

ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN

2024-2029

ENERGY CONSUMPTION & EMISSIONS
CONSERVATION & REDUCTION GOALS

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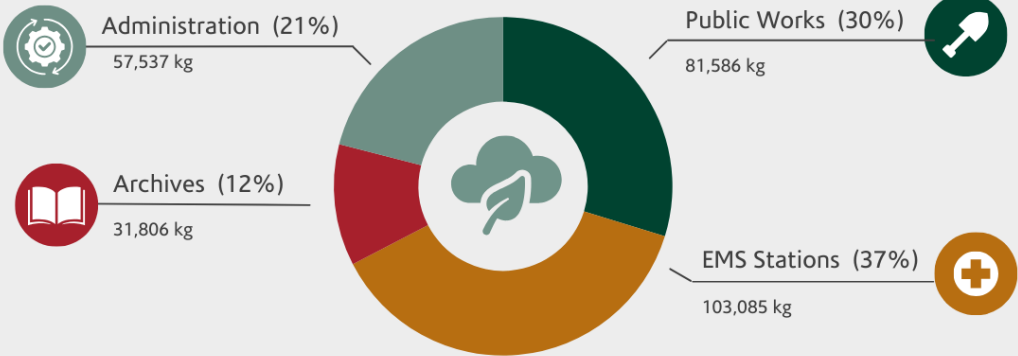
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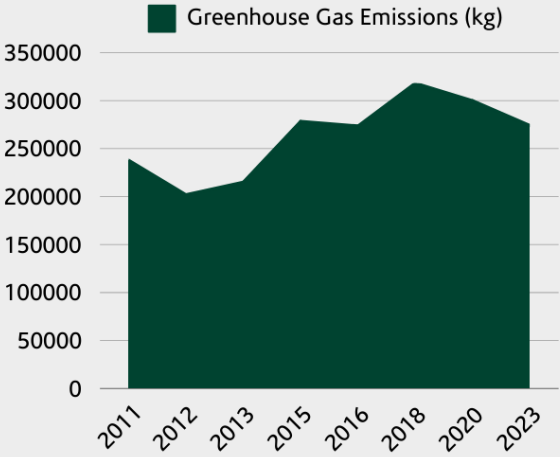
2023 FACILITY EMISSIONS

Perth County has 12 facilities in four categories which contribute to annual greenhouse gas emissions.



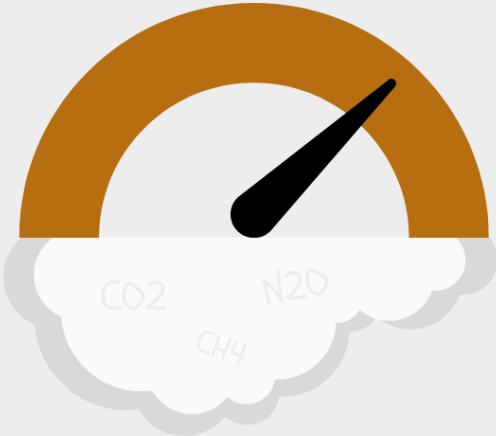
EMISSIONS TRAJECTORY

Since 2018, Perth County has reduced greenhouse gas emissions in facilities by 13.87% (44,138.4 kg).



EMISSION SOURCES

73.5% of Perth County's 2023 emissions were generated through fleet, totaling 761,024 Kg.



BENEFITS OF REDUCING GHG EMISSIONS



Decrease in operational costs



Provide modern services to community



Environmental sustainability & resiliency

Introduction to Perth County

The County of Perth is a rich agricultural community distinct in its heritage and culture, located in the centre of Southwestern Ontario. Perth County is comprised of thriving rural communities with four local municipalities being the Municipality of North Perth, the Municipality of West Perth, the Township of Perth East, and the Township of Perth South. Perth County provides a wide variety of upper-tier municipal services to its residents and visitors. The Geographic County of Perth has an increasing population of 81,500 residents (2021), growing by 5.8% since 2016 (Statistics Canada, 2021). Planning how best to reduce emissions while promoting growth will be an exciting opportunity over the next five years.

Ontario Regulation 25/23

Ontario Regulation 25/23 requires every municipality, municipal service board, post-secondary education institution, public hospital and school board (public agencies) to update their previous Energy Conservation and Demand Management Plans submitted July 1, 2019, and every five years afterwards.

This Energy Conservation and Demand Management Plan includes three sections. Section One discusses Perth County's annual energy consumption and the emissions associated with operations. Section Two describes greenhouse gas emission offsets and energy conservation measures currently used. Section Three describes previous, current and proposed ways to conserve or reduce county energy consumption. This report enables the County of Perth to plan for future energy demand, forecast results of current and proposed measures, and meet goals to reduce greenhouse gas emissions over time.

Validity Period

This report is valid between the dates of July 1, 2024 and June 30, 2029. According to O. Reg. 25/23, the 5-year update approved by Council will be required before July 1, 2029.

Perth County's Objective to Reduce Greenhouse Gas Emissions

Perth County is motivated to improve the energy efficiency of buildings and operations to:

- Reduce operational costs,
- Provide modern services to rate-payers, and
- Ensure environmental sustainability and resiliency.

Perth County is adopting efficient infrastructure, smart growth tactics, stewardship programs, and improved technologies. As an upper tier municipality working alongside four passionate local municipalities, Perth County strives to lead and collaborate on effective, meaningful projects and improvements across the jurisdiction.

In the 2023 Perth County Strategic Plan, Priority 2 highlights Perth County's intention to reduce greenhouse gas emissions and climate change impacts; "Support and champion initiatives that help the County, its residents, and its landowners protect the region's soil, water, air, and lower their environmental footprint".

Section One: Annual Energy Consumption and Emissions

Municipal Facilities

The County of Perth owns twelve (12) facilities related to operations including administrative offices, council chambers, archive buildings, emergency medical service stations, and public works buildings. Table 1 outlines Perth County’s facilities. Perth County does not own or operate any facilities used for street lighting or water and wastewater treatment, storage, or distribution.

Table 1 - Facilities Owned and Managed by the County of Perth in 2023

FACILITY	ADDRESS	SIZE (M ²)	OPERATION TYPE	USE	FUEL
County Courthouse (1887)	1 Huron St Stratford	1,773	Administrative office, municipal council chambers, courthouse.	Year-round 35 hrs/wk	Electricity Natural Gas
Listowel EMS (1990)	255 Sarah Ave Listowel	325	Ambulance station, offices, and facilities	Year-round 168 hrs/wk	Electricity Natural Gas
Milverton EMS (2004)	22 Mill St. Milverton	317	Ambulance station, offices, and facilities	Year-round 168 hrs/wk	Electricity Natural Gas
Milverton Public Works (1987)	6372 Line 131 Milverton	269	Facility to store, maintain, or repair equipment and vehicles.	Year-round 55 hrs/wk	Electricity Natural Gas
Mitchell EMS (2009)	16 Napier St. Mitchell	334	Ambulance station, offices, and facilities	Year-round 168 hrs/wk	Electricity Natural Gas
Mitchell Public Works (2016)	4 Napier St. Mitchell	2,055	Facility to store, maintain, or repair equipment and vehicles.	Year-round 88 hrs/wk	Electricity Natural Gas
St. Mary’s EMS (2007)	241 Queen St. W St. Mary’s	324	Ambulance station, offices, and facilities	Year-round 168 hrs/wk	Electricity Natural Gas
Stratford Public Works (2009)	4312 Road 119 Stratford	669	Facility to store, maintain, or repair equipment and vehicles.	Year-round 55 hrs/wk	Electricity Natural Gas
Stratford Perth Archives (2016)	4273 Line 34 Stratford	929	Public Library	Year-round 35 hrs/wk	Electricity Natural Gas
24 St. Andrew St. (1910)	24 St. Andrew St. Stratford	431	Unoccupied/ vacant since 2014	Unoccupied	Electricity Natural Gas
Stratford Perth EMS Headquarters (2016)	480 Douro St. Stratford	2,177	Ambulance station, offices, equipment and vehicle storage	Year-round 168 hrs/wk	Electricity Natural Gas
Registry Office (1957)	5 Huron St. Stratford	808	Administrative Office <i>*as of 2024 this facility amalgamated with 1 Huron St.</i>	Year-round 40 hrs/wk	Electricity Natural Gas

Energy Consumption in 2023

Perth County uses Natural Gas, Electricity, and Water to maintain facilities, along with diesel and gasoline in the fleet. The County of Perth’s annual energy consumption during 2023 is outlined in Table 2, with site and facility specific breakdown included in Table 3.

Table 2 - Total Fuel Consumption in Buildings and Facilities in 2023

Energy Source	Used	Supplier	Measurement	Consumed	Total Cost
Water	Yes	Festival Hydro, North, East, West, St Mary's	Cubic Meter (M ³)	2,756.49	\$51,362.28
Electricity (Hydro)	Yes	Festival Hydro; Hydro One, ERTH Power	Kilowatt Hour (kWh)	777,865.79	\$125,879.05
Natural Gas	Yes	Enbridge	Cubic Meter (M ³)	131,139.00	\$65,219.44
				Total:	\$ 242,460.77

Emission factors for electricity and natural gas were sourced from the Environment Climate Change Canada, National Inventory Report (2021) found in the Appendices. Energy consumption by facility is included in Table 3 and visually represented in Figure 1 comparing 2023 to 2018's reported consumption. **Nine of the twelve facilities experienced a greenhouse gas emissions reduction since 2018, as shown in Table 4.**

Table 3 - Facility Energy Consumption in 2023

Facility	ELECTRICITY		NATURAL GAS			
	Consumption (kWh)	CO ₂ (kg)	Consumption (M ³)	CO ₂ (kg)	CH ₄ (kg)	N ₂ O (kg)
County Courthouse	167,170.96	5,015.13	24,992.00	48,009.63	0.92	0.87
Listowel EMS	31,594.58	947.84	3,141.00	6,033.86	0.12	0.11
Milverton EMS	26,192.29	785.77	6,340.00	12,179.14	0.23	0.22
Milverton Public Works	12,322.48	369.67	6,475.00	12,438.47	0.24	0.23
Mitchell EMS	25,697.27	770.92	3,272.00	6,285.51	0.12	0.11
Mitchell Public Works	73,260.70	2,197.80	24,588.00	47,233.54	0.91	0.86
St. Mary's EMS	29,263.26	877.90	4,558.31	8,756.51	0.17	0.16
Stratford Public Works	31,793.10	953.80	9,573.00	18,389.73	0.35	0.34
Stratford Perth Archives	133,962.05	4,018.90	10,702.00	20,558.54	0.40	0.37
24 St. Andrew St.	14,525.20	435.80	2,121.00	4,074.44	0.08	0.07
EMS Headquarters	192,294.36	5,768.83	31,585.00	60,674.78	1.17	1.11
Registry Office	39,789.54	1,193.69	3,141.00	6,033.86	0.12	0.11
TOTAL	777,865.79	23,335.97	130,488.31	250,668.04	4.83	4.57

CO₂ = Carbon Dioxide (30g/kwh) (1921 g/m³) CH₄ = Methane (0.037g/m³) N₂O = Nitrous Oxide (0.035g/m³)

Table 4 - Change in Emissions by Facility 2018-2023

FACILITY	2018 GHG emissions (kg)	2023 GHG emissions (kg)	Kg Change	% Change
County Courthouse	58,747	53,027	- 5,721	- 9.7
Listowel EMS	6,477	6,982	+ 505	7.8
Milverton EMS	21,993	12,965	- 9,028	-41.0
Milverton Public Works	19,578	12,809	- 6,769	-34.6
Mitchell EMS	9,573	7,057	- 2,516	-26.3
Mitchell Public Works	45,388	49,433	+ 4,045	8.9
St. Mary's EMS	10,680	9,635	- 1,046	-9.8
Stratford Public Works	27,204	19,344	- 7,860	-28.9
Stratford Perth Archives	21,094	24,578	+ 3,484	16.5
24 St. Andrew St.	8,440	4,510	- 3,929	-46.6
EMS Headquarters	69,010	66,446	- 2,564	-3.7
Registry Office	19,967	7,228	- 12,739	-63.8
TOTAL	318,152	274,013	- 44,138	-13.87

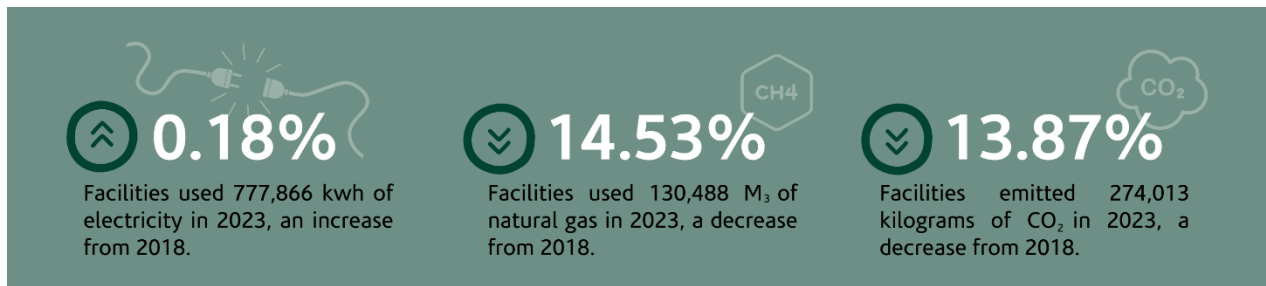


Figure 1- Facility Greenhouse Gas Emissions Comparison 2018-2023

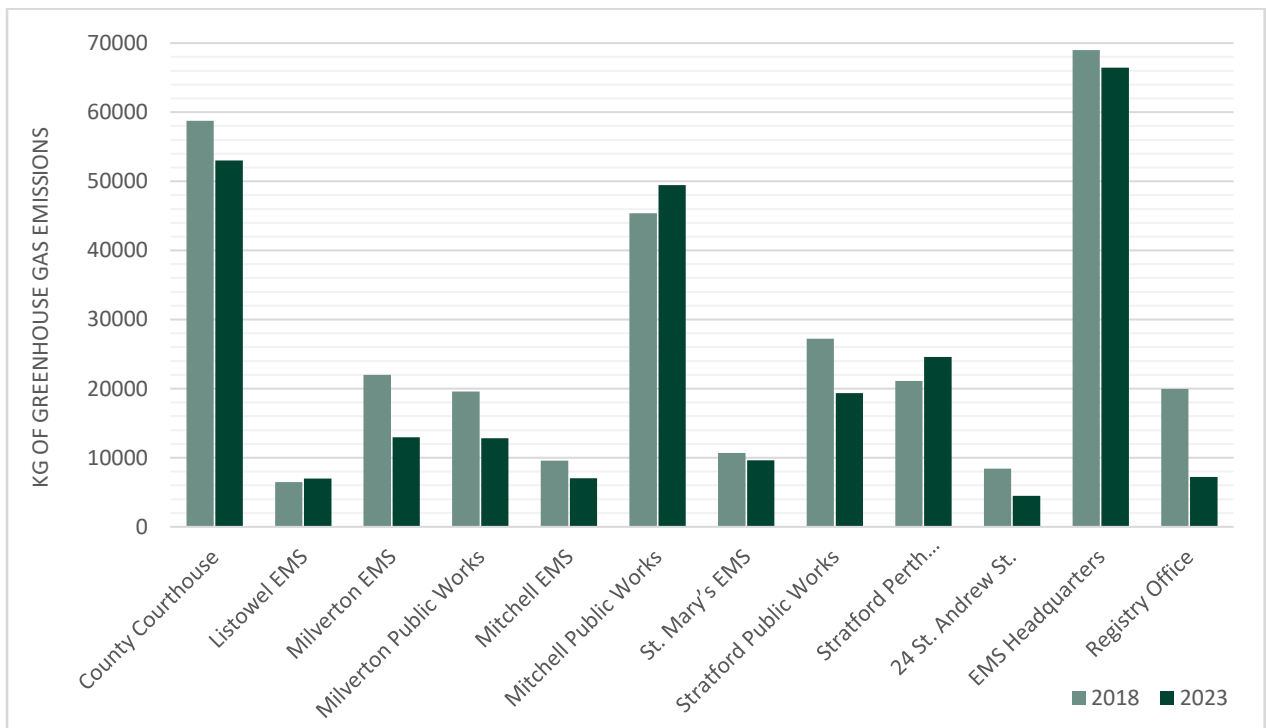
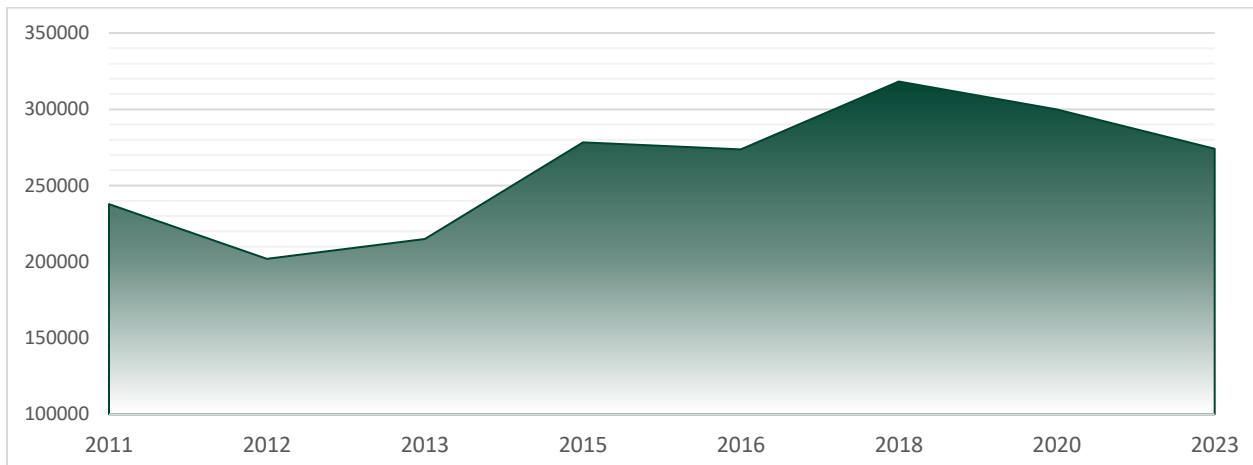


Figure 1 describes the change in GHGE each facility has experienced from 2018 to 2023. Nine of the twelve facilities experienced a decrease in GHGE. Although three facilities experienced an increase in GHGE, the total emissions produced by these facilities has decreased by **13.87%**, or **274,013 Kilograms**. On average, facilities had a **-19.3%** change in GHGE over the 5-year reporting term, ranging from +16.5% to -63.8% change.

Figure 2 shows a comparison of GHGE produced by County of Perth's facilities between 2011-2023, including natural gas, propane, and electricity. The 2014-2016 construction of the Archives Building, EMS Headquarters Building and Mitchell Public Works Building are captured within Figure 2, the construction and subsequent operation of these facilities accounted for increased emissions during these years and the following years of operation. A steady decrease in emissions has been realized since the previous Energy Conservation and Demand Management Plan produced in 2018, illustrated in Figure 2. This decrease can be attributed to installation of motion sensor lights and energy efficient lighting upgrades, low flow water fixtures, behavioural changes and potentially because of more staff able to work from home on occasion.

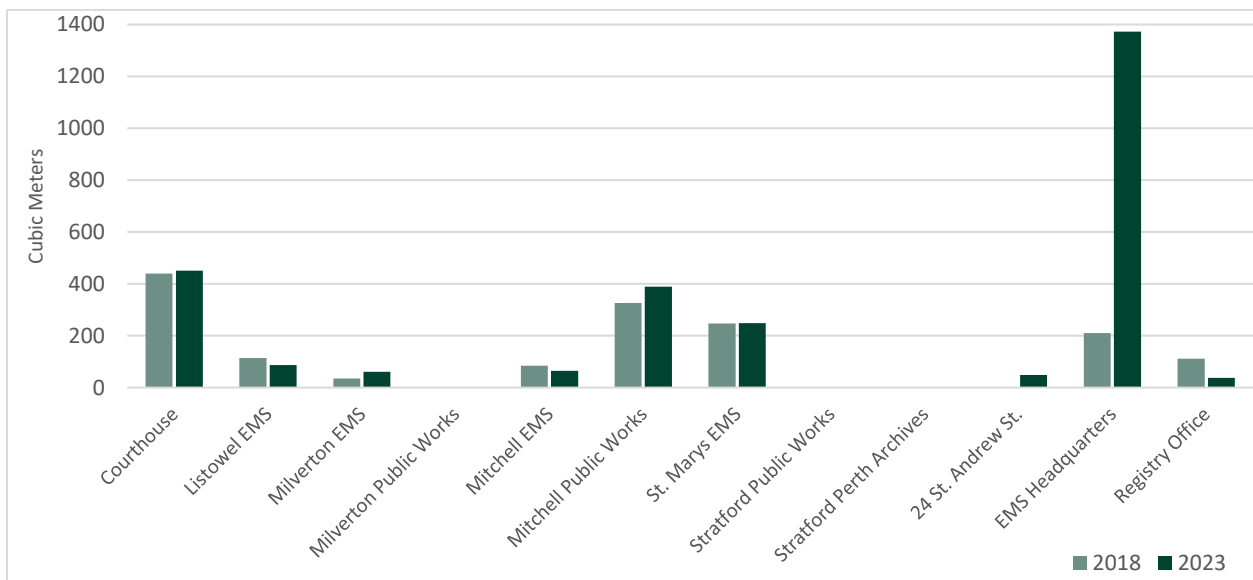
Figure 2 - Perth County Annual CO₂, CH₄ and N₂O Emissions (Kg)



Water Usage in Facilities


Water usage occurs in all of Perth County’s facilities, three of which are on private wells. In 2023, Perth County used **2,756.49 M₃** of water, costing \$51,362.28 (Table 2). Water use has increased at the Courthouse, Mitchell Public Works, Milverton EMS, and EMS Headquarters, all other facilities have seen a decline in water usage. Figure 3 illustrates the change in water consumption across Perth County’s facilities between 2018 and 2023. A total increase of water consumption by **1,188.98 M₃** per year (+175.8% change) can be attributed to new, larger facilities that are more heavily used. The increase noted at EMS headquarters is not as drastic as depicted. The increase in water consumption reported at EMS is attributed to under reporting of consumption in 2018, The 2023 values are accurately reported and based off metered consumption at the facility. Facilities showing a decrease in usage have achieved this through infrastructure upgrades (low flow fixtures) and staff behavioral change (education and awareness).

Figure 3 - Water Consumption in Perth County Facilities 2018-2023



Fleet Vehicles

Although not a requirement by the Energy Conservation Demand Management Plans of years past, ICLEI (Local Governments for Sustainability) and the Federation of Canadian Municipalities 2021 Partners for Climate Protection Protocol recommend including fleet vehicles into greenhouse gas emissions (GHGE) calculations to more accurately manage assets and reduce operational emissions over time. Going forward, Perth County will include fleet emissions in Energy Conservation and Demand Management Plans as a reference point, in order to identify opportunities for the adoption of zero-emission or low-emission vehicles where appropriate.

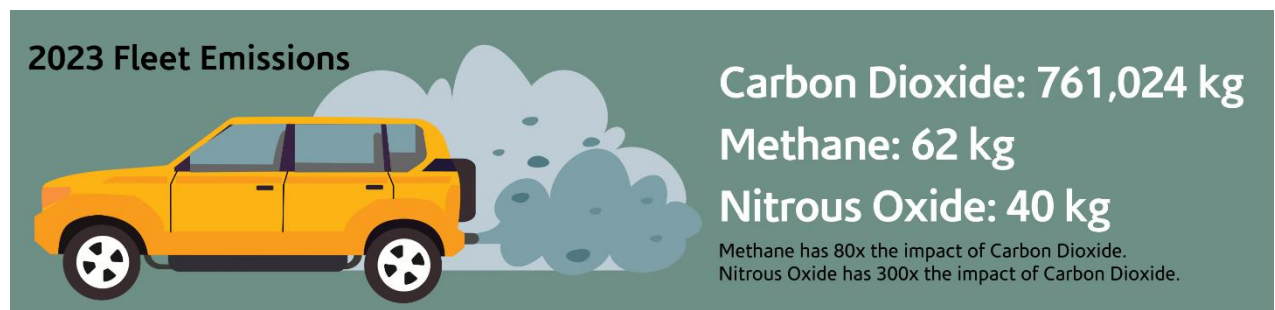


73.5% emissions
In 2023, 761,126 Kg of Perth County's total GHG emissions came from fleet.

GHGE contributions vary depending on the vehicle type and usage. As a rural municipality, there are a variety of vehicle types that are used seasonally and year-round across a large geographic area. In 2023 Perth County owned a fleet of forty-five (45) vehicles. Six (6) vehicles in fleet take coloured fuel (diesel); twelve (12) fleet vehicles take diesel fuel; the average cost per litre of diesel in 2023 was \$1.31. Twenty-eight (28) vehicles in fleet take gasoline; the average cost per litre of gasoline in 2023 was \$1.44.

Although there are many options for light-duty hybrid or zero-emission vehicles (ZEVs), heavy-duty vehicles including ambulances, vocational trucks and heavy-duty pickup trucks $\frac{3}{4}$ ton or heavier are still unavailable or out of budgetary reach for Perth County. As of 2023, 29% of Perth County's fleet was light-duty pick-up trucks, vans or sport utility vehicles (SUV)s. Replacing these vehicles with hybrids or ZEVs could have a significant impact on the total **761,126 kilograms** of GHGE produced in 2023 by Perth County's fleet. Replacing fleet vehicles takes time, as the replacement durations are cyclical. The age of Perth County's fleet ranges from 2 to 14 years, with regular annual investments occurring across all vehicle types.

Figure 4 shows the visual representation of GHG emissions produced by Perth County's fleet in 2023. Table 5 details Perth County's fleet, along with fuel consumption, cost of fuel, and emissions for Carbon Dioxide, Methane, and Nitrous Oxide. Emissions from engine oil and other forms of petroleum and synthetic lubrication have not been factored into this analysis. Emission factors for mobile internal combustion engines can be found in Appendix A.



2023 Fleet Emissions

Carbon Dioxide: 761,024 kg
Methane: 62 kg
Nitrous Oxide: 40 kg

Methane has 80x the impact of Carbon Dioxide.
Nitrous Oxide has 300x the impact of Carbon Dioxide.

Figure 4 - Fleet Emissions by Vehicle (2023)

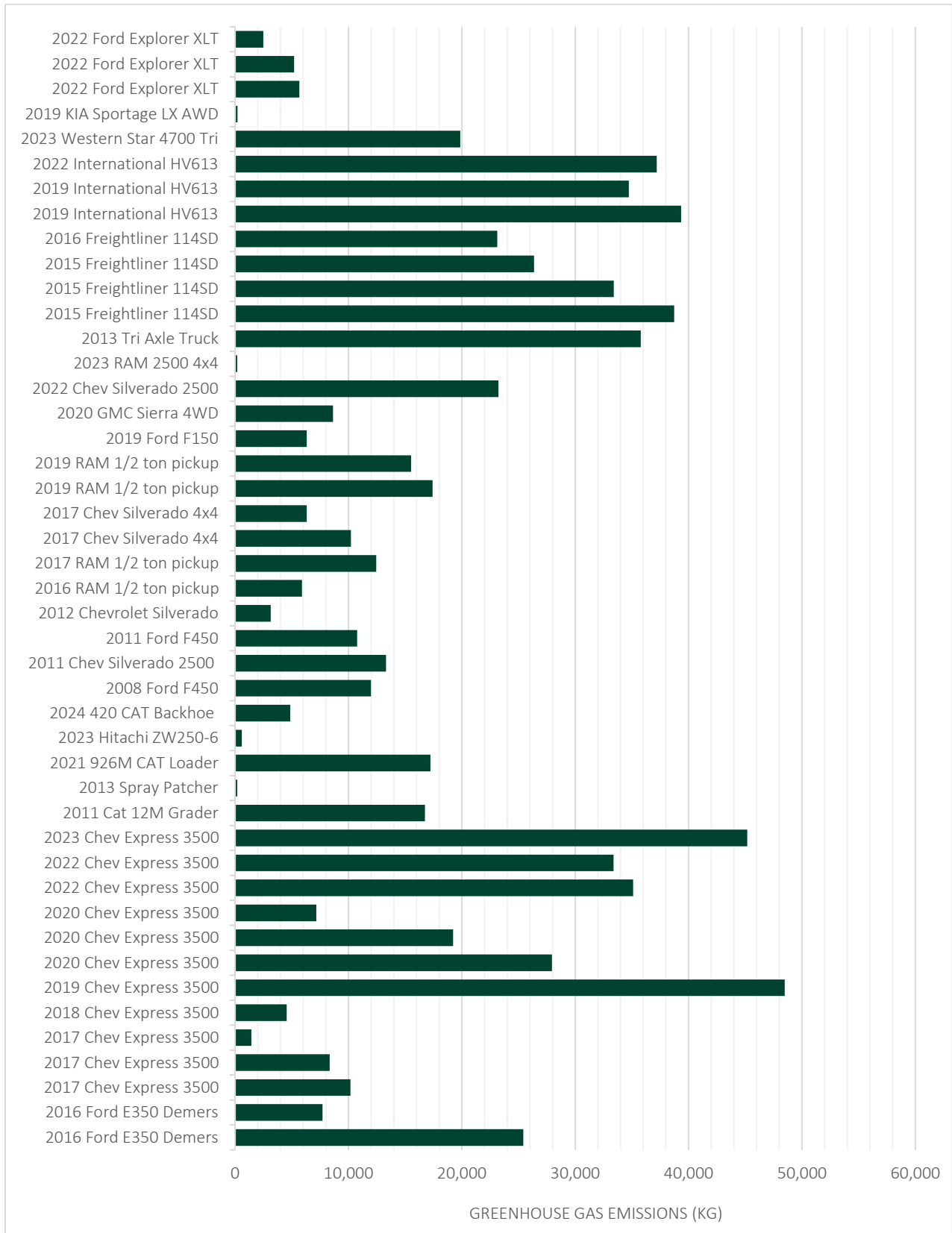


Table 5 - Fleet Fuel Consumption & GHG Emissions in 2023

Vehicle Type	Fuel (\$)	Litres (L)	CO ₂ (Kg)	CH ₄ (Kg)	N ₂ O (Kg)
2016 Ford E350 Demers	14,429.93	11,015.21	25,415.40	3.11	1.21
2016 Ford E350 Demers	3,762.82	2,872.38	7,699.42	0.38	0.29
2017 Chev Express 3500	6,343.08	4,404.92	10,163.46	1.24	0.48
2017 Chev Express 3500	5,205.58	3,614.99	8,340.86	1.02	0.40
2017 Chev Express 3500	890.41	618.34	1,426.70	0.17	0.07
2018 Chev Express 3500	2,835.87	1,969.35	4,543.89	0.56	0.22
2019 Chev Express 3500	30,253.48	21,009.36	48,474.90	5.92	2.31
2020 Chev Express 3500	17,432.87	12,106.16	27,932.54	3.41	1.33
2020 Chev Express 3500	11,992.14	8,327.88	19,214.91	2.35	0.92
2020 Chev Express 3500	4,469.37	3,103.73	7,161.23	0.88	0.34
2022 Chev Express 3500	21,899.65	15,208.09	35,089.63	4.29	1.67
2022 Chev Express 3500	20,833.58	14,467.76	33,381.47	4.08	1.59
2023 Chev Express 3500	28,193.40	19,578.75	45,174.05	5.52	2.15
2011 Cat 12M Grader	8,184.84	6,247.97	16,747.68	0.46	0.14
2013 Spray Patcher	87.89	67.09	179.84	0.00	0.00
2021 926M CAT Loader	8,414.15	6,423.02	17,216.89	0.47	0.14
2023 Hitachi ZW250-6	288.93	220.56	591.20	0.02	0.00
2024 420 CAT Backhoe	2,374.11	1,812.30	4,857.86	0.13	0.04
2008 Ford F450	5,851.00	4,466.41	11,972.22	0.59	0.46
2011 Chev Silverado 2500	6,506.50	4,966.79	13,313.49	0.66	0.51
2011 Ford F450	5,255.18	4,011.59	10,753.06	0.53	0.41
2012 Chevrolet Silverado	1,962.31	1,362.72	3,144.19	0.24	0.43
2016 RAM 1/2 ton pickup	3,681.10	2,556.32	5,898.20	0.45	0.81
2017 RAM 1/2 ton pickup	7,759.76	5,388.72	12,433.40	0.94	1.71
2017 Chev Silverado 4x4	6,378.88	4,429.78	10,220.83	0.78	1.40
2017 Chev Silverado 4x4	3,937.86	2,734.63	6,309.60	0.48	0.87
2019 RAM 1/2 ton pickup	10,871.32	7,549.53	17,419.03	1.32	2.39
2019 RAM 1/2 ton pickup	9,681.25	6,723.09	15,512.19	1.18	2.13
2019 Ford F150	3,937.04	2,734.06	6,308.29	0.48	0.87
2020 GMC Sierra 4WD	5,392.92	3,745.08	8,641.03	0.66	1.19
2022 Chev Silverado 2500	14,495.61	10,066.40	23,226.20	2.84	1.11
2023 RAM 2500 4x4	121.69	84.51	194.98	0.02	0.01
2013 Tri Axle Truck	17,484.20	13,346.72	35,775.88	1.78	1.36
2015 Freightliner 114SD	18,926.93	14,448.04	38,727.97	1.92	1.47
2015 Freightliner 114SD	16,326.24	12,462.78	33,406.48	1.66	1.27
2015 Freightliner 114SD	12,881.68	9,833.34	26,358.28	1.31	1.00
2016 Freightliner 114SD	11,301.65	8,627.21	23,125.25	1.15	0.88
2019 International HV613	19,228.46	14,678.21	39,344.95	1.95	1.50
2019 International HV613	16,967.94	12,952.63	34,719.51	1.72	1.32
2022 International HV613	18,177.31	13,875.81	37,194.11	1.85	1.42
2023 Western Star 4700 Tri	12,386.62	8,601.82	19,846.98	2.43	0.95
2019 KIA Sportage LX AWD	134.67	93.52	215.78	0.02	0.03
2022 Ford Explorer XLT	3,535.88	2,455.47	5,665.51	0.49	0.71
2022 Ford Explorer XLT	3,251.28	2,257.83	5,209.50	0.45	0.65
2022 Ford Explorer XLT	1,544.63	1,072.66	2,474.95	0.21	0.31
TOTAL:	425,872.01	308,593.51	761,023.77	62.12	40.47

EF = Emission Factor

CO₂ = Carbon Dioxide

CH₄ = Methane

N₂O = Nitrous Oxide

Section Two: Conservation Strategies

Renewable Energy Generation

The County of Perth owns and operates a free-standing 10-kilowatt solar photovoltaic system located at the Public Works property at 4 Napier Street in Mitchell. In 2023, the system produced 16,555 kWh of energy. The renewable energy generation offsets Perth County's facility emissions by **496.65 kg** of CO₂, or **6.04%** as well as offsetting energy costs to the facility.

The County of Perth will consider conducting an analysis or audit to determine most effective locations for solar panel additions, along with a cost benefit comparison to maintain operational efficiencies. This may lead to expanding the existing solar array at the current location, as well as investigating opportunities to introduce new solar arrays at facilities across the County.



Perth County Stewardship Program

In 2024, Perth County launched a Stewardship Program supporting tree planting projects across private and public lands. Perth County Council launched the program with \$75,000 in available grant funds. The first-year intake of applications included tree planting projects across 39 properties, cost-sharing the planting of 14,955 trees. The trees planted with support from the Stewardship Program in 2024 will have carbon sequestration power of 41,874 Kg per year, in perpetuity until the trees age out. These trees have the equivalent carbon emission offset to county operations of **4.04%**. This offset cannot be claimed for the 2023 year, but it was in the best interest of this report to capture the detail of this program going forward.

The County of Perth intends to continue increasing investment year-over-year into the Stewardship Program to benefit the surrounding environments while also utilizing their ability to sequester carbon and other GHGE. The trees planted will provide a multitude of additional benefits to Perth County's resiliency and adaptation to climactic changes.



Total Emissions Offsets

As a rural municipality with a large geographic area and smaller communities, there is a consensus that reducing emissions particularly in fleet will take a decade or more to transition to lower emission options. While continuing to work on these long-term strategies, short-term focus will be placed on increasing greenhouse gas offsets including renewable power generation and carbon sequestration.

In 2023, Perth County's energy offsets covered **0.05%** of the total GHG emissions produced. There is an opportunity to increase the offset capacity by looking at investments in tree planting and ecosystem restoration, as well as renewable power generation. More information about Perth County's objectives can be found in Section Three.

Changes Since 2018

Many investments and improvements have been made since the 2018 Energy Conservation and Demand Management Plan. Perth County has grown considerably in population and in desire for positive environmental change.

Due to the nature of Perth County’s operations and the relatively young inventory of buildings, not many significant upgrades were needed or undertaken in the past 5-years. As illustrated in Table 2, most facilities experienced a decrease in CO₂ emissions from 2018-2023. Three facilities experienced an increase in emissions caused by increased use.

One major change noted is an increase in the cost of fuels across facilities and fleet. To continue to run fiscally responsible operations, rising fuel costs will continue to drive the adoption of energy and water efficient upgrades across facilities and fleet operated by the County of Perth.

Other notable operational considerations towards greenhouse gas emissions that aren’t captured in facilities are the use of a rainwater catchment system for the wash bay at the Mitchell Public Works Building; and the use of cold in-place road resurfacing techniques, which is known to have 50% less greenhouse gas implications than hot-mix paving applications and costs 40% less (Alkins et al, 2007).

Total GHG Emissions for 2023

Total greenhouse gas emissions (GHGE) produced by Perth County in 2023, alongside the emission offsets are shown in Table 6. In the facilities category, emissions have been reduced by **44,138 Kg**, or **13.87%** since 2018. As this is the first time reporting on fleet, an emissions comparison will not be provided in this report, but will be available in the 2029 plan.

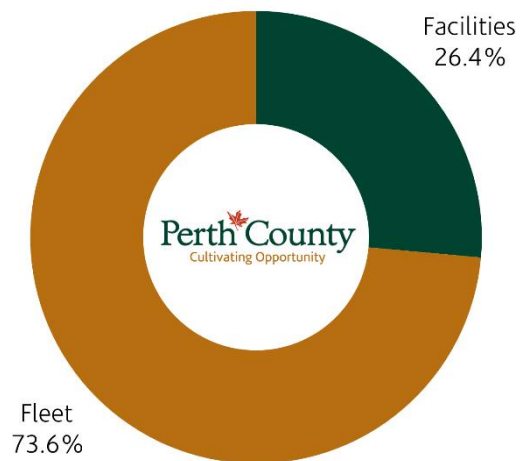
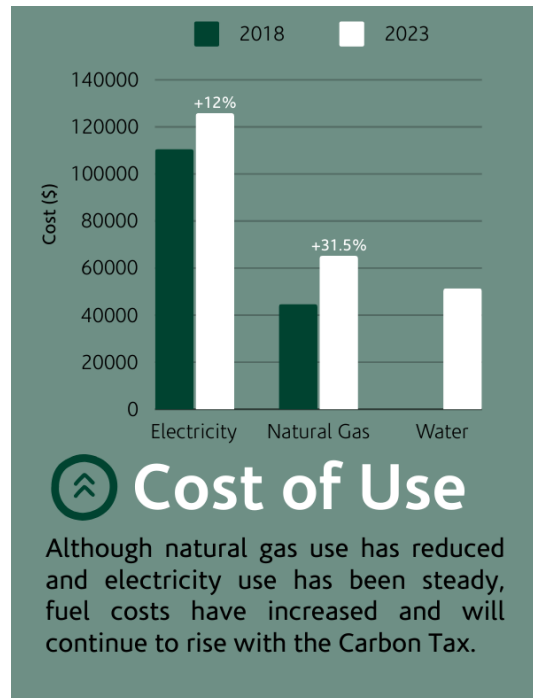


Table 6 - Net Emissions for Perth County in 2023

Category	kg CO ₂	kg CH ₄	kg NO ₂	Total
Facilities	274,004.06	4.83	4.57	274,013.46
Fleet	761,023.79	62.12	40.47	761,126.38
Total Emissions:	1,035,027.85	66.95	45.04	1,035,139.84
Renewable Energy Generation Offset	-496.65	0.00	0.00	-496.65
Net Emissions:	1,034,531.20	57.78	97.81	1,034,643.19

Section Three: Reduction Strategies and Measures to Implement

The County of Perth strives to meet greenhouse gas emission (GHGE) reduction targets set by international, federal, and provincial greenhouse gas reduction plans. To summarize, these plans recommend a reduction of 35-45% of 2005 levels by 2030, and a reduction of 80-100% of 2005 levels by 2050. By reducing GHGE in Perth County's operations, benefits will include:

- Extending the lifespan of facilities through retrofits;
- Maximizing financial efficiency through direct and indirect long-term cost avoidance leveraging up-front investments in green technology;
- Reducing strain on 'downstream' infrastructure, including water treatment, fueling units, and waste management, often owned and operated by partner organizations and lower tier municipalities.

Perth County plans to meet these recommended GHGE reduction targets by implementing the following measures:

Environmental Sustainability Plan

Proposed measures under the Energy Conservation and Demand Management Plan include considering carbon offset strategies such as employing renewable energy general facilities (solar panels), procuring non-fossil fuel reliant fleet vehicles (Battery Electric Vehicles), and continuing to foster a community cognizant of energy use (education and incentivization programs). These initiatives dovetail with existing actions and goals set out in Perth County's Greenhouse Gas Reduction Plan set to be updated in 2024 as the Environmental Sustainability Plan. This plan will further set goals over interim to long-term timelines, develop objectives in relation to Perth County and member municipality's operations, and include specific targets such as overall emissions reduction to meet provincial and federal targets in 2030 and 2050.

Solar Array Expansion

Solar power stands out as a renewable, abundant, and eco-friendly energy source, offering a sustainable solution for powering facilities. Embracing solar technology enhances the facilities' sustainability efforts and demonstrates a steadfast investment to emissions reduction.

Expanding existing solar panel arrays and adding panels to new facilities presents a strategic and environmentally conscious option for Perth County facilities to offset electricity usage and operational expenses. Existing solar arrays owned by the County of Perth offset electrical consumption in facilities by **2.13%** and offset facility emissions by **6.04%**. Embracing solar power through additional arrays can decrease energy bills, reduce GHGE, and contribute to a renewable energy source for the grid. Additional solar arrays can join the free-standing unit at 4 Napier Street in Mitchell, or be added to additional facilities as rooftop installations at the EMS buildings and rural shops.

OBJECTIVE: Perth County endeavours to add additional solar panel arrays to increase facility GHGE offset to 10%, or an annual output of 33,110 kWh by 2029. Collaboratively, Perth County will provide support or encourage the associated local municipalities to install solar arrays on their facilities, including fire halls, municipal offices, and park pavilions.

Passive Vegetative Heating and Cooling

Passive solar heating and cooling using strategic placement of vegetation offers a sustainable and environmentally conscious approach to moderating indoor temperatures year-round. The deliberate positioning of trees, shrubs, and drought tolerant perennial species in proximity to buildings serves a dual purpose:

- In spring and fall, vegetation provides natural shading reducing the necessity for air conditioning thereby also reducing expenses;
- In winter, vegetation is a barrier against winds, reducing heat dissipation and heating costs.

The harmonious integration of trees and shrubs adjacent to buildings and facilities fosters energy efficiency and elevates comfort and sustainability. Embracing this simple yet powerful technique allows a blend of the built environment with the surrounding natural landscape.

Adding landscape features around Perth County owned facilities is a cost-effective way of reducing energy consumption for heating and cooling. Additional benefits include providing natural species habitat, aesthetic value, and pollinator habitat. A feasible short-term enhancement to reduce emissions and improve the efficiency of facilities, where appropriate, to encourage passive climate control within buildings.

OBJECTIVE: Perth County endeavours to meet a **5%** increase in vegetative and canopy cover on Perth County facility properties by 2029. This objective can be measured through orthophotographic analysis.

Emissions Reduction in Fleet

The benefits of electric vehicles to the goal of reduced GHGE and cost savings are clear. Even through a lifecycle analysis, electric vehicles have significantly lower emissions and carbon footprint than internal combustion engine (ICE) vehicles. Adapting the procurement strategy to prioritize electric or hybrid vehicles when fleet are replaced is essential in reducing the emissions from Perth County's large fleet. Currently, there are thirteen (13) light-duty trucks, sport utility vehicles, and vans which could be replaced with hybrid or fully electric options.

Installing charging infrastructure at relevant facilities will ensure an effective transition to electrified fleet. Although EV chargers increase electrical usage, less emissions will be generated than if fleet remained ICE vehicles. A study from British Columbia indicates the GHGE of a gasoline car are over 40 times higher than that of an electric car which used hydroelectric sources to generate electricity for the charge (University of British Columbia, 2023). In Ontario, most electrical power is generated by hydroelectric or nuclear power generation, meaning emissions caused by the generation of this electricity is low. The addition of level 2 public EV chargers has been added to the scope of the renovations at the Perth County Courthouse to encourage staff and visitors to make the switch to electric.

Using the side-by-side comparison of a fully electric truck, a hybrid truck and a standard ICE truck in Appendix D, the carbon emissions from one full battery/ tank shows a difference in emissions of **97.5%** between ICE and electric, and a **22%** difference between ICE and hybrid. If all thirteen of Perth County's existing light-duty pickup trucks, SUV's and vans transitioned to hybrid or electric there could be an approximate reduction in CO₂ emissions by:

ICE to Electric: -96,986.8 Kg/year CO₂ (-12.7%) or ICE to Hybrid: -21,884.2 Kg/year CO₂ (-2.9%).

OBJECTIVE: Perth County endeavours to transition up to seven (7) eligible light duty vehicles slated for replacement from the Public Works, EMS, and Emergency Management Departments with hybrid or electric options by 2029 to reduce emissions produced by fleet by **5-12%**.

Supporting staff in the decision to take meetings across work locations remotely instead of driving to different work centres, work remotely from home, and use active or shared transportation methods to get to and from work will also reduce subsidiary greenhouse gas emissions associated with County operations. Training employees to increase awareness about the strategic benefits and cumulative impacts using EV or hybrid will have on reducing their personal, and county associated emissions is another opportunity.

Perth County Stewardship Program

Perth County has received an overwhelming demand for the Perth County Stewardship Program in the first year's intake response in 2024. As demand for this program grows, so shall the ability for the annual investment and eligibility of the program to acquire matching funding dollars from grant programs.

Stacking annual tree planting carbon sequestration value with a 5,000 trees planted per year increase year-over-year, an estimated 462,000 kg/year sequestration power will be in effect by 2029. Therefore, Perth County must continue to invest and increase funds provided to the Stewardship Program every year to ensure a steady increase in sequestration power.

OBJECTIVE: Perth County endeavours to increase the Stewardship Program to support the planting of 40,000 trees per year, with a carbon sequestration value of **112,000 Kg CO₂/year** by 2029.

Process and Program Improvements

The Energy Conservation and Demand Management Plan process is an opportunity to do a full-scale review of existing policies and processes utilized at the County of Perth. Supporting an integrated approach to achieving goals of GHGE reduction and increased offsets is possible by:

- Educate county staff about GHGE, and how actions contribute to emissions and offsets;
- Pursue external funding opportunities to support sustainability and resiliency projects;
- Develop a sustainable purchasing policy, embed these as standards throughout RFP processes;
- Develop an eligibility criteria in asset management for integration of sustainability, resiliency, and GHGE reduction during repair/replacement;
- Update corporate strategies including the Perth County Strategic Plan to incorporate climate related goals and best management practices;
- Collaborate with local municipalities on projects supporting GHGE reduction.

2029 Greenhouse Gas Reduction Target

From 2018 to 2023, The County of Perth endeavored to reduce GHGE and conserve energy. This translated successfully to a reduction in GHG emissions in facilities by 13.87%. During the upcoming 5-year reporting period, Perth County will endeavor to achieve a reduction in greenhouse gas emissions (including offsets) of 30% from 2018 levels by 2029 dovetailing with goals set in the Perth County 2021 Greenhouse Gas Reduction Plan and Provincial and Federal reduction goals looking to achieve Net Zero by 2050.

Appendices:

Appendix A: Emission Factors for Mobile Combustion

Type of Vehicle	CO ₂ (g/L)	CH ₄ (g/L)	N ₂ O (g/L)
Light-duty Gasoline Vehicles (tier 0-3 average)	2307.30	0.20	0.289
Light-duty Gasoline Trucks (tier 0-3 average)	2307.30	0.175	0.317
Heavy-duty Gasoline Vehicles (average)	2307.30	0.282	0.110
Light-duty Diesel Vehicles (average)	2680.5	0.073	0.196
Light-duty Diesel Trucks (average)	2680.5	0.073	0.196
Heavy-duty Diesel Vehicles (average)	2680.5	0.133	0.102
Off-road Gasoline 2-stroke	2307.3	10.56	0.013
Off-road Gasoline 4-stroke	2307.3	5.08	0.064
Off-road Diesel <19kw	2680.5	0.073	0.022
Off-road Diesel >19kW Tier 1-3	2680.5	0.073	0.022
Off-road Diesel >19kW Tier 4	2680.5	0.073	0.227
Off-road Natural Gas	1.9	0.0088	0.00006
Off-road Propane	1515	0.64	0.087
<i>Values sourced from the Environment Climate Change Canada, National Inventory Report (2021)</i>			

Appendix B: Emission Factors for Electricity

Consumption Intensity of 30g (CO₂ eq/ kwh) in 2021 in Ontario (ECCC, 2021, p.67). “Combustion and process emissions from utility electricity generation, steam production (for sale) and transmission. Excludes utility owned cogeneration at industrial sites. Includes post-meter, unintentional leaks from natural gas consumption” (ECCC, 2021).

Appendix C: Emission Factors for Natural Gas

Province of Ontario	CO ₂ (g/m ³)	CH ₄ (g/m ³)	N ₂ O (g/m ³)
2021	1921	0.037	0.035
<i>** Applies to fuel consumed by the Utility, Industry, Residential, Commercial, Institutional, Agricultural, and Transport subsectors</i>			
<i>Values sourced from the Environment Climate Change Canada, National Inventory Report (2021)</i>			

Appendix D: Fleet Emission Reduction Exercise

Model	Capacity (Tank/ Charge)	Consumption (L/100km)	Range (Ford's approx.)	Emissions		
				CO ₂ (g/km)	CH ₄ (g/km)	N ₂ O (g/km)
2023 Ford Lightning Lariat SuperCrew Extended Range	131 kWh	3.9 kWh/km	515 km	7.63	0	0
2023 Ford-F150 Lariat SuperCrew Powerboost Full Hybrid V6	116 Litres 1.5 kWh	10.5 city/ 10.4 hwy (10.4 avg)	1,126 km	237.70	0.018	0.032
2023 Ford LF-150 Lariat SuperCrew 5.L Ti-VCT V8	98 Litres	14.2 city/ 12.9 hwy (13.5 avg)	742 km	304.74	0.023	0.042

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Glossary of Terms

- GHGE – Greenhouse Gas Emissions
- ICE vehicle – Internal Combustion Engine Vehicle
- Net Zero – Where the total amount of energy used is equal to the amount of renewable energy created.
- Offset – A form of renewable energy generation or GHG sequestration to offset the energy consumed.
- ZEVs – Zero Emission Vehicles, typically fully battery powered, hydrogen, or methane.