JUNE 2024

MUNICIPALITY OF West Perth

ENERGY CONSERVATION & DEMAND MANAGEMENT PLAN

2024-2029

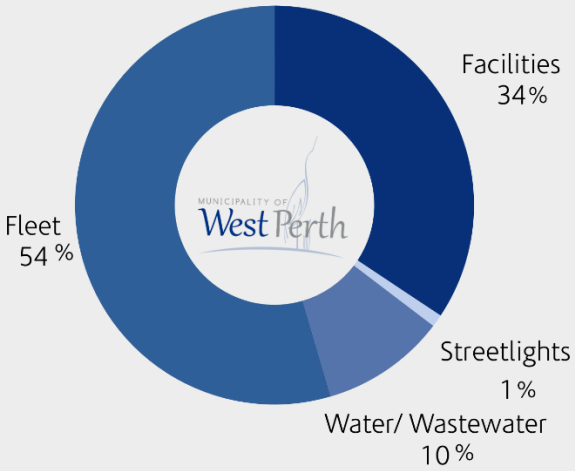
ENERGY CONSUMPTION & EMISSIONS
CONSERVATION & REDUCTION GOALS

Contents

Executive Summary

2023 GREENHOUSE GAS EMISSIONS

West Perth has reduced total GHGE by 5.2% since 2018.



FACILITY UPGRADES

The Municipal Office, Fire Hall, Keterson Pavilion, and Mitchell Operations Centre have all been rebuilt as new facilities since 2018, showing an approximate decrease of greenhouse gas emissions by:

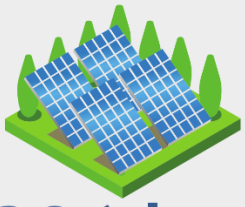
-57,915 kg

EMISSION OFFSETS

West Perth's tree planting programs have contributed 14,014 trees to the landscape since 2018, providing carbon sequestration power to offset emissions by 5.12%.

39,028 kg/yr

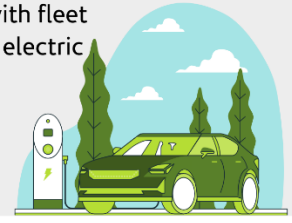
Solar panels at the Wastewater Treatment Plant generated 10,190 kWh of renewable electricity in 2023, offsetting GHGE by 306 kg/year. Three new facilities are 'solar ready' to expand solar arrays across the municipal campus in coming years.



306 kg/yr

CONSERVATION CHANGES

- LED motion activated lighting across facilities.
- Community garden spaces built and utilized.
- Parks and Trails Masterplan for green links and alternate community transportation planning.
- EV Chargers installed, with fleet transition to hybrid and electric in the future.



OPPORTUNITIES FOR 2029

- Decrease operational utility costs with efficiency upgrades
- Electrifying light duty fleet to reduce emissions
- Use a climate-lens for decisions & investments

Introduction to Municipality of West Perth

The Municipality of West Perth was incorporated in 1998 following the amalgamation of the Townships Logan, Hibbert, Fullarton and Mitchell. West Perth is where nature, industry and culture interact harmoniously. Located within 35 minutes of London, Waterloo and Goderich, West Perth is home to 9,000 residents. Comprised of rolling farmland, quaint villages and bustling towns, West Perth is a popular destination to live, work, play and invest. A bustling small-town at its core, West Perth is a perfect location for businesses, being within a close distance to all major markets. West Perth is largely a rural municipality, with a variety of small settlement areas such as Brodhagen, Cromarty, Dublin, Fullarton, Monkton (split with North Perth), Russeldale, St. Columban (split with Huron East), Staffa, and a core urban area in Mitchell.

Ontario Regulation 25/23

Ontario Regulation 25-23 was created under the *Electricity Act, 1998,* requiring that every municipality, municipal service board, and public agency update an Energy Conservation and Demand Management Plan written July 1, 2019 every five years afterwards.

The Energy Conservation and Demand Management Plan includes three sections. The first section discusses West Perth's annual energy consumption and the emissions associated with their operations. The second section provides a description of the greenhouse gas emission offsets and energy conservation measures currently in place. The third section provides a description of previous, current and proposed ways to conserve or reduce energy consumed by the operations of the municipality. This report enables the Municipality to predict the future demand for energy, forecast the 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 produced before July 1, 2029.

Commitment to Greenhouse Gas Reduction

The Municipality of West 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. As a lower tier municipality working alongside a County and three other passionate local municipalities, West Perth strives to lead and collaborate on effective, meaningful projects and improvements across the municipality.

In the 2019 Energy Conservation and Demand Management Plan, West Perth outlined a desire to **achieve a 3% reduction in greenhouse gas emissions by 2024** using 2012 as the baseline year. The methods for meeting this objective included reducing energy consumption, investing in energy efficient and renewable projects to contribute to offsets, and seeking opportunities for technological advancement.

Section One: Annual Energy Consumption and Emissions

Municipal Facilities

The Municipality of West Perth owns twenty-one (21) facilities related to operations in roads, water/ wastewater, municipal administration, recreation and leisure, and community services (Table 1).

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

FACILITY	ADDRESS	SIZE (M^2)	TYPE	USE	FUEL
Municipal Office	160 Wellington St. Mitchell	1,300	Administrative office, municipal council chambers	Daily	Electricity, Natural Gas
Former Municipal Office	169 St. David St. Mitchell	1,733	Administrative office, municipal council chambers	Unoccupied	Electricity & Natural Gas
West Perth Fire Hall	170 Wellington St. Mitchell	1,162	Fire Hall, offices, training room, storage space	Daily	Electricity & Natural Gas
West Perth Public Library	105 St. Andrew St. Mitchell	594	Public Library	Daily	Electricity & Natural Gas
OPP/ Water Building	132 St. George St. Mitchell	614	Police Station and Well Water extraction station	Daily	Electricity & Natural Gas
West Perth Arena, Community Centre, and Pavilion	185 Wellington St. Mitchell	3,850	Community Centre, Ice rink, Administrative rooms	Daily	Electricity & Natural Gas
Mitchell Lions Pool Bathhouse	19 Blenheim St. Mitchell	367	Indoor recreation facility	Seasonal	Electricity & Natural Gas
Brodhagen Community Centre	6708 Perth Line 44, Brodhagen	732	Community Centre	Daily	Electricity & Propane
Dublin Community Centre	7015 Helen St. Dublin	384	Community Centre	Daily	Electricity & Natural Gas
Mitchell Operations Centre	50 Arthur St. Mitchell	2,812	Equipment/Vehicle storage, Administrative offices	Daily	Electricity & Natural Gas
Water Treatment 1,2,3 (Wells #1, #2)	132 St. George St. Mitchell	284	Water Treatment Facility	Daily	Electricity
Well #3	100 St. George St. Mitchell	16	Water Pumping Facility	Daily	Electricity
Water Treatment and Well #4	48 Arthur St. Mitchell	130	Water Treatment Facility, Maintenance room	Daily	Electricity
Water Booster/ Standpipe Building	87 Arthur St. Mitchell	73	Water Pumping Facility, Maintenance room	Daily	Electricity
Mitchell Wastewater Treatment Plant	5949 Frank St. Mitchell	366	Sewage Treatment Facility, Maintenance room	Daily	Electricity & Natural Gas
Herbert St. Pumping Station	79 Herbert St. Mitchell	55	Sewage Pumping Facility, Maintenance room	Daily	Electricity
James St. Pumping Station	130 James St. Mitchell	232	Sewage Pumping Facility, Maintenance room	Daily	Electricity
Welcome Centre	9 Huron Rd, Mitchell	37	Tourism Booth, Community Sign	Seasonal	Electricity
Lions Club Pavilion	17 Blanshard St, Mitchell	72	Pavilion with Kitchen	Seasonal	Electricity
Lions Club Barn	Blenheim St, Mitchell	65	Zoo with Animal resources	Daily	Electricity
Elevated Water Tank	125 Clarke St., Michell	248	Water Pumping Facility, Maintenance room	Daily	Electricity

Facility Energy Consumption in 2023

In 2023, West Perth used water, electricity, propane, and natural gas in facilities. Annual energy consumption for 2023 is outlined in Table 2, with site and facility specific breakdown included in Table 3, excluding water and wastewater facilities shown in Table 4.

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

ENERGY SOURCE	SUPPLIER	MEASUREMENT	CONSUMED	COST
Water	West Perth	Cubic Meter (M^3)	8,178.00	$ 16,042.68
Electricity	ERTH Power; Hydro One	Kilowatt Hour (kWh)	3,331,901.00	$ 433,147.13
Natural Gas	Enbridge	Cubic Meter (M^3)	124,701.00	$ 28,177.18
Propane		Litre (L)	1,062.30	undefined
			Total:	**$ 477,366.99**

Consumption across facilities varied based on usage type. Emission Factors for electricity, natural gas, and propane were sourced from the Environment Climate Change Canada, National Inventory Report (2021) found in the Appendices.

Table 3 - Facility Energy Consumption in 2023

Facility	ELECTRICITY Consumption (kWh)	CO_2 (kg)	NATURAL GAS & PROPANE Consumption (M^3) (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Municipal Office	49,093.20	1,472.80	5,668.00	10,888.23	0.21	0.20
Former Municipal Office	40,882.00	1,226.46	8,633.00	16,583.99	0.32	0.30
West Perth Fire Hall	45,316.80	1,359.50	10,259.00	19,707.54	0.38	0.36
West Perth Public Library	23,035.00	691.05	7,253.00	13,933.01	0.27	0.25
OPP/ Water Building	65,839.00	1,975.17	2,336.00	4,487.46	0.09	0.08
West Perth Arena, Community Centre and Pavilion	384,586.00	11,537.58	45,003.00	86,450.76	1.67	1.58
Mitchell Lions Pool Bathhouse	52,562.00	1,576.86	14,101.00	27,088.02	0.52	0.49
Brodhagen Community Centre	60,029.00	1,802.67	1,062.30	1,609.385	0.03	1.15
Dublin Community Centre	13,433.00	402.99	2,628.00	5,048.39	0.10	0.09
Mitchell Operations Centre	52,875.00	1,586.25	27,083.00	52,026.44	1.00	0.95
Welcome Centre	16,316.00	489.89	0	0	0	0
Lions Pavilion	4,320.00	129.60	0	0	0	0
Lions Zoo	9,843.00	295.29	0	0	0	0
TOTALS:	**818,130.00**	**24,546.11**	**122,964 M_3 1,062.30 L**	**237,823.23**	**4.59**	**5.45**

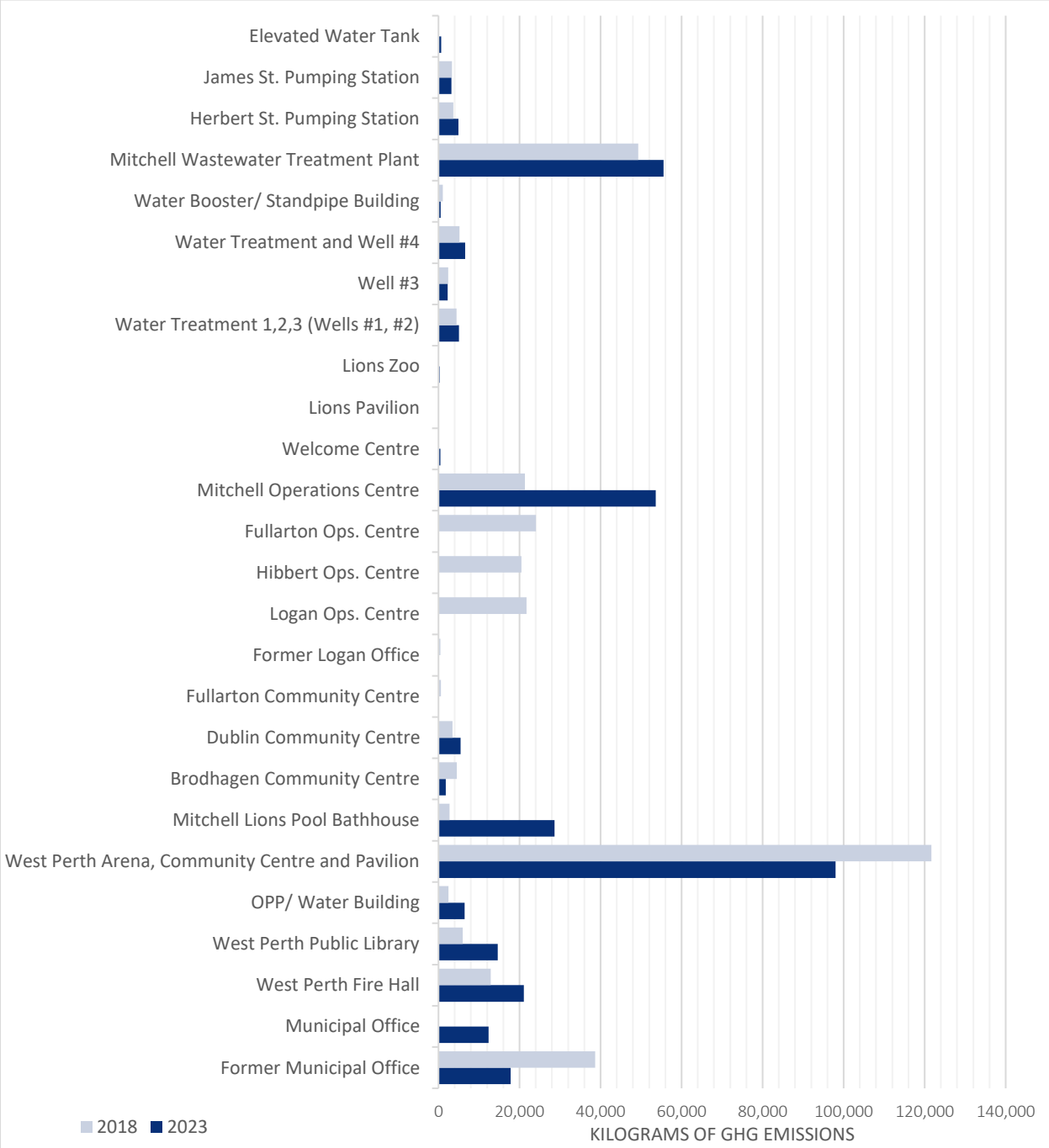
CO_2 = Carbon Dioxide (30g/kwh) (1921 g/m^3) CH_4 = Methane (0.037g/m^3) N_2O = Nitrous Oxide (0.035g/m^3)

Total energy consumption by facility is visually represented in Figure 1 comparing 2023 to 2018's reported consumption. Five (5) facilities were sold between the last report in 2019 and 2023 (Figure 1), including the Mitchell Friendship Centre which was not reported. Four (4) other facilities were added to the analysis for 2023, either because the facility is new, or because the Municipality is now responsible for the electricity, propane, or natural gas management. The only remaining facility using and consuming propane is the Brodhagen Community Centre.

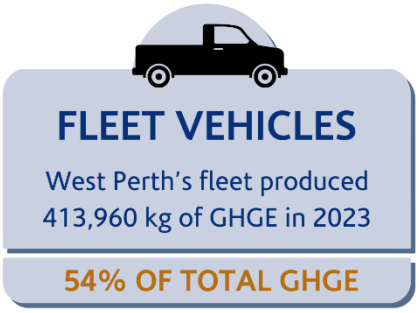
Despite all the changes to the portfolio of facilities, West Perth achieved the 2018 emissions reduction objective, decreasing facility emissions by **2.63%**. Eleven (11) facilities decreased emissions, while fifteen (15) saw an increase in emissions. The West Perth Arena, Community Centre and Pavilion experienced the

greatest decrease during the reporting period, and underwent significant efficiency improvements including new insulation, roofing, lighting, and cooling technology for the ice rink. The Mitchell Operations Centre experienced the greatest increase in emissions. However, it should be noted that the Mitchell Operations Centre replaced three rural-based operations centres in Logan, Hibbert, and Fullarton. If these rural shops and Mitchell Operations Centre in 2018 were combined, their total emissions would have equaled 87,557.28 kg; whereas in 2023 the Mitchell Operations Centre had 53,614.64 kg of emissions, meaning the total emissions from operations centres has actually decreased by **38.8%**, reiterating the positive impact centralizing operations has had on West Perth's financial and emissions goals.

Figure 1 - Annual GHGE by Facility, 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 recommends including fleet vehicles in greenhouse gas emissions (GHGE) calculations to more accurately manage assets and reduce operational emissions over time. Going forward, West 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. GHGE 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, Municipality of West Perth owned a fleet of fifty-one (51) vehicles (Appendix B).

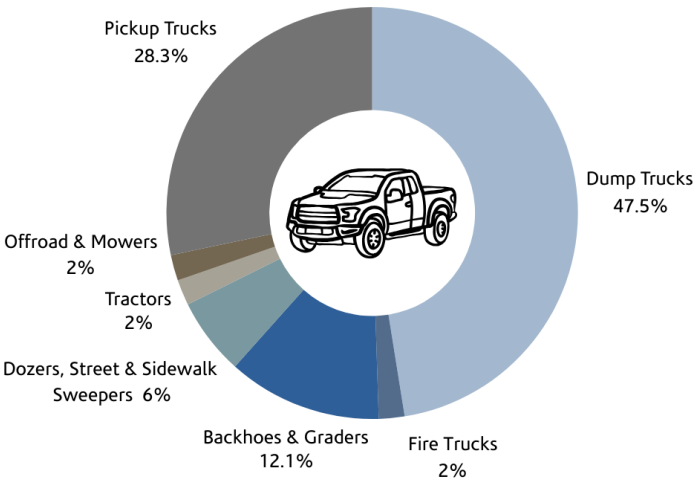
- Twenty-nine (29) vehicles use diesel. The average $/L of diesel in 2023 was $1.31
- Twenty-one (21) vehicles use gasoline. The average $/L of gasoline in 2023 was $1.44.
- One (1) vehicle is electric. This vehicle is an ice resurfacer.

The fifty-one vehicles in fleet in 2023 amassed a total of **413,960 kg** of greenhouse gas emissions. The majority of emissions were produced by dump trucks and pickup trucks. These vehicles are primarily used by the operations department focused on road maintenance and environmental services, both integral to maintaining high quality standards of community amenities. Figure 2 illustrates the composition of vehicles making up West Perth's fleet in 2023.

31% of West Perth's fleet are considered light-duty vehicles which have many options available for hybrid or electric alternatives. The remaining 69% of fleet is considered heavy-duty; there are few, if any, options available to replace with low emission alternatives. Replacing light-duty vehicles with hybrid or electric options would have a significant impact on the greenhouse gas emissions produced by West Perth's fleet.

The complete list of vehicles, fuel consumption, and greenhouse gas emissions can be found in Appendix B. Emission factors for Mobile Combustion can be found in Appendix A.

Figure 2 - Vehicle composition in 2023



Electric Vehicle Chargers

In 2023, work began to acquire a network of Electric Vehicle chargers across municipally owned facilities in West Perth. Eight (8) Level-2 AC *Chargepoint* charging ports were successfully installed in January 2024 and energized for community use in February 2024. There are four (4) ports at the West Perth Municipal Office, and four (4) ports at Keterson Pavilion, which shares a parking lot with the West Perth Community Centre and Arena. The addition of these chargers will increase electricity use at the facilities they are wired into, however, the offset they provide to community-wide emissions is important as West Perth encourages the

community to move away from internal combustion engine vehicles. One (1) Level-3 DC Fast Charger has been planned to be added to West Perth Community Centre and Arena, and is waiting funding approval in 2024 before installation can occur, in partnership with IVY Charging Networks and Rural Recharge. Chargers installed in 2024 will not be included in the analysis of this ECDMP, but will be shown in 2029's Plan.

Streetlights and Traffic Signals

The Municipality of West Perth is primarily rural with a few small hamlets and even fewer villages and towns. Streetlights exist in the Town of Mitchell, Dublin, Brodhagen, Fullarton, Russeldale, Cromarty, Staffa, Monkton, and St. Columban. In 2015, all existing streetlights underwent conversion to LED luminaries to improve energy efficiency and reduce operational costs. In 2023, West Perth operated **822** streetlights with a total output of 49,858 Watts operating on average for 12-hours within a 24-hour period. The annual electricity consumed by streetlights amounted to **218,378.04 kWh** in 2023. The greenhouse gas emissions produced by the electricity consumed to operate the streetlight networks equates to **6,551.34 kg** per year.

Communities in West Perth are experiencing substantial growth, primarily in the form of residential neighbourhoods both in densification and sprawl. With the growth of communities also comes the necessity for more servicing and therefore more streetlights. The expectation that additional streetlights and traffic signals will cause electricity consumption to increase over the next five-year reporting period is rational. However, consideration will be made to ensure all future lighting installed complies with Energy Star standards will assist in moderating the intensity of any increase that may be experienced.

Water and Wastewater

The Municipality of West Perth provides municipal water and sanitary sewer within the serviced settlement of Mitchell. Managed by the department of Environmental Services, the operation and maintenance of all municipal water and wastewater facilities including wastewater treatment, water towers, and sewage pumping stations falls under the scope of the Energy Conservation and Demand Management Plan. The consumption and emissions data for water and wastewater infrastructure is described in Table 4 in detail. Ensuring facilities related to water and wastewater are analyzed separately from other facilities allows a more strategic analysis of facility usage, vs. water infrastructure usage.

Table 4 – Water and Wastewater Facility Energy Consumption in 2023

	ELECTRICITY		NATURAL GAS			
Facility	Consumption (kWh)	CO_2 (kg)	Consumption (M^3)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Water Treatment 1,2,3 (Wells #1, #2)	167,998.00	5,039.94	0.00	0.00	0.00	0.00
Well #3	74,647.00	2,239.41	0.00	0.00	0.00	0.00
Water Treatment and Well #4	218,818.00	6,564.54	0.00	0.00	0.00	0.00
Water Booster/ Standpipe Building	17,058.00	511.74	0.00	0.00	0.00	0.00
Mitchell Wastewater Treatment Plant	1,740,072.00	52,202.16	1,737.00	3,336.78	0.06	0.06
Herbert St. Pumping Station	164,922.00	4,947.66	0.00	0.00	0.00	0.00
James St. Pumping Station	107,445.00	3,223.35	0.00	0.00	0.00	0.00
Elevated Water Tank	22,811.00	684.33	0.00	0.00	0.00	0.00
TOTALS:	**2,513,771.00**	**75,413.13**	**1,737.00**	**3,336.78**	**0.06**	**0.06**

CO_2 = Carbon Dioxide (30g/kwh) (1921 g/m^3) CH_4 = Methane (0.037g/m^3) N_2O = Nitrous Oxide (0.035g/m^3)

A brief summary of the water processed by these facilities, and the associated GHGE are described in Table 5. A comprehensive and detailed annual report is produced and available on the West Perth website for public viewing. As shown in Figure 1, five (5) of the water and wastewater facilities experienced an increase in emissions between 2018 and 2023, while three (3) had a decrease.

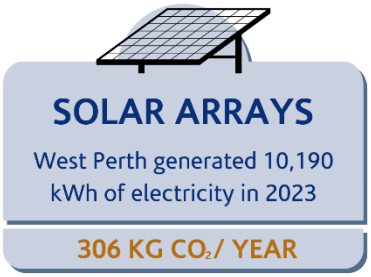
In 2023, 10.4% of the total GHGE produced by Municipality of West Perth originated from the facility energy consumption and emissions produced by water and wastewater systems. Ensuring these systems are functional, exceed quality standards, and maintain efficiency are key considerations for Environmental Services staff at West Perth. Maintaining existing infrastructure through the growth seen in the Town of Mitchell has been a challenge, and investment has been made to further protect and plan for lifecycle upgrades.

Table 5- West Perth Water & Wastewater Emissions in 2023

Facility	Input (Megalitre)	Output (Megalitre)	CH_4 (kg)	N_2O (kg)
Mitchell Wastewater Treatment Plant	1,832.40	1,832.40	546.00	0.00
Water Treatment 1,2,3	372.41	372.41	0.00	0.00
Water Treatment & Well #4	744.83	744.83	0.00	0.00

In 2023, the majority of inputs to the Wastewater Treatment Plant originated from industrial sources. As the community of Mitchell continues to grow, additional usage will occur from industrial, commercial and residential sources. An analysis on drinking water and wastewater system expansions has been done to determine the costs associated with an expansion, and a timeline for when an expansion would be necessary completed. An expansion to the existing water and wastewater systems may be necessary in the next 10-years, (or two reporting cycles); Therefore, an anticipation that emissions generated by this category are probable to increase. Ensuring technology incorporated into the current system is the most efficient, and any emission offset potential capitalized on will be integral to reduce the significance of the greenhouse gas emissions generated by such an expansion.

Renewable Energy Generation



The Municipality of West Perth owns and operates one free-standing, 40 panel, 10-kilowatt solar photovoltaic system located at the Wastewater Treatment Centre in Mitchell (see photo below). In 2023, the system produced 10,190 kWh of energy. A solar heating system at Lions Pool in Mitchell is a rooftop heating system which exclusively warms the pool water. There is no metering on this passive solar water heater, and therefore cannot be quantified in this analysis (Table 6). The renewable energy generation produced by the solar array at 5949 Frank St. offsets West Perth's CO_2 emissions by 305.7 kg per year, as well as generating a meager reduction in electricity cost for the facility.

Table 6 - Renewable Energy Generation (2023)

Energy Source	Address	Description	Annual Production
Solar Panel	5949 Frank St. Mitchell	Ground mounted 'tracker' style (2013)	10,190 kWh
Solar Heating System	19 Blenheim St. Mitchell	Pool heater system from rooftop of pool bathhouse (2010).	unknown

The Municipality of West Perth has built 3 new buildings within the last 5-year reporting period that have been strategically engineered with roofs that are 'solar ready' and electrical panel space to accommodate a solar input. The new Municipal Office, Fire Hall, and Keterson Park Pavilion are all viable rooftop solar array candidates, which would dramatically extend the Municipality's renewable energy generation and therefore GHGE offsets.

West Perth Healthy Forests Grant & Tree Power Program

In a rural municipality, heavily dominated by agriculture and industrial land uses, forest cover has been extremely low, falling well below the recommended coverage rates by Environment and Climate Change Canada. In 2023, West Perth had the lowest forest cover out of all four local municipalities in Perth County, at 7.76% of the municipal landcover. This equated to 44.967 square kilometers of tree cover, not specifically forests, in West Perth. In a recent study by Maitland Valley Conservation Authority, forest quality is also at an all-time low, suffering impacts by invasive species causing over 30% of trees in forests to be standing dead. In order to maintain healthy and resilient ecosystems, communities, and industries, investment in rejuvenating natural infrastructure is imperative, which includes tree cover.

In 2021, the Municipality of West Perth launched the West Perth Healthy Forests Grant, a financial incentive program for West Perth landowners to plant trees to improve ecosystem resiliency, carbon sequestration, and agricultural land preservation. The incentive offers eligible applicants a subsidy to offset the cost of trees by up to 30%. As

of 2023, 44 private landowners had participated in the program, planting a total of 6,353 trees in the Municipality. Trees improve air quality, absorb groundwater, provide thermal regulation, and sequester carbon at a rate of 2.8 kg per year in rural areas (Trees Canada, 1999). The trees planted through this program have a combined carbon sequestration value of **17,788.40 kg** per year.

Aside from tree sale programs, municipal operations have planted trees between 2019 and 2023 on public lands to improve forest cover and tree canopy in the Municipality, including:

Year	Location or Program	# Trees
2018	Plant a Tree Program	126
2020	Municipal Tree Planting	150
2021	Veterans Park	17 trees, 20 shrubs
2022	Cooper Field	10
2022	Municipal Office & Fire Hall	8
2022	Heskey Flats	150 (high mortality reported)
2023	Dog Park	55
2018-2023	General Operations	7125
	Total:	7,661

These 7,661 trees planted, minus a predicted 50% mortality at the Heskey Flats in 2022, have an annual carbon sequestration value of **21,240 kg** of CO_2. Continuing to plant trees on roadsides, parks, and other public lands is an important addition to the community for all the benefits trees provide, but also as a valuable tool to sequester carbon and process other greenhouse gases in West Perth. In total, between 2018 and 2023, 14,014 trees have been planted or subsidized by the Municipality, creating a carbon sequestration power of **39,028.40 kg** per year of CO_2. This equates to a total emission offset of **5.12%.**

In 2024, West Perth initiated a Tree Power Program, a tree sale for residents of West Perth to purchase one or two native trees to be planted on urban or rural private lands. This program differs from the Healthy Forests Grant as it caters to urban residents who may only want one tree, at a subsidized price. Tree sales in 2024 amassed 150 trees. Although these trees cannot be included in the summary for the reporting year (2023), moving forward West Perth intends on continuing to invest in tree planting programs across the municipality to promote habitat resilience and ecological sustainability, as well as reap the benefits of the sequestration power.

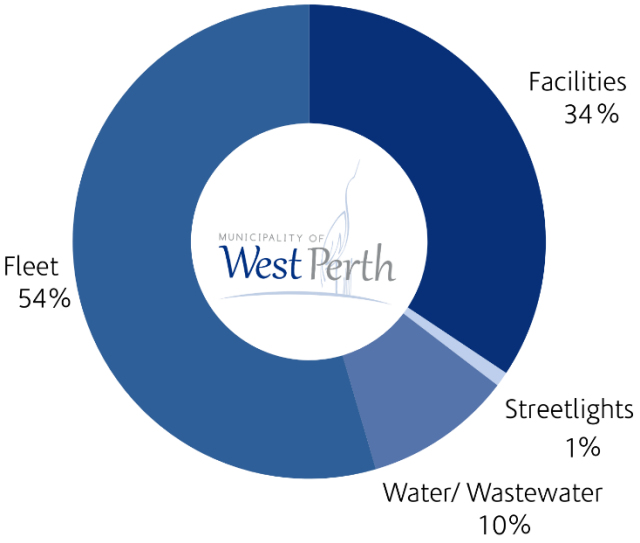
Municipality-wide Conservation Measures

Across municipal facilities, many steps have been taken to progress operations towards the goals set out in the 2021 Greenhouse Gas Reduction Plan. Improvements include:

- LED lighting upgrades at the Arena, Library, Community Centre, Parks and Playgrounds, including baseball lighting. All lighting fixtures in new facilities, namely the Fire Hall and new Municipal Office are occupant controlled (motion detection) LED lighting.
- Community gardens established in Mitchell and operated through library and recreation community education programs to grow food and engage seniors, families, and children.
- Facility and sports field condition assessments have been completed to monitor lifecycle of assets and scope opportunities for maintenance improvements or replacement to improve efficiency and quality of assets.
- A Parks and Trails Master Plan is in progress and will highlight green-links, active transportation corridors, and opportunities for ecological integration into urban and rural communities.

Net Greenhouse Gas Emissions for 2023

Determining the emissions produced by The Municipality of West Perth in 2023 occurred through the analysis of four categories of emissions sources: facilities, streetlights, water/ wastewater, and fleet. Between these four categories, a total of **762,186.71 kg** of greenhouse gas emissions was produced in this reporting year (Table 7). **54%** of the total emissions were generated by fleet, with facilities generating **34%**, water/ wastewater producing **10%** of emissions, and streetlights only contributing **1%** of the total emissions.



Through this analysis, observations can be made about areas that should be prioritized for further GHGE reduction, as well as opportunities for offset contributors to meet objectives of net zero by 2050. The existing offset programs utilized by Municipality of West Perth in 2023 included a tree planting program, and solar energy generation. These two offset programs contributed to a reduction of greenhouse gas emissions by **5.2%.** Net GHG emissions produced in 2023 by the Municipality are 722,852.61 (Table 7).

Table 7 - Municipality of West Perth's Net Emissions for 2023

Category	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	Emissions (kg)
Facilities	262,369.34	4.59	5.45	262,379.38
Water/ Wastewater	78,749.91	546.06	0.06	79,296.03
Streetlights	6,551.34	-	-	6,551.34
Fleet	413,897.61	39.89	22.46	413,959.96
Total Emissions:	**761,568.20**	**590.54**	**27.97**	**762,186.71**
Tree Planting Offset	- 39,028.40	-	-	- 39,028.40
Solar Generation	- 305.70	-	-	- 305.70
Net Emissions:	**722,234.10**	**590.54**	**27.97**	**722,852.61**

CO_2 = Carbon Dioxide CH_4 = Methane N_2O = Nitrous Oxide

Section Three: Reduction Strategies and Measures to Implement

The Municipality of West Perth is dedicated to achieving greenhouse gas emission reduction targets set by various levels of government. West Perth aims to reduce emissions using 2005 as a baseline year by **35-45% by 2030** and **80-100% by 2050**. Energy efficiency reduces emissions and offers additional advantages, including:

- Prolonging facility life through retrofits;
- Enhancing financial efficiency by avoiding long-term costs with green technology investments;
- Alleviating pressure on critical infrastructure like water treatment and waste management.

To reach energy conservation objectives, West Perth will implement the following strategies:

Environmental Sustainability Plan

The Municipality of West Perth adopted the Perth County and associated Municipalities Greenhouse Gas Reduction Plan in 2021 to address climate change by ambitiously reducing local greenhouse gas emissions. This comprehensive plan consists of 20 actions and 7 goals spanning 7 categories to decrease GHGE and enhance community resilience. West Perth is actively working towards completing these actions, such as implementing public transportation networks, installing electric vehicle (EV) charging stations at municipal facilities, and updating the recreation, parks, and trails masterplan to promote active transportation. These initiatives complement the existing goals outlined in the Greenhouse Gas Reduction Plan, which is set to be updated in 2024 as the Environmental Sustainability Plan to meet provincial and federal milestones for 2030 and 2050.

Some proposed measures under this Energy Conservation and Demand Management Plan include exploring carbon offset strategies like utilizing renewable energy sources (solar panels), transitioning to non-fossil fuel fleet vehicles where feasible (Battery Electric Vehicles), and continuing to educate and incentivize the community to be mindful of energy consumption.

Solar Array Expansion

Incorporating solar panel arrays on existing facilities presents a strategic and environmentally conscious option for West Perth. By leveraging solar energy, municipally owned facilities can markedly offset consumption of electricity and operational expenses. The existing solar array owned by Municipality of West Perth at the Wastewater Treatment Centre offset electrical consumption in facilities by **1.25%** and offset GHGE from facilities by **0.11%.** Proposed locations for additional solar arrays include the Municipal Office at 160 Wellington Street, the Fire Hall at 170 Wellington Street, and Keterson Park Pavilion at 185 Wellington Street in rooftop applications. All three of these buildings were engineered with the intention on incorporating solar arrays in capacity for added weight-load on the roof and panel/electrical capacity, understanding the commitment to net zero by 2050. Therefore, these three buildings are considered 'solar ready'. New funding through the Federation of Canadian Municipalities has been announced to help municipalities fund emissions reduction projects, which could be accessed to complete these solar array expansions.

Objective: In the next five-year reporting period, West Perth will release a request for quotes for solar systems on three (3) recently built facilities, and establish a plan in the capital budget to support the investment in solar for short and long-term installations. A five-year target of adding additional solar panel arrays to increase the emission offset to **10%,** or systems with output of **100 kW** generation is desirable.

Emission-free Vehicle & Handheld Machinery Acquisition

The advantages of electric vehicles in decreasing greenhouse gas emissions are evident. Even when considering a lifecycle analysis, electric vehicles have a notably lower environmental impact. It is crucial to establish a procurement strategy and plan that prioritizes electric vehicles when replacing fleet with the goal to reduce emissions from this category. West Perth operates nine (9) light-duty pickup trucks for various departments like building, fire, recreation, and roads. Six (6) of these vehicles are candidates to transition to hybrid or electric models before the next reporting period in 2029. The Olympia ice re-surfacer in use is currently fully electric and is due for replacement in 2028 which will be another electric model, aiming to maintain the device's efficiency.

In the side-by-side comparison provided in Appendix D, showcasing a fully electric truck, a hybrid truck, and a standard internal combustion engine (ICE) truck, the carbon emissions from a full battery/tank display a 97.5% variance between ICE and electric, and a 22% difference between ICE and hybrid. With the six (6) pick-up trucks slated for replacement within the next 5 years, an estimated emissions reduction of between **7,841 and 34,752 kg** of GHGE per year.

Installing adequate charging infrastructure at relevant facilities is crucial for ensuring the efficiency of a fleet's transition to electric vehicles. Despite the increased electrical usage associated with charging infrastructure, the environmental impact is significantly lower compared to supporting the use of internal combustion engine vehicles. A study conducted in British Columbia revealed that gasoline cars produce greenhouse gas emissions over 40 times higher than electric cars charged using hydroelectric sources (University of British Columbia, 2023). In 2024, eight (8) publicly accessible ChargePoint Level 2-AC EV chargers were installed at municipal facilities located at 160 Wellington Street and 185 Wellington Street in Mitchell. Additionally, private chargers may need to be considered for the Public Works yard as the department's vehicles switch to electric. To support this initiative, a Ministry of Transportation Ontario ChargeON grant application was submitted in January 2024. This application aims to collaborate with IVY Charging Networks to install a publicly accessible Level 3-DC Fast Charger at 185 Wellington Street.

Objective: In the next five-year reporting period, six light duty vehicles are scheduled for replacement. Hybrid or fully electric options will be preferentially considered to reduce the significant emissions produced by fleet. At least **50%** of these vehicles will be replaced with hybrid or fully electric options.

Other than the reported fleet vehicles, the Municipality of West Perth operates many hand-held gas-powered tools, including chainsaws, lawn trimmers, pressure washers, blowers, hedge trimmers, and more. All tools in this category have battery-powered alternatives readily available at similar prices. Not only are battery powered options more efficient, they are also lightweight, quiet, and simple to use and maintain. The noise factor alone is a strong benefit to surrounding landowners when work is being completed in urban areas. West Perth Operations and Parks departments commit to replacing these smaller tools with battery operated alternatives to continue to reduce fuel consumption, emissions, and storage of fuels across facilities.

Objective: Phase-out small fuel-powered hand tools and equipment with battery powered options, sourcing one brand to maintain efficient and simple operations with battery-to-device compatibility.

Encouraging employees to work from home and utilize active or shared transportation options for commuting can help decrease greenhouse gas emissions subsidiary to Municipal operations. Providing training to educate staff about the advantages of these practices and the overall impact on reducing both personal and municipally related emissions is crucial in eliciting behavioural change within our communities.

Habitat and Green Space Integration

Above and beyond the benefits of energy conservation and demand management, West Perth is committed to increasing availability of pollinator habitat and natural infrastructure in and around facilities to improve general environmental benefits. In 2022, a large pollinator field was planted adjacent to the West Perth Wetlands, with the intention to improve a vacant parcel of land into something beneficial for pollinators and migratory birds, including grassland species. This project was less than successful due to a lack of rain helping seeds propagate, and an onslaught of unintended species emerging, overtaking the planted pollinator species. Mowing of this property also occurred at a non-ideal time due to miscommunication. A replanting of grassland and pollinator species could be undertaken to revive and revitalize the project, along with the incorporation of a small trail for recreational uses. This project will be included in the scope of the new Parks and Trails Masterplan.

A rain garden was planned to be installed between the West Perth Fire Hall and the West Perth Municipal Office upon completion of both facilities in 2022. However, due to a lack of available native vegetation through the partner organization Upper Thames River Conservation Authority and municipal budget constraints on the municipal office project, this project was never realized. The potential to complete this project still exists, and would be a beautiful and beneficial use of this marginal space. Therefore, West Perth intends to complete the scope of this rain garden or pollinator garden before the next ECDMP.

Objective: Realize two pollinator habitat projects at owned lands and facilities in Mitchell in order to increase habitat capacity for at risk, vulnerable, and migratory bird and insect species.

2029 Greenhouse Gas Reduction Target

From 2018 to 2023, the Municipality of West Perth endeavored to reduce greenhouse gas emissions and conserve energy by 3 to 7%. Work completed between 2019-2023 translated to a reduction in GHG emissions in facilities by 2.63%, or 21.18% if offsets are included. During the upcoming 5-year reporting period, West Perth endeavors to achieve a reduction in greenhouse gas emissions (including offsets) of **35-45% by 2030**, 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_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: West Perth Fleet Emissions in 2023

Vehicle Type	Fuel ($)	Litres (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Diesel Engine					
Firetruck #Ladder 95	890.72	679.94	1,822.58	0.09	0.07
Firetruck #Pumper 92	890.72	679.94	1,822.58	0.09	0.07
Firetruck #Rescue 98	890.72	679.94	1,822.58	0.09	0.07
Firetruck #Tanker 93	890.72	679.94	1,822.58	0.09	0.07
Firetruck #Tanker 96	890.72	679.94	1,822.58	0.09	0.07
Dump Truck #71	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #78	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #85	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #88	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #91	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #96	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #99	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #102	9,563.00	7,300.00	19,567.65	0.97	0.74
Dump Truck #105	9,563.00	7,300.00	19,567.65	0.97	0.74
Pickup #107	4,098.43	3,128.57	8,386.13	0.42	0.32
Dump Truck #108	9,563.00	7,300.00	19,567.65	0.97	0.74
Backhoe #98	4098.43	3128.57	8,386.13	0.42	0.32
Ford Tractor	729.82	557.12	1,493.36	0.04	0.01
Grader #86	6,830.71	5,214.29	13,976.90	0.38	1.18

Vehicle Type	Fuel ($)	Litres (L)	CO_2 (kg)	CH_4 (kg)	N_2O (kg)
Grader #103	6,830.71	5,214.29	13,976.90	0.38	1.18
Grader #74	6,830.71	5,214.29	13,976.90	0.38	1.18
Landfill Compactor CAT 816F #72	2,272.17	1,734.48	4,649.27	0.13	0.39
Landfill Dozer CAT D6N LGP #95	2,272.18	1,734.49	4,649.30	0.13	0.39
Sweeper #60	2,732.29	2,085.71	5,590.75	0.28	0.21
Trackless MT6 #32	2,732.29	2,085.71	5,590.75	0.15	0.41
Trackless MT6 #92	2,732.29	2,085.71	5,590.75	0.15	0.41
Tractor #83	1,366.14	1,042.86	2,795.39	0.08	0.02
Tractor #84	1,366.14	1,042.86	2,795.39	0.08	0.00
Tractor #93	1,366.14	1,042.86	2,795.39	0.08	0.02
Gasoline Engine					
Pickup #Building Services	2,685.20	1,827.44	4,216.45	0.32	0.58
Pickup #Support99	862.26	598.79	1,381.59	0.10	0.19
Pickup #700	3,744.23	2,600.16	5,999.35	0.46	0.82
Pickup #701	3,744.23	2,600.16	5,999.35	0.46	0.82
Pickup #703	3,744.23	2,600.16	5,999.35	0.46	0.82
Pickup #87	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #89	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #90	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #94	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #100	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #101	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #104	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #106	5,165.75	3,587.33	8,277.05	1.01	0.39
Pickup #02	2,210.68	1,535.20	3,542.17	0.27	0.49
Pickup #04	2,210.68	1,535.20	3,542.17	0.27	0.49
Pickup #05	2,210.68	1,535.20	3,542.17	0.43	0.17
Pickup #06	2,210.68	1,535.20	3,542.17	0.27	0.49
Pickup #07	2,210.68	1,535.20	3,542.17	0.27	0.49
4x4 Utility Vehicle #66	581.81	404.03	932.22	2.05	0.03
John Deere Mower Z960M	1,872.11	1,300.08	2,999.67	6.60	0.08
John Deere Mower Z960M	1,872.11	1,300.08	2,999.67	6.60	0.08
Electric Engine					
Olympia Ice Resurfacer					

EF = Emission Factor CO2 = Carbon Dioxide CH4 = Methane N2O = Nitrous Oxide

Appendix C: 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 D: Emission Factors for Natural Gas & Propane

Province of Ontario	CO_2 (g/m^3)	CH_4 (g/m^3)	N_2O (g/m^3)
2021 Natural Gas	1921	0.037	0.035
2021 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 E: Emission Factors for CH_4 from Wastewater Treatment and Discharge

Treatment	CH_4 (kg CH4/kg BOD removed)	N_2O (kg N2O-N/kg N)
No Treatment	0.036	0
Primary	0.0036	0
Aerobic Lagoon	0	0
Anaerobic Lagoon	0.288	0
Facultative Lagoon	0.072	0
Other Lagoon	0.072	0
Secondary Anaerobic	0.288	0
Secondary Activated Sludge	0.0036	0.016
Trickling Filter	0.0036	0.016
Trickling Filter – High Rate	0.0036	0.016
Rotating Biological Contactor	0.0036	0.016
Sequencing Batch Reactor	0.018	0.016
Secondary Biofiltration	0.0036	0.016
Secondary with Biological Nutrient Removal	0.0036	0.016
Septic	0.18	0.0045
Septic with Marine Outfall	0.18	0
Wetland	0.0612	0
Other/ Unknown	0.072	0.016
Values sourced from the ICLEI & FCM 2021 Report		

Appendix F: Fleet Emission Reduction Exercise

Model	Tank/ Charge Capacity	Consumption (L/100km)	Range (Ford's approx.)	Emissions CO_2 (g/km)	CH_4 (g/km)	N_2O (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, for the purposes of this report, includes Carbon Dioxide, Methane, and Nitrous Oxide, as specified by Environment and Climate Change Canada.

ECDMP – Energy, Conservation and Demand Management Plan.

Energy Efficiency – Taking actions to reduce energy consumption to perform the same or similar task, reducing redundant energy use.

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 powered by electric battery, hydrogen, or methane.