MUNICIPALITY OF
North Perth

JUNE 2024

ENERGY CONSERVATION AND DEMAND MANAGEMENT PLAN

2024-2029

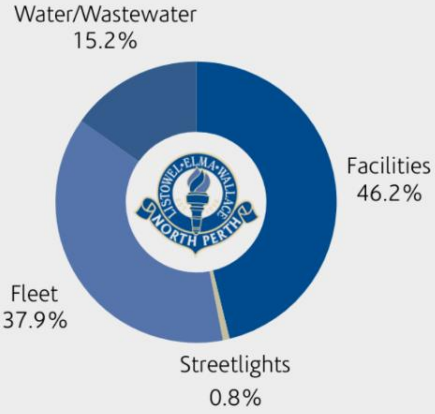
ENERGY CONSUMPTION & EMISSIONS
CONSERVATION & REDUCTION GOALS

Contents

Executive Summary

2023 GREENHOUSE GAS EMISSIONS

North Perth has reduced total GHGE by 11.83% since 2018.



LIGHTING UPGRADES

Retrofitting four facilities with LED lightbulbs has an annual savings of 79,608 kWh.

2,388

EMISSION OFFSETS

North Perth's tree planting programs sequester enough carbon dioxide each year to offset municipal emissions by 12.9%

14,000 trees

Solar panels offset facility energy consumption by 332,000 kWh. That is a 4.8% reduction!

4.8%

OPPORTUNITIES TO STRIVE FOR BY 2029

- Decrease operational utility costs
- Electrifying light duty fleet to reduce emissions
- Implement a climate-lens for operational decisions

Introduction to Municipality of North Perth

The Municipality of North Perth is a growing community offering the best of both rural and urban life to over 15,500 residents. Found in the northern reaches of Perth County and the heart of Southwestern Ontario, North Perth is the County's fastest growing community. Quality services, small-town characteristics, and successful economic growth offer a home that is attractive to residents, business, and industry. North Perth incorporated as a municipality in 1998. The rural and urban areas make North Perth the strong and dynamic community that we are today.

Ontario Regulation 25/23

Ontario Regulation 25/23 was created under the Electricity Act (1998) on February 23, 2023. This Regulation replaced O. Reg 507/18 and O. Reg. 397/11, filed under the repealed Green Energy Act (2009). O. Reg 25/23 requires every municipality, municipal service board and public agencies to update existing Energy Conservation and Demand Management Plans written July 1, 2019 every five years afterwards.

The 2024 Energy Conservation and Demand Management Plan includes three sections. Section One discusses North Perth'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 North Perth energy consumption. This report enables North 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 submitted before July 1, 2029.

Commitment to Greenhouse Gas Reduction

The Municipality of North Perth is driven to improve the energy efficiency of buildings and operations to reduce costs of operation, provide modern services to residents, and ensure environmental sustainability and resiliency to protect communities in the face of a changing climate.

The Municipality of North Perth has made large investments and adopted a variety of climate-focused infrastructure, smart growth tactics, stewardship programs, and improved technologies. As a lower tier municipality working alongside one upper tier municipality and three associated local municipalities, North Perth strives to lead and collaborate on effective, meaningful projects and improvements for energy conservation, sustainability and resiliency.

The Municipality of North Perth has prioritized carbon footprint reduction and compensation for more than a decade, through initiatives and plans such as the Carbon Footprint Reduction and Compensation Strategy, the Carbon Footprint Initiative, and adopting the Perth County Greenhouse Gas Reduction Plan. As a member of the Carbon Footprint Initiative, North Perth committed to a 25% reduction in carbon emissions by 2025 using 2015 as the baseline year. As of December 31, 2023, North Perth has reduced carbon emissions by **12.6%**, when including carbon offset programs. Methodologies for achieving this reduction included decreased energy consumption, investing in energy efficient and renewable projects, carbon offset projects, and seeking opportunities for technological advancement.

Section One: Annual Energy Consumption and Emissions

Municipal Facilities

The Municipality of North Perth owns 33 facilities related to operations (Table 1) including administrative offices, council chambers, public libraries, water wells, wastewater treatment plant, wastewater pump stations and public works buildings where equipment and vehicles are maintained, repaired and stored.

Table 1 - Facilities Owned and Managed by North Perth in 2023

FACILITY	ADDRESS	SIZE (M2)	OPERATION TYPE	FACILITY USE	FUEL
North Perth Municipal Office	330 Wallace Ave N, Listowel	1128	Administrative offices and related facilities, including municipal council chambers	Year-round 42.5 hrs/wk	Electricity Natural Gas
Atwood Library	218 Main St Atwood	86	Public libraries	Year-round 15 hrs/wk	Electricity Natural Gas
Listowel Library	260 Main St W. Listowel	771	Public libraries	Year-round 52 hrs/wk	Electricity Natural Gas
Monkton Library	216 Winstanley, Monkton	186	Public libraries	Not in use – Sold in 2024	Electricity
Atwood Fire Hall	141 Arthur St Atwood	290	Fire stations and associated offices and facilities	Year-round 168 hrs/wk	Electricity Natural Gas
Listowel Fire Hall	620 Wallace Ave S. Listowel	1516	Fire stations and associated offices and facilities	Year-round 168 hrs/wk	Electricity Natural Gas
Monkton Fire Hall	215 Nelson St Monkton	541	Fire stations and associated offices and facilities	Year-round 168 hrs/wk	Electricity
Elma Logan Training Centre	215 Nelson St Monkton	167	Training Facility and associated offices and facilities	Year-round 4 hrs/wk	Electricity
Wallace Shop	5882 Line 88, Gowanstown	883	Facilities where equipment or vehicles are maintained, repaired or stored	Year-round 84 hrs/wk	Electricity Natural Gas
Listowel Shop	580 Main St. Listowel	650	Facilities where equipment or vehicles are maintained, repaired or stored	Year-round 84 hrs/wk	Electricity Natural Gas
Elma Shop	171 Monument Rd. Atwood	306	Facilities where equipment or vehicles are maintained, repaired or stored	Year-round 84 hrs/wk	Electricity Natural Gas
Elma Landfill	7080 Road 166, Atwood	49	Administrative offices and related facilities.	Year-round 40 hrs/wk	Electricity Propane
Steve Kerr Memorial Complex	965 Binning St Listowel	6396	Indoor ice rink and recreational facility, storage shed	Year-round 84 hrs/wk	Electricity Natural Gas
Elma Logan Rec Complex	200 Nelson St Monkton	4102	Indoor ice rinks, public libraries, day care	Year-round 84 hrs/wk	Electricity, Propane
Wallace Arena	6670 Perth Line 88, Gowanstown	2369	Indoor ice rink	Year-round 84 hrs/wk	Electricity Furnace Oil Propane
Elma Memorial Community Centre	251 Main St. Atwood	940	Community Centre	Year-round 40 hrs/wk	Electricity Natural Gas

FACILITY	ADDRESS	SIZE (M^2)	OPERATION TYPE	USE	FUEL
Wastewater Treatment Plant	6115 Line 84, Elma Township	776	Facilities related to the treatment of sewage.	Year-round 168 hrs/wk	Electricity Natural Gas
Septage Receiving Station	6115 Line 84, Elma Township	130	Facilities related to the pumping of sewage.	Year-round 168 hrs/wk	Electricity Natural Gas
Atwood PS #1	269 Main St. Atwood	No building	Facilities related to the pumping of sewage.	Year-round 168 hr/wk	Electricity
Atwood PS #2	82 Monument Road, Atwood	55	Facilities related to the pumping of sewage.	Year-round 168 hr/wk	Electricity
Hwy 23 PS	1200 Mitchell Road, Listowel	124	Facilities related to the pumping of sewage.	Year-round 168 hrs/wk	Electricity
Winston PS	587 Winston St East, Listowel	No Building	Facilities related to the pumping of sewage.	Year-round 168 hr/wk	Electricity
Davidson PS	441 Davidson Ave N., Listowel	No Building	Facilities related to the pumping of sewage.	Year-round 168 hr/wk	Electricity
Inkerman PS	140 Inkerman St. W., Listowel	15	Facilities related to the pumping of sewage.	Year-round 168 hr/wk	Electricity
Elm PS	665 Elm Ave, Listowel	15	Facilities related to the pumping of sewage.	Year-round 168 hr/wk	Electricity
Danbrook Well	246 Queen St, Atwood	69	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Smith Well	102 Parkview Cres., Atwood	12	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Gowanstown Well	5961 Maple Ln, Gowanstown	11	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Molesworth Well	8106 Road 177, Molesworth	12	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Listowel Well #4	160 Elizabeth St., Listowel	106	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Listowel Well # 5	580 Main St, Listowel	28	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Listowel Well # 6	510 Bright St, Listowel	26	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity
Water Tower	580 Main St, Listowel	79	Facilities related to the pumping of water	Year-round 168 hrs/wk	Electricity

Energy Consumption in 2023

The Municipality of North Perth's energy consumption during 2023 is outlined in Table 2, with site and facility specific breakdown included in Table 3 and Table 4. The municipality's goals and objectives for conserving and otherwise reducing energy consumption and managing energy demand are challenging, as communities rapidly expand and the subsequent requirement to provide added services are contradictory to reduction. For example, the upgrades to the Wastewater Treatment Plant, an additional wastewater pump station in 2023, added streetlights and a satellite municipal office were not a factor in the 2018 emissions calculations. The buildings and facilities in the 2023 energy consumption totals also include all water wells and wastewater pump stations, which were not included in the 2019 Energy Conservation and Demand Management Plan. North Perth uses electricity, natural gas, propane, furnace fuel and water to maintain facilities. Emission factors for these fuels are included in the Appendices.

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

Energy Source	Supplier	Measurement	Consumed	Total Cost
Water	North Perth	Cubic Meter (M^3)	3,770.1	$17,898.66
Electricity (Hydro)	Hydro One	Kilowatt Hour (kWh)	7,618,181.15	$1,163,121.67
Natural Gas	Union Gas	Cubic Meter (M^3)	183,485.00	$98,705.41
Propane	Sparling Propane	Litre (L)	79,927.40	$50,662.31
Furnace Fuel	Foxton Fuels	Litre (L)	15,303.96	$17,951.33
			Total:	$1,348,339.38

Table 3 - Facility Electricity and Natural Gas Consumption in 2023

Facility	ELECTRICITY Consumption (kWh)	CO_2 (kg)	NATURAL GAS Consumption (m^3)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
North Perth Municipal Office	210,321.72	6,309.65	25,641.00	49,256.36	0.95	0.90
Atwood Library	2,569.15	77.07	681.00	1,308.20	0.03	0.02
Listowel Library	80,590.80	2,417.72	14,902.00	28,626.74	0.55	0.52
Monkton Library	1,681.24	50.44	-	-	-	-
Listowel Fire Hall	57,255.63	1,717.67	11,769.00	22,608.25	0.44	0.41
Atwood Fire Hall	10,912.84	327.39	5,068.00	9,735.63	0.19	0.18
Monkton Fire Hall	26,278.23	788.35	-	-	-	-
Elma Logan Training Centre	2,762.00	82.86	-	-	-	-
Wallace Shop	17,387.73	521.63	8,393.00	16,122.95	0.31	0.29
Listowel Shop	80,426.10	2,412.78	13,250.00	25,453.25	0.49	0.46
Elma Shop	19,508.59	585.26	9,673.00	18,581.83	0.36	0.34
Elma Landfill	19,425.27	582.76	-	-	-	-
Steve Kerr Memorial Complex	517,982.75	15,539.48	82,523.00	158,526.68	3.05	2.89
Elma Logan Rec Complex	353,434.90	10,603.05	-	-	-	-
Wallace Arena	218,344.56	6,550.34	-	-	-	-
Elma Memorial Community Centre	91,658.08	2,749.74	6,008.00	11,541.37	0.22	0.21
Totals	**1,710,539.59**	**51,316.19**	**177,908.00**	**341,761.27**	**6.58**	**6.23**

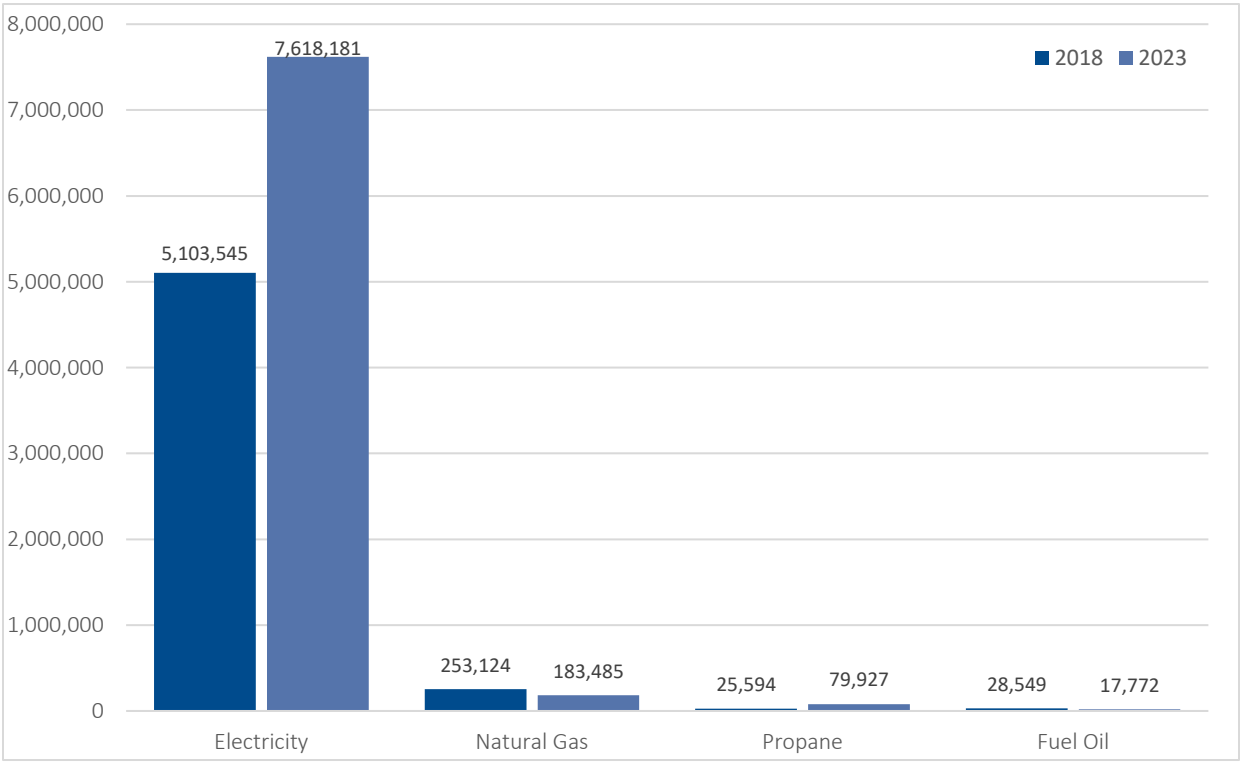
CO_2 = Carbon Dioxide CH_4 = Methane N_2O = Nitrous Oxide

Table 4 – Facility Propane and Furnace Fuel Consumption in 2023

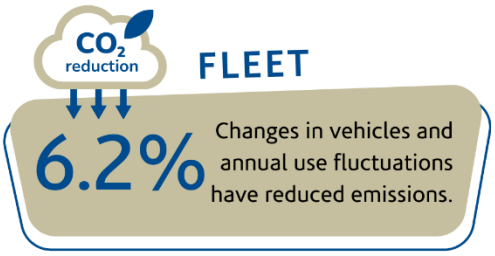
Facility	PROPANE Total (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	FURNACE FUEL Total (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Monkton Fire Hall	10,844.50	16,429.42	0.29	1.17	-	-	-	-
Elma Logan Training Centre	2,418.40	3,663.88	0.07	0.26	2,418.40	6,657.86	0.06	0.01
Elma Landfill	949.30	1,438.19	0.03	0.10	-	-	-	-
Elma Logan Rec Complex	57,911.40	87,735.77	1.56	6.25	-	-	-	-
Wallace Arena	7,763.80	11,762.16	0.21	0.84	15,303.96	42131.80	0.40	0.09
Totals:	**79,887.40**	**121,029.41**	**2.16**	**8.63**	**17,722.36**	**48,789.66**	**0.46**	**0.11**

Figure 1 illustrates North Perth's energy consumption changes the previous Energy Conservation and Demand Management Plan and this report's reporting year. There has been a reduction in natural gas and fuel oil use and an increase in electricity and propane use. When comparing 2018 to 2023 electricity consumption, it should be noted that greater than 100% of the increase is related to the Wastewater Treatment Plant (WWTP) upgrades completed in 2020. These upgrades included a new headworks building containing an automated bar screen and grease removal equipment, and two new digesters with blowers. The magnitude of the WWTP upgrades skews the energy consumption data results. If the increase in hydro consumption resulting from upgrades were omitted solely for data analysis purposes, the energy consumption of all other municipal facilities and streetlights would be reduced by 2.1% from 2018-2023.

Figure 1 - Energy Consumption Comparison by Type 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, North Perth 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. GHG emissions vary depending on the vehicle type and usage. As a rural municipality, a variety of vehicle types are used seasonally and year-round across a large geographic area.

In 2023 North Perth owned a fleet of sixty-five (65) vehicles:

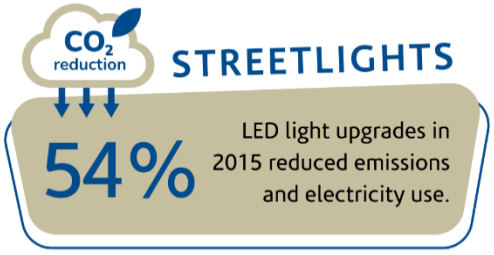
- Thirty-eight (38) vehicles that use diesel. The average $/L of diesel in 2023 was $1.31.
- Twenty-four (24) vehicles that use gasoline. The average $/L of gasoline in 2023 was $1.44.
- Three (3) propane powered ice re-surfacers.

Emission factors for mobile combustion as well as a complete list of all municipal vehicles in operation in 2023 are located in the Appendices. A summary of the North Perth fleet fuel consumption and GHG emissions appears in Table 5.

Table 5 – 2023 Fleet Fuel Consumption & GHG Emissions

VEHICLE TYPE	FUEL ($)	FUEL (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	Total (kg)
Diesel	227,788.97	139,037.58	345,821.35	19.52	13.91	345,854.78
Gas	74,308.80	47,070.73	108,583.97	9.75	11.71	108,605.43
Propane	9,643.21	2,430.00	3,681.45	0.26	0.00	3,681.71
Total	**311,740.98**	**188,538.31**	**458,086.77**	**29.53**	**25.62**	**458,141.92**

Streetlights and Traffic Signals



North Perth operates 1,363 streetlights and three (3) traffic signals. The municipality has experienced significant growth since transitioning to LED streetlights in 2015. Despite installing more streetlights and traffic signals, North Perth has successfully decreased CO_2 emissions associated with the operation of streetlights by >54% since 2015 (Table 6).

Table 6 – 2023 Streetlight and Traffic Signal Emissions

Facility	Consumption (kWh)	CO_2 (kg)
Streetlights and Traffic Signals	311,844	9,355.32

Water and Wastewater

North Perth is responsible for four (4) water systems and related distribution systems that include seven (7) municipal wells producing 913.99 Mega litres of water. The municipality is also responsible for a Wastewater Treatment Plant and two (2) collection systems that include eight (8) wastewater pump stations. In 2023, the Wastewater Treatment Plant treated 2,686.23 Mega litres of wastewater (Table 7). Wastewater flow includes waste from two industrial sources that have their own water wells.

Upgrades and expansion of the Wastewater Treatment Plant due to significant growth of the communities of Listowel and Atwood in both residential and industrial capacity have caused electricity consumption for plant operation to double since the last report with a consistent decrease in the consumption of natural gas also noted. As North Perth continues to grow, future upgrades will add to demands for electricity. Emission factors for Wastewater Treatment and Discharge are included in the Appendicies.

Table 7 - Water and Wastewater Emissions in 2023 compared to 2018

	ELECTRICITY		NATURAL GAS				TREATMENT AND DISCHARGE	
	Consumption		Consumption					
Facility	(kWh)	CO_2 (kg)	(m3)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	CH_4 (kg)	N_2O (kg)
2023								
Wastewater Treatment Plant	4,714,751.91	141,442.56	5,577.00	10,713.42	0.21	0.20	3,523.89	1,900.34
Septage Receiving Station	62,699.46	1,880.98	-	-	-	-	-	-
Wastewater Pump Stations	361,502.14	10,845.06	-	-	-	-	-	-
Water wells and Storage	456,844.05	13,705.32	-	-	-	-	-	-
TOTAL:	5,595,797.56	167,873.92	5,577.00	10,713.42	0.21	0.20	3,523.89	1,900.34
2018								
Wastewater Treatment Plant	2,019,261.43	60,577.84	9,625.22	18,490.05	0.36	0.34	3,773.55	4,344.38
Septage Receiving Station	85,784.00	2,573.52	-	-	-	-	-	-
Wastewater Pump Stations	326,043.80	9,781.31	-	-	-	-	-	-
Water wells and Storage	423,324.00	12,699.72	-	-	-	-	-	-
TOTAL:	2,854,413.23	85,632.39	9,625.22	18,490.05	0.36	0.34	3,773.55	4,344.38

Total GHG Emissions for 2023

Gathering data related to energy consumption and greenhouse gas emissions for comparison over a period of five years can be a challenging endeavor. Facilities are added, removed, or renovated which makes comparing "apples to apples" difficult. As well, the amount of growth experienced across the municipality puts a higher demand on resources and further creates comparison issues. A good example of this involves the upgrades at the Wastewater Treatment Plant which have resulted in increased hydro consumption and is directly related to the growth of our community. North Perth's total emissions generated in 2023 are included in Table 8. Factoring in the carbon offset of the Tree Planting Program, total emissions were reduced by **138,292 kg**, or **11.83%** since 2018.

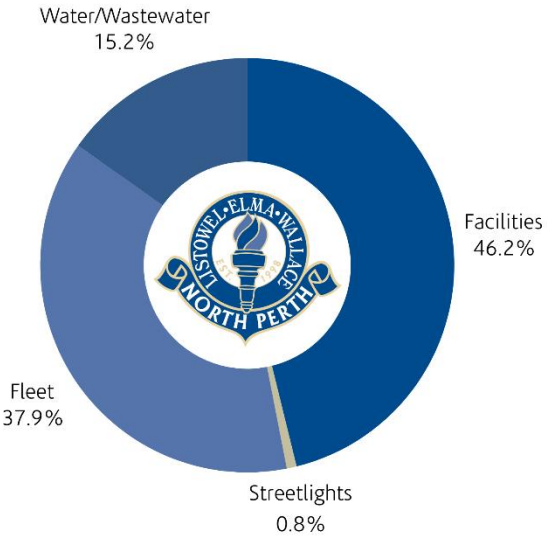


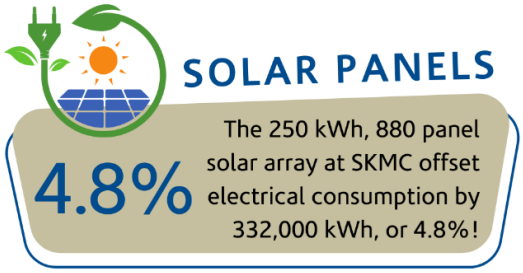
Table 8 – Net Emissions for North Perth in 2023

Category	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	Total Emissions (kg)
Facilities	562,896.53	9.2	14.97	562,920.70
Water/ Wastewater	178,587.34	3,524.10	1,900.54	184,011.98
Streetlights	9,355.32	0	0	9,355.32
Fleet	458,086.77	29.53	25.62	458,141.92
Total Emissions:	**1,205,244.51**	**3,562.56**	**1,941.12**	**1,214,429.92**
Tree Planting Offset	-179,828.10	0	0	-179,828.10
Net Emissions:	**1,025,416.41**	**3,562.56**	**1,941.12**	**1,034,601.82**

Many investments and improvements have been made since the 2019 Energy Conservation and Demand Management Plan (ECDMP). North Perth has grown considerably in population and in the appetite for positive environmental change. A variety of projects to control energy costs and greenhouse gas emissions have been completed. Various methods for achieving emissions reduction goals are outlined below.

Renewable Energy Generation

The Municipality of North Perth operates an 880-panel solar array at the Steve Kerr Memorial Complex (installed July 2018). This array feeds directly into the power grid, creating an offset to the power consumed in that facility, therefore it is not pulled out separately as an offset in the analysis. Since installation, this solar array has offset North Perth's CO_2 emissions by **169,459 kg**, equating to an approximate monetary savings of $521,046.00. In 2023, the solar array produced 332,000 kWh of energy and avoided 35,533 kg of CO_2 emissions.



Following the success of the solar array installation at Steve Kerr Memorial Complex in Listowel, North Perth will consider implementing additional solar energy and ground source energy in new buildings, building retrofits, and facilities across the municipality. Pictured below is an aerial view of the 880-panel solar array at SKMC.

Figure 2 - Solar array at Steve Kerr Memorial Complex

Tree Planting Program

North Perth has made significant investments in reforestation programs, and partnerships with the local Conservation Authorities to analyze forest health within the watersheds overlapping municipal jurisdiction. Undertaking an aerial orthophotographic analysis, North Perth has 9.47% tree cover including woodlots and woodlands governed in the forest conservation by-law. Another recent analysis of forest health in watersheds in North Perth determined that 39% of trees in woodlots in North Perth were standing dead, mainly caused by the impacts from invasive species, namely the Emerald Ash Borer *(Agrilus planipennis)*. For these reasons and more, North Perth has prioritized the investment in tree planting to improve the carbon footprint of municipal operations and to rebuild the resilience of forests within the municipality.

The North Perth Tree Planting Program has been active for close to a decade. In 2023, 3,441 trees and shrubs were planted at various locations across the municipality with the assistance of dedicated community partners. Since the baseline year of 2015, North Perth has planted almost 14,000 trees and shrubs. Assuming a survival rate of 75%, the tree planting program has sequestered more than **179,000 kg** of CO_2 since 2015. These trees act as a carbon offset to municipal operations.

Lighting Retrofit Program

Use of existing facilities in North Perth has evolved greatly since 2018, with the Monkton Library and Childcare Centre amalgamating into the Elma Logan Community Centre as well as the Steve Kerr Memorial Complex replacing the Listowel Memorial Arena. In an effort to reduce carbon emissions and prioritize cost efficiencies related to electricity, the facilities noted in Table 8 received lighting retrofits to replace fluorescent lighting fixtures with LED options, improving energy efficiency and reducing GHG emissions by approximately **2,388 kg** per year.

Table 8- Lighting Retrofits 2019-2023

Facility	Upgrade Year	Annual Savings (kWh)	Annual CO_2 reduction (kg)
Wallace Arena	2020	28,738	862.14
Elma Logan Community Centre	2021	41,636	1,249.08
Listowel Fire Hall	2022	6,335	190.05
Atwood Fire Hall	2023	2,899	86.97
	Total:	79,608	2,388.24

Further investment in lighting retrofits has been deemed valuable for cost savings and GHGE reduction. Listowel Fire Hall will have lighting in the truck bay upgraded from fluorescent to LED in 2024. Other opportunities for upgrades will be considered when work is scheduled for the remaining facilities in North Perth.

Section Three: Reduction Strategies and Measures to Implement

The Municipality of North Perth is committed to meeting targets for greenhouse gas reduction set out by federal and provincial plans, as well as the Perth County Greenhouse Gas Reduction Plan. North Perth will strive to reduce energy consumption, achieve cost savings, and reduce greenhouse gas emissions. In addition to current efforts through renewable energy generation, tree planting, and building retrofit programs, North Perth will achieve energy conservation goals and objectives by considering the implementation of the following measures:

Environmental Sustainability Plan

North Perth's Greenhouse Gas Reduction Plan (2021) will be updated in 2024 as the Environmental Sustainability Plan. This plan will set goals across interim to long-term timelines, develop objectives and include specific targets such as overall emissions reduction to meet provincial and federal targets in 2030 and 2050. This plan will dovetail into the goals and initiatives intended for the Environmental Sustainability Plan to meet goals focused on resiliency and sustainability of the community and municipality of North Perth.

Climate Lens on Capital Investment

Adopting a more formalized climate lens on procurement policy and capital investments will enable North Perth to achieve energy savings and targets to reduce greenhouse gas emissions through building improvements during the next reporting period. Projects within this scope include:

- High efficiency HVAC and appliances
- Retrofit lighting and controls (occupancy sensors)
- Process improvements to reduce energy uses

North Perth will consider energy efficiency of acquired equipment which may require procurement policy modification to incorporate energy efficiencies into the criteria for selection and evaluation of equipment and supplies.

Solar Array Expansion

Incorporating solar panel arrays presents a strategic and environmentally conscious option for North Perth facilities. By leveraging solar energy, municipal owned facilities can markedly offset their electricity usage and operational expenses. The Steve Kerr Memorial Complex solar array offset electrical consumption by 4.8%. Embracing solar power through additional arrays would lead to decreased energy bills and would further offset North Perth's greenhouse gas emissions, contributing to a healthier environment. North Perth will consider potential solar array installations on existing buildings if feasible based on building engineering or space available for freestanding units, and on new projects in the future.

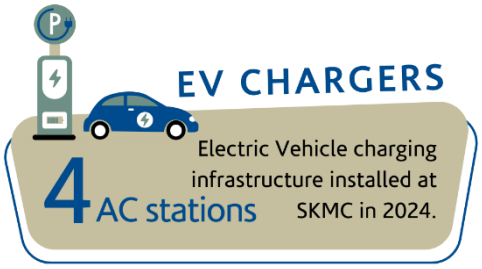
Passive Vegetative Heating and Cooling

Passive heating and cooling methods by the strategic placement of vegetation can lower heating costs in the winter and reduce air conditioning costs in the summer. Endeavouring to bolster or re-landscape the areas around North Perth owned facilities is a cost-effective way of reducing energy consumption for

heating and cooling, while having the subsidiary benefit of providing natural species habitats, aesthetic value, and pollinator habitats.

Emissions Reduction in Fleet

North Perth had one plug-in hybrid vehicle in 2023 and recently received a delivery of three hybrid vehicles. Developing a procurement strategy and plan to ensure electric vehicles are considered when fleet replacements are scheduled to occur is essential in reducing carbon emissions. Currently, there are nineteen (19) light-duty trucks and vans eligible to be converted to hybrid or fully electric. Over the next five-year reporting period, ten light-duty trucks are scheduled to be replaced, which if replaced with hybrid or fully electric options could significantly reduce emissions from fleet.



Installing charging infrastructure at relevant facilities will allow the potential conversion to an electrified fleet as well as supporting members of the community with charging ability across popular facilities and destinations such as downtown cores. Although EV chargers increase electrical usage, less emissions are generated when compared to internal combustion engine vehicles (ICE). Most electricity produced in Ontario is generated by hydroelectric or nuclear power generation, meaning related emissions are low.

Figure 3 - Level 2 AC Electric Vehicle Chargers at SKMC

North Perth installed two public level-2 chargers in 2024 at the Steve Kerr Memorial Complex. North Perth will also receive a level-3 charger which is to be installed at the Listowel Municipal Office in 2024. A funding application has been submitted for an additional set of level-2 chargers in 2024.

Greenhouse Gas Reduction 2029 Target

From 2018 to 2023, North Perth endeavored to reduce GHG emissions and conserve energy. This translated successfully to a reduction in overall GHG emissions by **11.68%.** During the upcoming 5-year reporting period, North Perth 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 North Perth 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_2O (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	0.11
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
Values sourced from the Environment Climate Change Canada, National Inventory Report (2021)			

Appendix B: Emission Factors for Electricity

Consumption Intensity of 30 (g CO_2 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 & Propane

Fuel Type	**CO_2 (g/m^3)**	**CH_4 (g/m^3)**	**N_2O (g/m^3)**
Natural Gas	1921	0.037	0.035
Propane	1515	0.027	0.108
*** Applies to fuel consumed by the Utility, Industry, Residential, Commercial, Institutional, Agricultural, and Transport subsectors*			
Values sourced from the Environment Climate Change Canada, National Inventory Report (2021)			

Appendix D: Emission Factors for Stationary Fuels (CO_2 CH_4 and N_2O)

Source	**CO_2 (g/L)**	**CH_4 (g/L)**	**N_2O (g/L)**
Light Fuel Oil	2753	0.026	0.031
Heavy Fuel Oil	3156	0.057	0.064
Kerosene	2560	0.026	0.031
** Forestry, Construction, Residential, Public Administration, and Commercial/Institutional			
Values sourced from the Environment Climate Change Canada, National Inventory Report (2021)			

Appendix E: Emission Factors for CH_4 and N_2O from Wastewater Treatment and Discharge

TREATMENT	CH_4 (kg)	N_2O (kg)
Secondary with Biological Nutrient Removal	0.0036	0.016
Values sourced from the ICLEI & FCM 2021 Report		

Appendix F: Fleet Inventory – 2023

VEHICLE/EQUIPMENT TYPE	FUEL ($)	FUEL (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Diesel Engines					
2015 Cat Grader	20,668.73	15,132.00	40,553.76	2.01	1.54
2005 John Deere Grader	18,487.43	10,893.50	26,194.58	1.45	1.11
2019 Cat Grader	21,606.24	13,739.70	3,590.40	1.83	1.40
2002 Volvo Grader	9,983.75	6,696.80	17,947.42	0.89	0.68
2017 Cat Grader	16,944.17	10,409.20	27,896.66	1.38	1.06
2003 Trackless	2,305.36	1,436.10	3,848.75	0.11	0.28
2006 Trackless	642.87	405.50	1,086.74	0.03	0.08
2017 Trackless	1,967.62	1,300.00	3,484.00	0.10	0.26
2010 Int. Tandem Plow	10,266.05	6,138.30	16,450.64	0.82	0.63
2014 Int. Workstar Plow	2,988.51	1,796.30	4,814.08	2.39	0.18
2016 Int. Tandem Plow	8,621.28	5,216.90	13,981.29	0.69	0.53
2021 Volvo Plow (Dump)	8,633.21	5,115.70	23,137.00	0.69	0.52
2019 Int. Plow	14,031.61	8,344.50	22,363.26	1.11	1.11
2011 Ford F350 1-Ton	5,547.41	3,307.10	8,863.03	0.44	0.34
2023 Chevy Silverado 1-Ton	8,870.97	5,133.90	13,758.85	0.68	0.52
2009 Sterling 5-Ton	9,685.30	5,664.40	15,180.59	0.75	0.58
2017 Chevy Silverado	4,056.15	2,497.42	6,693.09	0.18	0.49
2011 New Holland Loader	705.73	490.30	1,314.25	0.04	0.01
2020 Kubota LOADER	6,825.97	5,672.00	15,203.80	0.41	0.13
2011 Kubota Tractor	1,254.94	797.28	2,137.11	0.06	0.02
2009 John Deere Loader	7,061.17	4,159.50	11,149.54	0.30	0.09
2011 Kubota Tractor	526.61	332.49	891.25	0.02	0.01
2015 Cat Backhoe	2,451.99	1,493.40	4,002.31	0.20	0.15
2021 Cat Backhoe	2,146.18	1,229.80	3,295.86	0.16	0.13
2017 Cat Compactor	19,119.63	5,915.00	15,852.20	0.79	0.60
2005 John Deere Payloader	8,566.21	7,223.05	19,357.77	0.96	0.74
2010 Elgin Sweeper	1,045.15	634.60	1,700.73	0.08	0.07
2019 Kubota Disc Mower	232.63	167.00	447.56	0.01	0.00
2009 John Deere Mower	1,254.94	797.26	2,136.66	0.06	0.02
2020 Kubota Mower	1,254.94	797.26	2,136.66	0.06	0.02
2012 Spartan E-1 Rescue Pumper	1,847.99	1,129.52	3,027.11	0.15	0.12
2021 Freightliner Tanker	1,847.99	1,129.52	3,027.11	0.15	0.12

VEHICLE/EQUIPMENT TYPE	FUEL ($)	FUEL (L)	CO_2 (kg)	CH_4 (Kg)	N_2O (Kg)
2008 Spartan Rescue Pumper	1,847.99	1,129.52	3,027.11	0.15	0.12
2021 Freightliner Pumper	1,373.25	813.98	2,181.46	0.11	0.08
2007 Freightliner Tanker	1,095.98	687.98	1,843.79	0.09	0.07
2021 Freightliner Pumper	978.41	576.75	1,545.69	0.08	0.06
2003 Freightliner Tanker	921.07	554.86	1,487.02	0.07	0.06
1997 Freightliner Pumper	123.54	79.19	212.23	0.01	0.01
Gasoline Engines					
2019 Ford F-350 1-Ton	4,657.13	3,048.15	7,010.75	0.41	0.34
2019 Ford F-350 1-Ton	4,637.04	3,694.47	8,524.25	0.49	0.41
2019 Dodge Ram	5,549.14	3,116.04	7,189.64	0.62	0.90
2019 Chevy Silverado	6,210.01	4,132.56	9,535.06	0.83	1.19
2021 Chevy Silverado	1,891.18	1,571.91	3,626.86	0.61	0.45
2019 Dodge Ram	5,202.58	2,830.67	6,531.21	0.74	0.82
2021 Chevy Silverado	4,481.16	3,491.63	8,056.24	0.70	1.01
2024 Chevy Silverado	89.63	64.25	148.24	0.01	0.02
2019 Ford F150 XLT	4,566.56	2,705.97	6,243.48	0.54	0.78
2018 Dodge Ram	5,407.92	3,859.02	8,903.92	1.09	0.42
2014 Chevy Silverado	3,989.09	2,705.86	6,243.23	0.54	0.78
2024 Chevy Silverado 1500	195.24	138.63	319.86	0.03	0.04
2019 Ford F150	1,148.36	598.49	1,380.90	0.12	0.17
2014 Dodge Ram	921.27	566.10	1,306.16	0.11	0.16
2005 Dodge Ram	1,930.27	1,224.18	2,824.55	0.25	0.35
2022 Chevy Silverado	1,718.11	1,074.27	2,478.59	0.22	0.31
2007 Chevy Silverado	782.99	485.23	1,119.57	0.10	0.14
2022 Chevy Silverado	2,961.93	1,925.91	4,443.65	0.39	0.56
2013 GMC Sierra	2,961.93	1,925.91	4,443.65	0.39	0.56
2019 Ford F150 XLT	2,961.93	2,322.84	5,359.49	0.47	0.67
2022 Ford F150	3,590.80	505.63	1,166.64	0.10	0.15
2015 Dodge Caravan	6,782.93	4,013.34	9,259.98	0.80	1.16
2018 Hybrid Mitsubishi	1,069.65	688.74	1,589.13	0.14	0.20
2019 Dodge Grand Caravan	601.95	380.93	878.92	0.08	0.11
Propane Engine					
Olympia Ice Resurfacer (3)	9,643.21	2,430.00	3,681.45	0.26	0.00
TOTAL:	311,740.98	188,538.31	458,086.78	29.53	25.62

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