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SUMMARY REPORT FOR:

Niagara Peninsula Conservation Authority

June 9, 2025

Decarbonization Roadmap

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Executive Summary

In 2024, the Niagara Peninsula Conservation Authority retained Enviro-Stewards Inc. to develop its baseline corporate greenhouse gas (GHG) emissions that will support the establishment of a GHG emissions reduction target and to develop a decarbonization roadmap that guides operational actions to achieve GHG emissions reduction while also reducing operational costs.

An assessment, focused on energy usage, water consumption, waste, and GHG emissions, was conducted during the summer of 2024. The assessment considered 6 key NPCA-owned and managed properties (i.e., main office, Ball's Falls Conservation Area, Binbrook Conservation Area, Chippawa Creek Conservation Area, Gainsborough Conservation Area, and Long Beach Conservation Area) as well as fleet vehicles and land care equipment used by NPCA.

This report summarizes the findings of the assessment for resource consumption and GHG emissions reductions which are recommended for future implementation or detailed assessment through the upcoming NPCA's Corporate Climate Action Plan.

Identified opportunities as part of the assessment would, if implemented, result together in $76,865 financial operational cost savings (21.3%) and 211 tonnes CO_2e/yr GHG emissions reduction (78.3%) annually based on the 2023 baseline.

Detailed conservation opportunity descriptions are not included in this public version of the report. Enviro-Stewards' approach is unique to each individual GHG emission source and opportunities depends on the specific measured values and circumstances. To investigate whether a similar approach might be applicable in a different facility, we encourage reaching out via https://www.enviro-stewards.com/.

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1.0 Introduction

1.1 NIAGARA PENINSULA CONSERVATION AUTHORITY AND CLIMATE CHANGE ACTION PLAN

Niagara Peninsula Conservation Authority (NPCA) manages 41 conservation areas within the Niagara Peninsula watershed and with its role in watershed-based natural resource management to act as a leader in implementing local climate change adaptation and mitigation initiatives. Their strategic plan prioritizes climate change, and they are developing a climate change action plan (CCAP) aiming to build climate resilience in the Niagara Peninsula watershed, reduce its carbon footprint, and engage with NPCA staff and stakeholders in climate action.

In 2024, the NPCA retained Enviro-Stewards Inc. (Enviro-Stewards) to develop its baseline corporate greenhouse gas (GHG) emissions that will support the establishment of a GHG emissions reduction target and to develop a decarbonization roadmap that guides operational actions to achieve GHG emissions reduction while also reducing operational costs.

There are three types of GHG emissions: Scope 1, 2 and 3. Scope 1 are direct emissions produced on-site from burning fuels such as natural gas or propane or leaking refrigerants. Scope 2 are indirect emissions produced off-site from purchased electricity or other energy used on site. Scope 3 are indirect emissions due to upstream and downstream activities, e.g., purchased goods and services, leased vehicles, business travels, employee commuting, or waste generated.

An assessment, focused on energy usage, water consumption, waste, and GHG emissions, was conducted during the summer of 2024. The assessment considered 6 key NPCA-owned and managed properties (i.e., main office, Ball's Falls Conservation Area, Binbrook Conservation Area, Chippawa Creek Conservation Area, Gainsborough Conservation Area, and Long Beach Conservation Area) as well as fleet vehicles and land care equipment used by NPCA. Waste was also considered, however, its impact on GHG emissions was not included due to a lack of available information about the waste and recycling amounts at the time of the assessment (only the waste and recycling collection schedule from May to October for the parks was available).

This report summarizes the findings of the assessment for resource consumption and GHG emissions reductions which are recommended for future implementation or detailed assessment through the upcoming NPCA's CCAP.

1.2 GENERAL OVERVIEW OF APPROACH AND METHODS

The major sources for Scope 1 and 2 GHG emissions were identified for which NPCA is responsible that are due to corporate activities such as running land care equipment or fleet vehicles and to operations of the 6 key properties. The sources include natural gas (space heating), propane (space heating, hot water, backup power), electricity, dyed diesel (land care equipment), gasoline and diesel (fleet vehicles).

Available information to quantify the GHG emissions and establish a baseline was gathered from the NPCA team. The baseline was selected to be NPCA's GHG emissions in the year 2023 as it is the most recent complete calendar year.

In addition, water flow and electrical current sensors were temporarily deployed for quantifying water and electricity consumption at strategic locations. These readings were used to identify resource conservation opportunities. Also, during the site visits, water faucets, toilets, and urinals as well as showerheads at NPCA's properties were inspected for flow rates.

1.3 ANNUAL UTILITY CONSUMPTION

Historical electricity, propane, natural gas, water, fleet, and dyed diesel consumption and costs for NPCA were analyzed and highlights from the analysis are presented in this section.

For electricity, utility bill information covering the last two years was used for the key location except the main office. For the main office, bills were only available starting in April 2024 when NPCA moved into their new office space in Thorold, ON. NPCA leases 7 units (7, 8, 9, 11, 14, 15, and 16) of an office building shared with other tenants. The electricity supplied to all the units at the main office were temporarily metered at the utility meters. This consumption was used to extrapolate the whole year.

Propane is used as fuel for space and water heating as well as for backup power generators. The information provided by NPCA was based on the deliveries of propane, which included the amount of propane and date, to the following 5 key properties: Ball's Falls Conservation Area, Binbrook Conservation Area, Chippawa Creek Conservation Area, Gainsborough Conservation Area, and Long Beach Conservation Area (there is no delivery to the main office). The time of the deliveries covered roughly two years and varies from site to site. There was no differentiation between the different propane uses in the data set. At Long Beach, propane is only used for hot water. At Chippawa Creek, it is used for hot water and space heating. To determine the amount of propane used for hot water, Long Beach consumption was used and decreased according to the lesser number of campsites. Like Chippawa Creek, propane is used for both space heating and hot water at Binbrook. As there is no overnight camping at Binbrook, the hot water demand was derated by half. At Gainsborough, propane is also used for hot water and space heating. The amount of hot water for using faucets and dishwasher was estimated based on the number of full-time employees working at the location and their expected demand. At Ball's Falls, propane is used for space heating (church, shop, camp house) and backup power generation (shop, barn and bathroom generators). The propane delivery for the shop is the only location where propane is used for both. In this case, it was assumed that 10% of the propane is for operating the backup power generator. The propane cost fluctuates, and the cost used in this assessment are based on a few sample invoices for the propane rate with Free Gas Co.

The only consumption of natural gas is at the main office and at Binbrook's dam control building for space heating. However, only bills starting in April 2024 were available for the main office due to the recent move-in date. Natural gas consumption during the first months at the end of the heating season and Heating Degree Days (HDD) for that time were used to determine the demand for all the units at the main office. HDD represents an indication for the energy needed to heat a building by calculating the difference between a base temperature (18°C in this case) and the outdoor temperature. The natural gas consumption was extrapolated using the HDD for a whole year at that location. The winter 2024 to 2025 will be the first winter for NPCA at their new location for the main office. The natural gas extracted and used on-site at Binbrook for heating the dam control building is

included in the natural gas consumption. The average annual consumption at Binbrook is 21.2 m^3/year based on the most recent almost 6 years. As there is no commodity cost, the cost for natural gas is based on the few bills available for the main office.

Similar to propane, the amount and cost of water delivered by trucks in 2024 to the 5 key properties (the main office is supplied with city water) was provided by NPCA. NPCA is not separately billed for its water consumption at the main office as the water is not separately metered and, thus, not included in this assessment as the amount and costs were unknown. Also, Binbrook uses well water in addition to water that is trucked to site. For NPCA's water consumption, the well water at Binbrook is included. However, for estimating the average unit cost for water and for assessing the GHG emissions, the well water was excluded as there is no commodity cost and the impact on emissions is negligible. For the hauled water to the other sites, it was assumed that each water delivery consisted of a roundtrip of 50 kilometers by a medium-duty delivery truck with the fuel efficiency of a Ford F-750.

NPCA operates a fleet that mainly uses leased and rented vehicles. Technically, the emissions from leased and rented vehicles are considered Scope 3 emissions. However, they are also included in this assessment. NPCA also owns 4 vehicles. All vehicles were included in this assessment. The odometer readings of August 6, 2024, and the age of the vehicles was provided by NPCA. It was assumed that at the start of the lease and rental and purchase date, the odometer reading was 0. An average mileage for all vehicles was established using the odometer difference. Using emission factors for the vehicles, the GHG emissions associated with driving the fleet vehicles were calculated. For the fleet vehicles, it was assumed that 50% of the vehicles use gasoline and 50% diesel. The fuel cost is based on regular unleaded gasoline and diesel fuel costs at self-service filling stations during 2023.

The amount of dyed diesel purchased for operating all land care equipment for one year was provided. The total amount was used without determining which equipment used the dyed diesel. The dyed diesel cost includes taxes similar to the other fuel costs.

According to NPCA, no refrigerants were replaced and purchased in recent years.

The information of the electricity, propane, natural gas, water, fleet, and dyed diesel consumption for NPCA was compiled and used to prepare the 2023 baseline of GHG emissions. A breakdown of utility consumption and adjusted total cost for the utilities is shown in

Table 1. In 2023, NPCA consumed 879,378 kWh of electricity, 33,280 l of propane, and 7,981 m^3/year of water at the 6 sites. Additionally, 33,148 l of fuel for fleet vehicles and 11,538 l of dyed diesel for land care equipment was used. This is for all NPCA's fleet vehicles and land care equipment and not just for the 6 sites.

Table 1 – Annual Resource Consumption

RESOURCE	ANNUAL QUANTITIES		% OF TOTAL	ADJUSTED UNIT COST
		$	%	$/unit
Electricity	879,378 kWh	172,989	48%	$0.20
Ball's Falls	183,941 kWh			
Binbrook	60,786 kWh			
Chippawa Creek	149,748 kWh			
Gainsborough	19,240 kWh			
Long Beach	312,757 kWh			
Main Office*	152,905 kWh			
Propane	33,280 l	21,482	6%	$0.65
Natural Gas	32,384 m^3	39,467	11%	$1.22
Water	7,981 m^3	56,715	16%	$12.12
Fleet	33,148 l	53,434	15%	$1.61
Dyed Diesel	11,538 l	16,016	4%	$1.39
	TOTAL	**360,102**	**100%**	

* electricity consumption for main office is based on 4 months in 2024

Notes.

electricity average total costs incl. taxes	0.20 $/kWh
propane average cost (based on a few available invoices):	0.65 $/l
natural gas average total cost (not including natural gas extraction at Binbrook)	1.22 $/m3
natural gas costs are based on bills for main office	
about 2 bills for each unit at main office were available due to recent move-in	
water average cost (not including well water at Binbrook)	12.12 $/m3
water consumption quantity includes well water at Binbrook	
water consumption is not including main office	
fleet fuel costs based on annual average costs for gasoline (50%) and diesel (50%)	1.61 $/l
dyed diesel average total costs incl. taxes	1.39 $/l

Almost half of the utility expenditures (48%) is for electricity consumption while water accounts for 16% and the cost to fuel the fleet (15%) as the next biggest contributors. Together, these three items are responsible for more than ¾ of the NPCA's considered annual utility spending.

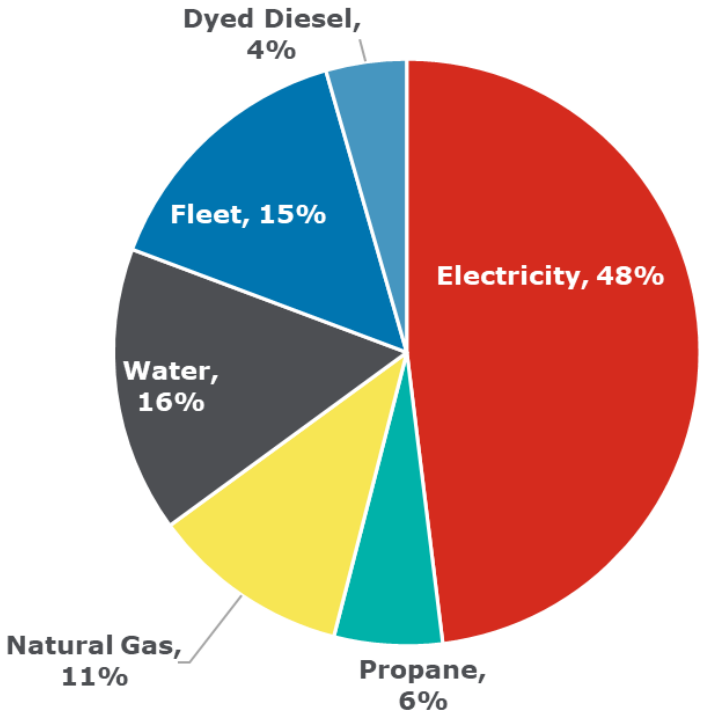

Figure 1 – Utility Expenditure by Type

1.4 ANNUAL GHG EMISSIONS

GHG emissions arise from the consumption of electricity, propane, natural gas, and water as well as operating the fleet vehicles and land care equipment. The emissions are presented in Table 2 and Figure 2 below and represent NPCA's estimated corporate GHG emissions for the baseline in 2023.

The emission factors (EF) used in this assessment for the different emission sources are listed below Table 2. The EFs for electricity and natural gas consumption are based on the provincial GHG intensities and the EF for propane on the national GHG intensity.

For the hauled water and fleet, the emission factors were calculated. As mentioned above, the delivery of water to the sites was considered for the hauled water. For the fleet, combined emission factors for the vehicles together with odometer readings were used. The emissions associated with extracting well water at Binbrook is negligible.

The combined total emissions are 270 tonnes CO_2e/yr. A breakdown of emissions for each utility type is described in more detail in Table 2.

Table 2 – GHG Emissions Due to Utility Consumption

SOURCE	ANNUAL QUANTITY	GHG
		tonnes/yr
Electricity	879,378 kWh	33
Propane	33,280 l	50
Natural gas	32,384 m^3	62
Water	7,981 m^3	
Hauled Water	4,680 m^3	11
Well Water	3,301 m^3	0
Fleet	285,425 km	82
Dyed Diesel	11,538 l	31
	TOTAL	**270**

Notes.

GHG emission factors:

Ontario electricity aggregate factor (kg CO2e/kWh)	0.038
Propane emission factor (kg CO2e/l)	1.515
Natural gas emission factor (kg CO2e/m^3)	1.928
Water supply trucking (kg CO2e/m3)	2.345
Fleet (kg CO2e/l)	2.460
Dyed diesel (kg CO2e/l)	2.690

Given the mix of electricity generation in Ontario, reduction in GHG gas emissions will be impacted more by propane, natural gas, and fuel (gasoline, diesel, dyed diesel) on a per dollar basis as compared to electricity. The main GHG emission sources are fuels for the fleet vehicles (30.2%), estimated natural gas (23.1%) and propane (18.7%) consumption. Together, these consist of almost ¾ of NPCA's GHG emissions.

In order to significantly reduce GHG emissions, these sources will need to be addressed despite their smaller contributions to annual expenditures.

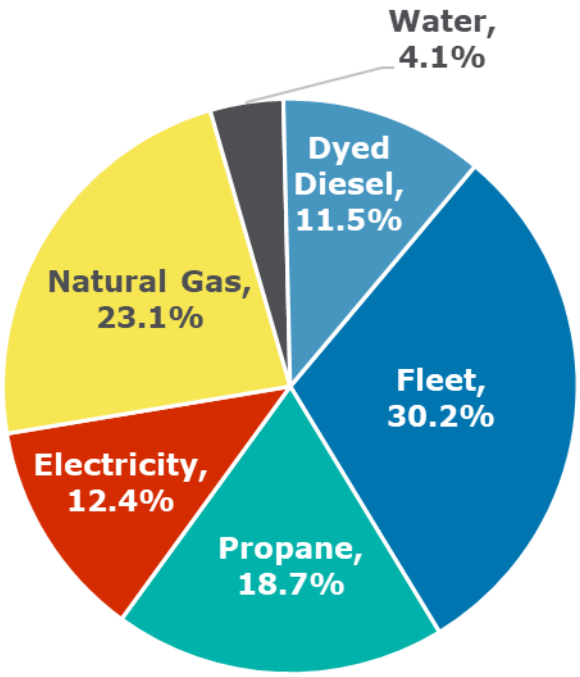

Figure 2 – GHG Emissions Due to Utility Consumption

1.5 DATA GAPS

The following information was not available for this assessment:

- Natural Gas (Scope 1): No winter consumption at main office due to April 2024 move-in. After the first winter in 2025, NPCA will have utility information available for their natural gas consumption at the main office and can collect it going forward.
- Propane (Scope 1): It is used also for operating backup generators at Ball's Falls. However, Ball's Falls barn and bathroom generator runtimes were unknown for this assessment but a minor usage for backup power and maintenance is assumed.
- Water (Scope 3): Receipts were only available for 2 to 4 months for Ball's Falls, Binbrook, Chippawa Creek, Gainsborough, and Long Beach for this assessment. Also, for the water consumption at the main office, no information was available as the water is not sub-metered for the different units of the office building where the main office is located.
- Waste (Scope 3): No actual waste amounts by type were available. The only available waste information for this assessment was the waste & recycling collection schedule for the parks.

2.0 Decarbonization Pathway.

Enviro-Stewards provided an example for a decarbonization pathway to guide NPCA with their goal setting process and recommendations for NPCA to consider for their GHG emission reduction efforts. The example for a decarbonization pathway is based on the baseline GHG emissions in 2023, which are 270 tonnes CO2e/yr, with a reduction target of 75% by 2050 starting with reduction measures in 2025. The 75% reduction in GHG emissions would lead to 68 tonnes CO2e/yr in 2050 with a reduction of 203 tonnes CO2e/yr.

GHG emission reduction due to implementation of recommended actions and fuel switching could result in $76,865 in financial operational cost savings (21.3%) and reduce the GHG emissions by 211 tonnes CO2e/yr (78.3%) annually — achieving the example target of 75% GHG reduction by 2050 based on the 2023 baseline following the proposed decarbonization pathway.

The change would mainly be due to the fuel switching of current natural gas, propane, and fuel consumption (fleet, dyed diesel) which would reduce the GHG emissions by 207 tonnes CO2e/yr (76.9%) and the operational cost by $62,010/yr (17.2%). The implementation of the conservation opportunities in this report contributes a saving of 4 tonnes CO2e/yr (1.4%) and $14,855/yr (4.1%).

The GHG emission reduction pathway is shown in Figure 3. This figure also includes the required path to meet the example reduction target (75% by 2050 based on 2023 baseline GHG emissions). The required path represents consistent GHG reduction year over year.

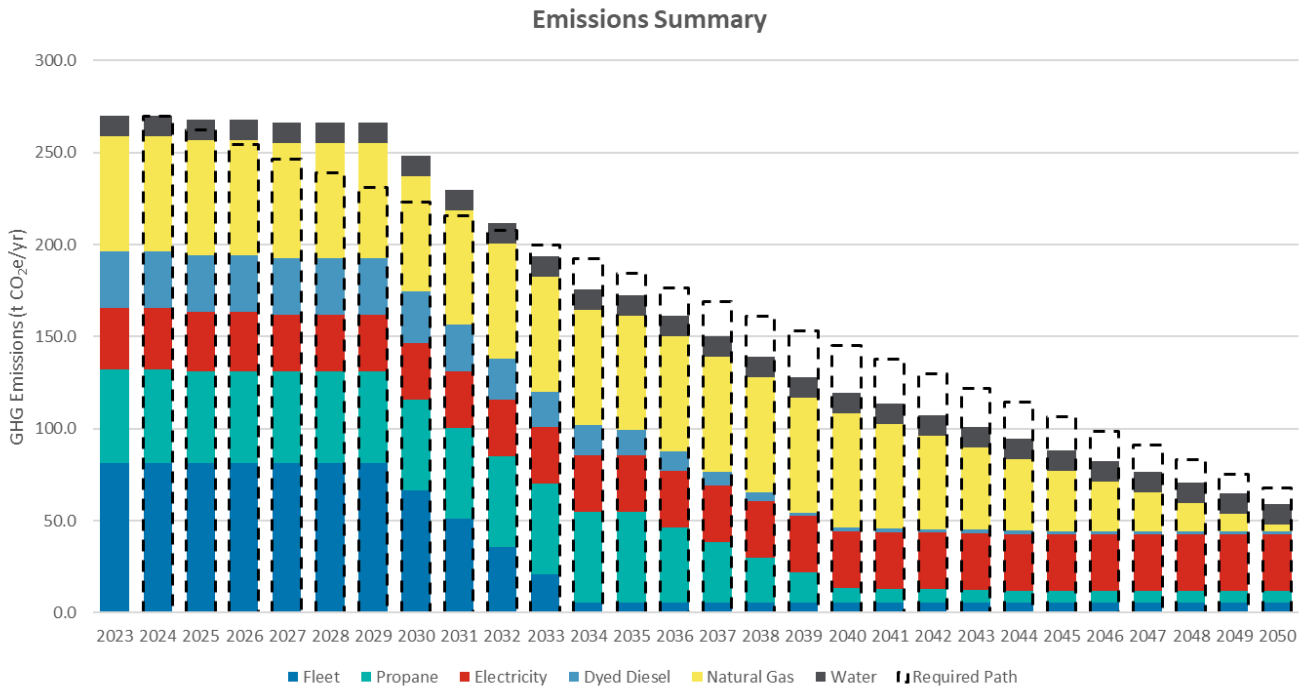

Figure 3 – Decarbonization Pathway Example

3.0 Conclusion

Total reduction due to implementation of the recommended actions could result in $76,865 in financial operational cost savings (21.3%) and reduce the GHG emissions by 211 tonnes CO2e/yr (78.3%) annually — achieving the example target of 75% GHG reduction by 2050 based on the 2023 baseline following the proposed decarbonization pathway.