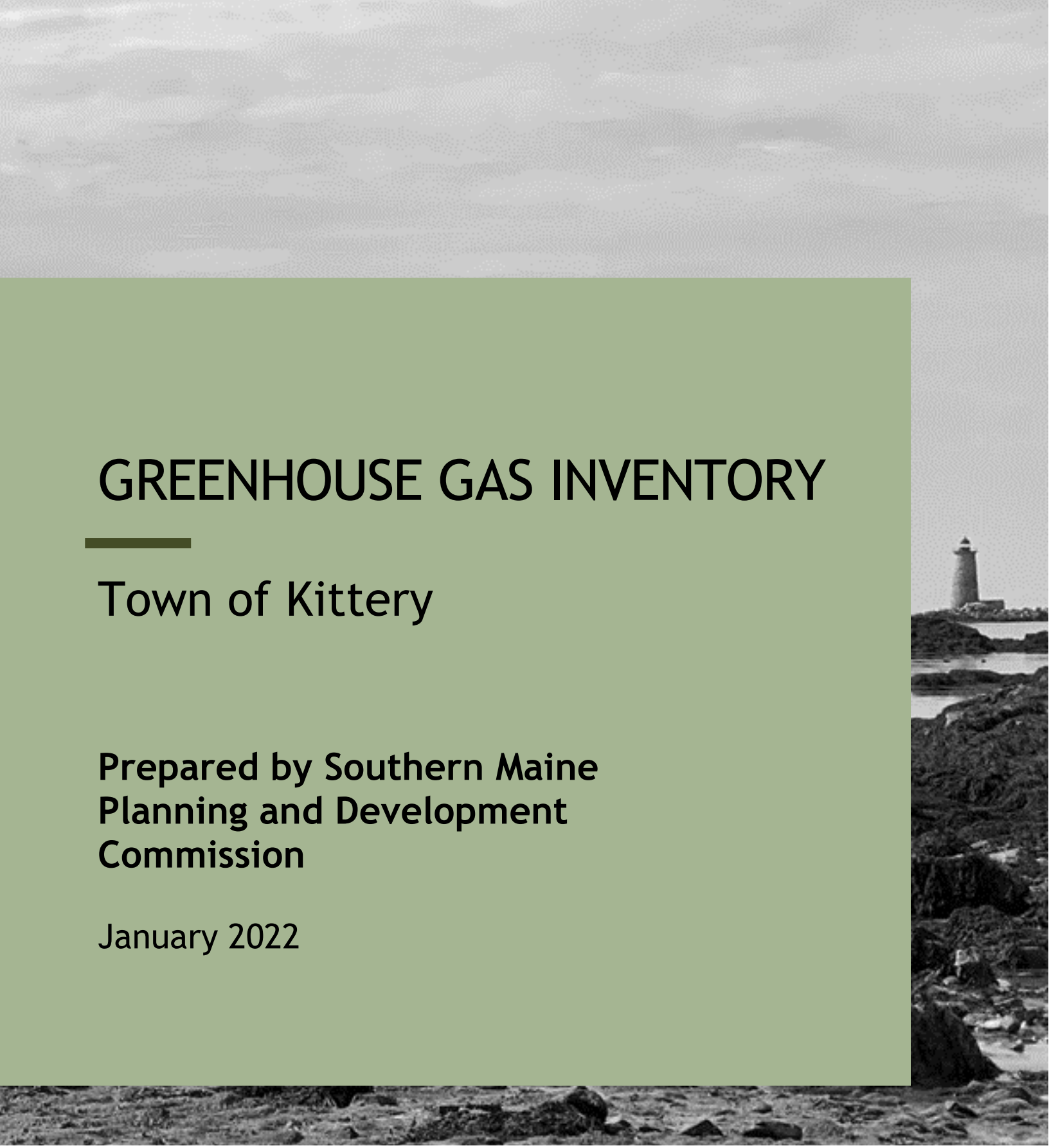


GREENHOUSE GAS INVENTORY

Town of Kittery

Prepared by Southern Maine Planning and Development Commission

January 2022

Karina Graeter, Southern Maine Planning & Development Commission

Kendra Amaral, Town Manager, Town of Kittery

Contents

Executive Summary

The Town of Kittery has made substantial progress on laying the foundation to address both the causes and impacts of climate change. These efforts are guided by the Coastal Community Resilience section (Topic Area 9) in the Kittery 2015-2025 Comprehensive Plan. The Kittery Town Council established the Kittery Climate Adaptation Committee in 2019 and also joined the SMPDC Regional Sustainability and Resilience Program. In June 2021, the Kittery Town Council approved a resolution to increase energy efficiency in municipal operations and raise awareness among residents and businesses about ways to reduce reliance on greenhouse gases. Kittery has already pursued many actions to reduce its reliance on fossil fuels, including installing energy-saving LED streetlights, purchasing electric vehicles, weatherizing municipal buildings, and purchasing solar energy for municipal electricity use. Kittery is also preparing for the impacts of climate change. The Town completed the Maine Flood Resilience Checklist and conducted a Coastal Hazards Planning Best Practices Assessment.

This greenhouse gas (GHG) inventory establishes a baseline of GHG emissions in the Town of Kittery. It identifies the activities and major sources of emissions, enabling the town to identify areas to focus emission reduction efforts, establish goals and track progress towards those goals, and facilitate decision-making about future policies and strategies.

This report contains two inventories for the Town of Kittery: A *community-wide inventory* and a *municipal inventory*. These inventories were conducted by the Town of Kittery and Southern Maine Planning and Development Commission. The community-wide inventory estimates the GHG emissions due to Kittery's sources and activities, including those of Kittery's residents, workforce, visitors, and economy. It was conducted using the methodology laid out in the SMPDC Greenhouse Gas Inventory Protocol for Southern Maine Cities and Towns for the year 2019. The municipal inventory accounts for the GHG emissions due to the municipal operations of the Town of Kittery, including municipal buildings, vehicles, and employee activities as well as the Kittery School District. It was prepared using the Local Government Operations Protocol for the quantification and reporting of greenhouse gas emissions inventories for the year 2019.

Community-wide emissions for Kittery in 2019 were estimated as 200,668 Metric Tons CO_2 equivalent (Metric Tons CO_2e; Figure A), corresponding to 19.9 MT/CO_2e per capita emissions based on the Kittery 2020 Census population. This emissions estimate is equivalent to the annual emissions of 43,641 passenger cars or annual emissions from energy use in 24,165 homes. The majority of these emissions (66%) came from stationary emission sources including electricity, natural gas, and discrete fuel use and transmission/distribution losses. Transportation emissions were the second largest sector at 34% of the total emissions inventory. Waste emissions from municipal solid waste and wastewater only made up 1% of the inventory.

The subsectors responsible for the most emissions were (Figure B):

1. **Industrial Stationary Energy (42.7%):** In particular, 26% of community-wide emissions resulted from natural gas use at the Portsmouth Naval Shipyard (PNSY) combined heat and power plant. Fifteen percent of community-wide emissions resulted from industrial electricity use and PNSY and other industrial facilities.
2. **Passenger vehicles (24%)**
3. **Commercial Stationary Energy (13.5%)**
4. **Residential Stationary Energy (9.6%)**

To support the GHG inventory, this report also includes *Additional Indicators of Climate Action*, other metrics that may be used to develop emissions reduction initiatives and set measurable goals. These stationary energy, transportation, and waste metrics may be used to measure progress on efforts that have an indirect impact on emissions, such as activities like educating residents and businesses about renewable energy or community building and environmental justice initiatives. These are critical activities that research has shown are vital to driving down GHG emissions across many sectors.

FIGURE A. KITTERY COMMUNITY-WIDE GHG INVENTORY GROUPED BY SECTOR.

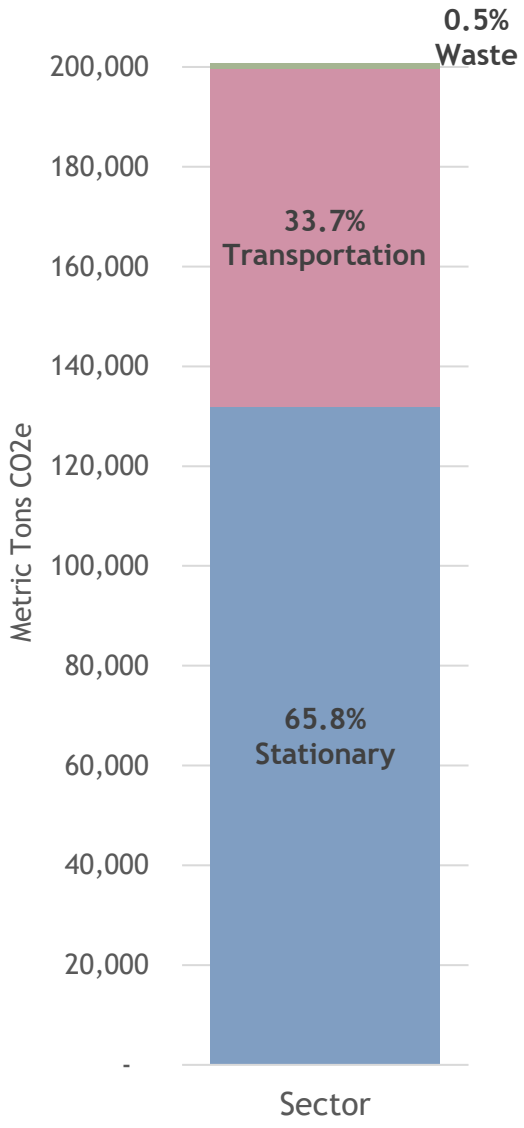
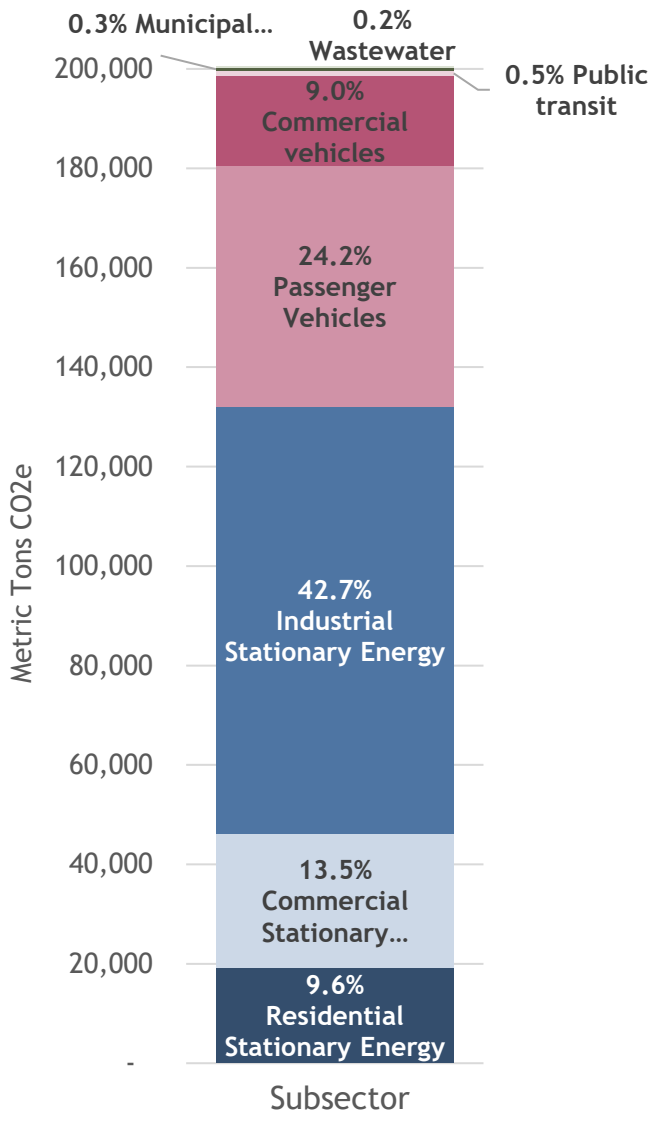


FIGURE B. KITTERY COMMUNITY-WIDE GHG INVENTORY GROUPED BY END USE AND SECTOR.



Municipal emissions for 2019 were estimated as 2,656 MT CO_2e (Figure C), corresponding to 0.264 MT CO_2e per capita based on the Kittery 2020 Census population. Estimated municipal emissions are comparable to only 1.3% of community-wide emissions. The largest sector was the stationary energy sector (43%), resulting from electricity, natural gas, and discrete fuel use in municipal buildings and facilities. Waste emissions were the second largest sector at 30% and transportation emissions compromised 27% of the estimated emissions.

The subsectors responsible for the most emissions were (Figure D):

1. **Building & Facilities (42.43%)**
2. **Wastewater Treatment (30.16%)**
3. **Vehicle Fleet (17.80%)**

FIGURE C. KITTERY MUNICIPAL GHG INVENTORY BY SECTOR.

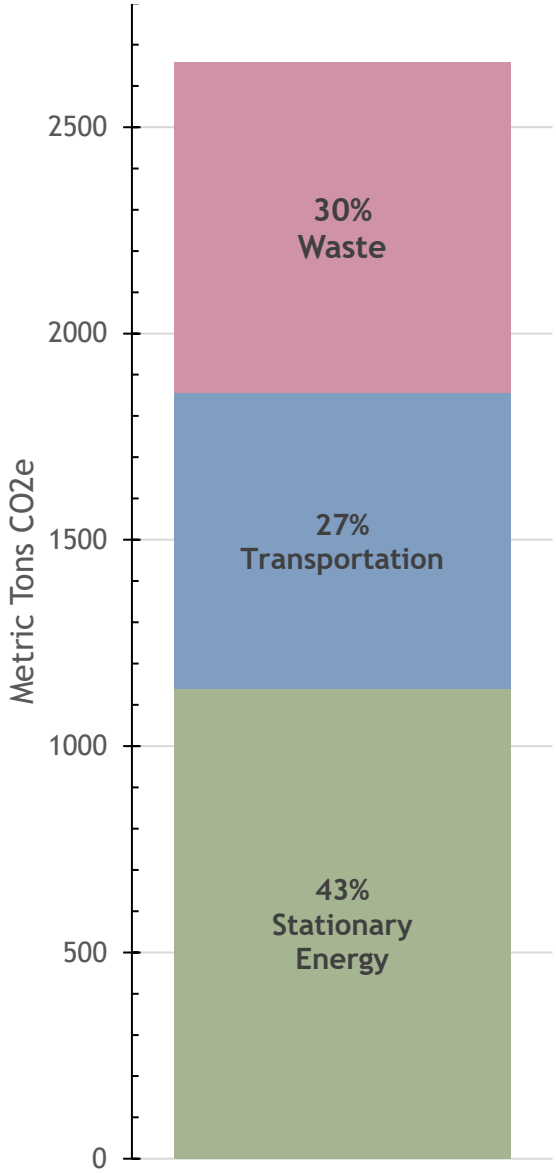
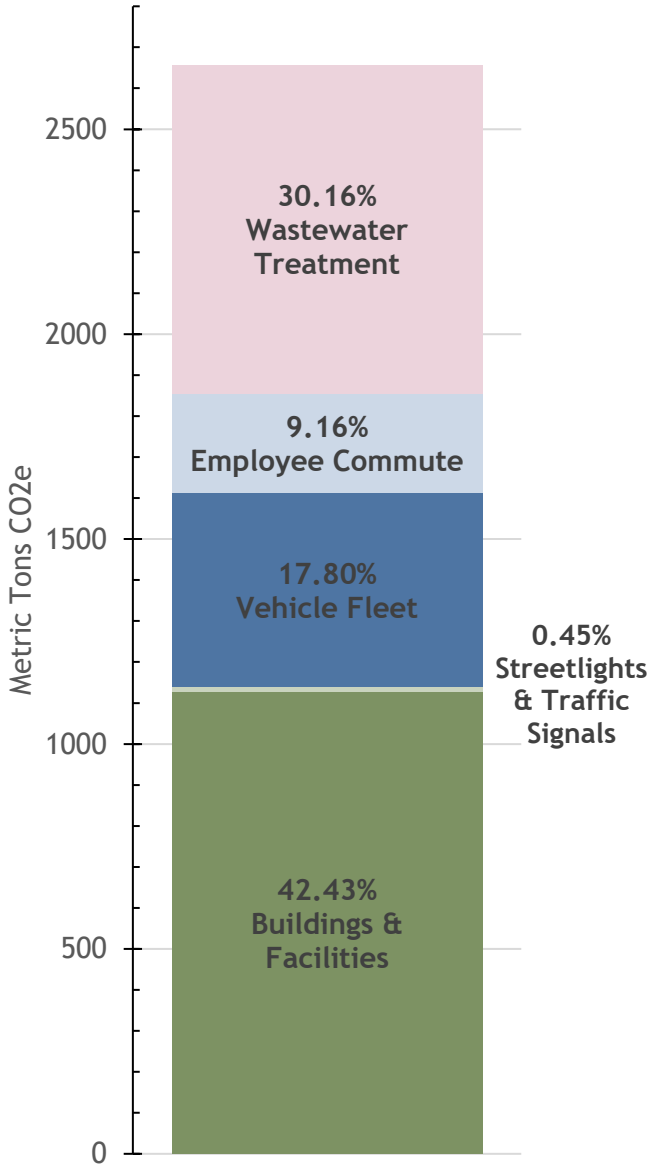


FIGURE D. KITTERY MUNICIPAL GHG INVENTORY BY SECTOR AND SUBSECTOR.



The Town of Kittery's community-wide and municipal GHG inventories can serve as a foundation to develop a climate action plan for reducing carbon emissions and adapting to the impacts of climate change. Future GHG inventories in two or three years may be used to evaluate Kittery's progress on emissions reductions efforts and toward identified goals. The following is a list of recommendations to improve the quality of a future GHG inventory:

Community-wide GHG inventory

- Survey residents to get a better estimate of annual discrete fuel use for home heating and other purposes.
- Survey businesses to get a better estimate of annual discrete fuel use for building heating and other purposes.
- Survey residents to get an estimate of annual air travel.
- Consider working with PNSY and other marine fleet owners to estimate emissions from marine vessels.
- Survey businesses about their waste volumes and management practices to improve estimates of MSW.
- Consider using ICLEI LEARN tool or other method to estimate emissions and sequestration of GHG from land use changes.
- Collect data on more *Additional Indicators of Climate Action*, including:
    - Number of solar panels installed
    - Hours of using of public EV charging stations
    - Number of private EV charging stations
    - Public transit ridership and number of routes
    - Number of residents composting at home
    - Amount of kitchen compost collected at the Kittery Resource Recovery Center
    - Reuse economy statistics
    - Business waste management practices

Municipal GHG inventory

- Streamline and standardize invoicing and record keeping of municipal discrete fuel and transportation fuel use to improve data accuracy.
- Conduct a survey of municipal employee commuting behavior to improve the estimate of employee commute emissions and add in employee business travel emissions.
- Begin to collect data on municipally-generated MSW to be able to estimate Waste - MSW emissions.

Introduction

Climate Action in Kittery

The oldest incorporated town in Maine, the Town of Kittery is a community of 10,070 people, encompassing 17 square miles of land and 57 square miles of water in the southernmost portion of the state.[1] Over the past decade, Kittery has made substantial progress on laying the foundation to address both the causes and impacts of climate change. The Town's actions on climate are guided by the Coastal Community Resilience section (Topic Area 9) in the Kittery 2015-2025 Comprehensive Plan, which establishes the following goals and objectives:

9) Coastal Community Resilience Goal Statement: Establish short-, medium-, and long-term plans to address the effect of climate change, including increased storm frequency and strength, coastal erosion and rising ocean levels, and transition of both public and private energy consumption to low and zero impact methods.

- **Objective 9.1.** Establish plans to address the effects of climate change.
- **Objective 9.2.** Reduce energy consumption and transition to low and zero impact methods.
- **Objective 9.3.** Provide education and incentives to protect the environment and improve quality of life.

To meet the goal and objectives, the Kittery Town Council established the Kittery Climate Adaptation Committee in 2019 and also joined the SMPDC Regional Sustainability and Resilience Program. In June 2021, the Kittery Town Council approved a resolution to increase energy efficiency in municipal operations and raise awareness among residents and businesses about ways to reduce reliance on greenhouse gases. Kittery has already pursued many actions to reduce its reliance on fossil, including installing energy-saving LED streetlights, purchasing electric vehicles, weatherizing municipal buildings, and purchasing solar energy for municipal electricity use. Kittery is also preparing for the impacts of climate change. The Town completed the Maine Flood Resilience Checklist and conducted a Coastal Hazards Planning Best Practices Assessment. It is also participating in an EDA grant-funded project assessing the economic and social vulnerabilities associated with sea level rise and coastal flood events and has been funded by the Piscataqua Regions Estuary Project to develop maps of flooding associated with sea-level rise and storm surge that will form the basis of floodplain development requirements and ordinance standards.

Why Greenhouse Gas Inventories Matter

The town of Kittery is already experiencing the impacts of climate change, including warmer air and ocean temperatures, shorter winters, and new pests and diseases.[2] These

[1] Population based on the 2020 Census

[2] MCC STS. 2020. *Scientific Assessment of Climate Change and Its Effects in Maine*. A Report by the Scientific and Technical Subcommittee (STS) of the Maine Climate Council (MCC). Augusta, Maine. 370 pp. http://climatecouncil.maine.gov/future/sites/maine.gov.future/files/inline-files/GOPIF_STS_REPORT_092320.pdf

changes are primarily driven by an increase of carbon dioxide (CO_2) and other greenhouse gases (GHGs) in the atmosphere, largely due to the combustion and use of fossil fuels. These GHGs trap heat in the Earth's atmosphere. They let short-wave sunlight pass through the atmosphere but prevent some of the long-wave radiation emitted from the earth from leaving, thereby warming the atmosphere. As we burn more and more fossil fuels, GHGs continue to build up in the atmosphere, trapping an ever-greater amount of heat.

A greenhouse gas inventory is an account of all the GHG emissions from sources within a community. It is a tool to help communities:

- Understand ongoing activities and major sources of emissions
- Identify areas to focus emission reduction efforts
- Establish goals and track progress towards those goals
- Facilitate decision-making about future policies and strategies

An inventory is usually calculated for a specific analysis year. Subsequent inventories every 3-5 years can aid local decision-makers and municipal staff in prioritizing and evaluating emission reduction strategies.

This report contains two inventories for the Town of Kittery: A *community-wide inventory* and a *municipal inventory*. A community-wide GHG inventory estimates the amount of GHG emissions associated with community sources and activities, meaning those of a municipality's residents, workforce, visitors, and economy. A municipal GHG inventory estimates only the emissions occurring because of local government operations, including those from government buildings and facilities, government fleet vehicles, wastewater treatment and potable water treatment facilities, landfill facilities, and other operations. There are benefits and weaknesses to both types of inventories, summarized in Table 1.

What Greenhouse Gases are Included

The primary GHGs included in a GHG inventory are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Each GHG contributes differently to warming in the atmosphere, where some are far more potent than others in the same quantities.[3] Because CH_4 and N_2O absorb far more energy than CO_2 in the atmosphere, global warming potentials (GWP) are needed to account for the warming impact of each gas. A GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. To show the total emissions impact, emissions of CH_4 and N_2O are converted to metric tons of CO_2 equivalent (MT CO_2e) using each gas' GWP.

[3] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

TABLE 1. PROS AND CONS OF COMMUNITY-WIDE AND MUNICIPAL GHG INVENTORIES

	Community-wide GHG inventory	Municipal GHG inventory
Pros	• Comprehensive view of all emissions occurring in the community • Provides insight into regulatory/educational/community emission reduction strategies • Helps set community-wide targets and strategies that can be implemented by the local government, residents, businesses, and region	• Provides clear picture of emissions directly controlled by the local government • Leads to concrete and implementable strategies for reducing municipal emissions • Easier and faster to complete
Cons	• More complex and time consuming to complete • Relies more heavily on modeled data and regional/national averages, as opposed to actual energy use data in the community	• Only a small portion of a community's overall emissions are quantified • Limited impact of resulting emission reduction strategies on community-wide emissions • Doesn't provide insight on regulatory/educational/community emission reduction strategies

There are many other types of greenhouse gases, including perfluorocarbons, hydrofluorocarbons, sulfur hexafluoride, and nitrogen trifluoride. This protocol does not address these gases because they occur in much smaller quantities and are difficult to estimate for community-wide and municipal sources.

Emission Scopes

GHG emissions are also categorized by scope. Scopes designate the location and control of the emissions. Emission scopes aid communities in understanding emission sources and in inventory reporting and disclosure. They are defined as follows:[4]

Scope 1 emissions are those that physically occur within the boundary of the community or municipality's operations (such as the combustion of fossil fuels for home heating).

Scope 2 emissions are those that result from energy use within the boundary of the community or municipal operations but whose emissions occur outside the boundary (such as grid-supplied electricity).

Scope 3 emissions occur outside of the community or municipal operations boundary but are driven by activities within the community (such as landfilling community waste outside the community).

[4] Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories, Greenhouse Gas Protocol, 2014. https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities

Community-wide Inventory

Overview

The community-wide inventory estimates the GHG emissions due to Kittery's sources and activities, including those of Kittery's residents, workforce, visitors, and economy. It was estimated using the following inventory boundaries.

Inventory Year: This inventory was calculated for all emissions activities occurring in 2019. In the case where 2019 data was not available, 2017, 2018, or 2020 data were used as a substitute. The coverage year for specific data sources is indicated in the detailed inventory in Appendix A.

Inventory Boundary: The inventory boundary is the geographic extent of Kittery's jurisdictional boundary. All emissions that originated inside Kittery's jurisdictional boundary are included and classified as Scope 1. All emissions that happened outside the jurisdictional boundary as a direct result of community activity within the boundary (i.e., electricity use, landfilling of waste) are also included in the inventory, but classified as either Scope 2 or Scope 3. Emissions from Portsmouth Naval Shipyard (PNSY) are included within the community-wide GHG inventory but are not considered local government emissions.

Methodology

This inventory was conducted using the methodology laid out in the SMPDC Greenhouse Gas Inventory Protocol for Southern Maine Cities and Towns. This is a standardized and simplified protocol for community-wide GHG inventories. The protocol is based on the 2014 Global Protocol for Community-Scale Greenhouse Gas Inventories. It is also informed by the ICLEI – Local Governments for Sustainability U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, and the Metropolitan Area Planning Council Greenhouse Gas Inventories for Massachusetts Cities and Towns. The ICLEI ClearPath reporting platform was used for emissions calculations and accounting.

Community-wide GHG emissions may be either directly created (e.g., through household heating or vehicle fuel combustion) or indirectly created (e.g., through grid electricity use)

by community members. For the inventory, emission types are divided into different sectors and subsectors. Table 2 shows the sectors and subsectors *included* in the Kittery GHG inventory.

There are several sectors and subsectors of emission sources that were *excluded* from Kittery's community-wide inventory (Table 3). In some cases, it is because these categories are not applicable to the Town of Kittery. In others, it is because data for emissions in those categories are less readily available, are likely inaccurate given current methodologies, and/or have little relevance to municipal climate action planning.

TABLE 2. SECTORS AND SUBSECTORS **INCLUDED** IN THE KITTERY COMMUNITY-WIDE GHG INVENTORY.

SECTOR	SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/END USE
STATIONARY ENERGY	Residential	Energy used in buildings as well as losses from distribution systems	Electricity
			Natural Gas
		Energy used in buildings	Discrete Fuel
	Commercial	Energy used in commercial, government, and institutional buildings as well as losses from distribution systems	Electricity
			Natural Gas
		Energy used in commercial, government, and institutional buildings	Discrete Fuel
	Industrial	Energy used in manufacturing and industrial facilities as well as losses from distribution systems	Electricity
			Natural Gas
		Energy used in manufacturing and industrial facilities	Discrete Fuel
TRANSPORTATION	Passenger Vehicles	Fuel combusted from all passenger vehicle trips that are attributable to the community	Gasoline, Diesel, Electricity
	Commercial Vehicles	Fuel combusted from all commercial vehicle trips that are attributable to the community	Gasoline, Diesel, Electricity
	Public Transit	Fuel combusted due to passenger miles travelled on public transit	Gasoline, Diesel, Electricity
WASTE	Municipal Solid Waste - Incineration	GHG emissions resulting from the incineration of all trash generated by residential and commercial activity in the community that is sent to an incineration plant	Incineration Emissions
	Wastewater – Septic	Emissions from wastewater processed in Kittery Septic Systems	Aerobic and Anaerobic Digestion
	Wastewater – Wastewater Treatment Plant	Emissions from wastewater treated at Kittery WWTP	Aerobic and Anaerobic Digestion
	Wastewater-Effluent Discharge	Emissions from wastewater effluent from Kittery WWTP	Aerobic and Anaerobic Digestion

TABLE 3. SECTORS AND SUBSECTORS **EXCLUDED** FROM THE KITTERY COMMUNITY-WIDE GHG INVENTORY.

SECTOR	SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/ END USE	REASON
TRANSPORTATION	Passenger Rail	Fuel combusted due to passenger miles travelled on passenger rail	Gasoline, Diesel, Electricity	Not applicable in Kittery
	Freight Rail	Emissions from the movement of freight on rail lines through a community	Gasoline, Diesel, Electricity	Data availability, not relevant for municipalities
	Off-Road Equipment	Emissions that result from airport equipment, agricultural tractors, chain saws, forklifts, snowmobiles, etc.	Gasoline, Diesel, Electricity	Data availability
	Aviation	Fuel combusted from passenger and commercial air travel	Jet Fuel	Data availability
	Marine Vessels	Fuel combusted by boats that are refueled at community harbors	Gasoline, Diesel	Data availability, methodology
WASTE	Municipal Solid Waste - Landfilling	Landfill gas emissions resulting from all trash generated by residential and commercial activity in the community and sent to landfill	Landfill Gas	Not applicable in Kittery
	Compost	GHG emissions resulting from the breakdown of all composted material generated by residential, commercial, and schools	Aerobic and Anaerobic Digestion	Data availability, methodology
INDUSTRIAL	Industrial Process Emissions	Process and fugitive emissions from industrial facilities	Combustion and other Chemical Emissions	Data availability
	Product Use	Emissions from the use of products such as refrigerants, foams, or aerosol cans	Combustion and other Chemical Emissions	Data availability
AGRICULTURE, FORESTRY, MARINE	Livestock	Emissions from manure management and enteric fermentation	Enteric fermentation and manure management	Data availability
	Land	Emissions and sequestration of GHGs from land use changes	Soil and Land Management Changes	Data availability, methodology

The Kittery GHG inventories presented here are *sector-based* inventories, which categorize emissions based on their source. As a result, the inventory excludes many of the direct and lifecycle GHG emissions of the goods and services consumed by Kittery's residents and economy (such as food, clothing, electronic equipment, etc.). It is likely that the GHG emissions impact of Kittery's consumption is even greater than the emission estimates reported here. Therefore, the emissions estimates presented in this report can be considered a lower bound of Kittery's true impact on the generation of GHG emissions within and beyond Kittery.

Collecting the data

Community-wide emissions are calculated for each activity by multiplying activity data (e.g., fuel consumption) by the corresponding emission factors (e.g., tons CO_2 emitted per gallon of fuel combusted). The quality and availability of fuel consumption data varies across sectors and subsectors. This inventory is based on the highest quality data available according to the following hierarchy:

1. Real consumption data for each fuel type or activity, disaggregated by subsector.
2. A representative sample set of real consumption data from surveys.
3. Modeled energy consumption/activity data.
4. Regional or national fuel consumption data scaled down using population or other indicators.

The quality of available data may reduce the confidence in the GHG emissions estimate for some subsectors of emissions. Similarly, the current scientific understanding and/or simplifications that must be made may also reduce confidence in the emissions factors used to convert activity data to emissions estimates (particularly for waste and electricity end uses as well as transmission and distribution losses). To provide a broad measure of these uncertainties, the level of confidence of the data quality in each subsector is indicated as either low, medium, or high according to the guidelines provided in the 2014 Global Protocol for Community-Scale Greenhouse Gas Inventories (Table 4).

TABLE 4. DATA QUALITY DESCRIPTIONS FROM TABLE 5.3 IN 2014 GLOBAL PROTOCOL FOR COMMUNITY-SCALE GREENHOUSE GAS INVENTORIES.

Data Quality	Activity Data	Emission Factor
High	Detailed activity data	Specific emission factors
Medium	Partial or modeled activity data using robust assumptions	More general emission factors
Low	Highly-modeled or uncertain activity data	Default emission factors

Inventory

Summary

Figures 1 and 2 summarize Kittery's 2019 community-wide GHG inventory. Community-wide emissions for 2019 were estimated as 200,668 Metric Tons CO_2 equivalent (Metric Tons CO_2e). The majority of these emissions (66%) came from stationary emission sources including electricity, natural gas, and discrete fuel use and transmission/distribution losses. Transportation emissions were the second largest sector at 34% of the total emissions inventory. Waste emissions from municipal solid waste and wastewater only made up 1% of the inventory.

FIGURE 1. KITTERY COMMUNITY-WIDE GHG INVENTORY GROUPED BY SECTOR.

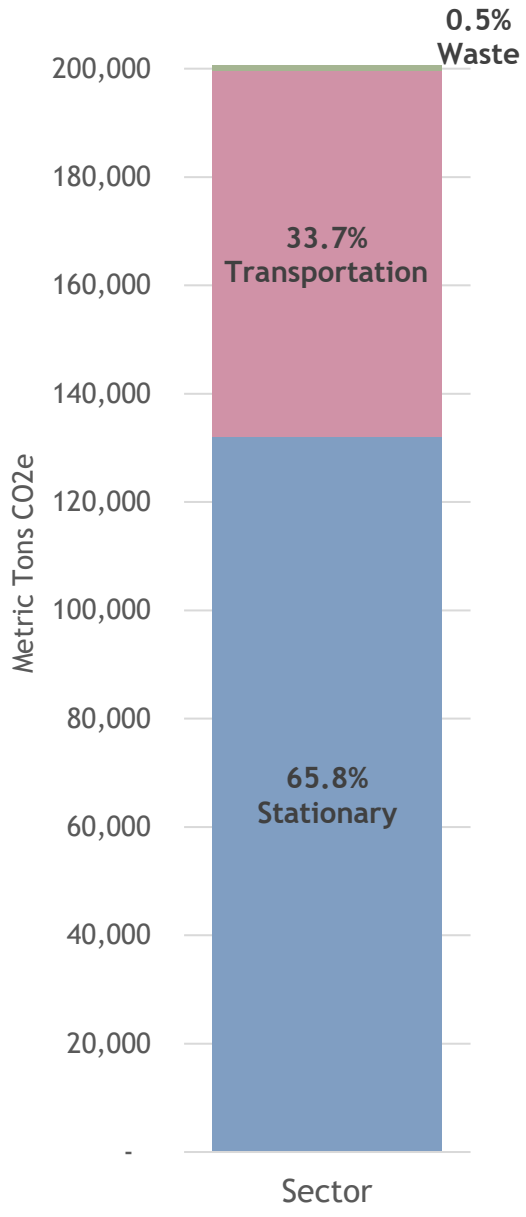
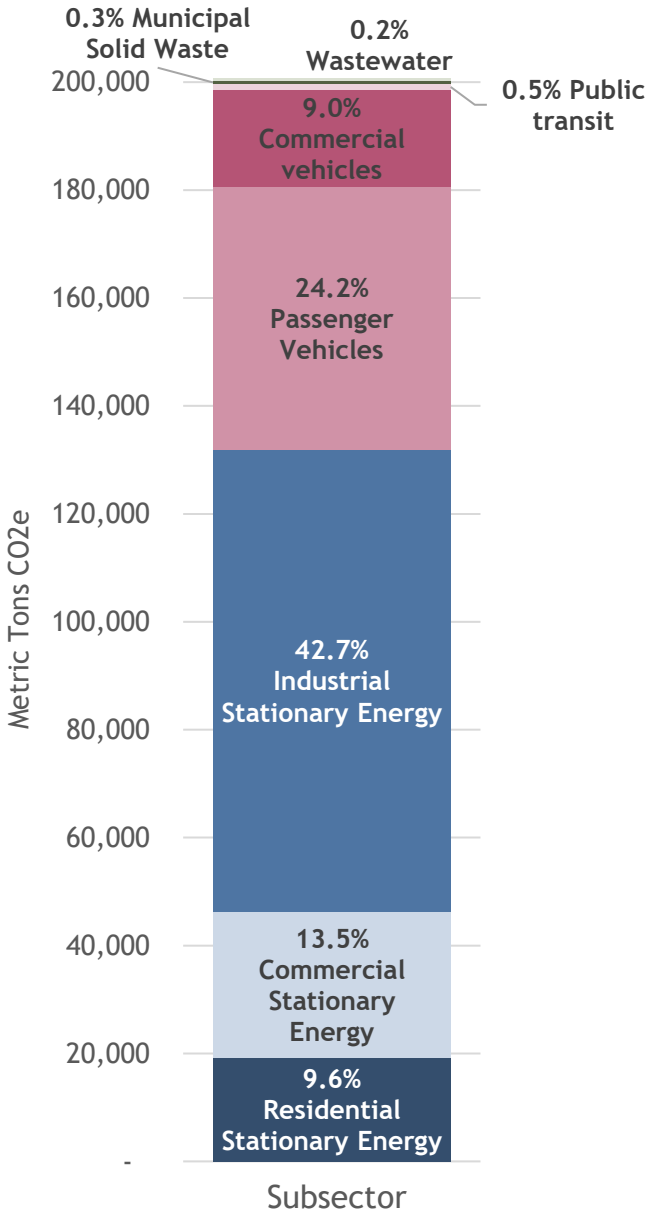


FIGURE 2. KITTERY COMMUNITY-WIDE GHG INVENTORY GROUPED BY END USE AND SECTOR.



The subsectors responsible for the most emissions were:

1. **Industrial Stationary Energy (42.7%):** In particular, 26% of community-wide emissions resulted from natural gas use at the Portsmouth Naval Shipyard (PNSY) combined heat and power plant. 15% of community-wide emissions resulted from industrial electricity use and PNSY and other industrial facilities.
2. **Passenger vehicles (24%)**
3. **Commercial Stationary Energy (13.5%)**
4. **Residential Stationary Energy (9.6%)**

Stationary Energy

The Stationary Energy sector includes GHG emissions resulting from energy use by buildings and industries. It includes the direct emissions from the combustion of fossil fuels (Scope 1) and the indirect emissions from the consumption of grid-supplied electricity (Scope 2). It also includes the losses from the transmission and distribution systems of grid-supplied electricity and natural gas (Scope 3). Data Sources for Kittery's Stationary Energy sector are presented in Table 5.

Overall, industrial natural gas and industrial electricity use were the largest end uses for the Stationary Energy sector (Figure 3 and Table 6). The industrial natural gas subsector specifically accounted for the natural gas that was used to power the PSNY combined heat and power plant. The industrial electricity emissions were likely dominated by PNSY electricity use as well. Overall, industrial energy use accounted for 65% of Kittery's stationary emissions and 42.7% of all community-wide emissions. The commercial subsector was the second largest, accounting for 20.5% of the stationary emissions. The residential subsector was the smallest at 14.5%.

TABLE 5. STATIONARY ENERGY SUBSECTORS AND DATA SOURCES

SUBSECTOR	EMISSIONS SOURCES	END USE/ENERGY TYPE	SCOPE	DATA SOURCE	DATA QUALITY
RESIDENTIAL	Energy used in buildings as well as losses from distribution systems	Electricity	2 and 3	Real consumption data from Central Maine Power (CMP)	High (use) Low (losses)
		Natural Gas	1 and 3	Real consumption data from Unitil	High
	Energy used in buildings	Discrete Fuel	1	Scaled down fuel consumption data from state datasets	Low
COMMERCIAL	Energy used in commercial, government, and institutional buildings as well as losses from distribution systems	Electricity	2 and 3	Real consumption data from Central Maine Power (CMP)	High (use) Low (losses)
		Natural Gas	1 and 3	Real consumption data from Unitil. Includes some industrial natural gas	High
	Energy used in commercial, government, and institutional buildings	Discrete Fuel	1	Scaled down fuel consumption data from state datasets and includes some industrial discrete fuel use	Low
INDUSTRIAL	Energy used in manufacturing and industrial facilities as well as losses from distribution systems	Electricity	2 and 3	Real consumption data from Central Maine Power (CMP)	High (use) Low (losses)
		Natural Gas	1 and 3	Real consumption data from EPA	Medium
	Energy used in manufacturing and industrial facilities	Discrete Fuel	1	Real consumption data from EPA	Medium

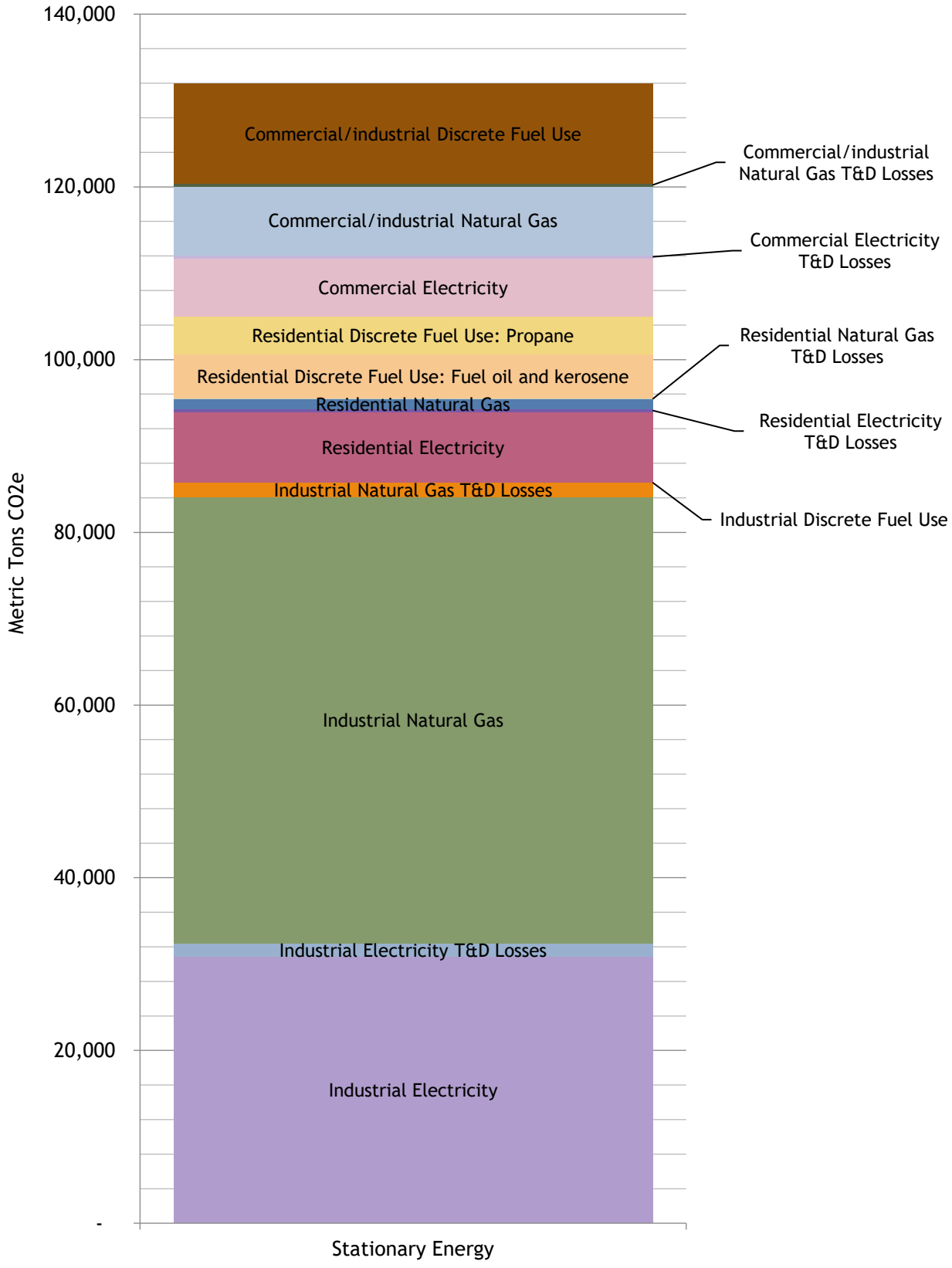


FIGURE 3. SUMMARY OF STATIONARY EMISSIONS FOR KITTERY COMMUNITY-WIDE GHG INVENTORY.

TABLE 6. STATIONARY EMISSIONS BY END USE AND SECTOR.

End Use and subsector	Emissions (MT CO_2e)	Percent of stationary emissions (%)
Industrial Electricity	30,869	23.4%
Industrial Electricity T&D Losses	1,574	1.2%
Industrial Natural Gas	51,615	39.1%
Industrial Natural Gas T&D Losses	1,687	1.3%
Industrial Discrete Fuel Use	30	0.0%
Residential Electricity	8,124	6.2%
Residential Electricity T&D Losses	414	0.3%
Residential Natural Gas	1,106	0.8%
Residential Natural Gas T&D Losses	36	0.0%
Residential Discrete Fuel Use: Fuel oil and kerosene	5,183	3.9%
Residential Discrete Fuel Use: Propane	4,320	3.3%
Commercial Electricity	6,765	5.1%
Commercial Electricity T&D Losses	345	0.3%
Commercial/industrial Natural Gas	8,016	6.1%
Commercial/industrial Natural Gas T&D Losses	261	0.2%
Commercial/industrial Discrete Fuel Use	11,615	8.8%

Data Quality Considerations

While data quality for electricity and natural gas are high, data quality for discrete fuel use is low. This is because the discrete fuel use estimates were based on statewide energy use data and national survey results. Additionally, the lack of real consumption data and need to rely on state surveys and average energy use data mean that discrete fuel use estimates are not available for every year, making it hard to measure year to year changes in fuel use. As a result, it is difficult to determine whether discrete fuel use is or is not a higher source of stationary emissions than electricity in the commercial and residential subsectors. Despite the lack of high-quality data, it is clear that discrete fuel use is a significant source of emissions for the Town of Kittery that may be targeted through local emission reduction strategies.

Transportation

The Transportation sector includes emissions from all on-road transportation sources, including passenger vehicles, commercial vehicles, and public transit. Due to limited data availability, it excludes emissions from marine vessels, freight rail, passenger rail, off-road equipment, and aviation. There is currently no quality data source for freight rail or off-road equipment for Maine communities. Passenger rail emissions are not relevant to the Town of Kittery where there is no passenger rail station. Aviation emissions and marine vessel emissions are excluded as well due to lack of data. Data Sources for Kittery's Transportation sector are presented in Table 7 and emissions estimates are presented in Figure 4 and Table 8.

On-road transportation emissions were calculated using modelled vehicle milage data and regional vehicle population data. This methodology is detailed in the report, Estimating On-Road Transportation Emissions in York County, Maine. The process starts by calculating the total number of miles driven by vehicles (vehicle miles travelled or VMT) using Streetlight Data, a cloud-based transportation data and analysis platform that uses records from smartphones and navigation devices in connected cars and trucks. VMT were estimated using the *activity-based VMT* methodology. Under this methodology, the VMT is based on all trips that occur because of people travelling to, from, and within a community. The activity-based VMT methodology provides an estimate of on-road transportation GHG emissions that is actionable and specifically excludes emissions from vehicles that pass through – but do not stop in – the community (such as those vehicles driving through on I-95 without stopping in Kittery). On-road transportation emissions are divided into scope 1 emissions (those miles driven within Kittery's jurisdictional boundary) and scope 3 emissions (those miles driven outside of Kittery's jurisdictional boundary).

Emissions from passenger vehicles accounted for most transportation emissions (71.8%). This is likely due to the high daily travel of passenger vehicles as well as the significant prevalence of low fuel efficiency SUVs and light-duty trucks in the region's vehicle population. Commercial vehicles were the second largest source of emissions (26.6%) and

public transit only accounted for a small fraction (1.6%) of the transportation emissions. The small number of electric vehicles (EVs) in the regional vehicle population (<1% of vehicles) had a negligible impact on the transportation emissions.

TABLE 7. TRANSPORTATION EMISSIONS SUBSECTORS AND DATA SOURCES.

SECTOR	SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE	SCOPE	DATA SOURCE	DATA QUALITY
TRANSPORTATION	Passenger Vehicles	Fuel combusted from all passenger vehicle trips that are attributable to the municipality	Gasoline, Diesel, Electricity	1 and 3	**Modeled energy consumption/ activity data based on real activity data**	Medium
	Commercial Vehicles	Fuel combusted from all commercial vehicle trips that are attributable to the municipality	Gasoline, Diesel, Electricity	1 and 3	**Modeled energy consumption/ activity data based on real activity data**	Medium
	Public Transit	Fuel combusted due to passenger miles travelled on public transit	Gasoline, Diesel, Electricity	1 and 3	**Modeled energy consumption/ activity data based on real activity data**	Medium

TABLE 8. TRANSPORTATION EMISSIONS BY SUBSECTOR.

Subsector	Emissions (MT CO_2e)	Percent of transportation emissions (%)
Passenger Vehicles	48,594	71.8%
Commercial Vehicles	18,006	26.6%
Public Transit	1,081	1.6%

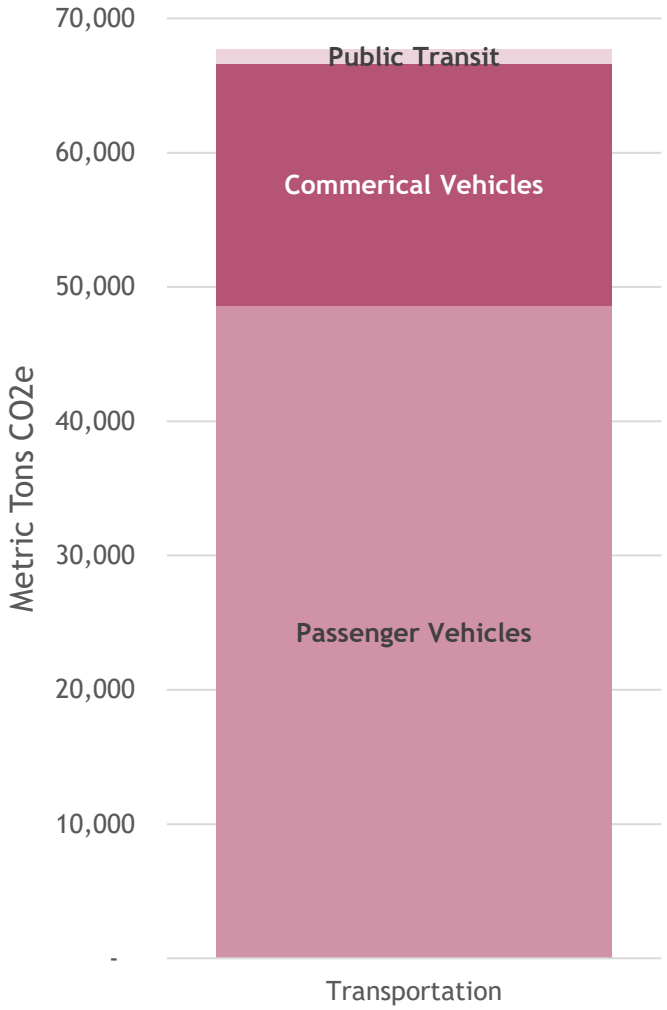


FIGURE 4. SUMMARY OF TRANSPORTATION EMISSIONS FOR KITTERY'S COMMUNITY-WIDE GHG INVENTORY.

Data Quality Considerations

SMPDC's approach to modelling vehicle miles traveled using Streetlight Data allows for a fuller and more accurate measure of on-road transportation emissions assigned to the Town of Kittery. However, without the inclusion of other forms of transportation, the picture of Kittery's transportation emissions remains incomplete. Marine emissions are likely a significant portion of Kittery's transportation emissions given the presence of the PNSY within the town's jurisdiction as well as the town's fishing and recreational boat fleets. Similarly, aviation is likely a significant source of Scope 3 emissions from the air travel of Kittery's residents and visitors. Aviation emissions may be estimated using a community-wide survey question asking about annual air travel by residents. An alternative metric for understanding the impact of aviation emissions could be the average or median number of flights flown by Kittery residents each year. Marine emissions might be harder to ascertain and might require the cooperation of the PNSY or other marine fleet owners.

Waste

The management of solid waste and wastewater results in GHG emissions through the decay of waste with biologic constituents or the burning of waste. The waste sector includes all emissions from the disposal and treatment of waste generated within the Town of Kittery, whether treated inside or outside of the municipal boundary. It also includes the treatment of waste generated outside of Kittery but imported into and processed at a wastewater facility within the municipality boundary. Data sources for Kittery's Waste sector are presented in Table 9. The Town of Kittery disposes of municipal solid waste through incineration, composting, and recycling. MSW – Incineration emissions include those from trash generated by residents and some commercial entities that is taken from the town transfer station to the EcoMaine waste-to-energy plant in Portland, Maine. Avoided emissions from composting and recycling excluded from this inventory because they are minimal and difficult to quantify. Wastewater treatment emission sources in Kittery include septic systems, the Kittery Wastewater Treatment Plant, and effluent discharge from the Kittery Wastewater Treatment Plant.

Figure 5 and Table 10 show the emission estimates for the Waste sector. Waste emissions made up just 1% of Kittery's community-wide GHG emissions. The majority of these (59.4%) were from the incineration of municipal solid waste. The second largest waste subsector was septic system emissions (34%).

TABLE 9. WASTE EMISSIONS SUBSECTORS AND DATA SOURCES.

SECTOR	SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE	SCOPE	DATA SOURCE	DATA QUALITY
WASTE	MSW - Incineration	Emissions resulting from the incineration of all trash generated by residential and commercial activity in the community that is sent to an incineration plant	Incineration Emissions	3	Kittery transfer MSW tonnage and EcoMaine emissions data from EPA	Medium
	Wastewater – Septic	Emissions from wastewater processed in Kittery Septic Systems	Aerobic and Anaerobic Digestion	1	Modeled emissions data based on number of septic systems	Low
	Wastewater – Wastewater Treatment Plant	Emissions from wastewater treated at Kittery WWTP	Aerobic and Anaerobic Digestion	1	Modeled emissions data based on number of sewer connections and population	Low
	Wastewater-Effluent Discharge	Emissions from wastewater effluent from Kittery WWTP	Aerobic and Anaerobic Digestion	1	Modeled emissions data based on number of sewer connections and population	Low

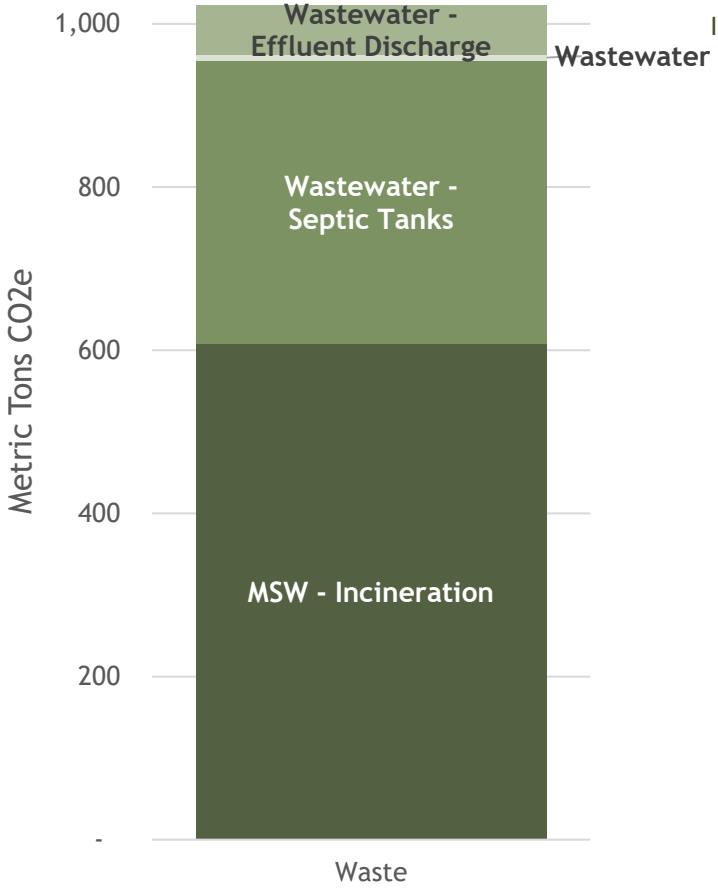


FIGURE 5. SUMMARY OF WASTE EMISSIONS FOR KITTERY'S COMMUNITY-WIDE GHG INVENTORY.

TABLE 10. WASTE EMISSIONS BY SUBSECTOR.

Subsector	Emissions (MT CO_2e)	Percent of Waste emissions (%)
MSW - Incineration	608	59.4%
Wastewater – Septic Tanks	348	34.0%
Wastewater - WWTP	7	0.7%
Wastewater - Effluent Discharge	61	6.0%

Data Quality Considerations

Emissions data from waste tend to be low quality due to both lack of activity data and uncertainty in emissions calculations. Because municipalities are responsible for transfer stations, residential waste options, and wastewater treatment plants, they often have good records of residential MSW and wastewater volumes. However, it is often unclear how much of the commercial and industrial waste streams are captured in municipal MSW. The Town of Kittery does allow commercial waste to be dropped off at their transfer station, but many businesses choose to pay for their waste to be picked up by private haulers. This indicates that MSW emissions are likely underestimated. To get a clearer picture of commercial waste volumes, Kittery could survey businesses about their waste volumes and management practices.

Additional Indicators of Climate Action

The process of calculating and inventorying GHG emissions from community-wide activities is a vital step for communities to understand the sources of their emissions and identify priority actions for reducing emissions. But due to the need to sometimes rely on statewide, national, or modelled data for GHG inventories, it can be hard to quantify the specific impact of mitigation efforts on the emissions calculated in the inventory. This is especially true for those efforts that have an indirect impact on emissions, such as activities like educating residents and businesses about renewable energy or community building and environmental justice initiatives. These are critical activities that research has shown are vital to driving down GHG emissions across many sectors.

Presented here, ***Additional Indicators of Climate Action*** are alternative metrics that may be used to develop emissions reduction initiatives and set measurable goals without the need to quantify their impact in MT CO_2e.

Stationary Energy

Indicators for stationary energy can provide a clearer picture of community efforts to increase energy efficiency and reduce reliance on fossil fuels in homes and businesses.

Heat pump and weatherization rebates

The number of heat pump and weatherization rebates show how many residents are taking advantage of Efficiency Maine programs to increase energy efficiency and decrease fossil fuel use. Overall, Kittery residents have claimed **153 heat pump rebates and 109 weatherization rebates** from 2015-2020. The most popular weatherization rebates are those for air sealing and attic insulation.

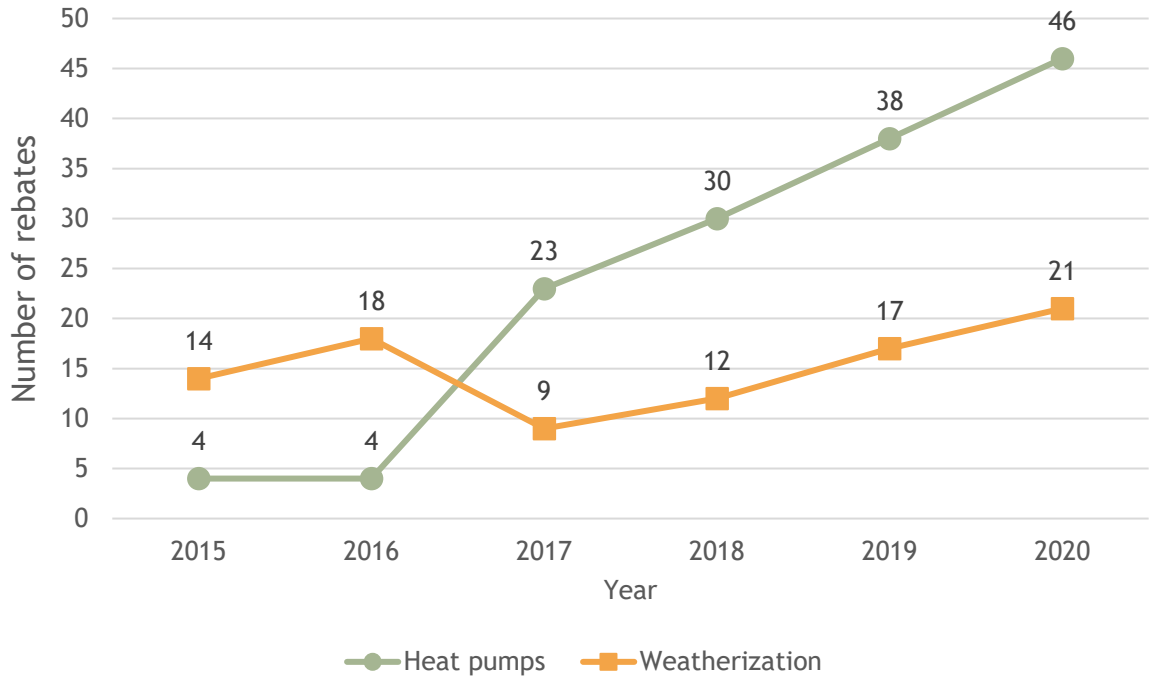


FIGURE 6. NUMBER OF EFFICIENCY MAINE HEAT PUMP AND WEATHERIZATION REBATES FOR THE TOWN OF KITTERY.

Electricity use per household

Tracking the electricity use per household can help Kittery set goals for energy efficiency. Average annual household electricity use for the Town of Kittery was **7,100 KWH per year** for 2017-2019. This is lower than the U.S. national average of 10,715 KWH per year in 2020, likely due to lower reliance on air conditioning in Kittery compared to the U.S. average.

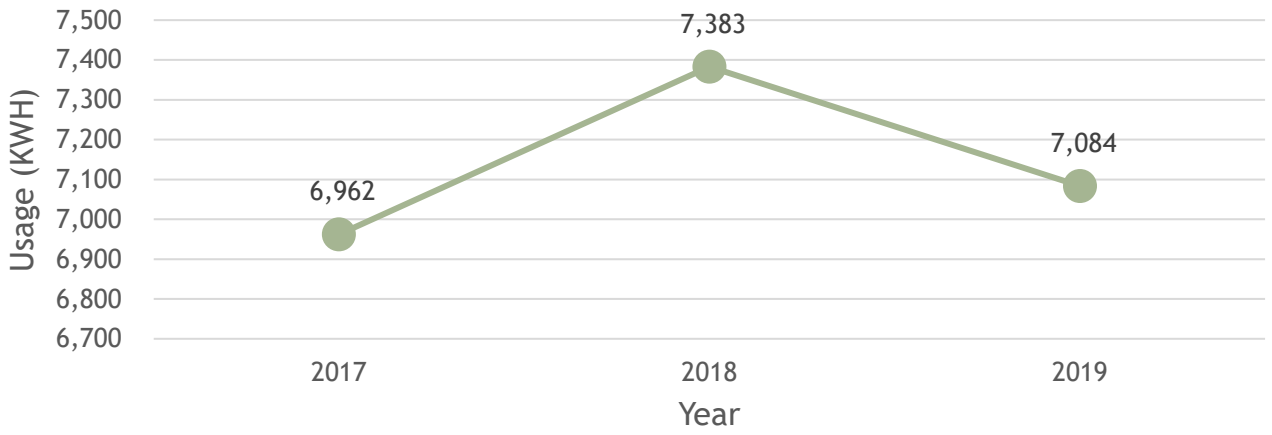


FIGURE 7. AVERAGE ANNUAL HOUSEHOLD ELECTRICITY USAGE FOR THE TOWN OF KITTERY. DATA OBTAINED FROM CENTRAL MAINE POWER.

Household energy burden

Kittery can track the impact of initiatives to support accessible renewable energy and energy efficiency by measuring the energy burden (percentage of household income devoted to energy expenditures) of average and low-income households. Kittery's **household energy burden was less than the Maine average** energy burden across all income levels. However, Kittery households with 0 – 60% of the area median income still faced a **severe energy burden** (10% or greater) and households 60-80% of the area median income faced **a high energy burden** (6%-10%).

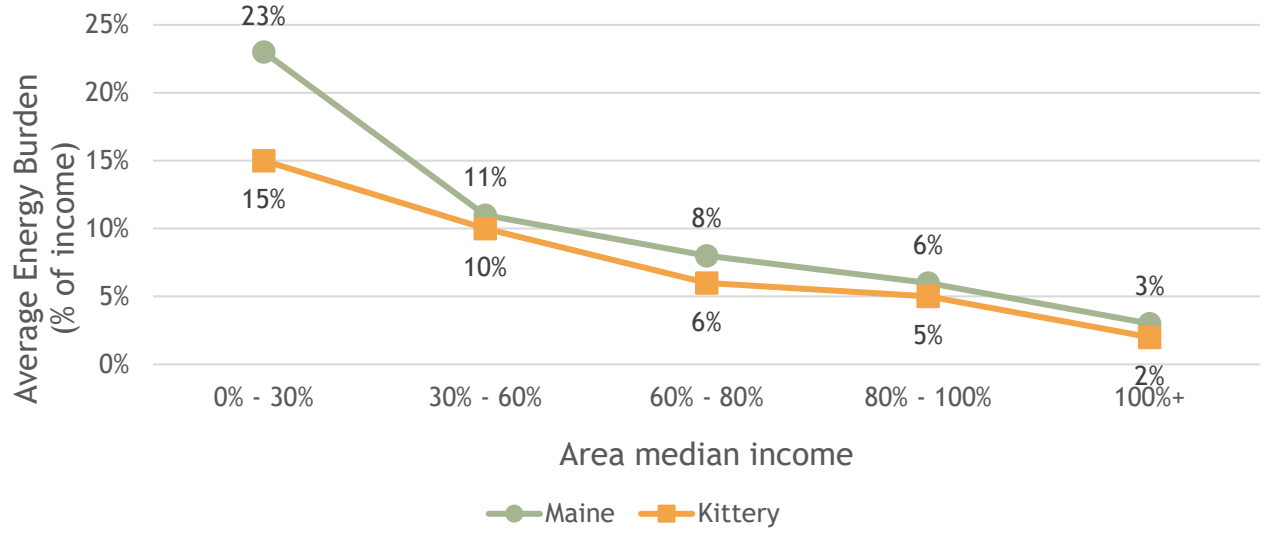


FIGURE 8. AVERAGE ENERGY BURDEN BY INCOME FOR THE STATE OF MAINE AND KITTERY. DATA OBTAINED FROM THE U.S. DEPARTMENT OF ENERGY'S LOW-INCOME ENERGY AFFORDABILITY TOOL.

Transportation

Indicators for transportation can help the community track efforts to increase electric vehicle adoption, walk/bike-ability, and use of public transit.

Number of EVs and Hybrids in local vehicle population

The number of electric vehicles (EVs) and hybrids registered in Kittery may be used to track community efforts to increase the number or residents or businesses driving EVs. From 2015 to 2019, the number of EVs and PHEVs registered in Kittery **increased from 1 to 32 vehicles**. In 2019, EVs and PHEVs currently made up **less than 1%** of Kittery's registered vehicle population.

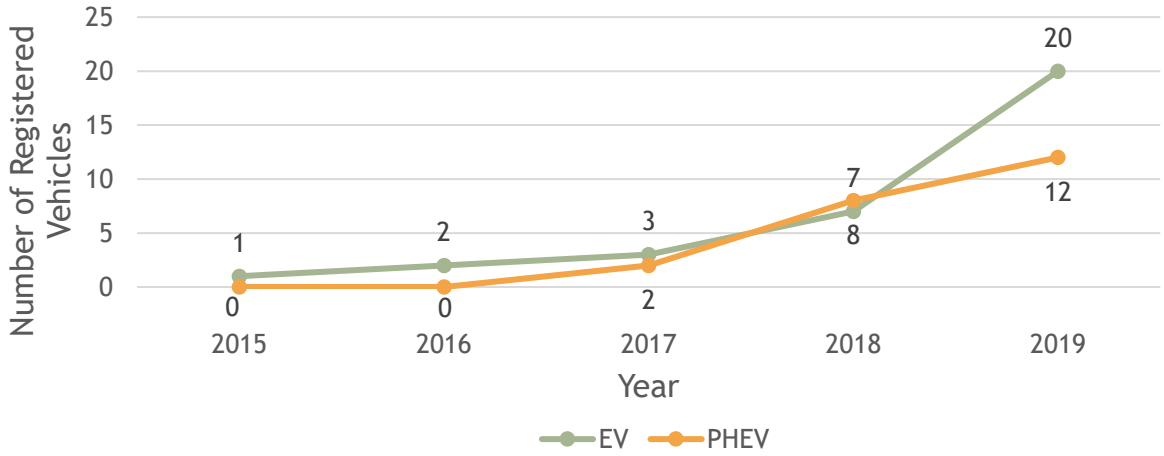


FIGURE 9. NUMBER OF ELECTRIC VEHICLES (EVS) AND PLUG-IN HYBRID ELECTRIC VEHICLES (PHEVS) REGISTERED IN THE TOWN OF KITTERY BY YEAR. DATA OBTAINED FROM THE MDEP VEHICLE POPULATION AND GREENHOUSE GAS DATA PORTAL.

Number of Public EV charging stations

The number of public EV charging stations is a way to estimate Kittery's accessibility to EV drivers. There were **sixteen public EV chargers** in Kittery as of December 2021: Four at Town Hall, eight at Kittery Premium Outlets, two at Rice Library, and two at Tributary Brewery and Blue Mermaid Restaurant (But according to Plugshare.com, these chargers are for patrons only).

Average Commutes

The average commute of residents and local employees helps Kittery track initiatives to improve workforce/affordable housing as well as remote work initiatives. According to the American Community Survey, the average commute for Kittery residents from 2015-2019 was **23.5 minutes**. This is slightly lower than the Maine average commute of 24.2 minutes and the U.S. average commute of 27.6 minutes.

FIGURE 10. PUBLIC EV CHARGING STATIONS AT KITTERY TOWN HALL.

Waste

Municipal solid waste disposal and wastewater treatment only accounted for 1% of Kittery's emissions. However, reducing, reusing, and recycling waste are vital strategies for reducing or avoiding emissions from the consumption of goods and foods which have impacts beyond Kittery's waste sector of the GHG inventory. Indicators for waste management help Kittery track efforts to reduce consumption and increase waste diversion.

Number of residents and businesses using curbside composting

Curbside composting offers an alternative to home composting for residents, apartment dwellers, and businesses. In Kittery, Mr. Fox Composting offers curbside composting for Kittery's residents and businesses. According to Mr. Fox Composting customer service, Kittery had **four commercial composters and 98 residential composters** utilizing their curbside composting services as of Oct. 2021.

Additionally, kitchen compost can now be brought to Kittery's Resource Recovery Center and dropped in a bin provided by Mr. Fox. Since implementation in September 2021, the number of 67 gallon bins available for kitchen compost has **increased from one to four** in December 2021.

Municipal Inventory

Overview

The municipal inventory accounts for the GHG emissions due to the municipal operations of the Town of Kittery, including municipal buildings, vehicles, and employee activities as well as those of the Kittery School District. It was estimated using the following inventory boundaries.

Inventory Year: This inventory was calculated for all emissions activities occurring in 2019. In the case where 2019 data was not available, 2017, 2018, or 2020 data were used as a substitute. The data coverage year for specific data sources are indicated in the detailed inventory in Appendix B.

Inventory Boundary: The boundary of this inventory is Kittery's operational control boundary. This includes any emissions sources that the municipality has full authority over their operating policies. All emissions that occur from sources owned or operated by the municipality are included and classified as Scope 1. All emissions that happen indirectly as a result of municipal activities (i.e. electricity and employee commute) are also included in the inventory, but classified as either Scope 2 or Scope 3.

Methodology

This inventory was prepared using the Local Government Operations Protocol for the quantification and reporting of greenhouse gas emissions inventories. Developed in partnership by the California Air Resources Board, California Climate Action Registry, and ICLEI – Local Governments for Sustainability, the protocol provides step-by-step guidance on developing a municipal GHG inventory.

Municipal GHG emissions may be either directly created (e.g., through building heating or vehicle fuel combustion) or indirectly created (e.g., through grid electricity use) by municipal operations. For the municipal inventory, emission types are divided into different sectors and subsectors. Table 11 shows the sectors and subsectors *included* in the Kittery municipal GHG inventory.

There are several subsectors of emission sources that were *excluded* from Kittery's municipal inventory. Kittery does not operate a transit fleet or a school bus fleet, and so these subsectors were excluded. Similarly, the Kittery Water District is a special district, a political subdivision to provide a single public service over which the Town of Kittery does not have operational control. Because of this, the water treatment subsector was excluded (although it's electricity use is captured in the community-wide inventory). Due to lack of municipally-generated waste data, the waste – municipal solid waste (MSW) subsector was excluded. Table 12 shows the sectors excluded from Kittery's municipal GHG inventory.

Collecting the data

Municipal emissions were calculated by multiplying activity data (e.g., fuel consumption) by the corresponding emission factors (e.g., tons CO_2 emitted per gallon of fuel combusted) for each activity. This activity data was compiled by municipal staff from vendor invoices

and utility data platforms. Similar to the community-wide GHG inventory, confidence of the data quality in each subsector was indicated as either low, medium, or high according to the guidelines provided in the 2014 Global Protocol for Community-Scale Greenhouse Gas Inventories (Table 4).

TABLE 11. SECTORS AND SUBSECTORS **INCLUDED** IN KITTERY'S MUNICIPAL GHG INVENTORY.

SECTOR	SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/END USE
STATIONARY ENERGY	Buildings and Facilities	Energy used in town offices, school buildings, fire stations, police stations, and parks and recreation facilities	Electricity
			Natural Gas
			Discrete Fuel
	Streetlights and Traffic Signals	Energy used in town street lighting and traffic signals	Electricity
TRANSPORTATION	Vehicle Fleet	Fuel combusted by municipally-owned vehicles	Gasoline, Diesel
	Employee Commute	Fuel combusted from vehicles used by municipal employees as they commute to and from work	Gasoline, Diesel
WASTE	Wastewater Treatment	Emissions from wastewater treated at Kittery WWTP	Aerobic and Anaerobic Digestion
		Emissions from wastewater treated in community septic systems	Aerobic and Anaerobic Digestion
		Energy used in wastewater processing at the WWTP and pump stations	Electricity

TABLE 12. SECTORS **EXCLUDED** FROM KITTERY'S MUNICIPAL GHG INVENTORY.

SECTOR	SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/END USE	REASON
STATIONARY ENERGY	Water treatment	Emissions from energy used to treat drinking water	Electricity	Not applicable to Kittery
TRANSPORTATION	Transit Fleet	Fuel combusted in transit vehicles.	Diesel	Not applicable to Kittery
	School Buses	Fuel combusted in school buses	Diesel	Not applicable to Kittery
WASTE AND WASTEWATER	Waste – MSW	Emissions from the incineration of municipal solid waste generated by municipal operations	Incineration Emissions	Data availability

Inventory

Summary

The summary of Kittery's Municipal GHG inventory is presented in Figures 10 and 11. Municipal emissions for 2019 were estimated as 2,656 MT CO_2e. Estimated municipal emissions are comparable to only 1.3% of community-wide emissions. The largest sector was the stationary energy sector (43%), resulting from electricity, natural gas, and discrete fuel use in municipal buildings and facilities. Waste emissions were the second largest sector at 30% and transportation emissions compromised 27% of the estimated emissions. The subsectors responsible for the most emissions were:

1. Building & Facilities (42.43%)
2. Wastewater Treatment (30.16%)
3. Vehicle Fleet (17.80%)

FIGURE 11. KITTERY'S 2019 MUNICIPAL GHG INVENTORY BY SECTOR.

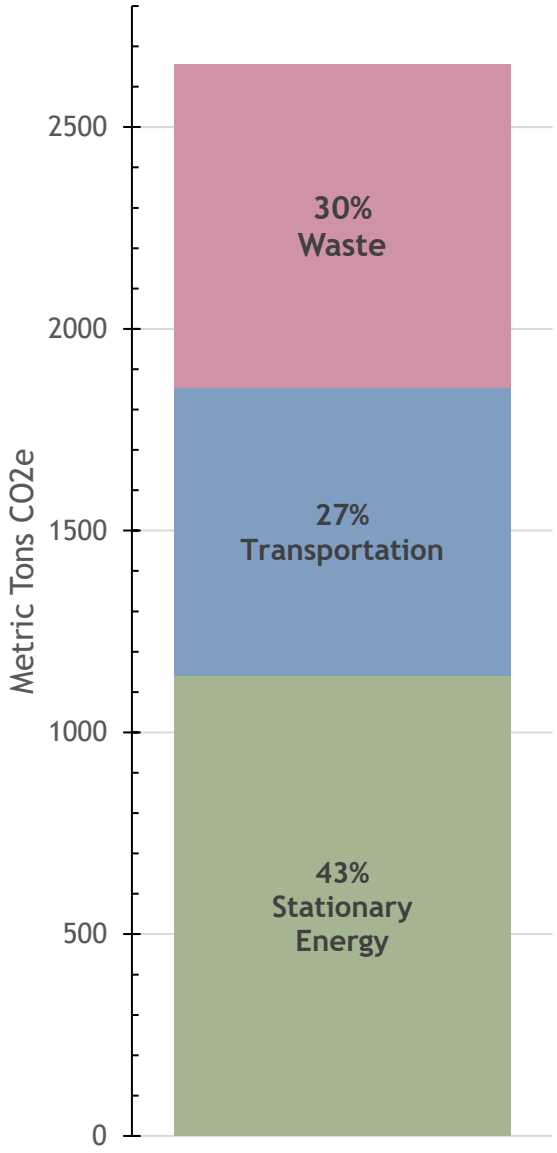
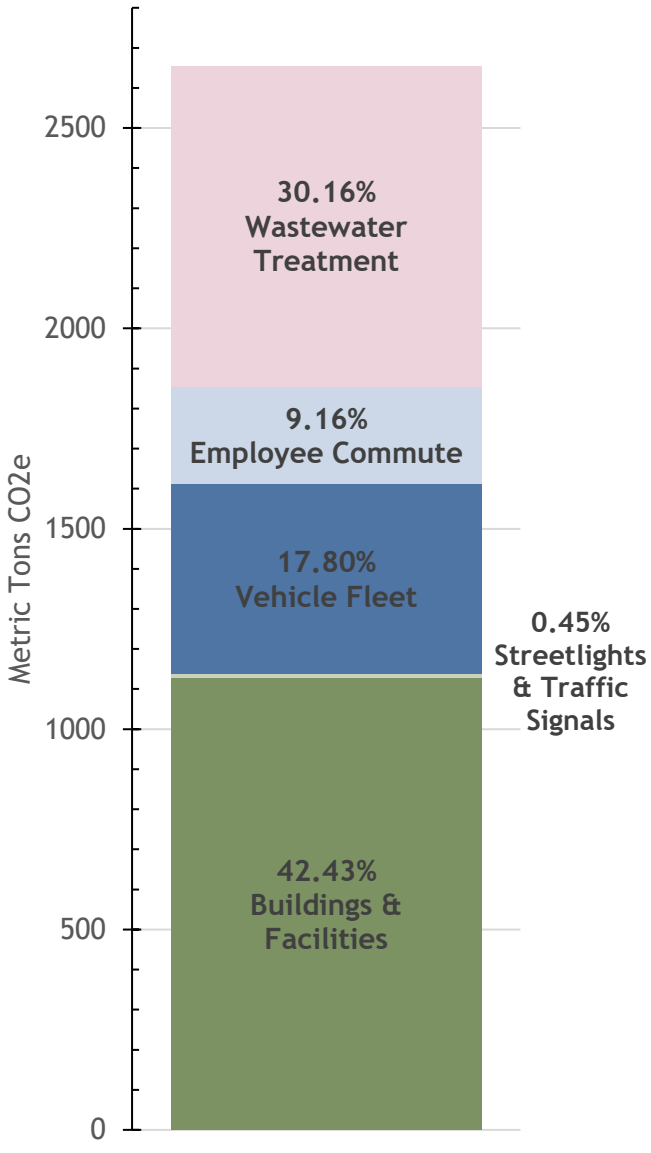


FIGURE 12. KITTERY'S 2019 MUNICIPAL GHG INVENTORY BY SECTOR AND SUBSECTOR.



Stationary Energy

The Stationary Energy sector includes GHG emissions resulting from energy use by municipal buildings and facilities as well as streetlights and traffic signals. It includes the direct emissions from the combustion of fossil fuels (Scope 1) and the indirect emissions from the consumption of grid-supplied electricity (Scope 2). The stationary energy subsectors and data sources are presented in Table 13. Table 14 lists the buildings included in the Kittery municipal GHG inventory. The Rice Public Library and Taylor Building annex were not included in the inventory because they were not municipally-owned in 2019. The old Kittery Community Center – Cole Street building was excluded because this building was shut down in 2020 and will be demolished shortly. Table 15 lists the area lighting included in the Kittery municipal GHG inventory.

Municipal stationary emissions were estimated as 1,139 MT CO_2e (Figure 13 and Table 16). Over 98% of these emissions came from building energy use, including electricity, natural gas, and discrete fuel use. Building - natural gas was the largest emissions energy type in the stationary sector (45%), followed by building – electricity.

TABLE 13. SUBSECTORS AND DATA SOURCES FOR MUNICIPAL STATIONARY ENERGY SECTOR.

SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/END USE	SCOPE	DATA SOURCE	DATA QUALITY
BUILDINGS AND FACILITIES	Energy used in town offices, school buildings, fire stations, police stations, and parks and recreation facilities	Electricity	2	Real consumption data from Central Maine Power (CMP)	High
		Natural Gas	1	Real consumption data from Unitil	High
		Discrete Fuel	1	Real consumption data from vendor invoices	Medium
STREETLIGHTS AND TRAFFIC SIGNALS	Energy used in town street lighting and traffic signals	Electricity	2	Real consumption data from Central Maine Power (CMP)	High

TABLE 14. BUILDINGS/FACILITIES INCLUDED IN KITTERY'S MUNICIPAL GHG INVENTORY AND THEIR ENERGY USES.

Buildings and Facilities	Electricity	Heating
Town Hall Complex	Yes	Natural Gas
Kittery Community Center	Yes	Natural Gas
Gorges Road Fire Station	Yes	Propane
Kittery Point Fire Station	Yes	Heating Oil
Public Works Office	Yes	Heating Oil
Transfer Station	Yes	Kerosene
Traip Academy	Yes	Natural Gas
Mitchell School	Yes	Propane
Shapleigh School	Yes	Natural Gas

TABLE 15. AREA LIGHTING INCLUDED IN KITTERY'S MUNICIPAL GHG INVENTORY.

Area Lighting
Kittery Community Center Field Lights
Traip Academy Shed/Boat Launch
Shapleigh Field Lights
Government Street Pier Lights
Haley Road Field Lights
Litchfield Road Field Lights
Memorial Field Lights
Pepperrell Cove Lights

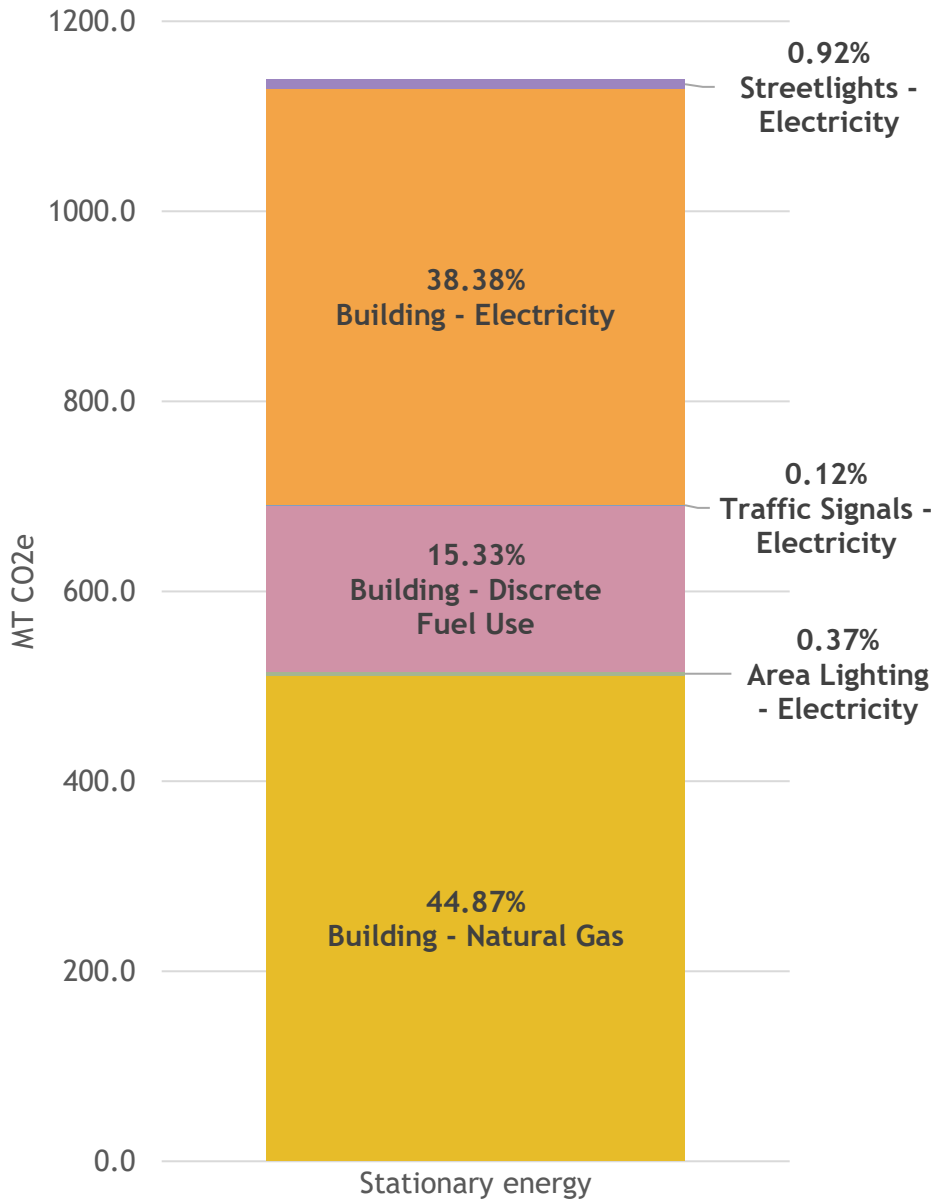


FIGURE 13. STATIONARY ENERGY EMISSIONS BY SUBSECTOR AND END USE FOR KITTERY'S MUNICIPAL GHG INVENTORY.

TABLE 16. KITTERY MUNICIPAL GHG INVENTORY STATIONARY EMISSIONS BY SUBSECTOR AND END USE.

Subsector and End Use	Emissions (MT CO_2e)	Percent of Stationary Energy Emissions
Area Lighting - Electricity	4.2	0.37%
Building - Electricity	437.2	38.38%
Building - Natural Gas	511.1	44.87%
Building - Discrete Fuel Use	174.6	15.33%
Streetlights - Electricity	10.5	0.92%
Traffic Signals - Electricity	1.4	0.12%

Figure 14 and Table 17 show municipal stationary energy emissions grouped by facility locations, including both building and area lighting. Kittery's school facilities (Shapleigh School, Traip Academy, and Mitchell School) were responsible for 60.6% of municipal stationary energy emissions. Shapleigh school emissions were slightly higher than Traip Academy emissions due to greater electricity usage. The top 6 highest emissions buildings were responsible for over 95% of municipal stationary emissions. The remaining facilities each account for less than 2% of the municipal stationary emissions, with facilities that have only area lighting (such as the field complexes) accounting for the least emissions.

TABLE 17. KITTERY MUNICIPAL GHG INVENTORY STATIONARY EMISSIONS GROUPED BY FACILITY LOCATION.

Facility	Emissions (MT CO_2e)	Percent of Stationary Energy Emissions
Shapleigh School	267.3	23.47%
Traip Academy	244.8	21.49%
Kittery Community Center	244.3	21.45%
Mitchell School	178.0	15.63%
Town Hall Complex	103.1	9.05%
Gorges Road Fire Station	48.4	4.25%
Transfer Station	18.2	1.60%
Kittery Point Fire Station	17.3	1.52%
Streetlights	10.5	0.92%
Pepperrell Cove	2.6	0.23%
Public Works Office	1.9	0.17%
Traffic Signals	1.4	0.12%
Government Street Pier	0.5	0.04%
Memorial Field	0.3	0.03%
Haley Road Field	0.2	0.02%
Litchfield Road Field	0.1	0.01%

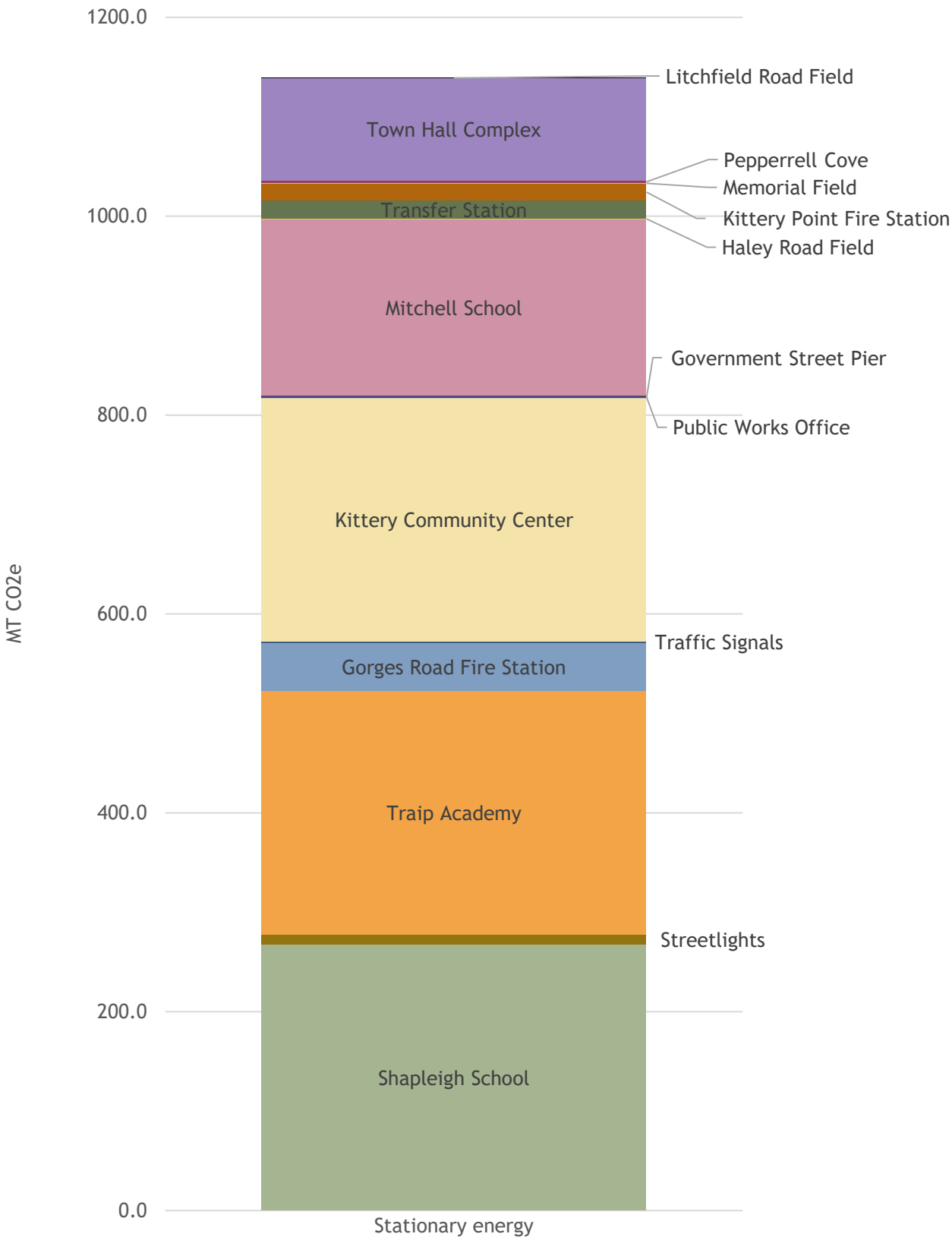


FIGURE 14. KITTERY MUNICIPAL GHG INVENTORY STATIONARY ENERGY EMISSIONS GROUPED BY FACILITY LOCATION.

Data Quality Considerations

For all end uses in the stationary energy sector, activity data came from real consumption records. In the case of electricity and natural gas, these records were provided by their respective utilities who keep extensive online data records. As a result, these are complete and high-quality data sources. For the different types of discrete fuel used for heating Kittery's municipal buildings, activity data was obtained from past invoices from several vendors. Because there is a reasonable likelihood that some invoices were misplaced or accidentally excluded from inventory, discrete fuel use estimates are considered medium quality and likely slightly under-represent actual discrete fuel use.

Transportation

The transportation sector includes all the emissions from fuel combusted in the local vehicle fleet, such as passenger vehicles, light, medium, and heavy-duty trucks, and any other vehicles. Because Kittery contracts out their school bus service to a private company, the emissions from school buses were not included. Vehicle fleet emissions estimates were based on the record of fuel used at the Department of Public Works fueling facility. However, due to lack of data, diesel consumption values are from fiscal year 2018 rather than calendar year 2019. Transportation subsectors and data sources are presented in Table 18. The Transportation sector also includes emissions from vehicle travel as municipal employees commute to and from Kittery, which are classified as Scope 3.

Municipal transportation emissions were estimated as 716 MT CO_2e (Figure 15 and Table 19). Approximately 1/3 of transportation emissions came from each of the vehicle fleet - gasoline, vehicle fleet – diesel, and employee commute – gasoline end uses. Employee commute – diesel made up less than 1% of municipal transportation emissions.

TABLE 18. TRANSPORTATION SUBSECTORS AND DATA SOURCES FOR KITTERY'S MUNICIPAL GHG INVENTORY.

SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/END USE	SCOPE	DATA SOURCE	DATA QUALITY
VEHICLE FLEET	Fuel combusted by municipally-owned vehicles	Gasoline, Diesel	1	Real consumption data from vendor invoices	Medium
EMPLOYEE COMMUTE	Fuel combusted as employees commute to Kittery	Gasoline, Diesel	3	Estimated average and national fuel consumption data	Low

TABLE 19. TRANSPORTATION EMISSIONS BY SUBSECTOR AND END USE FOR KITTERY'S MUNICIPAL GHG INVENTORY.

Subsector and end use	Emissions (MT CO_2e)	Percent of Transportation Emissions
Vehicle Fleet - Gasoline	245.3	34.3%
Vehicle Fleet - Diesel	227.5	31.8%
Employee Commute - Gasoline	240.2	33.5%
Employee Commute - Diesel	3.2	0.4%

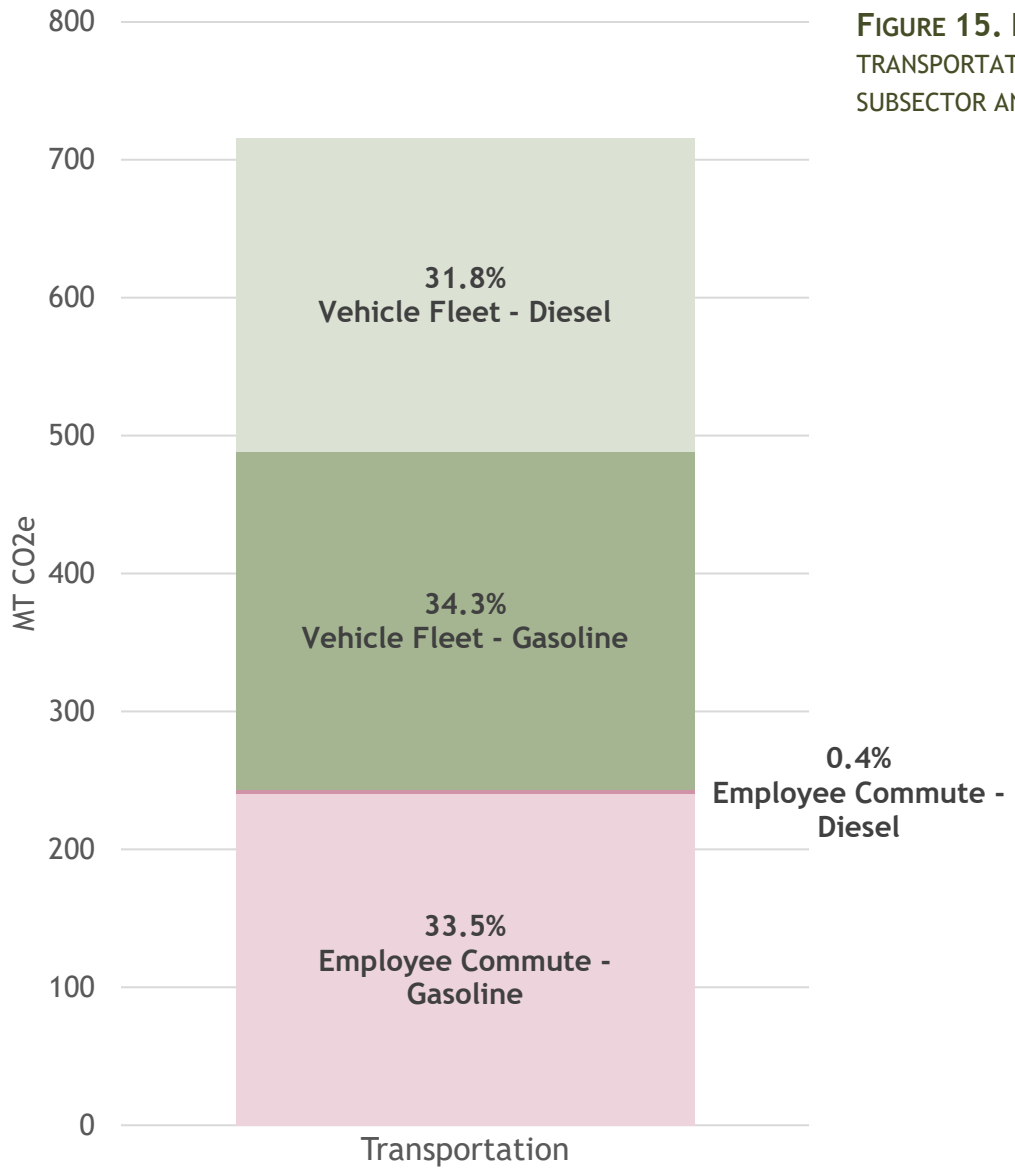


FIGURE 15. KITTERY MUNICIPAL TRANSPORTATION EMISSIONS BY SUBSECTOR AND END USE.

Data Quality Considerations

Activity data for the vehicle fleet subsector come from real consumption data from vendor invoices. However, the difference in time period covered by the vehicle fleet – gasoline record (calendar year 2019) and the vehicle fleet – diesel record (fiscal year 2018), make it difficult to compare the relative use and emissions of the two fuel types across the vehicle fleet. Estimates of emissions for the employee commute subsector are low quality. Due to time and capacity constraints, employee commute emissions were estimated roughly based on 1) an average commute distance, 2) the number of full time equivalent municipal employees, and 3) the vehicle population of York County. In the future, a more detailed estimate of employee commute could be made using a survey of employee commuting behaviors.

Waste

The waste sector includes all the emissions from the treatment of waste occurring within the municipal operational control boundary. The subsector and data sources included in the Waste sector are presented in Table 20. The sector includes emissions from electricity used in the Kittery Wastewater Treatment Plant (WWTP) and the pump stations in the sewer system. It also includes the emissions from aerobic and anaerobic digestion both during treatment in the WWTP and from effluent discharge. Additionally, it includes the emissions from septic tanks within the Town of Kittery. While the municipality does not maintain these septic systems, it does have regulatory control over the tanks and the sewer system. The waste sector does not include emissions estimates for municipal solid waste (MSW). Kittery operates a transfer station for municipal solid waste, but no landfill or waste treatment facilities. While Kittery's municipal operations do generate MSW, there currently is no data available about the amount of waste generated within municipal buildings and facilities.

Municipal waste emissions were estimated as 801 MT CO_2e (Figure 16 and Table 21). Septic tank emissions were the largest source of waste emissions (43%). Electricity use at the pump stations and the WWTP together made up 39% of waste emissions, with anaerobic/aerobic digestion emissions accounting for 18% of the waste emissions.

TABLE 20. WASTE SUBSECTORS AND DATA SOURCE FOR KITTERY'S MUNICIPAL GHG INVENTORY.

SUBSECTOR	EMISSIONS SOURCES	ENERGY TYPE/END USE	SCOPE	DATA SOURCE	DATA QUALITY
WASTE	Wastewater Treatment	Emissions from wastewater treated at Kittery WWTP	Aerobic and Anaerobic Digestion	Modeled emissions data based on number of sewer connections and population	Low
		Emissions from wastewater treated in community septic systems	Aerobic and Anaerobic Digestion	Modeled emissions data based on number of septic systems	Low
		Energy used in wastewater processing at the WWTP and pump stations	Electricity	Real consumption data from Central Maine Power (CMP)	High

TABLE 21. KITTERY MUNICIPAL GHG INVENTORY WASTE EMISSIONS BY END USE.

End use	Emissions (MT CO_2e)	Percent of Waste Emissions
Pump Stations - Electricity	114.5	14%
WWTP - Electricity	199.1	25%
WWTP - Anerobic Digestion	6.9	1%
Effluent Discharge	133.0	17%
Septic Tanks	347.6	43%

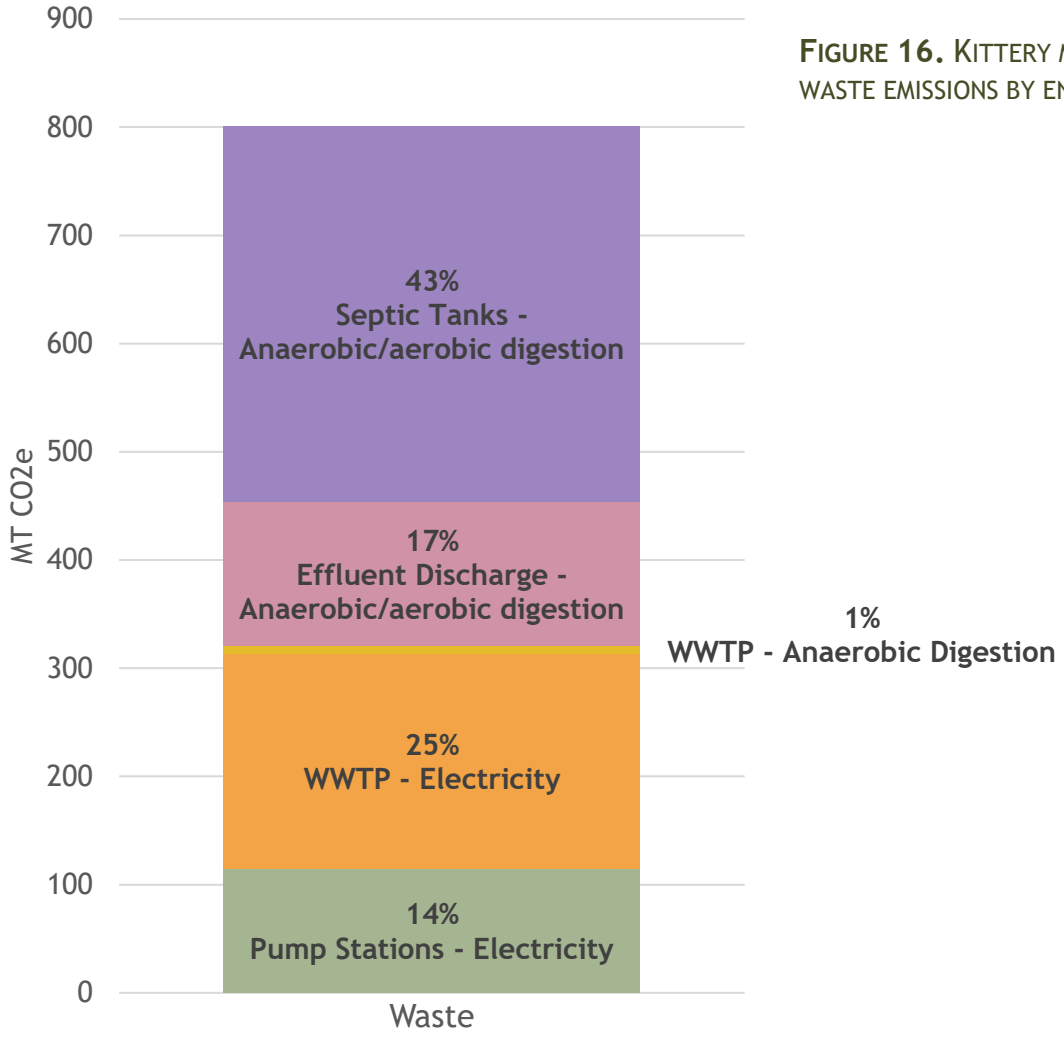


FIGURE 16. KITTERY MUNICIPAL WASTE EMISSIONS BY END USE.

Data Quality Considerations

The waste sector is the sector with the lowest quality data and highest uncertainty. While electricity data for the pump stations and WWTP are high quality, emissions data from aerobic/anaerobic digestion are low quality due to both lack of activity data and uncertainty in emissions calculations that are very process specific. Thus, the relatively high septic emissions (13% of the total municipal GHG inventory estimate) should be considered to have high uncertainty.

This inventory does not include estimates for emissions from municipally-generated or school-generated MSW. Town-wide Kittery MSW is transported from the transfer station to the EcoMaine Waste-to-energy plant in Portland. Town-wide Kittery MSW emissions are included in the community-wide GHG inventory. Municipal and school activities likely generate enough MSW to result in non-negligible MSW emissions from waste incineration at EcoMaine. For future municipal GHG inventories, Kittery could measure/estimate the tonnage of municipally-generated and school-generated MSW for inclusion in the waste sector. For now, the exclusion of the MSW subsector should not prohibit the development of waste management strategies to help the Town of Kittery reduce consumption and increase waste diversion.

Conclusion and Recommendations

The Town of Kittery's first GHG inventory summarizes the ongoing activities and the major sources of emissions in the community and in municipal operations for 2019. This inventory can serve as a foundation to help Kittery meet its Coastal Community Resilience Goal and the following objectives of the Kittery Comprehensive Plan:

- **Objective 9.1.** Establish plans to address the effects of climate change.
- **Objective 9.2.** Reduce energy consumption and transition to low and zero impact methods.

The GHG inventory can be used to develop a Kittery climate action plan for reducing carbon emissions and adapting to the impacts of climate change. The data provided in both the community-wide and municipal inventories may be used to:

1. Identify areas to focus emission reduction efforts
2. Establish goals and targets and track progress towards them
3. Facilitate decision-making about future policies and strategies

Future GHG inventories in two or three years may be used to evaluate Kittery's progress on emissions reductions efforts and toward identified goals. The following is a list of recommendations to improve the quality of a future GHG inventory:

Community-wide GHG inventory

- Survey residents to get a better estimate of annual discrete fuel use for home heating and other purposes (Stationary Energy – Residential Discrete Fuel Use).
- Survey businesses to get a better estimate of annual discrete fuel use for building heating and other purposes (Stationary Energy – Commercial and Industrial Discrete Fuel Use).
- Survey residents to get an estimate of annual air travel (Transportation – Aviation).

- Consider working with PNSY and other marine fleet owners to estimate emissions from marine vessels.
- Survey businesses about their waste volumes and management practices to improve estimates of MSW.
- Consider using ICLEI LEARN tool or other method to estimate emissions and sequestration of GHG from land use changes (Agriculture, Forestry, Marine – Land).
- Collect data on more *Additional Indicators of Climate Action*, including:
    - Number of solar panels installed (potentially using data from code enforcement)
    - Hours of using of public EV charging stations (using data from EV charging station providers)
    - Number of private EV charging stations (using data from code enforcement)
    - Public transit ridership and number of routes (using data from local transit authorities)
    - Number of residents composting at home (using a survey)
    - Amount of kitchen compost collected at the Kittery Resource Recovery Center (using weight data from KRRC or Mr. Fox)
    - Reuse economy statistics (using data from re-use businesses)
    - Business waste management practices (using a survey of businesses)

Municipal GHG inventory

- Streamline and standardize invoicing and record keeping of municipal discrete fuel and transportation fuel use to improve data accuracy.
- Conduct a survey of municipal employee commuting behavior to improve the estimate of employee commute emissions and add in employee business travel emissions.
- Begin to collect data on municipally-generated MSW to be able to estimate Waste MSW emissions.

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Appendix A – Community-wide GHG inventory data table

ClearPath Inventory Record	ClearPath Calculator Used	ClearPath Category	Record time period	Sector	Subsector	End use	Scope	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Data Quality	Notes
Kittery Residential Electricity 2019	Emissions from Grid Electricity	Residential Energy	CY 2019	Stationary Energy	Residential	Electricity	Scope 2	8045.17	1.27	0.16	8124.26	High	Kittery Electricity data provided by Central Maine Power.
Kittery Residential Electricity LOSSES 2019	Emissions from Electric Power Transmission and Distribution Losses	Upstream Impacts of Activities	CY 2019	Stationary Energy	Residential	Electricity	Scope 3	410.30	0.06	0.01	414.34	High	Calculated using the EGRID Grid Gross Loss Factor for the eastern power grid in the U.S. (5.1%) and Kittery's residential electricity usage from CMP data.
Kittery Residential Natural Gas 2020	Emissions from Stationary Fuel Combustion	Residential Energy	CY 2020	Stationary Energy	Residential	Natural Gas	Scope 1	1102.68	0.10	0.00	1106.15	High	Natural Gas usage data provided by Unitil. Unitil data separates out usage into two sectors: Residential and combined Commercial and Industrial. Meter reclassification (meters at PNSY) in 2019 shifts a significant portion of natural gas usage from C&I to Residential. To account for this shift, using 2020 data rather than 2019 data for the inventory. Only a 2% difference in total natural gas usage between 2019 and 2020.
Kittery Residential Natural Gas LOSSES 2020	Fugitive Emissions from Natural Gas Distribution	Process & Fugitive Emissions	CY 2020	Stationary Energy	Residential	Natural Gas	Scope 3	0.01	1.29	0.00	36.08	Low	Calculated using the Kittery 2020 residential natural gas usage data from Unitil and the generic calculation inputs for leakage rate, natural gas energy density, natural gas density, natural gas % CH4 and Natural Gas % CO2.
Kittery Residential "Bottled, tank, or LP gas" 2018	Emissions from Stationary Fuel Combustion	Residential Energy	CY 2018	Stationary Energy	Residential	Discrete Fuel Use	Scope 1	4278.63	0.77	0.08	4320.32	Low	Estimated using EIA 2018 average Maine consumption. 2019 data not yet available.
Kittery Residential "Fuel oil, kerosene, etc." 2018	Emissions from Stationary Fuel Combustion	Residential Energy	CY 2018	Stationary Energy	Residential	Discrete Fuel Use	Scope 1	5148.84	0.76	0.05	5183.39	Low	Estimated using EIA 2018 Maine residential consumption figures. 2019 data not yet available.
Kittery Commercial Electricity 2019	Emissions from Grid Electricity	Commercial Energy	CY 2019	Stationary Energy	Commercial	Electricity	Scope 2	6698.96	1.06	0.14	6764.82	High	Electricity data provided by Central Maine Power.
Kittery Commerical Electricity LOSSES 2019	Emissions from Electric Power Transmission and Distribution Losses	Upstream Impacts of Activities	CY 2019	Stationary Energy	Commercial	Electricity	Scope 3	341.65	0.05	0.01	345.01	High	Calculated using the EGRID Grid Gross Loss Factor for the eastern power grid in the U.S. (5.1%) and Kittery's commercial electricity usage from CMP data.
Kittery Commercial Natural Gas 2020	Emissions from Stationary Fuel Combustion	Commercial Energy	CY 2020	Stationary Energy	Commercial/Industrial	Natural Gas	Scope 1	7991.06	0.75	0.02	8016.16	High	Natural Gas usage data provided by Unitil. Unitil data separates out usage into two sectors: Residential and Combined Commercial and Industrial. Meter reclassification (meters at PNSY) in 2019 shifts a significant portion of natural gas usage from C&I to Residential. To account for this shift, using 2020 data rather than 2019 data for the inventory. Only a 2% difference in total natural gas usage between 2019 and 2020. Commercial Natural Gas usage estimated by taking the Unitil C&I natural gas usage and subtracting the Industrial Natural Gas Usage Provided for PNSY by the EPA Flight tool.
Kittery Commercial Natural Gas LOSSES 2020	Fugitive Emissions from Natural Gas Distribution	Process & Fugitive Emissions	CY 2020	Stationary Energy	Commercial/Industrial	Natural Gas	Scope 3	0.10	9.34	0.00	261.49	Low	Calculated using the Kittery 2020 Commercial/Industrial natural gas usage data from Unitil and the generic calculation inputs for leakage rate, natural gas energy density, natural gas density, natural gas % CH4 and Natural Gas % CO2.

Kittery Commercial Fuel Oil 2019	Emissions from Stationary Fuel Combustion	Commercial Energy	CY 2019	Stationary Energy	Commercial/Industrial	Discrete Fuel Use	Scope 1	11537.78	1.70	0.11	11615.22	Low	This data set is an estimate of all commercial and industrial heating emissions excluding natural gas usage and EXCLUDING the heating fuel used for the PNSY heating plant. We assume that all properties that don't use natural gas (i.e. the total number of establishments minus the number of C&I natural gas meters) use heating fuel oil no. 2, as it is the most popular heating fuel in Maine. This likely somewhat overestimates the emissions from those establishments with propane heating.
Kittery Industrial Electricity 2019	Emissions from Grid Electricity	Industrial Energy	CY 2019	Stationary Energy	Industrial	Electricity	Scope 2	30568.97	4.81	0.63	30869.48	High	Data provided by Central Maine Power. Unclear exactly what the source is of the high industrial electricity usage. Confirmed with CMP representatives that all electricity generated by the PNSY combined heat and power plant are "behind the meter" and therefore excluded from CMP's usage measurements.
Kittery Industrial Electricity LOSSES 2019	Emissions from Electric Power Transmission and Distribution Losses	Upstream Impacts of Activities	CY 2019	Stationary Energy	Industrial	Electricity	Scope 3	1559.02	0.25	0.03	1574.34	High	Calculated using the EGRID Grid Gross Loss Factor for the eastern power grid in the U.S. (5.1%) and Kittery's industrial electricity usage from CMP data.
Kittery Industrial Natural Gas LOSSES 2019	Fugitive Emissions from Natural Gas Distribution	Process & Fugitive Emissions	CY 2019	Stationary Energy	Industrial	Natural Gas	Scope 3	0.64	60.24	0.00	1687.24	Low	Calculated using the Kittery 2019 PNSY natural gas usage data from EPA and the generic calculation inputs for leakage rate, natural gas energy density, natural gas density, natural gas % CH4 and Natural Gas % CO2.
Kittery Industrial PNSY Power Plant Natural Gas 2019	Emissions from Stationary Fuel Combustion at Energy Industries	Industrial Energy	CY 2019	Stationary Energy	Industrial	Natural Gas	Scope 1	51561.99	0.97	0.10	51614.99	Medium	Natural Gas Usage at PNSY power plant. 2019 usage data provided by the EPA Greenhouse Gas Emissions from Large Facilities (FLIGHT) tool: https://ghgdata.epa.gov/ghgp/service/html/2019?id=1004698&et=undefined.
Kittery Industrial PNSY Power Plant Distillate Fuel Oil 2019	Emissions from Stationary Fuel Combustion at Energy Industries	Industrial Energy	CY 2019	Stationary Energy	Industrial	Discrete Fuel Use	Scope 1	29.95	0.00	0.00	30.06	Medium	Data on fuel use at PNSY power plant collected from EPA Mandatory reporting. 2019 data provided by the EPA Greenhouse Gas Emissions from Large Facilities (FLIGHT) tool: https://ghgdata.epa.gov/ghgp/service/facilityDetail/2019?id=1004698&ds=E&et=&popup=true
Kittery Commercial On Road Transportation 2019	On Road Transportation	Transportation & Mobile Sources	CY 2019	Transportation	Commercial Vehicles	Gasoline and Diesel	Scope 1 and 3	17946.24	0.73	0.15	18006.43	Medium	Kittery Commercial On Road Transportation emissions. Emissions estimates calculated by SMPDC using an origin-destination methodology. Methodology and results available at https://smpdc.org/sustainable_transportation. Precent of trips that are commercial were estimated based on the percent of York County 2017 vehicle population that consists of single unit and combination trucks.
Kittery Passenger Vehicle Emissions 2019	On Road Transportation	Transportation & Mobile Sources	CY 2019	Transportation	Passenger Vehicles	Gasoline and Diesel	Scope 1 and 3	48427.87	2.07	0.41	48594.48	Medium	Emissions estimates calculated by SMPDC using an origin-destination methodology. Methodology and results available at https://smpdc.org/sustainable_transportation. 9% of VMT (and emissions) come from internal trips while 91% are regional (between Kittery and another nearby town or county)
Kittery Public Transit On Road Transportation 2019	On Road Transportation	Transportation & Mobile Sources	CY 2019	Transportation	Public Transit	Diesel	Scope 1 and 3	1043.32	0.46	0.09	1080.91	Medium	Emissions from Passenger transit are based upon VMT for all Bus types. Emissions estimates calculated by SMPDC using an origin-destination methodology. Methodology and results available at https://smpdc.org/sustainable_transportation. This includes school buses.

Kittery Municipal Solid Waste 2019	Combustion of Solid Waste Generated by the Community	Solid Waste	CY 2019	Waste	MSW - Incineration	Incineration Emissions	Scope 3	575.50	0.51	0.07	607.59	Medium	Calculated using EcoMaine reported GHG data available here: https://ghgdata.epa.gov/ghgp/service/html/2019?id=1005673&et=undefined. 2019 total MSW incinerated at EcoMaine obtained from The 2019 EcoMaine Annual Report (page 5, https://www.ecomaine.org/wp-content/uploads/2020/06/2019-ecomaine-Annual-Report-Spread.pdf)
Kittery Septic Emissions 2019	Fugitive Emissions from Septic Systems	Water & Wastewater	CY 2019	Waste	Wastewater	Aerobic and Anaerobic Digestion	Scope 1	0.00	12.41	0.00	347.60	Low	Estimate of number of septic systems (1316 systems) provided by Kittery Sewer Dept. Number of septic systems converted to population served using US Census data for Kittery for 2019 population and 2015-2019 number of households (https://www.census.gov/quickfacts/kitterytownyorkcountymaine). Make the assumption that all septic systems are for households, not commercial operations.
Kittery Wastewater Process N2O emissions 2019	Process N2O Emissions from Wastewater Treatment	Water & Wastewater	CY 2019	Waste	Wastewater	Aerobic and Anaerobic Digestion	Scope 1	0.00	0.00	0.03	6.90	Low	Number of sewer connections (3200) provided by Kittery Sewer District. Sewer District also supplied information that PNSY contributes approx. 17% to annual flow as an industrial user. Converted to population served using Census data for Kittery 2019 population and 2015-2019 number of households:https://www.census.gov/quickfacts/kitterytownyorkcountymaine.
Kittery Wastewater Fugitive N2O emissions from effluent discharge 2019	Process N2O from Effluent Discharge to Rivers and Estuaries	Water & Wastewater	CY 2019	Waste	Wastewater	Aerobic and Anaerobic Digestion	Scope 1	0.00	0.00	0.23	61.16	Low	Number of sewer connections (3200) provided by Kittery Sewer District. Sewer District also supplied info that PNSY contributes approx. 17% to annual flow as an industrial user. Converted to population served using Census data for Kittery 2019 population and 2015-2019 number of households:https://www.census.gov/quickfacts/kitterytownyorkcountymaine.

Appendix B – Municipal GHG Inventory Data Table

ClearPath Inventory Record	ClearPath Calculator Used	ClearPath Category	Record time period	Sector	Subsector	End use	Scope	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Data Quality	Notes
Kittery Point Fire Station - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	3.40	0.00	0.00	3.43	High	Data for Jan - Dec 2019. Source is CMP billing.
Town Hall Complex - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	72.82	0.01	0.00	73.53	High	Data for Jan - Dec 2019. Source is CMP billing.
Traip Academy - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	90.03	0.01	0.00	90.92	High	Data for Jan - Dec 2019. Source is CMP billing.
Memorial Field - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.30	0.00	0.00	0.30	High	Data for Jan - Dec 2019. Source is CMP billing.
Shapleigh School - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	112.86	0.02	0.00	113.97	High	Data for Jan - Dec 2019. Source is CMP billing.
KCC Field - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.07	0.00	0.00	0.07	High	Data for Jan - Dec 2019. Source is CMP billing.
Shapleigh Field - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.02	0.00	0.00	0.02	High	Data for Jan - Dec 2019. Source is CMP billing.
Government Street Pier - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.46	0.00	0.00	0.47	High	Lights, hoist for commercial fishing operations. Data for Jan - Dec 2019. Source is CMP billing.
Mitchell School - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	59.77	0.01	0.00	60.36	High	Data for Jan - Dec 2019. Source is CMP billing.
Public Works Office - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.22	0.00	0.00	0.23	High	Data for Jan - Dec 2019. Source is CMP billing.
Traip Shed/Boat Launch - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.42	0.00	0.00	0.43	High	Data for Jan - Dec 2019. Source is CMP billing.
Litchfield Rd Field - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.09	0.00	0.00	0.09	High	Data for Jan - Dec 2019. Source is CMP billing.
Gorges Road Fire Station - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	9.62	0.00	0.00	9.71	High	Fire station used on a variable basis depending on Fire Service calls during a given week or month. Data for Jan - Dec 2019. Source is CMP billing.
Pepperrell Cove - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	2.61	0.00	0.00	2.64	High	Data for Jan - Dec 2019. Source is CMP billing.
KCC - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	68.80	0.01	0.00	69.47	High	Data for Jan - Dec 2019. Source is CMP billing.
Haley Road Field - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	0.20	0.00	0.00	0.20	High	Data for Jan - Dec 2019. Source is CMP billing.
Transfer Station - Electricity - 2019	Emissions from Grid Electricity	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Electricity	Scope 2	15.43	0.00	0.00	15.59	High	Data for Jan - Dec 2019. Source is CMP billing.
Gorges Road Fire Station - Propane - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Discrete Fuel Use	Scope 1	38.34	0.01	0.00	38.71	Medium	Source: Estes Oil & Propane bills Jan to Dec 2019

Public Works Office - Heating Fuel - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Discrete Fuel Use	Scope 1	1.68	0.00	0.00	1.69	Medium	Data for Jan - Dec 2019. Source is vendor billing.
KCC - Natural Gas - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Natural Gas	Scope 1	174.25	0.02	0.00	174.79	High	Data for Jan - Dec 2019. Source is Unitil billing.
Traip Academy - Natural Gas - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Natural Gas	Scope 1	153.00	0.01	0.00	153.48	High	Data for Jan - Dec 2019. Source is Unitil billing.
Shapleigh School - Natural Gas - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Natural Gas	Scope 1	152.82	0.01	0.00	153.30	High	Data for Jan - Dec 2019. Source is Unitil billing.
Mitchell School - Propane - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Propane	Scope 1	116.56	0.02	0.00	117.69	Medium	Data for Jan - Dec 2019. Source is vendor billing.
Town Hall Complex - Natural Gas - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Natural Gas	Scope 1	29.43	0.00	0.00	29.52	High	Data for Jan - Dec 2019. Source is Unitil billing.
Transfer Station - Kerosene - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Kerosene	Scope 1	2.58	0.00	0.00	2.60	Medium	Data for Jan - Dec 2019. Source is vendor billing.
Kittery Point Fire Station - Propane - 2019	Emissions from Stationary Fuel Combustion	Buildings & Facilities	CY 2019	Stationary Energy	Buildings & Facilities	Propane	Scope 1	13.76	0.00	0.00	13.89	Medium	Source: Estes Oil & Propane bills Jan to Dec 2019
Traffic Signals	Emissions from Grid Electricity	Street Lights & Traffic Signals	CY 2019	Stationary Energy	Street Lights & Traffic Signals	Electricity	Scope 2	1.41	0.00	0.00	1.42	High	Data for Jan - Dec 2019. Source is CMP billing.
Streetlights	Emissions from Grid Electricity	Street Lights & Traffic Signals	CY 2019	Stationary Energy	Street Lights & Traffic Signals	Electricity	Scope 2	10.40	0.00	0.00	10.50	High	Converted to LED in 2019. Data for Jan - Dec 2019. Source is CMP billing.
Gasoline Fleet	Fleet Vehicle Emissions	Vehicle Fleet	CY 2019	Transportation	Vehicle Fleet	Gasoline	Scope 1	245.28	0.00	0.00	245.28	Medium	Source is municipal Records
Diesel Fleet - FY18	Fleet Vehicle Emissions	Vehicle Fleet	FY 2018	Transportation	Vehicle Fleet	Diesel	Scope 1	227.47	0.00	0.00	227.47	Medium	Data entered in municipal records for 2019 appeared off (1913 gallons) so added in Fiscal year 2018 data instead (July 17 to June 18) from "Kittery Energy Study Worksheet 090120".
Pump Stations - Electricity - 2019	Emissions from Grid Electricity	Water & Wastewater Treatment Facilities	CY 2019	Waste	Wastewater Treatment	Electricity	Scope 2	113.43	0.02	0.00	114.55	High	Data for Jan - Dec 2019. Source is CMP billing.
Wastewater Treatment Plant - Electricity - 2019	Emissions from Grid Electricity	Water & Wastewater Treatment Facilities	CY 2019	Waste	Wastewater Treatment	Electricity	Scope 2	197.14	0.03	0.00	199.08	High	Data for Jan - Dec 2019. Source is CMP billing.
Kittery Septic Emissions 2019	Fugitive Emissions from Septic Systems	Water & Wastewater Treatment Facilities	CY 2019	Waste	Wastewater Treatment	Aerobic and Anaerobic Digestion	Scope 1	0.0	12.41	0.0	347.60	Low	Estimate of number of septic systems (1316 systems) provided by Kittery Sewer Dept. Number of Septic systems converted to population served using US Census data for Kittery for 2019 population and 2015-2019 number of households (https://www.census.gov/quickfacts/kitterytownyorkcountymaine). Made the assumption that all septic systems are for households, not commercial operations.

Kittery Wastewater Process N2O emissions 2019	Process N2O Emissions from Wastewater Treatment	Water & Wastewater Treatment Facilities	CY 2019	Waste	Wastewater Treatment	Aerobic and Anaerobic Digestion	Scope 1	0.0	0.0	0.03	6.90	Low	Number of Sewer connections (3200) provided by Kittery Sewer District. Sewer District also supplied info that PNSY contributes Approx. 17% to annual flow as an industrial user. Converted to population served using Census data for Kittery 2019 population and 2015-2019 number of households:https://www.census.gov/quickfacts/kitterytownyorkcountymaine.
Kittery Wastewater Fugitive N2O emissions from effluent discharge 2019	Process N2O from Effluent Discharge to Rivers and Estuaries	Water & Wastewater Treatment Facilities	CY 2019	Waste	Wastewater Treatment	Aerobic and Anaerobic Digestion	Scope 1	0.0	0.0	0.50	132.99	Low	Number of Sewer connections (3200) provided by Kittery Sewer District. Sewer District also supplied info that PNSY contributes Approx. 17% to annual flow as an industrial user. Converted to population served using Census data for Kittery 2019 population and 2015-2019 number of households:https://www.census.gov/quickfacts/kitterytownyorkcountymaine.
Kittery Employee commute 2019 - Gasoline	Employee Commute	Employee Commute	CY 2019	Transportation	Employee Commute	Gasoline	Scope 3	238.14	0.01	0.01	240.17	Low	Calculated based on estimate Kittery FTE (120) and estimated one way commute distance (10 miles). Estimate average employee commutes to work 230 days a year: 230 days * 120 employees *10 miles *2 ways = 552,000 miles annually. Calculation in "Kittery employee commute calc" spreadsheet
Kittery Employee commute 2019 - Diesel	Employee Commute	Employee Commute	CY 2019	Transportation	Employee Commute	Diesel	Scope 3	3.20	0.00	0.00	3.20	Low	Calculated based on estimate Kittery FTE (120) and estimated one way commute distance (10 miles). Estimate average employee commutes to work 230 days a year: 230 days * 120 employees *10 miles *2 ways = 552,000 miles annually. Calculation in "Kittery employee commute calc" spreadsheet