<u>Municipality of McDougall</u>

Corporate Milestone 1

submission to:

Federation of Canadian Municipalities
Partners for Climate Protection Program

Version: 4

Date: August 4, 2022

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Foreword

In addition to participating in the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection (PCP) Program, the Municipality of McDougall is a proud member of the Integrated Community Energy and Climate Action Plans (ICECAP) Partnership.

ICECAP is a partnership between the Municipalities and First Nations located in the Georgian Bay Biosphere region for the purpose of a collaborative, more cost-effective approach to energy management and the reduction of greenhouse gas emissions for the operations of each corporate stakeholder, for each participating community and for the broader region.

The 4 main objectives of ICECAP are to:

1. Encourage the reduction of greenhouse gas emissions
2. Improve energy efficiency
3. Reduce the use of fossil fuels
4. Adapt to a changing climate by building greater resilience

By completing this corporate baseline and inventory, the Municipality of McDougall is also contributing to the achievement of the goals and objectives established by ICECAP. The findings and insights discovered will improve local climate change knowledge by understanding where emissions are coming from in the Municipality of McDougall's internal operations. As a result, the information obtained will ultimately inform and provide direction into climate change and energy planning for the Municipality of McDougall, the ICECAP partnership, and the broader region.

ICECAP's current members are as follows:

- Township of the Archipelago
- Township of Carling
- Township of Georgian Bay
- Municipality of McDougall
- Township of McKellar
- Town of Parry Sound
- Township of Seguin
- Shawanaga First Nation
- Moose Deer Point First Nation
- Georgian Bay Biosphere

Executive Summary

In their Fifth Assessment Report (2014)[1], the Intergovernmental Panel on Climate Change notes that greenhouse gas (GHG) emission growth continues to accelerate, and that ambitious and aggressive mitigation actions are indispensable in mitigating climate change. By actively managing, monitoring, and taking measures to limit the production of GHG emissions, the impacts of climate change will reduce in severity.

As front-line responders to severe weather events and other climate change impacts, municipalities often experience and witness the financial, environmental, and social repercussions of climate change within their own operations and the community they serve. Municipalities therefore have the ability to be leaders in addressing climate change, as their knowledge of community needs and considerations can guide the successful implementation of initiatives designed to tackle climate change. As the Federation of Canadian Municipalities (2009)[2] has noted, municipal governments can influence or control nearly half of Canada's GHG emissions. Through efforts to reduce GHG emissions, municipalities can therefore lead the way in climate change mitigation and protect their residents from future climate change impacts.

By taking the appropriate steps to respond to climate change through mitigation and adaptation, municipal governments also can save money in municipal operations, lower energy costs for residents and businesses, and increase investment in the local economy. Establishing a GHG emission baseline is a useful tool to identify areas for improvement, inform the development of a GHG reduction action plan, estimate cost savings from reductions, and serve as a reference point to track improvements. To do this, many municipalities in Canada have joined the Federation of Canadian Municipalities' Partners for Climate Protection program to reduce the GHG emissions produced by their operations and community.

What is the Federation of Canadian Municipalities?

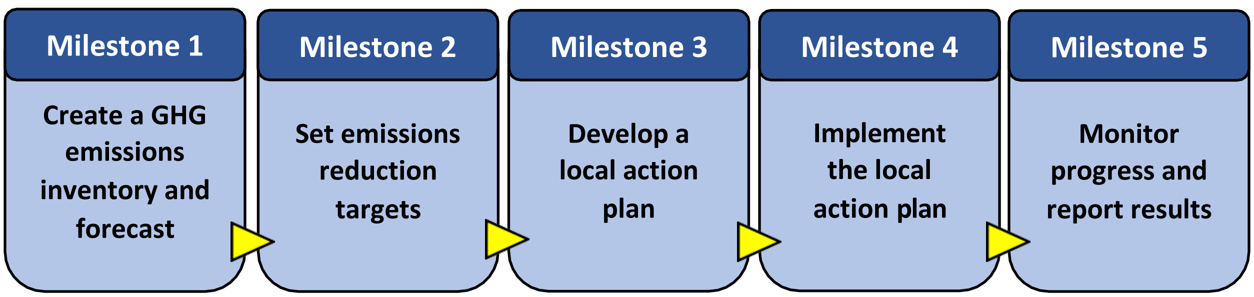
The Federation of Canadian Municipalities (FCM) is the national voice for municipal governments in Canada. With a congregation of nearly 2,000 municipal members across the country, FCM advocates for municipalities to ensure their citizen's needs are reflected in federal policies and programs. Through this advocacy the FCM is able to provide funding and programming that help municipalities tackle local challenges, such as climate change, asset management, economic development, and more.

[1] https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_full.pdf

[2] https://fcm.ca/sites/default/files/documents/resources/report/act-locally-municipal-role-fighting-climate-change.pdf

What is the Partners for Climate Protection program?

The Partners for Climate Protection (PCP) program is designed to guide municipalities through the process of reducing greenhouse gas emissions through climate change and energy planning. In partnership with the International Council for Local Environmental Initiatives (ICLEI), the PCP program is administered by the FCM. Since the program's establishment in 1997, nearly 400 municipalities across Canada have joined, with the Municipality of McDougall becoming a participant in 2022. The PCP program consists of a five-step milestone framework that guides municipalities in their efforts to reduce greenhouse gas emissions. The five milestones are as follows:



The Partners for Climate Protection program looks at these milestones from two different perspectives; corporate and community. **Corporate** refers to the greenhouse gas emissions produced as a result of a local government's operations and services. Its purpose is to identify the GHG emissions within a local government's direct control or influence, and for which the local government is accountable as a corporate entity. **Community** refers to the greenhouse gas emissions generated by the residents and businesses of the community in which the local government serves and represents.

This report will focus on the Municipality of McDougall's corporate operations. Thus, the purpose of this report will be to establish a corporate greenhouse gas emission baseline and inventory as part of the Municipality of McDougall's participation in the Partners for Climate Protection program and ICECAP.

Corporate Greenhouse Gas Emissions

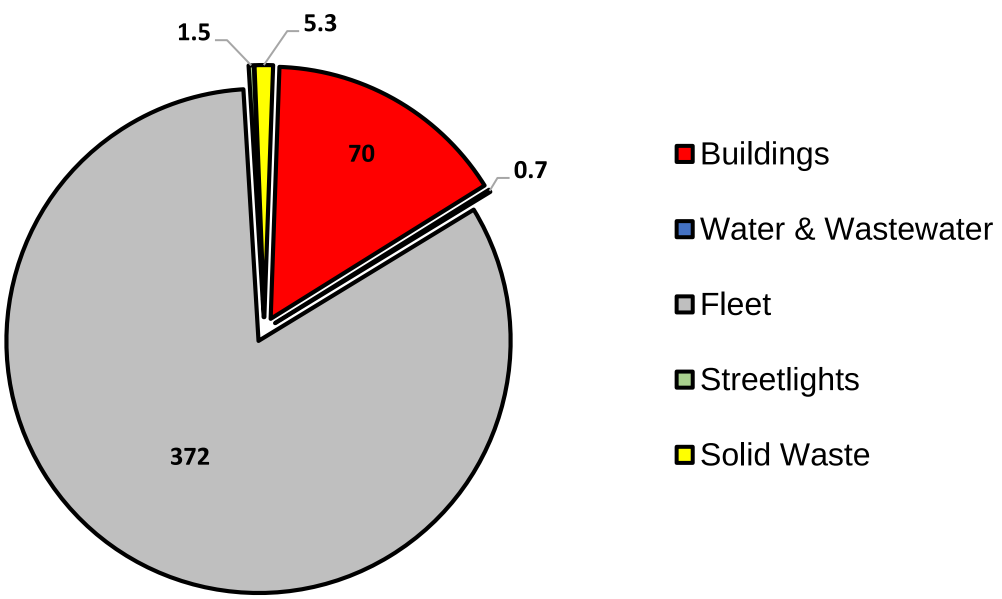
The Municipality of McDougall's corporate greenhouse gas (GHG) inventory identifies and quantifies the sources of GHG emissions from its municipal operations and establishes a baseline from which future emissions reductions and progress can be measured. With the production of this inventory, the baseline year of 2016 has been established. Table A lists the Municipality of McDougall's corporate emission sectors.

Table A: Municipality of McDougall's Corporate GHG Emission Sectors

GHG Emission Sectors	Metric Tonnes of CO_2e
Buildings	70
Water & Wastewater	0.7
Streetlights	1.5
Fleet	372
Waste	5.3
Total Emissions	**449**

The Municipality of McDougall's fleet is its largest emitting sector, accounting for 82.9% of its corporate GHG emissions in 2016. This is followed by the buildings sector, which produced approximately 16% of corporate GHG emissions. Figure A shows the GHG emissions associated with each sector.

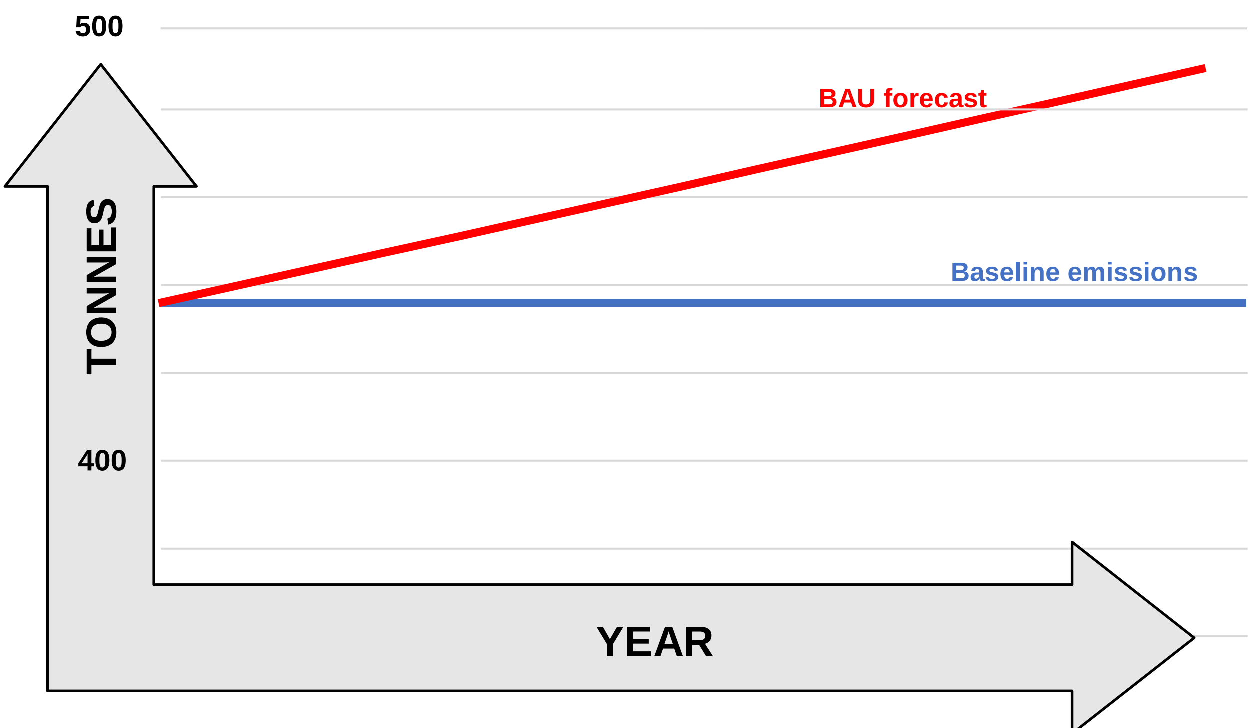
Figure A: GHG Emission Sectors



Business as Usual Forecast

As part of Corporate Milestone 1, municipalities are also required to forecast GHG emissions to a specified year, based on permanent-resident population growth. However, this is problematic and unrepresentative in producing a business as usual (BAU) forecast since the Municipality of McDougall was experiencing a decline in its permanent resident population in 2016. This population decline would therefore demonstrate that GHG emissions would decrease naturally as the permanent-resident population shrinks, a situation which can be assumed to be untrue, given the influence seasonal residents have over the production of corporate GHG emissions in the Municipality of McDougall. As a result, an alternative metric using annual residential property growth rate was developed to capture the influence seasonal residents have on corporate GHG emissions. With an average annual residential property growth rate of 0.44%, corporate GHG emissions are expected to increase 6.2% by 2030 if no actions are taken to reduce GHG emissions. This will result in corporate GHG emissions totaling 477 tonnes of CO_2e in the year 2030. Figure B shows the anticipated GHG emissions growth in this BAU scenario.

Figure B: Business as Usual Forecast



	Baseline Emissions (2016)	BAU Forecast (2030)
Total GHG Emissions	**449**	**477**

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1. Methodology Background

1.1 Greenhouse Gas Inventory

A greenhouse gas (GHG) inventory brings together data on community and municipal sources of GHG emissions to estimate emissions for a given year. Ideally, two separate GHG inventories and forecasts will be created for the Municipality of McDougall (MM): one for municipal operations and one for community sources. As per the PCP protocol, the inventories consist of the following sources of GHG emissions.

Corporate	***Community***
• Buildings • Streetlights • Water and Sewage Treatment • Municipal Fleet • Solid Waste	• Residential • Commercial and Institutional • Industrial • Transportation • Solid Waste

1.2 Scope

This document will focus solely on ***corporate*** GHG emissions.

1.3 Baseline Year

Establishing a baseline is a useful tool to identify areas for improvement, inform the development of a GHG reduction action plan, estimate cost savings from reductions, and serve as a reference point to track improvements. A baseline year of 2016 was selected because during the development of this baseline, it was the year in which the most recent Statistics Canada Census was published, providing the most recent data on population statistics. Other ICECAP members have also selected 2016 as their baseline year, which allows the MM to easily benchmark its emissions and energy performance against neighbouring municipalities. This will assist in identifying opportunities for energy efficiency and conservation initiatives that will lead to emissions reductions and cost savings.

1.4 Data Collection and Sources

To determine the quantity of GHG emissions produced by the MM's corporate operations, data was collected from municipal records where possible. If municipal data could not be acquired, data from provincial and federal agencies was collected to inform any applicable assumptions.

Data quality was assessed primarily on its relevance. While data accuracy is also a critical characteristic when assessing data quality, data accuracy received a secondary role. This is because all data was retrieved from reputable and trustworthy sources, such as federal, provincial, and municipal government agencies, and can therefore be considered accurate.

For a detailed summary of corporate data sources and quality, please refer to Table 1.

Table 1: Corporate Energy & GHG Emissions Baseline Data Sources

Sector	Data	Source	Data Quality	Notes
Buildings	Electricity Consumption	Municipal Records	High	Actual energy consumption for baseline year.
	Fuel Oil Consumption	Municipal Records	High	Actual energy consumption for baseline year.
Water & Wastewater	Electricity Consumption	Municipal Records	High	Actual energy consumption for baseline year.
Streetlights	Electricity Consumption	Municipal Records	High	Actual energy consumption for baseline year.
Fleet	Diesel Consumption	Municipal Records	Medium	Actual diesel consumption for baseline year.
	Gasoline Consumption	Municipal Records	High	Actual gasoline consumption for baseline year.
Waste	Tonnes of Waste	Assumptions	Low	Based primarily on assumptions.
	Degradable Organic Carbon	PCP Protocol	Medium	Quantities and types of waste disposed at landfill in baseline year.
	Landfill Characteristics	Municipal Records	High	Actual landfill characteristics and management practices provided by staff.
BAU Forecast	Residential Property Growth Rate	MPAC	High	Actual quantity of residential properties for baseline year and prior years.

2.0 Calculation Process

2.1 Buildings and Facilities

To calculate the GHG emissions produced by the MM's buildings and facilities the PCP recommended approach of obtaining actual energy consumption data for the baseline year was pursued. For reference, a simplified version of the formula used for calculating building and facility emissions as per the PCP protocol is as follows.

2.1.1 Formula

$$\sum (FC * Cef) + (FC * CHef * CHwp) + (FC * Nef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

Cef = Emission factor for Carbon Dioxide (CO_2)

CHef = Emission factor for Methane (CH_4)

Nef = Emission factor for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

2.1.2 Assumptions

No assumptions were made in calculating GHG emissions produced by corporate buildings and facilities because actual energy consumption data was available.

2.1.3 Outcome

The MM's buildings and facilities produced **70** tonnes of CO_2e in 2016.

2.2 Water and Wastewater

To calculate the GHG emissions produced by the MM's water and wastewater infrastructure the PCP recommended approach of obtaining actual energy consumption data for the baseline year was pursued. For reference, a simplified version of the formula used for calculating water and wastewater emissions as per the PCP protocol is as follows.

2.2.1 Formula

$$\sum (FC * Cef) + (FC * CHef * CHwp) + (FC * Nef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

Cef = Emission factor for Carbon Dioxide (CO_2)

CHef = Emission factor for Methane (CH_4)

Nef = Emission factor for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

2.2.2 Assumptions

No assumptions were made in calculating the GHG emissions produced by water and wastewater treatment/delivery because actual energy consumption data was available.

2.2.3 Outcome

The MM's water and wastewater infrastructure produced **0.7** tonnes of CO_2e in 2016.

2.3 Streetlights

To calculate the GHG emissions produced by the MM's streetlights the PCP recommended approach of obtaining actual energy consumption data for the baseline year was pursued. For reference, a simplified version of the formula used for calculating streetlight emissions as per the PCP protocol is as follows.

2.3.1 Formula

$$\sum(FC * Cef) + (FC * CHef * CHwp) + (FC * Nef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

Cef = Emission factor for Carbon Dioxide (CO_2)

CHef = Emission factor for Methane (CH_4)

Nef = Emission factor for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

2.3.2 Assumptions

No assumptions were made in calculating the GHG emissions produced by streetlights because actual energy consumption data was available.

2.3.3 Outcome

The MM's streetlighting produced **1.5** tonnes of CO_2e in 2016.

2.4 Fleet

To calculate the GHG emissions produced by the MM's fleet the PCP recommended approach of obtaining actual fuel consumption data for each municipal vehicle in the baseline year was pursued. For reference, a simplified version of the formula used for calculating fleet emissions as per the PCP protocol is as follows.

2.4.1 Formula

$$\sum (FC * VTC) + (FC * VTCHef * CHwp) + (FC * VTNef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

VTC = Emission factor by vehicle type for Carbon Dioxide (CO_2)

VTCHef = Emission factor by vehicle type for Methane (CH_4)

VTNef = Emission factor by vehicle type for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

2.4.2 Assumptions

Minor assumptions were used to calculate the emissions produced by the diesel consumed from a portion of the MM's fleet. Specifically, diesel fuel consumption at the public works building on Municipal Drive could not be directly allocated to vehicles because of a shared refueling tank that is used there. However, fuels records describing the quantity of diesel supplied, and the mileage of each vehicle using this fuel tank were available.

Given that each vehicle using the shared diesel tank was a similar class and had the same emission factor associated with it, it was assumed that each vehicle had a similar fuel economy. Since the emission factor was the same for each vehicle, this was considered a justified assumption because the emissions outcome would be the same regardless of how fuel was allocated between vehicles. Therefore, vehicle mileage was aggregated and then converted to a percentage of total mileage for each vehicle. This same percentage was then applied to the total quantity of diesel consumed at Municipal Drive to arrive at an estimated diesel consumption per vehicle.

2.4.3 Outcome

The MM's fleet produced **372** tonnes of CO_2e in 2016.

2.5 Waste

Since actual data on corporately generated waste is not available, local governments can estimate the quantity of solid waste generated at corporate buildings and facilities and the quantity of community waste that is diverted as part of municipal operations (i.e. parks and sidewalk garbage receptacles). This estimate is determined on the size of the garbage bins used, their average fullness at pickup, and the frequency of pickup.

The type of landfill is another determinant of the formula used for estimating emissions from corporate solid waste. For reference, a simplified version of this formula, as per the PCP protocol is as follows.

2.5.1 Formula

$$\sum 25 * (GBC * BF * PU * 2.136) * \left(\left(\frac{16}{12}\right) * MCF * DOC * DOCF * F\right) * (1 - MR) * (1 - OX)$$

Where:

GBC = garbage bin capacity (m^3)

BF = Approximately how full the bin is when it is emptied (%)

PU = Frequency of pickup (times per month)

MCF = Methane correction factor

DOC = Degradable organic content

DOCF = Fraction of DOC dissimilated

F = Fraction of methane in landfill gas

MR = Methane recovery at landfill (%)

OX = Oxidation Factor

2.5.2 Assumptions

Data on the actual tonnage of corporate solid waste generated by the MM in 2016 does not exist. Gaining an understanding of solid waste practices and policies can help to determine some of the factors and coefficients of the formula that are determinant on landfill management and operations.

It was assumed that when corporate solid waste is generated, it is either sent to the transfer station or directly to the McDougall landfill. However, this waste is mixed with community generated waste as part of the solid waste and landfill services offered by the MM. As a result, the tonnage of waste reported by the McDougall landfill can only be used as a reference to determine the accuracy of the solid waste estimate. This is because once waste has been aggregated, it is impossible to discern waste produced by municipal operations and the broader community. Although McDougall owns and operates its own landfill, the Federation of Canadian Municipalities has advised and approved the use of the corporate waste generation model for measuring corporate waste emissions.

Staff from the McDougall landfill have noted that no emission capture technology exists. This is because a feasibility study was undertaken, which determined that it was economically unfeasible to purchase the technology and embark on installation. While this technology does not exist, the landfill is still being actively managed. Garbage is compacted daily to reduce its volume and then buried to allow for additional landfill space, and to deter wildlife. The landfill is also classified as engineered and is lined to capture leachate. These factors helped to determine assumptions on several of the values required by the formula.

Next was the process of determining the quantity of solid waste produced. It was assumed that buildings with a relatively small number of daily occupants (classified as minor buildings) had a single bin for garbage, sized at $0.08m^3$, and was removed weekly to eliminate any odours. This is equivalent to 2 large-sized garbage bags being produced per week and is appropriate given the occupancy of these facilities. Additionally, this represents an average across buildings with a smaller number of daily occupants. For example, the public works building may produce twice this amount in a given week, whereas the administrative office may produce half this amount.

Within the purview of municipal operations, the MM is also responsible for the maintenance of 5 beaches. Given the seasonal variability of visitation that these beaches experience, a single $0.08m^3$ garbage bin was allocated to its premises to accommodate the waste generated there. Additionally, seasonality affects the frequency in which the receptacle needs to be emptied. As a result, it was assumed that the waste receptacle is continuously monitored and emptied when close to full, which would vary in frequency as a result of McDougall's seasonal population influx. Therefore, during July and August, receptacles are emptied weekly, and during May, June, September, and October they are emptied bi-weekly before being removed for the winter months. This assumption was then used to create a monthly average which could be applied across the entire year.

2.5.3 Outcome

The MM's corporate operations produced **5.3** tonnes of CO_2e in 2016.

2.6 Business as Usual

The year 2030 has been chosen for the BAU forecast.

2.6.1 Assumptions

In their 2016 Population Census, Statistics Canada reported that the MM experienced a decline in population between the years 2011 and 2016. However, given that the BAU forecast is determined by annual population growth, it was determined that the reported decline in population would be unrepresentative of corporate operations and the projected BAU for the following reasons.

Geographically positioned on the eastern shoreline of Georgian Bay and in the heart of cottage country, the MM and the surrounding region is a major tourist destination. In addition to the numerous cottages and seasonal residences that attract tourists within the MM, there is a high volume of traffic and activity that passes through the MM to reach marinas, Provincial Parks, and other seasonal destinations. As a result of this tourism, an increase in population occurs during the warmer months, raising the population from 2,702 permanent residents to include thousands of extra seasonal residents. However, Statistics Canada only accounts for the 2,702 permanent residents in their 2016 Population Census. As a result, Statistics Canada's population decline is derived from permanent residents, failing to account for the major seasonal population influx. This is problematic and unrepresentative in producing a BAU forecast because the services and amenities provided by corporate operations are not restricted for permanent resident use only. For example, the MM provides the numerous seasonal residences with emergency services, and seasonal residents utilize roads and other local infrastructure, causing additional wear-and-tear that requires McDougall staff to maintain and repair. Therefore, as seasonal population grows, so too will corporate operations, and the associated GHG emissions. Essentially, using Statistics Canada's population decline would demonstrate that there would be a natural decrease in GHG emissions as population shrinks, a situation which can logically be assumed to be untrue, given that municipal operations are conducted on behalf of all residents residing in the jurisdiction, not just the permanent ones. As a result, the following methodology and assumptions were considered in producing a growth statistic that would factor seasonal population in producing a BAU forecast.

Data was first retrieved from the Municipal Property Assessment Corporation (MPAC). This data was referenced because it classifies each property in Ontario according to its functional purposes. For example, data entries categorized as a 300 series property are classified as a residential property, including both permanent residences and seasonal residences.

It can be difficult to assume the number of people that are staying at a seasonal residence at any given time. For example, it is common for numerous different families to rent a single seasonal residence throughout the summer. This produces a high degree of variability in the population of any single seasonal residence, as one week could have 3 residents occupying the premises and the following week could have 8. From a calculation perspective, the most appropriate response would be to use a provincial statistic, such as the average number of residents per household. However, using a statistical average such as the average number of residents per household results in a static number, and shifts the aspect of variability to the object it represents, which in this case is the household. Therefore, accounting for seasonal population in an annual population growth rate would require calculating the growth rate of the number of residential properties as determined by MPAC. Based on the static nature of the number of residents per household, it was assumed that the growth rate of the number of residential properties would be the same as population, and that municipal operations would grow at a similar rate to match the added demand of municipal services. As a result, the annual growth rate of residential properties was used to determine the BAU forecast.

Given that the BAU forecast was determined by annual residential property growth, multiple years of data was used to eliminate the possibility of an outlier skewing the calculation result. With this consideration, the residential property growth rate from 2011 to 2016 was calculated, and then averaged on a year-by-year basis. This resulted in an average annual residential property growth rate of 0.44%. This growth rate was then used to forecast emissions to the year 2030.

2.6.2 Outcome

Given an average annual residential property growth rate of 0.44% forecasted to the year 2030, the MM is expected to produce 477 tonnes of CO_2e in 2030, representing a 6.2% increase from baseline levels if business is to continue as usual.