Pickup Truck	Ford	F250		2016	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Parks	30	135	Pickup Truck	Chevrolet	Silverado 3500 HD		2019	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Parks		143	Pickup Truck	Ford	F150 Hybrid		2021	Gasoline	N/A	N/A

FLEET GENERAL										OPERATIONS		ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Segment (Vehicle or Equipment)	Type	Department	Asset ID	Township ID	Description	Make	Model	Make Year	Township Purchased Year	Fuel Type	Total Fuel Used (L)	
Vehicle	Light Duty Vehicle	Public Works	21	117	Pickup Truck	Ford	F150	2013	2013	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Public Works		145	Pickup Truck	Ford	F150	2016	2016	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Public Works	32	136	Pickup Truck	Chevrolet	Silverado 1500	2019	2019	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Public Works	34	141	Pickup Truck	Ford	F150	2020	2020	Gasoline	N/A	N/A
Vehicle	Light Duty Vehicle	Public Works	35	140	Pickup Truck	Ford	F150	2020	2020	Gasoline	N/A	N/A
Vehicle	Medium Duty Vehicle	Fire	FD-9	ATV3 Trailer	Trailer	Advantage Utility Trailer	Advantage Utility Trailer	2010	2010	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Fire	FD-11	ATV4 Trailer	Trailer	Webliner Trailer	Webliner Trailer	2016	2016	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Fire	FD-15	Marine2 Trailer	Trailer	Connor Industries Trailer	Connor Industries Trailer	2008	2008	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Fire		Marine4 Trailer	N/A	N/A	N/A	2023	2023	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Fire	FD-19	Marine3 Trailer	Trailer	Easy Hauler Trailer	Easy Hauler Trailer	2005	2005	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Parks	17	111	Float Trailer	24'	Trailer		2011	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Parks			Dump Trailer	Quality	Dump 6x14 foot		2015	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Parks	24		Trailer	Wells Cargo	FastTrack Ramp		2015	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Public Works		122	Trailer	Wells Cargo	N/A	2015	2015	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Public Works	20	102	Float Trailer	EZ Loader	Float Trailer	2005	2005	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Medium Duty Vehicle	Public Works		144	Float Trailer	JC trailer	Tag	2022	2023	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Ships and Boats	Building			N/A	Honda 4 stroke Motor	N/A		2008	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Ships and Boats	Building			N/A	N/A	N/A		2008	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Ships and Boats	Fire	FD-12	Marine2	Boat	Stanley 26' Boat	Stanley 26' Boat	2008	2008	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Ships and Boats	Fire		Marine4 Boat	N/A	N/A	N/A	2021	2023	Clear (low sulfur) Diesel	N/A	N/A
Vehicle	Tractor and Combines	Parks			Tractor	Kubota	B2650HSD	2014	2014	Coloured Diesel	N/A	N/A

Clear (low sulfur) Diesel	**85,000**	235.05
Coloured Diesel	**20,000**	55.31
Gasoline	**25,000**	58.04
		348.40

Appendix G - Lake of Bays Streetlight Data

Year: **2018**

GENERAL		ANNUAL ELECTRICITY CONSUMPTION (kWh)) (Note 1)	GHG EMISSIONS (t CO_2e)
Asset Name	Light Type		
Street Light	LED	4,200	0.12
Street Light	LED	4,200	0.12
Street Light	LED	4,200	0.12
Street Light	LED	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12

GENERAL		ANNUAL ELECTRICITY CONSUMPTION (kWh)) (Note 1)	GHG EMISSIONS (t CO_2e)
Asset Name	Light Type		
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12

TATHAM ENGINEERING

GENERAL		ANNUAL ELECTRICITY CONSUMPTION (kWh)) (Note 1)	GHG EMISSIONS (t CO_2e)
Asset Name	Light Type		
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12

GENERAL		ANNUAL ELECTRICITY CONSUMPTION (kWh)) (Note 1)	GHG EMISSIONS (t CO_2e)
Asset Name	Light Type		
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12
Street Light	N/A	4,200	0.12

Note:

1. Annual consumption based on 350 kWh per month per streetlight

Appendix H: Township of Muskoka Lakes Energy and GHG Data

TATHAM ENGINEERING

Appendix H - Township of Muskoka Lakes
Building Data

Year: **2018**

BUILDING INFORMATION						FUEL AND ENERGY CONSUMPTION					ENERGY RELATED GHG EMISSIONS (t CO_2e)				TOTAL GHG EMISSIONS				EXISTING MECHANICAL			
Facility Name	Operation Type	Description	Total Floor Area (m^2)	Year Built	In Service in 2024? (Y / N)	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil 1 & 2 (L)	Fuel Oil 4 & 6 (L)	Propane (L)	Electricity GHG Emissions	Natural Gas GHG Emissions	Fuel Oil 1 & 2 GHG Emissions	Propane GHG Emissions	Total GHG Emissions (tCO_2e)	GHG Intensity (tCO_2e /m^2)	Energy Intensity (ekWh/m^2)	Energy Intensity (GJ/m^2)	Existing Heating Source (Note 1)	Existing Heating Source Efficiency	Energy Use Index (EUI) (ekBTU/sq.ft)	Energy Star Typical EUI (ekBTU/sq.ft)
Administration Building	Administration	Municipal Office	1,628	1973	Y	191,340.00				20,590.34	5.65	0.00	0.00	31.80	37.45	0.02300	206.40	0.74	Gas Furnace + RTU	81%	63	52.9 (Office)
Visitors Centre	Administration	Visitors Centre	144	< 2009	Y	2,445.67				1,909.81	0.07	0.00	0.00	2.95	3.02	0.02098	110.23	0.40	N/A	N/A	33	52.9 (Office)
Bala Arena	Arena	Ice/Curling Rink	2,199	1973	Y	192,583.00	8,442.07				5.69	0.00	23.32	0.00	29.01	0.01319	128.97	0.46	Gas Boiler	95%	41	50.8 (Ice/Curling Rink)
Port Carling Arena	Arena	Ice/Curling Rink	2,580	1973	Y	416,493.90				10,267.03	12.31	0.00	0.00	15.86	28.16	0.01092	189.42	0.68	Propane Furnaces + RTU	85%	59	50.8 (Ice/Curling Rink)
Bala Community Centre	Community Centre	Social/Meeting Hall	494	1953	Y	21,668.44	7,618.66				0.64	0.00	21.04	0.00	21.68	0.04394	210.29	0.76	Oil Furnace	84%	67	56.1 (Social/Meeting Hall)
Foots Bay Community Centre	Community Centre	Social/Meeting Hall	520	1979	Y	26,829.84					0.79	0.00	0.00	0.00	0.79	0.00152	51.57	0.19	Electric heat	100%	16	56.1 (Social/Meeting Hall)
Glen Orchard Community Centre	Community Centre	Social/Meeting Hall	279	1964	Y	4,816.76	3,563.64				0.14	0.00	9.84	0.00	9.98	0.03583	155.09	0.56	Propane Furnace	95%	49	56.1 (Social/Meeting Hall)
Hekkla Community Centre	Community Centre	Social/Meeting Hall	149	1930	Y	3,273.12	2,452.58				0.10	0.00	6.77	0.00	6.87	0.04622	199.85	0.72	Oil Furnace	84%	64	56.1 (Social/Meeting Hall)
Milford Bay Community Centre	Community Centre	Social/Meeting Hall	1,026	1979	Y	31,537.01	22,348.81			1,139.70	0.93	0.00	61.73	1.76	64.42	0.06281	273.41	0.98	Oil Furnace	84%	87	56.1 (Social/Meeting Hall)
Peninsula Community Centre	Community Centre	Social/Meeting Hall	805	1986	Y	65,395.16	3,061.39				1.93	0.00	8.46	0.00	10.39	0.01291	122.29	0.44	Oil Furnace + Electric Heat	81%	39	56.1 (Social/Meeting Hall)
Port Carling Community Centre	Community Centre	Social/Meeting Hall	818	2000	Y	92,960.00				10,267.03	2.75	0.00	0.00	15.86	18.60	0.02275	202.00	0.73	RTU's	80%	62	56.1 (Social/Meeting Hall)
Raymond Community Centre	Community Centre	Social/Meeting Hall	474	1983	Y		4,113.45			698.04	0.00	0.00	11.36	1.08	12.44	0.02625	103.93	0.37	Propane Furnace	95%	33	56.1 (Social/Meeting Hall)
Torrance Community Centre	Community Centre	Social/Meeting Hall	557	1997	Y	24,516.86	3,688.84			3,681.24	0.72	0.00	10.19	5.68	16.60	0.02978	161.74	0.58	Oil Furnace + Electric Basebaords	90%	50	56.1 (Social/Meeting Hall)
Ullswater Community Hall	Community Centre	Social/Meeting Hall	330	1975	Y	6,946.65				3,708.19	0.21	0.00	0.00	5.73	5.93	0.01799	100.11	0.36	Propane Furnace	95%	30	56.1 (Social/Meeting Hall)
Walkers Point Community Centre	Community Centre	Social/Meeting Hall, Library	474	1978	Y	125,360.00					3.70	0.00	0.00	0.00	3.70	0.00782	264.58	0.95	Electric Heat	100%	84	56.1 (Social/Meeting Hall)
Windermere Community Centre	Community Centre	Social/Meeting Hall	323	1912	Y	87,000.00					2.57	0.00	0.00	0.00	2.57	0.00795	269.10	0.97	Electric Baseboards + Forced air electric heat	100%	85	56.1 (Social/Meeting Hall)
Windermere Village Hall	Community Centre	Meeting Hall	111	1953	Y	29,703.99	1,033.81				0.88	0.00	2.86	0.00	3.73	0.03348	366.39	1.32	Oil Furnace	81%	116	56.1 (Social/Meeting Hall)
Bala Fire Hall	Fire Hall	1 Pumper/Tanker, 1 Pumper, 1 Rescue, 1 Hazmat Trailer, 1 Snowmobile	297	2007	Y - Fire station 3	19,480.34				4,782.09	0.58	0.00	0.00	7.38	7.96	0.02678	178.62	0.64	Propane Shop Furnace + Electric Heat	90%	54	63.5 (Fire Station)
Foots Bay Fire Hall	Fire Hall	1 Tanker, 1 Rescue, 1 Snowmobile, 1 Fire Boat	250	1978	Y	20,345.59					0.60	0.00	0.00	0.00	0.60	0.00241	81.41	0.29	Electric Heat	100%	26	63.5 (Fire Station)
Glen Orchard Fire Hall	Fire Hall	1 Mini Pumper	197	1991	Y - Fire station 1	47,509.58					1.40	0.00	0.00	0.00	1.40	0.00713	241.22	0.87	Electric Heat	100%	76	63.5 (Fire Station)
Milford Bay Fire Hall	Fire Hall	1 Pumper/Tanker, 1 Pumper, 1 Rescue, 1 Amphibious Argo, 1 Fire Boat	235	1976	Y - Fire station 9	15,514.07	3,230.59				0.46	0.00	8.92	0.00	9.38	0.03991	214.14	0.77	Oil Furnace	81%	68	63.5 (Fire Station)
Port Carling Fire Hall	Fire Hall	1 Pumper/Tanker, 1 Pumper, 1 Command Truck, 1 Spare Tanker	566	2007	Y	20,943.40				6,889.69	0.62	0.00	0.00	10.64	11.26	0.01990	122.63	0.44	In-Floor Heat Boiler + Propane Furnace + Packaged RTU	85%	37	63.5 (Fire Station)
Raymond Fire Hall	Fire Hall	1 Pumper, 1 Tanker	158	1981	Y - Fire station 7	3,542.80				1,992.76	0.10	0.00	0.00	3.08	3.18	0.02015	111.14	0.40	Propane Furnace	95%	33	63.5 (Fire Station)
Torrance Fire Hall	Fire Hall	1 Pumper/Tanker, 1 Rescue, 1 Fire Boat (Quen's Walk Dock), 1 Wild Land ATV	720	1985	Y	18,626.30					0.55	0.00	0.00	0.00	0.55	0.00076	25.89	0.09	Propane Furnace + Electric Heat	95%	8	63.5 (Fire Station)
Walkers Point Fire Hall	Fire Hall	1 Pumper/Tanker, 1 Spare Pumper	284	2008	Y - Fire station 4	937.58				5,015.80	0.03	0.00	0.00	7.75	7.77	0.02734	127.34	0.46	Propane Furnace + Tube Heaters	95%	37	63.5 (Fire Station)
Windermere Fire Hall	Fire Hall	1 Pumper/Tanker, 1 Pumper, 1 Snowmobile	314	1995	Y - Fire station 7	6,127.73				4,420.53	0.18	0.00	0.00	6.83	7.01	0.02232	118.49	0.43	Propane Furnace + Tube Heaters	95%	35	63.5 (Fire Station)
Port Carling Library	Public Library	Public Library	697	2000	Y	87,265.28				10,954.11	2.58	0.00	0.00	16.92	19.49	0.02798	235.77	0.85	Gas Boilers + Hydronic Heaters	85%	72	71.6 (Library)
Glen Orchard Public Works Yard	Public Works Yard	Public Works Yard, Garage, Shed	408	1991	Y	32,932.25				11,159.39	0.97	0.00	0.00	17.23	18.21	0.04458	272.74	0.98	Electric Baseboards (Staff building) + Propane Unit Heaters	100%	82	47.9 (Vehicle Repair Services)
Patterson Public Works Yard	Public Works Yard	Public Works Yard, Garage, Shed	307	1977	Y	43,612.91				8,450.08	1.29	0.00	0.00	13.05	14.34	0.04677	336.04	1.21	Propane Furnace + Electric Heat	95%	102	47.9 (Vehicle Repair Services)
Ranwood Public Works Yard	Public Works Yard	Public Works Yard, Garage, Shed	453	1977	Y	22,390.53				20,382.39	0.66	0.00	0.00	31.48	32.14	0.07089	365.47	1.32	Propane Tube Heaters	80%	108	47.9 (Vehicle Repair Services)

Note:

1. N/A - Information for building mechanical equipment is not available.

Appendix H - Township of Muskoka Lakes
Fleet Data

Year: **2018**

FLEET GENERAL						OPERATIONS		
Segment (Vehicle or Equipment)	Type	Department	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Vehicle	Passenger Car	Buildings	Jeep	Cherokee	30,956	Gasoline (Unleaded)	3,194.82	7.44
Vehicle	Light Duty Vehicle	Buildings	Chevrolet	Colorado	18,447	Gasoline (Unleaded)	2,154.57	5.01
Vehicle	Light Duty Vehicle	Buildings	Chevrolet	Colorado	15,643	Gasoline (Unleaded)	1,854.88	4.31
Vehicle	Passenger Car	Buildings	Jeep	Liberty	9,243	Gasoline (Unleaded)	1,251.29	2.91
Vehicle	Passenger Car	Buildings	Jeep	Liberty	4,030	Gasoline (Unleaded)	644.02	1.50
Vehicle	Medium Duty Vehicle	Buildings	GMC	Canyon	9,476	Gasoline (Unleaded)	1,268.35	2.96
Vehicle	Light Duty Vehicle	Buildings	Chevrolet	1500 SIL	22,015	Gasoline (Unleaded)	3,419.57	7.94
Vehicle	Light Duty Vehicle	Buildings	Chevrolet	Colorado	24,083	Gasoline (Unleaded)	2,764.42	6.42
Vehicle	Light Duty Vehicle	Buildings	Chevrolet	Colorado	22,283	Gasoline (Unleaded)	2,438.74	5.67
Equipment	Industrial/Commercial Equipment	Buildings	N/A	N/A	N/A	Gasoline (Unleaded)	11.00	0.03
Equipment	Industrial/Commercial Equipment	Buildings	N/A	N/A	N/A	Gasoline (Unleaded)	14.00	0.03
Vehicle	Heavy Duty Vehicle	Fire	Ford	N/A	1,454	Diesel	741	2.00
Vehicle	Heavy Duty Vehicle	Fire	Ford	N/A	153	Gasoline (Unleaded)	138.14	0.32
Vehicle	Heavy Duty Vehicle	Fire	Ford	F800	2,140	Diesel	707	1.91
Vehicle	Light Duty Vehicle	Fire	Ford	E Super Duty V10	1,651	Gasoline (Unleaded)	751.69	1.77
Vehicle	Light Duty Vehicle	Fire	Dodge	RPC	908	Gasoline (Unleaded)	449.62	1.05
Vehicle	Heavy Duty Vehicle	Fire	Freightliner	N/A	2,022	Diesel	684	1.85
Vehicle	Heavy Duty Vehicle	Fire	Ford	F550	1,261	Diesel	498	1.35
Vehicle	Light Duty Vehicle	Fire	Ford	COF	237	Diesel	138	0.37
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,996	Diesel	940	2.54
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,091	Diesel	548	1.48

FLEET GENERAL						OPERATIONS		
Segment (Vehicle or Equipment)	Type	Department	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,373	Diesel	605	1.64
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,271	Diesel	606	1.64
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,300	Diesel	644	1.75
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,637	Diesel	857	2.32
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	1,883	Diesel	940	2.55
Vehicle	Heavy Duty Vehicle	Fire	Pierce	N/A	1,946	Diesel	1,006	2.73
Vehicle	Heavy Duty Vehicle	Fire	International	N/A	864	Diesel	583	1.58
Vehicle	Passenger Car	Fire	Ford	Expedition	20,010	Gasoline (Unleaded)	2,874.31	6.68
Vehicle	Medium Duty Vehicle	Fire	Dodge	Ram	40,360	Gasoline (Unleaded)	6,521.86	15.16
Vehicle	Medium Duty Vehicle	Fire	Ford	N/A	742	Diesel	316	0.86
Vehicle	Light Duty Vehicle	Fire	Chevrolet	1500 SIL	29,123	Gasoline (Unleaded)	4,153.87	9.65
Vehicle	Light Duty Vehicle	Fire	Chevrolet	1500 SIL	1,798	Gasoline (Unleaded)	521.60	1.21
Vehicle	Heavy Duty Vehicle	Fire	Freightliner	N/A	1,007	Diesel	772	2.09
Vehicle	Heavy Duty Vehicle	Fire	Freightliner	N/A	2,240	Diesel	1,146	3.11
Vehicle	Medium Duty Vehicle	Fire	Dodge	Ram	1,097	Gasoline (Unleaded)	380.62	0.88
Vehicle	Heavy Duty Vehicle	Fire	Freightliner	N/A	858	Diesel	600	1.62
Vehicle	Heavy Duty Vehicle	Fire	N/A	N/A	0	Diesel	40	0.11
Vehicle	Heavy Duty Vehicle	Fire	Ford	N/A	1,027	Diesel	308	0.84
Vehicle	Heavy Duty Vehicle	Fire	Freightliner	N/A	484	Diesel	333	0.90
Vehicle	Heavy Duty Vehicle	Fire	Sterling	STE	996	Diesel	473	1.28
Vehicle	Medium Duty Vehicle	Fire	GMC	C70	2,615	Diesel	1,024	2.78
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	N/A	Gasoline (Unleaded)	22.12	0.05
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	215,381	Gasoline (Unleaded)	228.84	0.55
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	N/A	Gasoline (Unleaded)	21.66	0.05
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	N/A	Gasoline (Unleaded)	313.66	0.76

FLEET GENERAL						OPERATIONS		
Segment (Vehicle or Equipment)	Type	Department	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	27,959	Gasoline (Unleaded)	87.03	0.21
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	N/A	Gasoline (Unleaded)	64.93	0.16
Equipment	Industrial/Commercial Equipment	Fire	N/A	N/A	N/A	Gasoline (Unleaded)	40.46	0.10
Vehicle	Light Duty Vehicle	Maintenance (Public Works)	Dodge	Ram 1500	10,821	Gasoline (Unleaded)	1,725.60	4.01
Equipment	Industrial/Commercial Equipment	Maintenance (Public Works)	Multiple - See equipment list from	Multiple - See equipment list from	N/A	Gasoline (Unleaded)	126.11	0.30
Vehicle	Light Duty Vehicle	Maintenance (Public Works)	Chevrolet	1500 SIL	23,186	Gasoline (Unleaded)	3,055.56	7.10
Equipment	Tractor and Combines	Parks (Public Works)	John Deere	4210 tractor with JD47 backhoe and JD420	N/A	Diesel	89	0.25
Vehicle	Light Duty Vehicle	Parks (Public Works)	Dodge	Ram 1500	26,577	Gasoline (Unleaded)	4,708.27	10.94
Vehicle	Medium Duty Vehicle	Parks (Public Works)	Chevrolet	3500HD	14,151	Diesel	3,831	10.44
Vehicle	Heavy Duty Vehicle	Parks (Public Works)	Ford	F350	18,032	Gasoline (Unleaded)	4,670.21	10.85
Vehicle	Light Duty Vehicle	Parks (Public Works)	Ford	F150	28,948	Gasoline (Unleaded)	4,038.69	9.39
Vehicle	Medium Duty Vehicle	Parks (Public Works)	Ford	F250	21,152	Gasoline (Unleaded)	4,352.22	10.13
Vehicle	Medium Duty Vehicle	Parks (Public Works)	GMC	Sierra	22,728	Gasoline (Unleaded)	5,179.75	12.06
Equipment	Lawn and Garden Equipment	Parks (Public Works)	John Deere	N/A	N/A	Gasoline (Unleaded)	2,873.00	6.88
Equipment	Industrial/Commercial Equipment	Parks (Public Works)	N/A	N/A	N/A	Gasoline (Unleaded)	549.00	1.32
Equipment	Industrial/Commercial Equipment	Parks (Public Works)	N/A	N/A	N/A	Gasoline (Unleaded)	27.00	0.06
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Case	621 Front End Loader	374	Diesel	1,532	4.20
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Champion	740 Motor Grader	584	Diesel	5,800	15.91
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Johnston	4000 Street Sweeper	111	Diesel	811	2.19
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Case	590 Super M Rubber Tire Combo	222	Diesel	1,121	3.07
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Sterling	TA	16,329	Diesel	10,080	27.20
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Sterling	TA	2,625	Diesel	2,369	6.39
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Volvo	EC160BLC Hydraulic Excavator	222	Diesel	269	0.74
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Sterling	SA	15,493	Diesel	9,214	24.97
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Dodge	Ram 3500	30,209	Diesel	6,759	18.45

FLEET GENERAL						OPERATIONS		
Segment (Vehicle or Equipment)	Type	Department	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Sterling	SA	14,533	Diesel	9,139	24.76
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Sterling	SA	19,121	Diesel	10,684	28.95
Vehicle	Light Duty Vehicle	Roads (Public Works)	Ford	F150	19,094	Gasoline (Unleaded)	2,743.52	6.38
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Freightliner	TA	18,309	Diesel	11,464	31.05
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Case	590 Super N Rubber Tire Combo	978	Diesel	5,823	15.97
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Vermeer	BC1000XL 49 HP Wood Chipper	24	Diesel	153	0.42
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Western Star	SA	18,422	Diesel	9,698	26.29
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Western Star	TA	23,240	Diesel	14,097	38.19
Vehicle	Light Duty Vehicle	Roads (Public Works)	Ford	F150	16,074	Gasoline (Unleaded)	2,456.79	5.71
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Case	590 Super N Rubber Tire Combo	1,079	Diesel	5,452	14.95
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Western Star	TA	25,083	Diesel	15,129	40.99
Vehicle	Light Duty Vehicle	Roads (Public Works)	Chevrolet	1500 SIL	55,135	Gasoline (Unleaded)	8,405.96	19.53
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Ford	F350	24,773	Diesel	5,978	16.30
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Freightliner	TA	22,511	Diesel	14,035	38.02
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Western Star	TA	19,987	Diesel	11,266	30.53
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	John Deere	770GP Motor Grader	816	Diesel	10,471	28.71
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Wacker-Neuson	DPU4545 Vibratory Plate Packer	N/A	Diesel	10,533	28.89
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	N/A	N/A	N/A	Gasoline (Unleaded)	74.35	0.18
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Ford	F350	24,822	Diesel	5,646	15.41
Vehicle	Light Duty Vehicle	Roads (Public Works)	Chevrolet	1500 SIL	67,448	Gasoline (Unleaded)	9,485.36	22.03
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Caterpillar	272D XHP Skid Steer with 74" Bucket	27	Diesel	222	0.61
Vehicle	Heavy Duty Vehicle	Roads (Public Works)	Freightliner	114 SD TA	26,726	Diesel	16,032	43.43
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	Multiple - See equipment list from	Multiple - See equipment list from	N/A	Gasoline (Unleaded)	262.03	0.63
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	N/A	N/A	N/A	Gasoline (Unleaded)	112.00	0.27
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	N/A	N/A	N/A	Diesel	319	0.88

FLEET GENERAL						OPERATIONS		
Segment (Vehicle or Equipment)	Type	Department	Make	Model	Total Mileage (km)	Fuel Type	Total Fuel Used (L)	ANNUAL TOTAL GHG EMISSIONS (t CO_2e)
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	N/A	N/A	N/A	Diesel	143	0.39
Equipment	Industrial/Commercial Equipment	Roads (Public Works)	N/A	N/A	N/A	Diesel	337	0.93

Appendix H - Township of Muskoka Lakes Streetlight Data

Year: **2018**

GENERAL Asset Name	ANNUAL ELECTRICITY CONSUMPTION (kWh) (Note 1)	GHG EMISSIONS ($t CO_2e$)
Bala St. Lts - 200126418047	128,448	3.80
Watt Dock Lts (Skeleton Bay) - 200117692188	262	0.01
Port Carling St. Lts - 200116847985	78,672	2.32
Milford Bay St. Lts - 200107366035	22,248	0.66
Port Carling St. Lts - 200104024888	4,162	0.12
Torrance St. Lts - 200099823273	22,764	0.67
Milford Bay Dock Lts - 200084161817	3,361	0.10
Windermere St. Lts - 200040032574	17,520	0.52

Note:

1. Annual electricity consumption based on hydro bills