



Brighton

Year-End Benchmarking Report

For years
2019 and 2020

Prepared by:
Town of Brighton
Department of Public Works



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I. Overview

Climate change is the result of the combustion of fossil fuels and other human activity¹. Tracking and reporting building energy use is one exercise that has shown to help raise awareness and often result in significant energy reduction². The first Town of Brighton Year-End Benchmark Report was published in 2018 to comply with the 2017 Local Law for Energy Benchmarking for Municipal Buildings of the Town of Brighton. This local law requires the Town of Brighton to annually report the energy use for covered municipal buildings, a practice known as benchmarking. Benchmarking measures the total electricity and natural gas consumed in a building and adjusts for other factors so that the Town can understand how efficiently each building uses energy. This information allows the Town to prioritize buildings for energy efficiency investments and to monitor building performance over time.

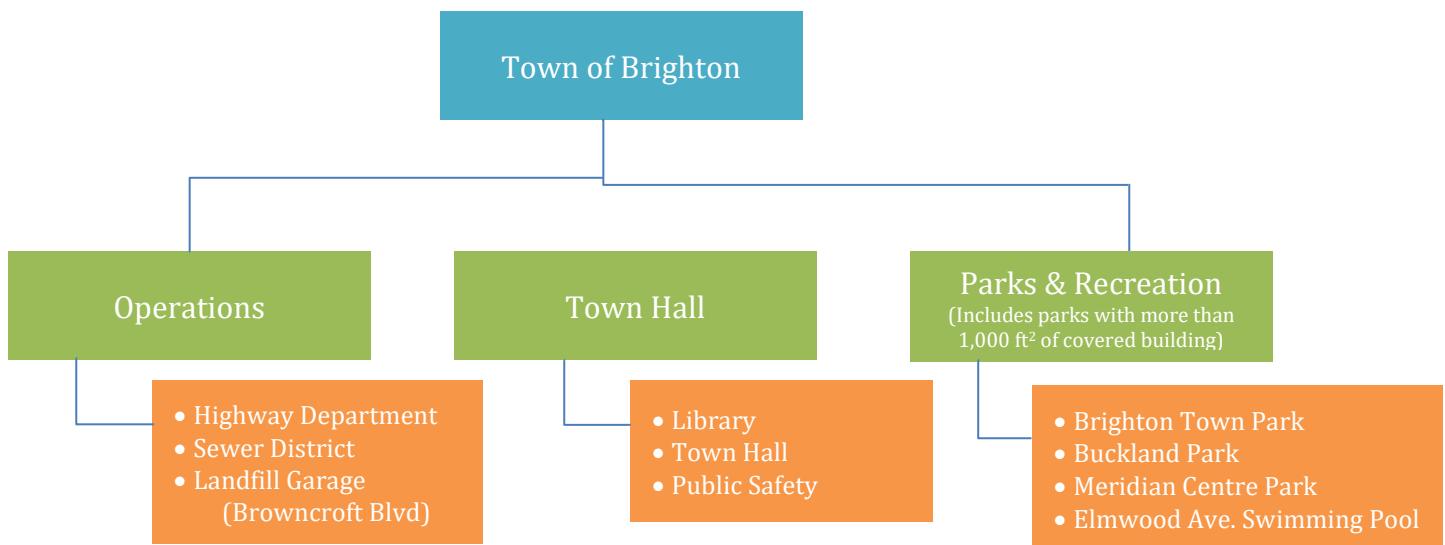
II. Methodology

The data for the 2019, and 2020 Benchmark Review were collected and evaluated using the same methods as the 2017 and 2018 datasets. The report shows the energy use intensity (EUI) and GHG emissions calculated by the U.S. EPA's Portfolio Manager benchmarking tool for each Town building. Energy consumption is aggregated on a building level before the data are loaded into Portfolio Manager. The EUI calculations are performed by the ENERGY STAR Portfolio Manager tool according to the EPA's technical methodology.

For benchmarking purposes, the Town of Brighton's covered municipal buildings have been divided into three sectors as depicted in Figure-1, Operations, Town Hall and Parks & Recreation, which mimics the 2014 Greenhouse Gas Inventory organizational structure. Each covered municipal building's energy use and GHG emissions were computed by the software from electrical and natural gas bills which were entered for each calendar year.



Figure 1: Town Organizational Breakdown



III. Summary of Results for 2021

The figure for total GHG emissions from covered municipal buildings in the Town of Brighton was **436.2 MTCO_{2e}** for the 2019 calendar year. This year's total GHG emissions represent a 13.8% **decrease** from the figure of **506.2 MTCO_{2e}** which was calculated for the 2018 calendar year. Table 1 summarizes the energy consumption for the covered municipal buildings in each sector derived from the benchmarking information.

Table 1: GHG Emissions Summary per Sector

Sector	Total Annual GHG Emissions (MTCO _{2e})	Percentage (%)
Operations	153.4	35.2
Town Hall	256.4	58.8
Parks & Recreation	26.3	6.0
Total:	436.2	100

Tables 2-4 below further break down the energy use and emissions by each covered municipal building in all three sectors.



Table 2: Energy Summary by Building in Operations Sector

Operations					
Building Name	Address	Gross Floor Area (ft ²)	Site EUI (kBtu/ft ²)	Weather Normalized Source EUI (kBtu/ft ²)	Annual GHG Emission (MTCO _{2e})
Highway Department	1941 Elmwood Ave.	43,000	69.3	68.9	143.7
Landfill Garage (Browncroft Blvd)	444 Browncroft Blvd	3,000	66.5	66.8	9.7

Table 3: Energy Summary by Building in Town Hall Sector

Town Hall					
Building Name	Address	Gross Floor Area (ft ²)	Site EUI (kBtu/ft ²)	Weather Normalized Source EUI (kBtu/ft ²)	Annual GHG Emission (MTCO _{2e})
Town Hall and Library	2300 Elmwood Ave.	56,714	106.7	107.1	256.4

Table 4: Energy Summary by Building in Parks & Recreation Sector

Parks & Recreation					
Building Name	Address	Gross Floor Area (ft ²)	Site EUI (kBtu/ft ²)	Weather Normalized Source EUI (kBtu/ft ²)	Annual GHG Emission (MTCO _{2e})
Brighton Town Park	777 Westfall Rd.	2,500	49.5	49.8	5.4
Buckland Park	1341 Westfall Rd.	6,100	86.4	86.7	19.1
Meridian Centre Park	2025 South Winton Rd.	1,300	23.2	23	0.9
Elmwood Ave. Swimming Pool	2300 Elmwood Ave.	2,700	10.3	10.3	0.9



IV. Energy Use Intensity 2021

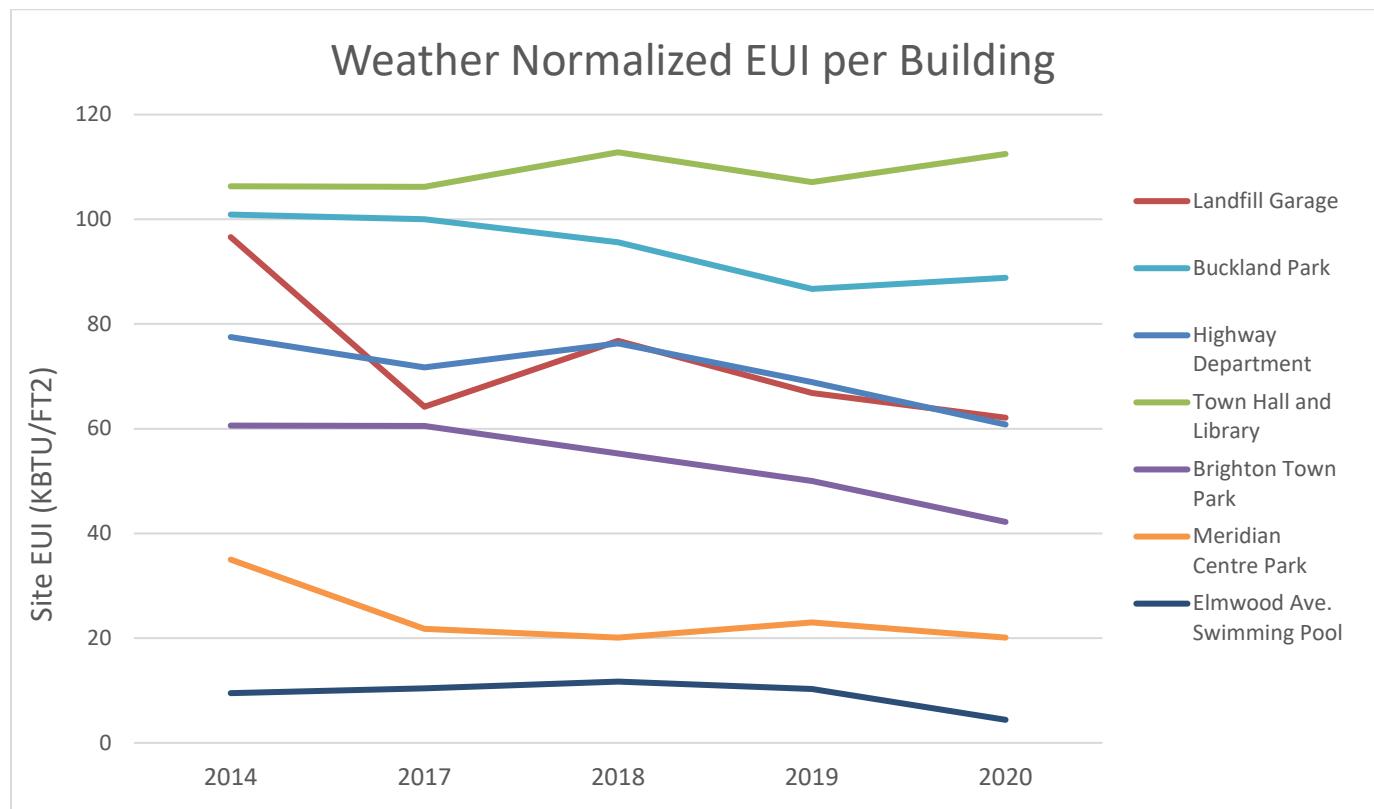
Energy Use Intensity (EUI) is a building's total annual energy use (electricity and natural gas) divided by its gross floor area. It is presented in kBtu/sf (thousand British thermal units per square foot) and since it normalizes for size, the energy use of similar building types can be compared despite size differences. Higher EUIs show greater energy use, whereas lower EUIs indicate more energy efficient buildings, given similar operational schedules.

In 2019, the Town Hall building, which has the highest gross floor area (56,714 ft²), is responsible for 57.9% of the covered municipal facility GHG emissions. Additionally, Portfolio Manager determined that the Town Hall building has the highest Source Energy Use Intensity (EUI) of the buildings measured with a value of 103.9 kBTU/ft². The median weather normalized EUI for all Town owned facilities which have been benchmarked is **76.3** kBtu/ft².

In 2020, the Town Hall building was responsible for 63.1% of the covered municipal facility GHG emissions. The Town Hall was again the highest Source Energy Use Intensity (EUI) with a value of 112.5 kBTU/ft².

Portfolio Manager does not track nationwide median EUI values for the “Other” building category, which is what all the Town’s municipal facilities technically fall under. However, a few related building uses are tracked that are at least partly related to town facilities, especially those under the Town Hall umbrella- such as libraries (median site EUI 71.6 kBtu/ft²), police stations (63.5 kBtu/ft²), and general offices (52.9 kBtu/ft²). Therefore, it may be difficult to accurately compare the Town’s benchmark scores to other buildings of similar nature across the country, but these related figures do show that at least the Town Hall facility likely has a relatively high EUI compared to comparable buildings. Figure 2 below provides Weather Normalized EUI comparison of all of the buildings benchmarked in the Town of Brighton.

Figure 2: Energy Use Intensity



V. Historical Comparison

One of the major objectives of the Energy Benchmarking program is to monitor building performance over time. Town facilities contribute to Brighton's greenhouse gas emissions through energy consumption. Historical comparison of energy benchmarks allows the Town to monitor the trend in energy use and GHG reduction to determine progress on the reduction goals of 20 by 30 for Town Facilities, established in the Town's Draft Climate Action Plan. Figures 3 and 4 provide a comparison of energy usage (electricity and natural gas) and total emissions for 2017 through 2020.

Figure 3: Energy Usage Trends

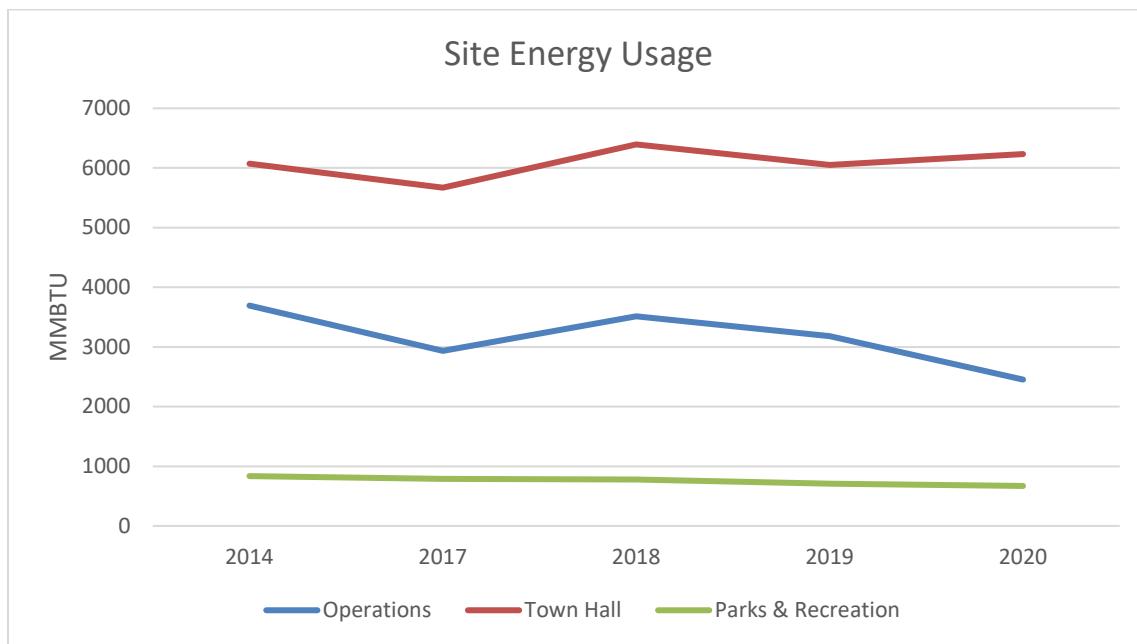
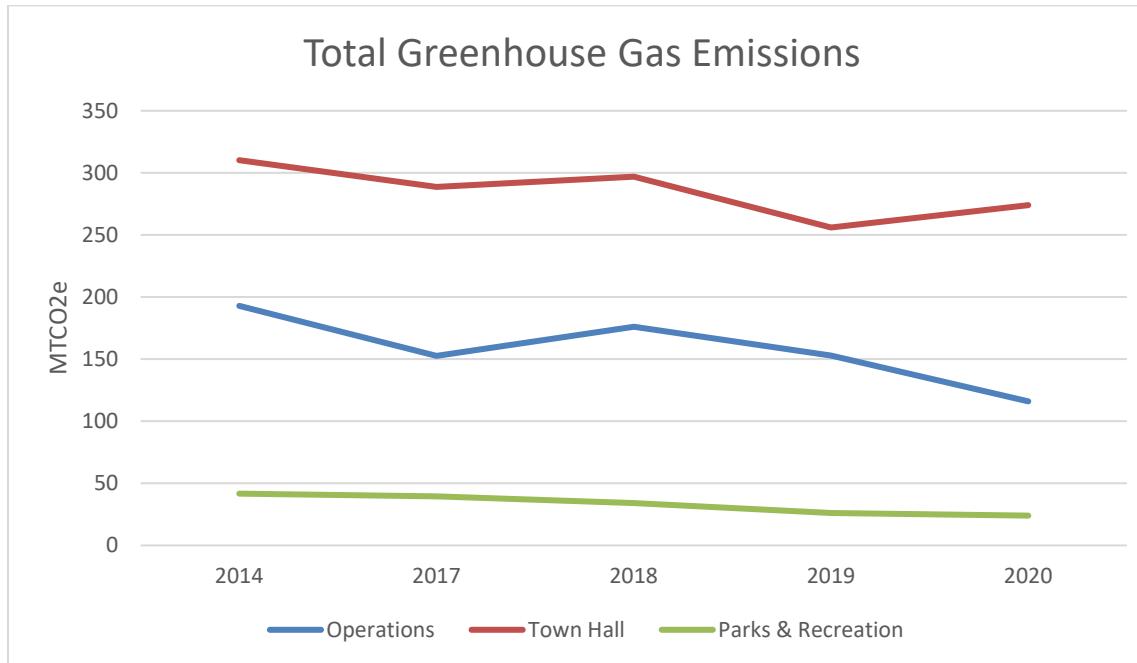


Figure 4: Emissions Trends





a. 2018 to 2019

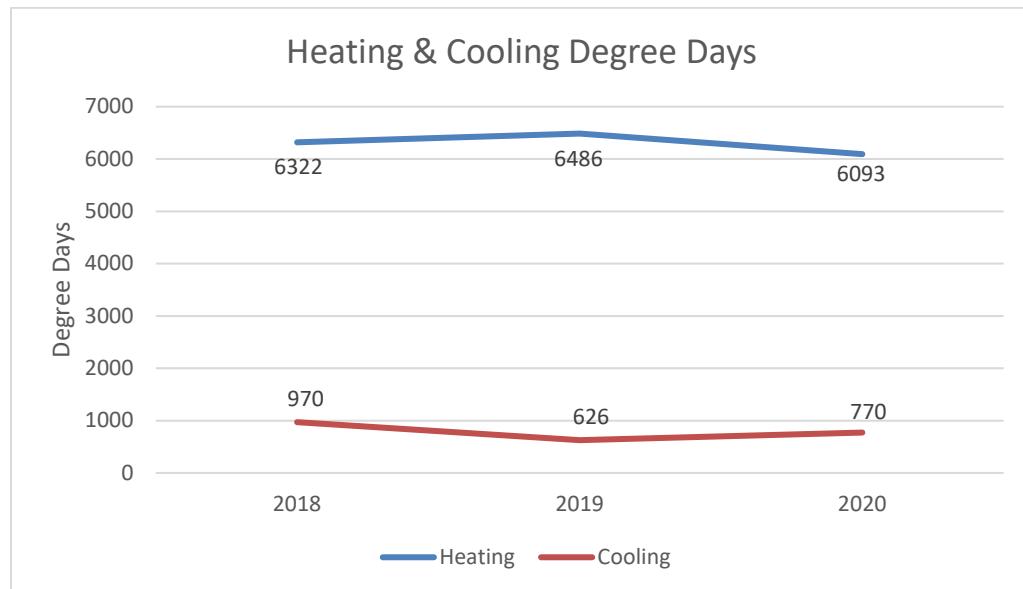
The energy consumption in Town buildings in 2019 was lower than in 2018 as expected, principally due to two main factors:

First, a project commenced in October 2019 to convert most existing lighting fixtures using fluorescent and incandescent lamps to more efficient LED flood lights and lamps. LED lamps are significantly more efficient than fluorescent and incandescent lamps because these older technologies release a comparatively greater share of their energy as heat rather than light, and also have longer run times. This results in both a decrease in electricity demand for the lighting itself and a decreased cooling load due to the reduction in extraneous heat generation.

Second, the weather pattern of 2019 resulted in slightly lower HVAC loads than in 2018. A Heating Degree Day (HDD) is equivalent to the number of days a building must be heated by 1 degree to maintain the building at its operating temperature, using a basis of 65°F (e.g. a day with an average temperature of 55°F results in 10 HDD). The Cooling degree days are calculated the same way for days where the temperature is over 65°F. Figure 5 displays the HDD & CDD for the Town of Brighton in from 2018 through 2020. The 2019 weather pattern saw roughly a 2% increase in HDD and a 30% decrease in CDD. Therefore, with all other factors being equal, the HVAC energy usage patterns are expected to follow these same trends and show an overall drop (the drop in cooling electricity demand outweighing the small heating gas demand increase).

These two primary factors resulted in the decline of Site EUI and Total Greenhouse Gas from 2018 to 2019. A more detailed analysis would be required to determine the exact contribution of each factor to the decrease in energy consumption from 2018 to 2019.

Figure 5: Heating & Cooling Degree Days





b. 2019 to 2020, COVID-19 pandemic

The energy consumption in Town buildings in 2020 was lower than in 2019 for all Town buildings except Town Hall.

An analysis of HDD and CDD shows a 7% decrease in HDD and a 23% increase in CDD from 2019 to 2020. Building energy usage would be expected to largely follow these trends, for a slight net decrease in energy usage, as seen in most Town facilities. However, Town Hall was an anomaly against this trend and showed a 3% increase in energy usage and a 7% increase in GHG emissions. This change was driven by a 17.4% year-over-year increase in gas consumption, as electricity consumption dropped by 10.6%-primarily due to the LED light conversion. Some of the gas consumption increase can be explained by the reduction in waste heat from the lighting system, which does result in some exchange of heating load from electricity to gas.

During March 2020, the COVID-19 pandemic began to impact the region. This pandemic resulted in the temporary shuttering of many municipal services and the closure of town hall. It is difficult to predict and analyze the impacts that these changes had on the energy use characteristics in Town facilities, but full and partial closures were likely a contributing factor to the decreased energy usage and emissions profiles seen in most buildings. Town Hall seeing a fairly substantial increase in energy usage is an anomaly that is difficult to explain, but is likely at least partially due to the fact that the police station attached to Town Hall remained open 24/7 and controls are not in place to shut down building-wide systems such as HVAC separately.

VI. Cost Comparison

The annual Benchmarking reports allow the Town to track its electricity and gas consumption year over year to understand both the efficiency of Town buildings over time and predict and account for energy costs. Figures 7 and 8 detail the expenditures on electricity and gas for Town Facilities from 2017-2020. 2018 was the peak year for both electricity and gas expenditures, and overall expenditures have decreased steadily since. Electricity expenditures have dropped by 27.6% from 2018 to 2020 and gas expenditures have dropped by 14.7% in the same period.

2018-2019

The decrease between 2018 and 2019 is largely the result of the Town's efforts to lower energy consumption and therefore expenditures, most significantly the widespread conversion to LED interior and flood lighting. In total, the Town saved roughly \$41,000 in energy costs between 2018 and 2019.

2019-2020

This was the first full year with the LED lighting systems in place, and the year of the beginning of the COVID-19 pandemic. These two factors were likely the main factors in the financial savings between the two years, with decreased demand charges during pandemic shutdowns being a likely primary contributor despite the relatively modest decrease in raw energy usage. In total, the Town saved roughly \$20,000 in energy costs between 2019 and 2020. Much of this savings likely came from reduced peak demand charges, especially during cooling season, resulting from the LED conversion project.

Figures 6 & 7: Electricity Expenditures 2017 to 2020

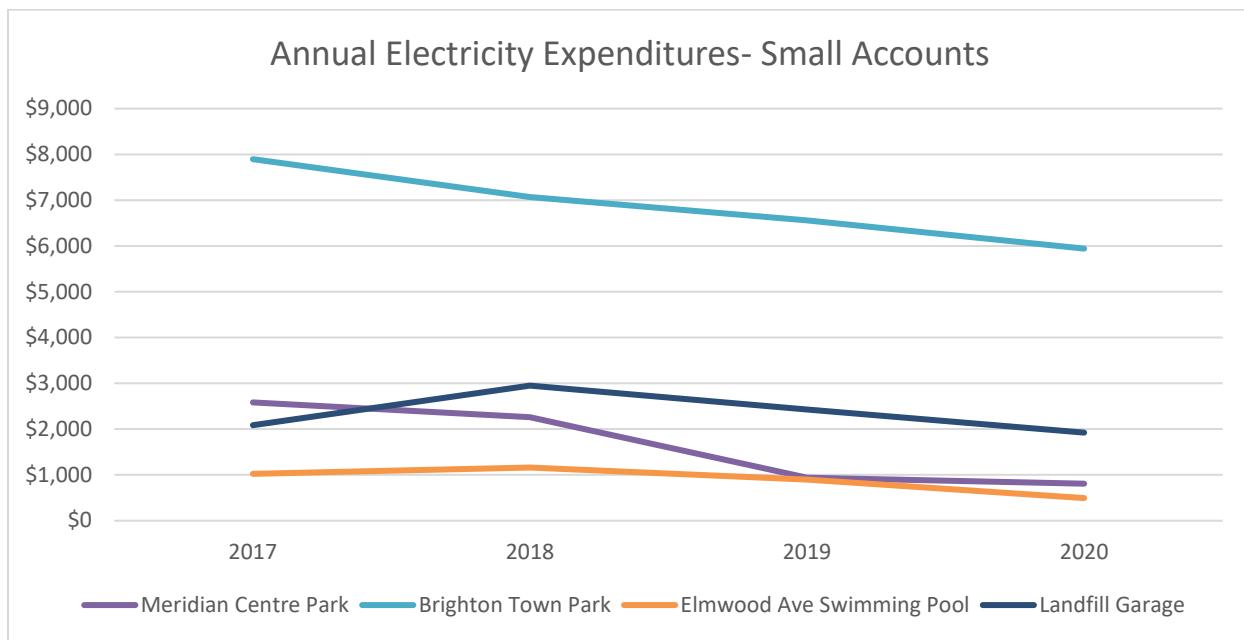
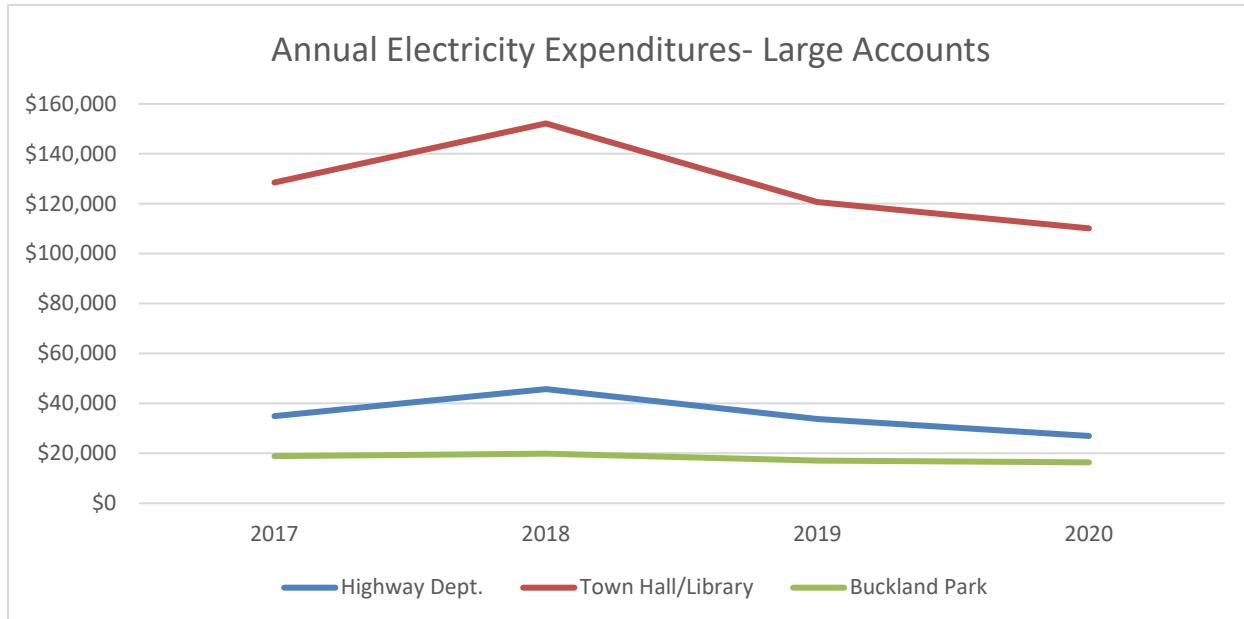


Figure 8: Gas Expenditures 2017 to 2020

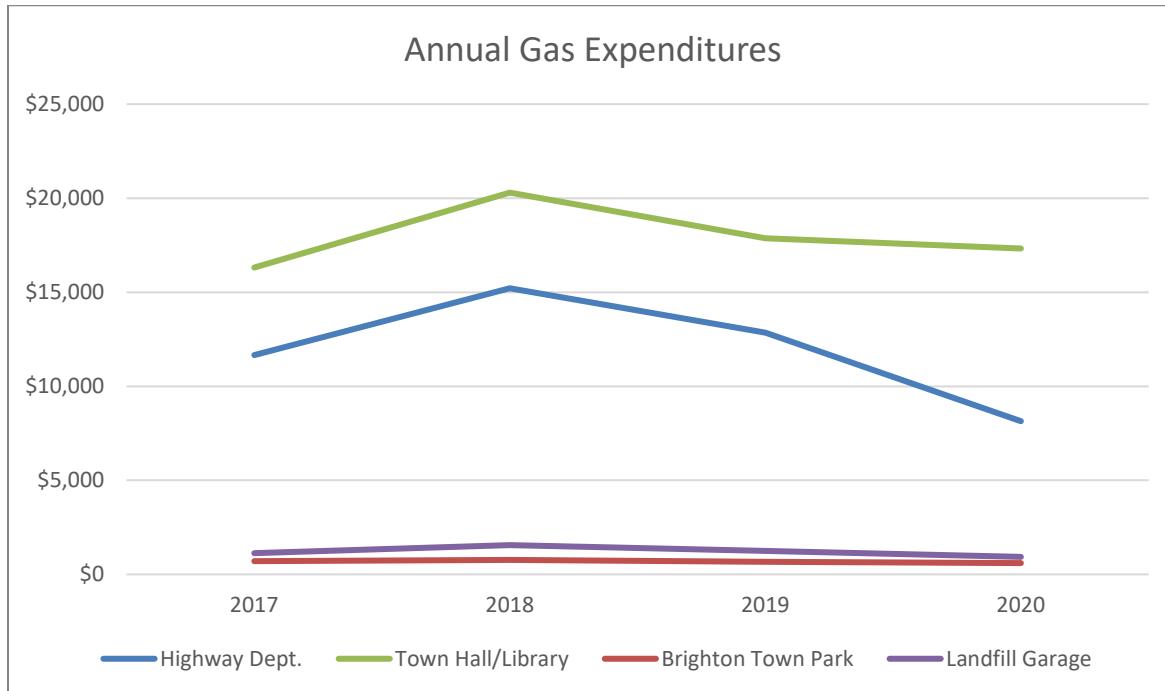
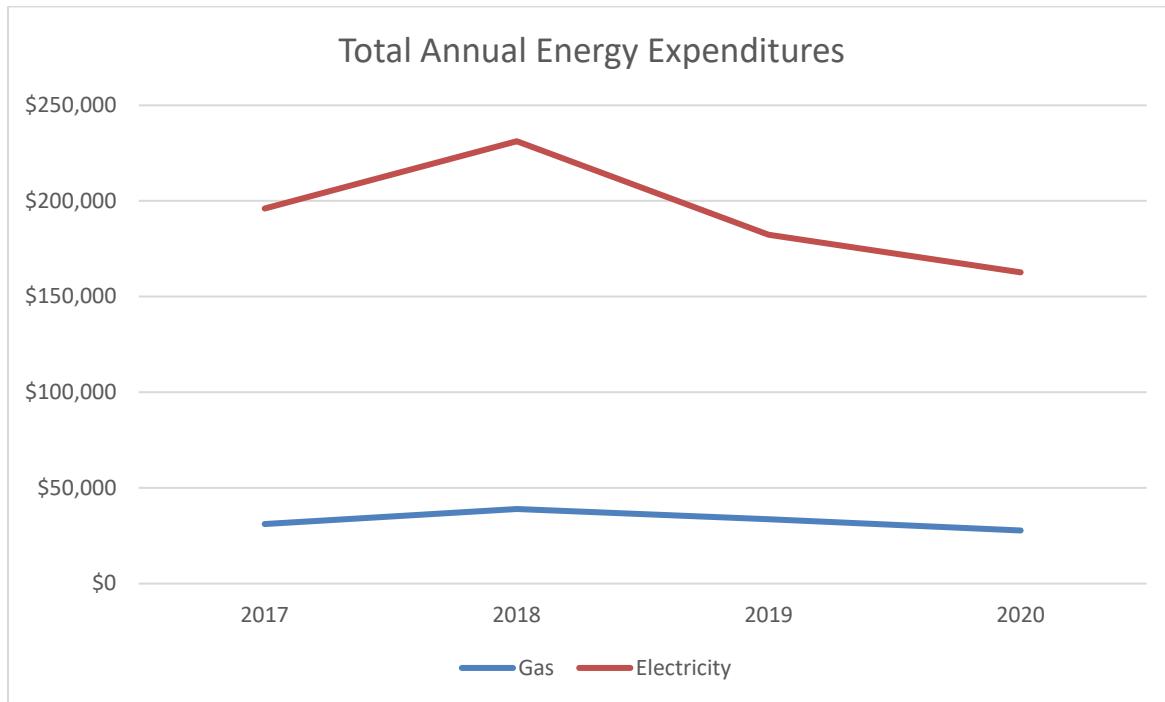


Figure 9: Total Annual Energy Expenditures





VII. Conclusion

The year to year analysis revealed a general decrease in energy usage and GHG emissions across the Town portfolio except for Town Hall as shown in Table 6 below.

Figure 10: Weather Normalized EUI Trends

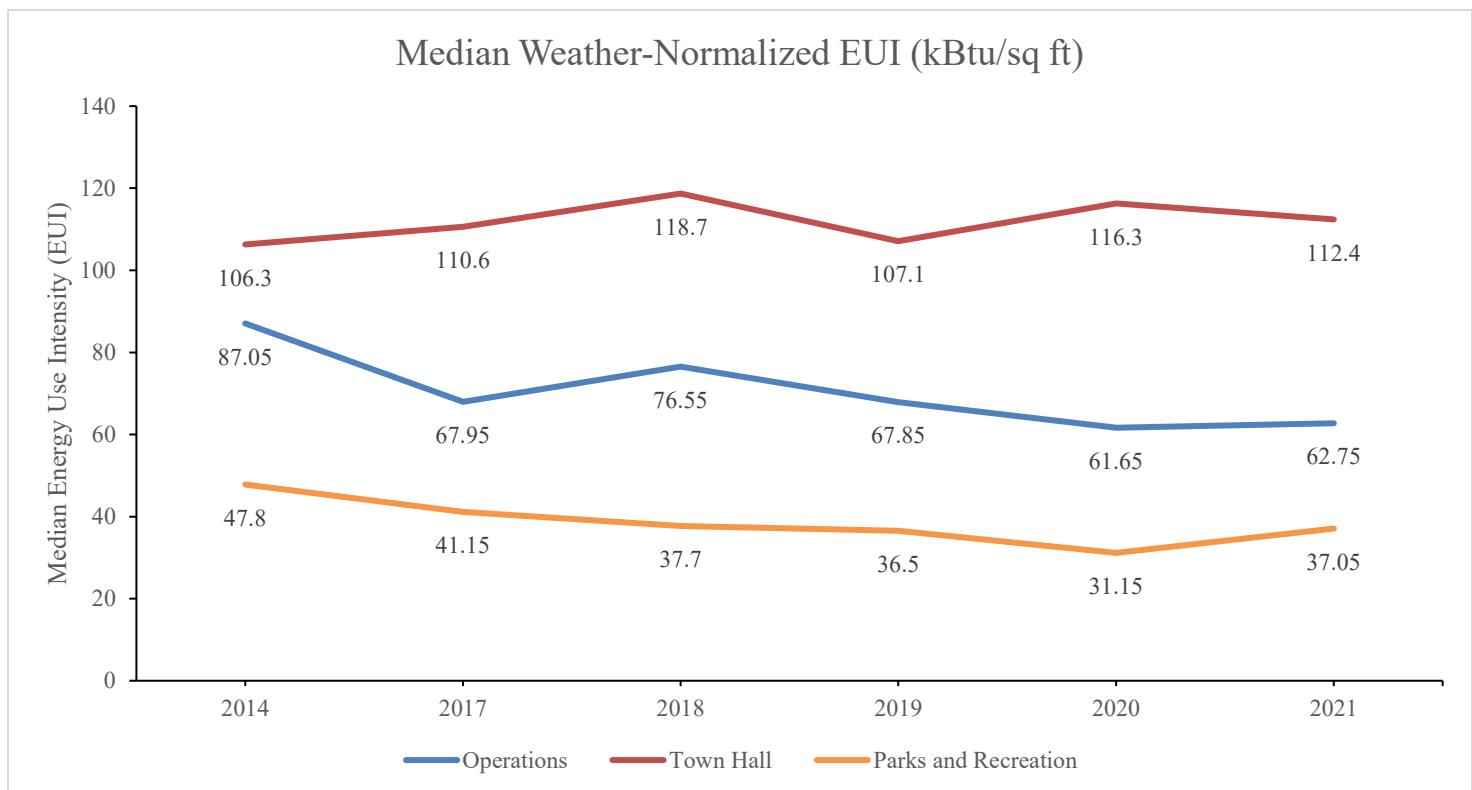


Table 9: 2018 vs 2019 Change in Energy Usage & GHG Emissions

	Change in Site Energy Usage (%)	Change in Total GHG Emissions(%)
Operations	-9.5	-13
Town Hall	-7.2	-16.5
Parks & Recreation	-9.1	-24.5

Across all town facilities, 2019 saw a decrease in site energy usage and greenhouse gas emissions compared to 2018. This decrease is especially notable since there were more heating days in 2019. As shown in Figures 5 and 6, the number of HDD increased by 164 from 2018 to 2019. Since 2019 was a colder year, the Town would have expected a proportional increase in natural gas costs and GHG emissions. Despite this, the Town reported a \$54,230 decrease in 2019 municipal building energy expenditures compared to 2018, attributable mostly to the LED conversion project.



The annual benchmarking reports for the Town and associated data can be found at the following link:

<https://www.townofbrighton.org/452/Green-Brighton>

VIII. Glossary & Acronyms

- **Cooling Degree Day/CDD:** The equivalent number of days a building must be cooled by 1 degree to maintain the building at operating indoor temperature, using a basis of 65°F.
- **Covered Municipal Building:** Building or facility owned or occupied by the Town of Brighton that is 1,000ft² or larger
- **DOE:** Department of Energy
- **EUI:** Energy use intensity
- **GHG:** Greenhouse Gas
- **Heating Degree Day/HDD:** The equivalent number of days a building must be cooled by 1 degree to maintain the building at operating indoor temperature, using a basis of 65°F.
- **kBTu:** 1000 British Thermal Units. Where 1 BTU is the amount of heat needed to raise one pound of water one degree Fahrenheit
- **MT CO₂e:** Metric tons carbon dioxide equivalent. Standard unit for measuring GHG emissions
- **NYC:** New York City
- **Weather Normalized Source:** The source energy use the property would have consumed during a 30-year average weather conditions

IX. References

- 1 New York State Department of Environmental Conservation (NYSDEC). "Climate Action Plan Interim Report." (2010). Retrieved from: https://www.dec.ny.gov/docs/administration_pdf/irexecsumm.pdf
- 2 American Council for an Energy-Efficient Economical (ACEEE). "Multifamily benchmarking can save energy-with the right support." (2017). Retrieved from: aceee.org/blog/2017/09/multifamily-benchmarking-can-save
- 3 Energy Star. "Degree Days Calculator." Retrieved from: <https://portfoliomanager.energystar.gov/pm/degreeDaysCalculator>