Township of Hornepayne's Water and Wastewater Treatment Plants

Energy Assessment Report – Quarter 2 2025

Prepared for the Township of Hornepayne

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ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

STATEMENT OF CONFIDENTIALITY

OCWA's Energy Assessment of the
Township of Hornepayne's
Water Pollution Control Plant (WPCP)

VISION

MISSION

VALUES

VISION: Your Trusted Water Partner for Life.

MISSION: We provide clean water services for the health and sustainability of communities.

VALUES: Everything we do is guided by our belief in and commitment to:

- **Teamwork** – We bring together our local knowledge, skills and talents and collaborate with our clients to meet the needs of the communities we serve.
- **Reliability** – We provide essential services that meet or go beyond compliance standards and follow through on our commitments to each other and our clients.
- **Understanding** – We listen to each other, our clients and stakeholders to deliver total solutions.
- **Safety** – We make health, safety and wellness in our workplace and in the communities where we live and work, our number one priority.
- **Transparency** – We believe in communicating openly, honestly and authentically with each other, our clients and stakeholders.
- **Environment** – We protect the environment through innovative solutions that strengthen the health and sustainability of the communities we serve.
- **Diversity** – We embrace diverse perspectives and strive to create an equitable and inclusive environment where each of us feels respected and empowered to achieve our personal and professional goals.

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Introduction

Purpose of the Report

The purpose of this report is to analyze energy consumption, costs and GHG emissions data at the Township of Hornepayne's Water and Wastewater Treatment Plants for second quarter of 2025, using data from 2020 to 2024 as reference, to identify trends and assess the impact of operational variables such as raw flow volume, treated BOD, and outdoor temperature. This analysis will provide actionable insights to optimize energy efficiency while reducing costs and emissions.

Scope

This report focuses exclusively on electrical energy consumption and costs, as these are the primary components available for analysis. The analysis includes electrical energy consumption and costs from hydro bills, correlated with process data such as flow rates, nutrient loads, and other operational parameters. Other resources, such as natural gas, diesel fuel, or chemical consumption are outside the scope of this report. The findings aim to provide actionable insights to improve energy efficiency and cost management within these defined boundaries.

Methodology

Monthly Hydro Bills

Electricity consumption and cost data was extracted from hydro bills including:

- Electricity consumption (kWh)
- Peak Demand (kW)
- Electricity costs

Process Data from OCWA Database

Operational data for was obtained from the Ontario Clean Water Agency (OCWA) database including:

- Influent flow (m^3)
- Treated Biochemical Oxygen Demand (kg/month)
- Treated Nitrogen (kg/month)

Trend Analysis

Monthly energy consumption and cost trends were identified using statistical and graphical analysis. Seasonal variations and peak demand patterns were analyzed to identify opportunities for cost optimization.

Facility Description

Hornepayne Wastewater Treatment Plant

The Honka Drive Wastewater Treatment Plant also known Hornepayne WWTP as has one influent channel with a comminutor, and one bypass channel with a bar screen. The influent water is then directed towards an aeration tank with four cells, where Cells 1 and 4 are equipped with coarse bubble aeration systems, and Cells 2 and 3 are equipped with fine bubble aeration systems. Next, the secondary clarifier is equipped with a side water depth clarifier which has sludge and scum removal mechanisms. The secondary clarifier also includes a return activated sludge airlift system. For the purpose of disinfection, the secondary clarifier is followed by a chlorine contact tank, and a chlorination system with weigh scales that includes two chlorine cylinders with vacuum regulators, an injection system, and a diffuser in the chlorine contact chamber. The effluent outfall is directed through a designated sewer and ditch that empty into Little Jackfish River. There are two air blowers with 21.5 m3/min rated capacity and a 43 m^3 holding tank with a Spar jet type air diffusion system, a decanting device, and a submersible pipe.

Hornepayne Water Treatment Plant

The Herbert Avenue Water Treatment Plant also known as Hornepayne WTP is a surface water treatment system providing coagulation, membrane filtration and primary/secondary disinfection. The treatment process consists of three membrane filter trains, each preceded by a flocculation tank with mixer. Coagulant and sulphuric acid are used in the flocculation process with the chemically treated water being fed directly to the filters. Filtered water is directed to a two-cell clear well for treated water storage and post filtration disinfection. There is a third chamber, a high lift well containing the high lift pumps. Sodium hypochlorite is injected with the filtered water discharge for primary disinfection. Additional chlorine dosing is available at the plant discharge to distribution for the purpose of secondary disinfection. Sodium Hydroxide is used for pH adjustment of the treated water.

Q2- 2025 Summary of Energy Consumption, Cost and Plant Flow

Hornepayne Wastewater Treatment Plant

In Q2 2025, quarterly energy consumption at Hornepayne WWTP was 10% lower than the previous year. Electricity costs also decreased by 9.7%, while the treated flow increased by 12% compared to Q2 2024. This indicates that the costs is directly linked to increased electricity consumption. The total electricity consumption for the quarter was 59,040 kWh, resulting in a total cost of $13,085. Additionally, the total flow treated during this period was 104,277 m^3.

During Q2 2025, the highest energy consumption cost occurred in June, while the lowest cost was recorded in April. As it can be seen in Figure 1, The months with the highest and lowest energy consumption align with those of the highest and lowest costs, suggesting consumption directly influenced pricing. This will be explored further in the Energy Cost Analysis Section. The consumption pattern in Q2 2025 indicates that the facility is well in desirable ranges with energy consumption and cost compared to historical values in Q2

Figure 1 below depicts the energy usage, total cost and raw flow at the facility in Q2 2020-2025.

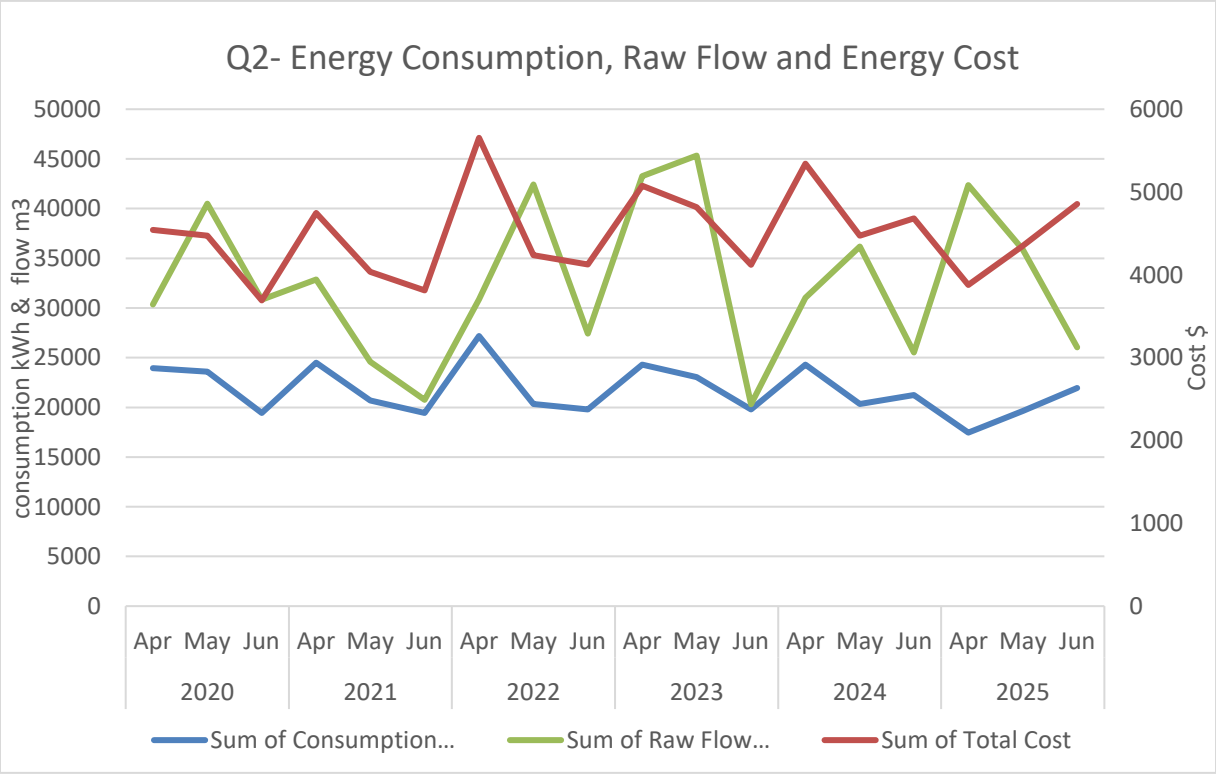

Figure 1: Energy Consumption, Raw Flow and Energy Cost Q2 -2020-2025

Hornepayne WWTP lies next to a river in a watershed, making it vulnerable to seasonal flow changes. In April and May, snowmelt and spring rain cause high water levels, further increased by residential runoff from infiltration and sump pumps. Monthly electricity energy consumption, energy costs and plant flow for Q1-Q2 2025 at Hornepayne WWTP are shown in

Total	**25,898**	**142,219**	**116,820**

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Table 1: 2025 Summary of Energy Consumption, Cost and Plant Flow

Months	Cost $	Raw Flow (m^3)	Consumption (kWh)
Jan	4,117	13,442	18,540
Feb	4,148	10,849	18,720
Mar	4,549	13,651	20,520
Apr	3,877	42,356	17,460
May	4,350	35,886	19,620
Jun	4,858	26,035	21,960
Total	**25,898**	**142,219**	**116,820**

Hornepayne Water Treatment Plant

In Q2 2025, the quarterly energy consumption and cost at the Hornepayne Water Treatment Plant (WTP) was 13% higher compared to Q2 2024. Meanwhile, the treated water flow increased by 28% compared to the same period last year. This suggests that while both energy consumption and cost at the Hornepayne Water Treatment Plant (WTP) increased in Q2 2025 compared to Q2 2024, while the efficiency of water treatment may have improved. A 28% increase in treated water with only a 13% increase in energy use suggests that the plant may be

treating more water per unit of energy than before. Figure 2 below depicts the energy usage, total cost and raw flow at the facility in Q2 2020- 2025.

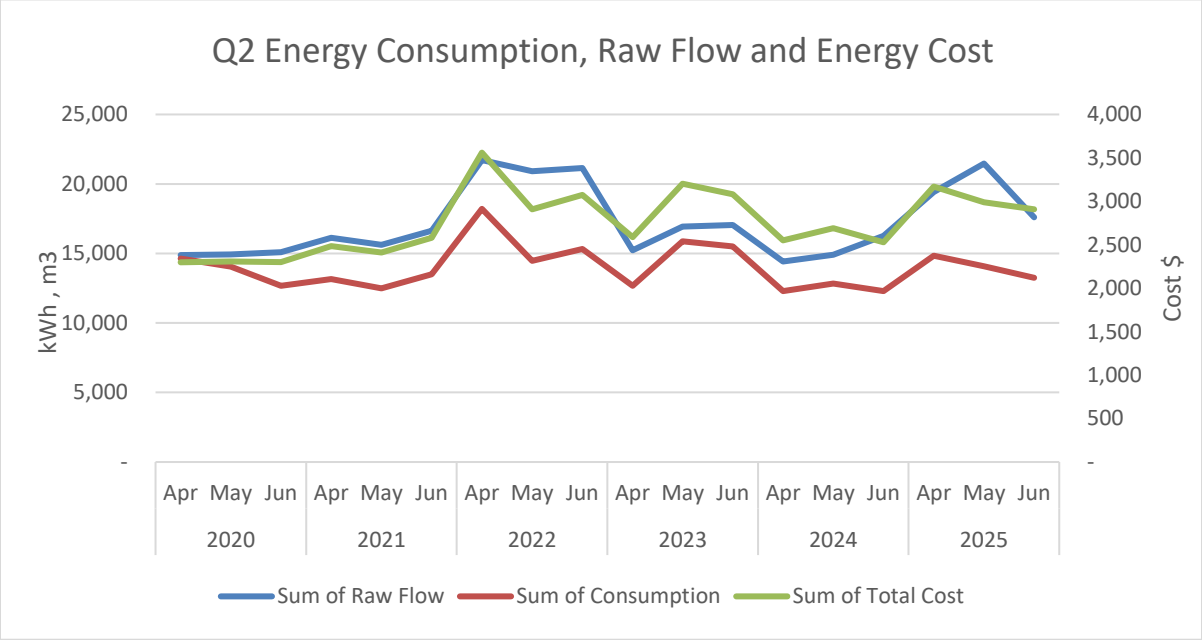

Figure 2: Energy Consumption, Raw Flow and Energy Cost Q2 -2020-2025

The total electricity consumption for the quarter was 42,163 kWh, resulting in a total cost of $9,066. Additionally, the total flow treated during this period was 58,481 m^3. During Q2 2025, the highest energy consumption cost occurred in May -21,457 kWh, while the lowest consumption was recorded in June -17,603 kWh. The months with the highest and lowest energy consumption do not align with those of the highest and lowest costs, suggesting that in addition to consumption other factors influenced pricing. This will be explored further in the Energy Cost Analysis Section. The consumption pattern in Q2 2025 indicates that the facility is well in desirable ranges with energy consumption and cost

Monthly electricity energy consumption, energy costs and plant flow for Q2 2025 at Hornepayne WTP are shown in Table 2.

Table 2:2025 Summary of Energy Consumption, Cost and Plant Flow

Months	Cost $	Raw Flow (m^3)	Consumption (kWh)
Jan	4,117	13,442	18,540
Feb	4,148	10,849	18,720
Mar	4,549	13,651	20,520
Apr	3,168	19,421	14,837
May	2,991	21,457	14,082
Jun	2,907	17,603	13,244

Energy Consumption Analysis

Hornepayne Wastewater Treatment Plant

The most important KPI for wastewater treatment energy usage is referred to as Volumetric Energy Intensity (VEI) and is expressed as the energy used per volume of water treated, or kWh per cubic meter treated. A lower volumetric energy intensity signifies a more energy-efficient wastewater treatment process, meaning less energy is used to treat the same volume of wastewater. Wastewater treatment facilities VEI generally ranges from 0.4 to 0.9 kWh/m^3 of treated wastewater. Figure 3 below depicts the quarterly average VEI at Hornepayne WWTP during Q2 during 2020 to 2025.

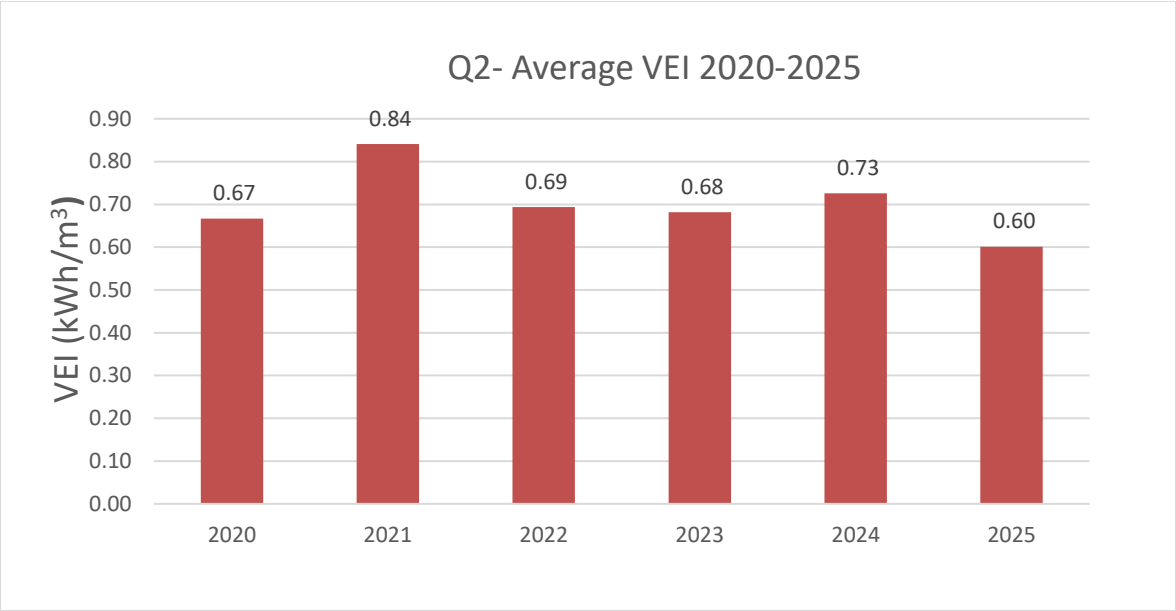

Figure 3: Hornepayne WWTP Q2 average VEI 2020-2025

The Hornepayne WWTP facility achieved an average VEI of 0.60 kWh/m^3 in Q2 2025, meeting the desired efficiency threshold. This represents a 17% improvement compared to the previous year. Relative to Q2 2024, the facility processed 12% more flow while using 10% less energy, resulting in a more efficient VEI. Despite the challenges posed by cold weather conditions—which typically increase energy consumption due to heating and operational demands—Q2 2025 showed a significantly lower VEI than Q1 2025.

This suggests an improvement in energy efficiency during the colder months, indicating progress in operational performance and energy management.

Annual regression analysis conducted for BOD, TKN, flow and temperature against consumption indicates that outdoor temperature is the variables that have the greatest correlation with electrical consumption. As temperature decreases, so does energy consumption. Conversely, as outdoor temperature increases electrical energy consumption decreases. Based on these findings, it is recommended that HVAC be prioritized in an energy audit to improve energy

efficiencies. Meanwhile flow and Organic loading (BOD and TKN) has a negligible effect on electrical energy consumption.

The average BOD energy intensity, or the amount of energy required for the removal of Biological Oxygen Demand (BOD), decreased by 42% from 28 kWh/kg treated to 16 kWh/kg treated. This suggests a substantial improvement in the facility's BOD energy efficiency. The facility is now using significantly less energy to remove each kilogram of BOD, indicating more effective treatment processes or upgraded equipment.

This decrease in in VEI is due to an increase in the total treated BOD in Q2-52%-, which increased from 2,785 kg to 4,254 kg. With more distribution of BOD being processed, the energy required per unit of removal became lower, resulting in improved efficiency.

On the other hand, the amount of treated nitrogen increased from 799 kg to 1,013 kg i.e., 27%. As a result, the average nitrogen energy intensity in Q2 decreased by 10% from 87 kWh/kg treated to 78 kWh/kg treated.

Hornepayne Water Treatment Plant

Volumetric Energy Intensity (VEI), measured as kilowatt-hours per cubic meter (kWh/m³) treated, is a key performance metric in water treatment plants (WTP). It signifies the amount of energy required to treat a unit volume of water. Lower VEI values suggest that the water treatment plant is more energy-efficient. This means it's using less energy to treat each cubic meter of water, which can be a sign of optimized processes and well-maintained equipment. Figure 4 below depicts the quarterly average VEI at Hornepayne WTP during Q2 during 2020 to 2025.

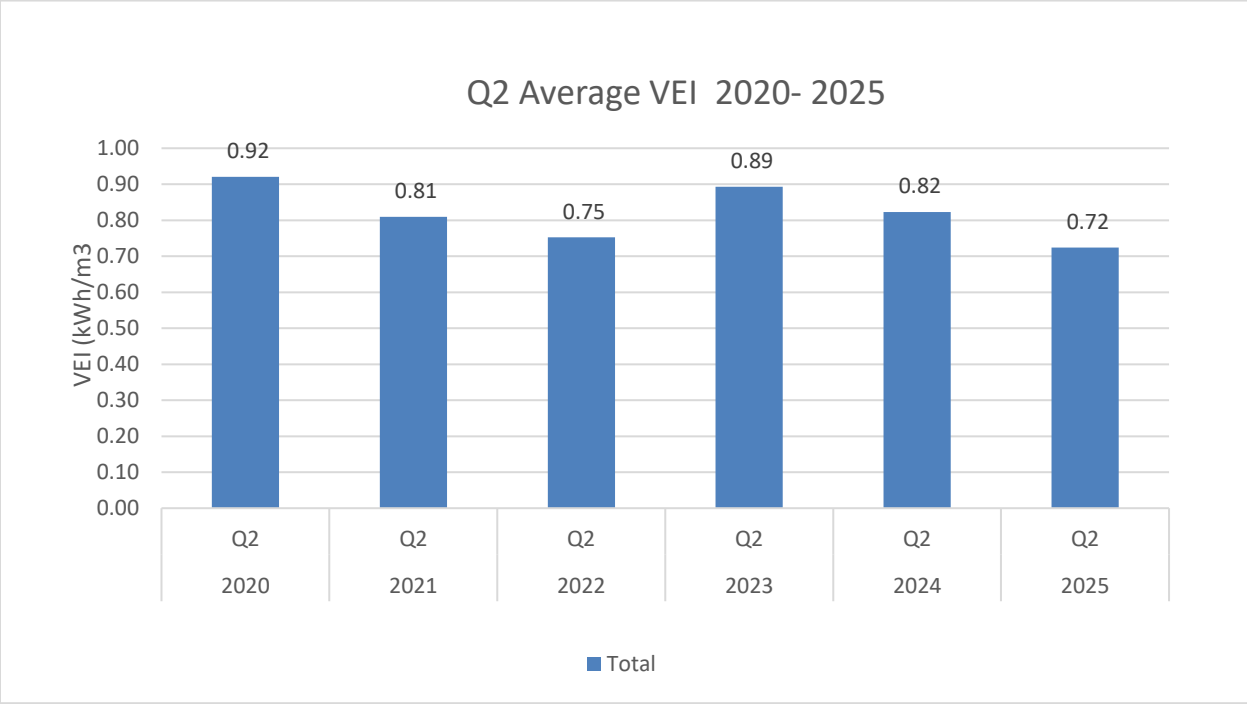

Figure 4: Hornepayne WWTP Q2 average VEI 2020-2025

The Hornepayne WTP facility has a good VEI of 0.75 kWh/m³ in comparison to 0.82 kWh/m³ in Q2 2024, indicating that the facility is energy efficient and operating within the desired limits. Facilities tend to become less energy efficient over time be due to factors like deteriorating equipment, increased influent flow rate, changes in water composition (higher organic load), outdated technology and lack of optimization. But Hornepayne WTP is within desirable limits and has the VEI decrease by 12% suggesting improvement in efficiency across the colder months of Q2 .

In general, water treatment facility tends to be least energy efficient during colder months, requiring more energy to treat 1m³ of water, and most efficient during warmer months, when less energy is needed per unit treated.

In Q2 2025, the facility's energy efficiency index (VEI) was lower than in Q2 2024. This happened because the total water volume needing treatment was higher by 28% in Q2 2025 compared to Q2 2024. When flow volume is higher, energy efficiency improves because the facility's energy consumption is spread over a larger amount of water. This suggests that optimizing energy use during lower flow periods such as adjusting heating methods or improving system efficiency could help mitigate these effects. Since a larger volume was processed closer to design capacity, the energy consumed per cubic meter decreased, making the facility appear more efficient overall.

Energy Cost Analysis

Hornepayne Wastewater Treatment Plant

Hornepayne WWTF uses the Tiered electricity pricing. With Tiered pricing, the facility can use a certain amount of electricity each month at a lower price. Once that limit (called a threshold) is exceeded, a higher price applies. The threshold changes with the season to reflect changing usage patterns.

Figure 5 below depicts the Quarterly electricity cost at Hornepayne WWTF Q2 2020 and 2025.

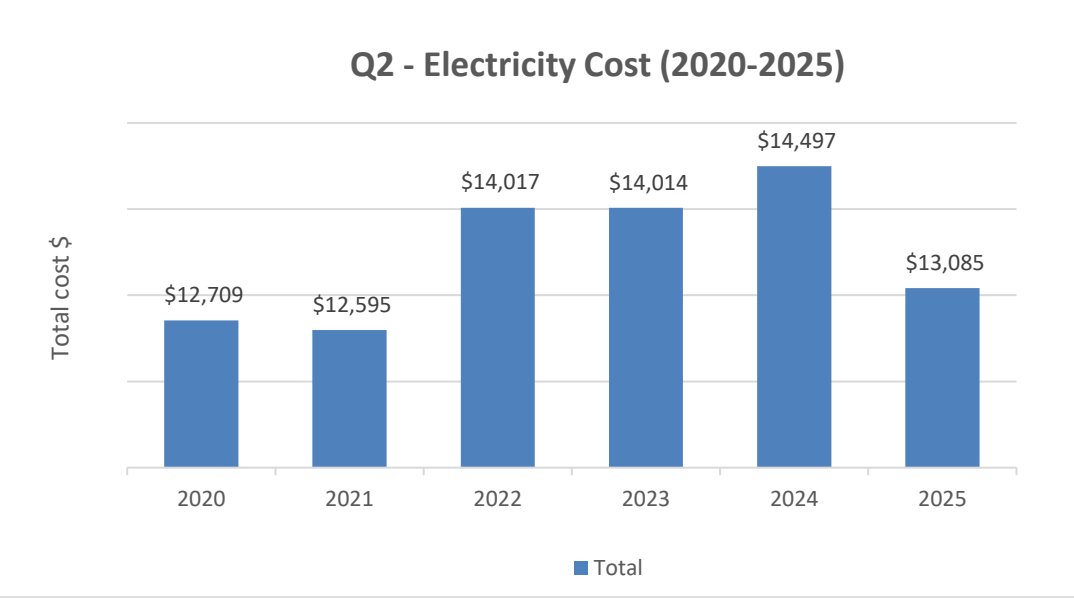

Figure 5 : Q2 Electricity Cost at Hornepayne WWTF – 2020 to 2025

Energy Cost: The total energy cost dropped from $14,497 to $13,085, a 10% reduction compared to Q2 2024.This is because of the decrease in energy consumption, likely due to improved efficiency or reduced operational activity.

Electricity Rate: The average blended electricity rate decreased from $0.124/kWh to $0.109/kWh, indicating more favorable energy pricing.

Total Cost per kWh: Despite the drop in both total cost and rate, the overall cost per kWh remained stable at $0.22, implying that the facility maintained a consistent energy cost structure relative to its usage.

Hornepayne Water Treatment Plant

The Hornepayne WTF is billed based on Time-of-Use (TOU) pricing. TOU rates are structured to encourage energy usage during off-peak hours. There are 3 times in a day when the TOU pricing changes; peak demand hours, mid -peak hours, and off-peak hours. It should be noted that there are price variations with the seasons; winter pricing are effective November 1st to April 30th every year

During Q2, electricity pricing transitions between seasons: April follows winter rates, while May and June adopt summer pricing. Off-peak hours are charged at 7.6¢ per kilowatt-hour, mid-peak at 12.2¢, and on-peak at 15.8¢ per kilowatt-hour[1]. The maximum energy consumption occurs during off-peak hours (60%), while consumption during on-peak and mid-peak hours remains well within expected trends. The Hornepayne WTF demonstrated a favorable TOU demand profile during Q2 2025 as shown on Figure 6.

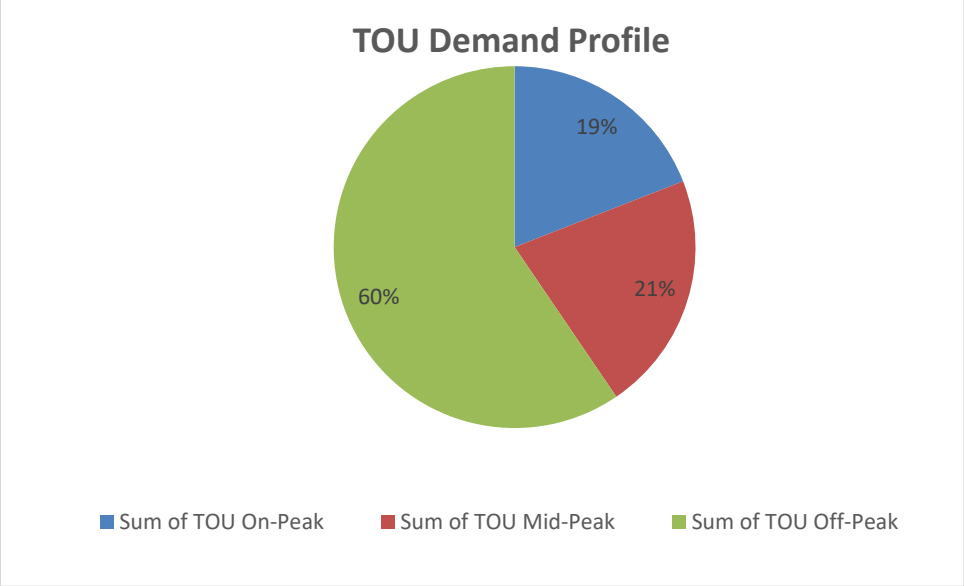

Figure 6: TOU Demand Profile Q2 2025.

[1] https://www.oeb.ca/consumer-information-and-protection/electricity-rates#current

Figure 7 below depicts the Quarterly electricity cost at Hornepayne WTF Q2 2020 and 2025.

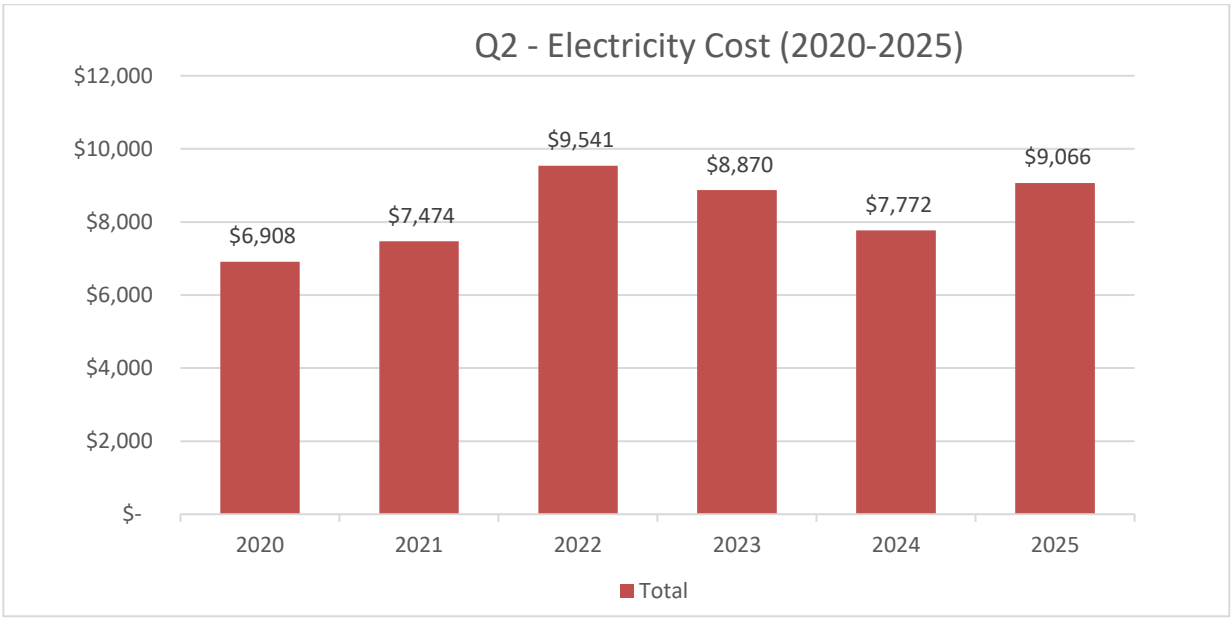

Figure 7: Q2 electricity cost at Hornepayne WTF Q2 2020 - 2025

Energy Cost: The total energy cost increased from $7,772 to $9,066, a 17% increase compared to Q2 2024.This increase in cost is in line with increase in energy consumption (13%) and electricity rates.

Electricity Rate: The average blended electricity rate decreased from $0.11/kWh to $0.10/kWh, indicating more favorable energy pricing.

Total Cost per kWh: The overall cost per kWh remained stable at $0.22 increasing from 0.21, implying that the facility maintained a comparatively consistent energy cost structure relative to its usage.

Energy GHG Emissions Analysis

The Energy GHG Emissions Analysis evaluates the greenhouse gas (GHG) emissions resulting from the plant's electricity consumption. Insights from this analysis can help guide policy and strategy development aimed at further reducing emissions. To calculate the GHG emissions associated with electricity consumption in Ontario, an emission factor of 35 g CO_2e/kWh was used, based on the grid electricity GHG intensity from the WEAO calculator. 2

With total electricity consumption of 57,780 kWh in Q2 2025, the estimated GHG emissions amount to approximately 2.07 metric tons (tonnes) of carbon dioxide equivalent (CO_2e), Figure 8.

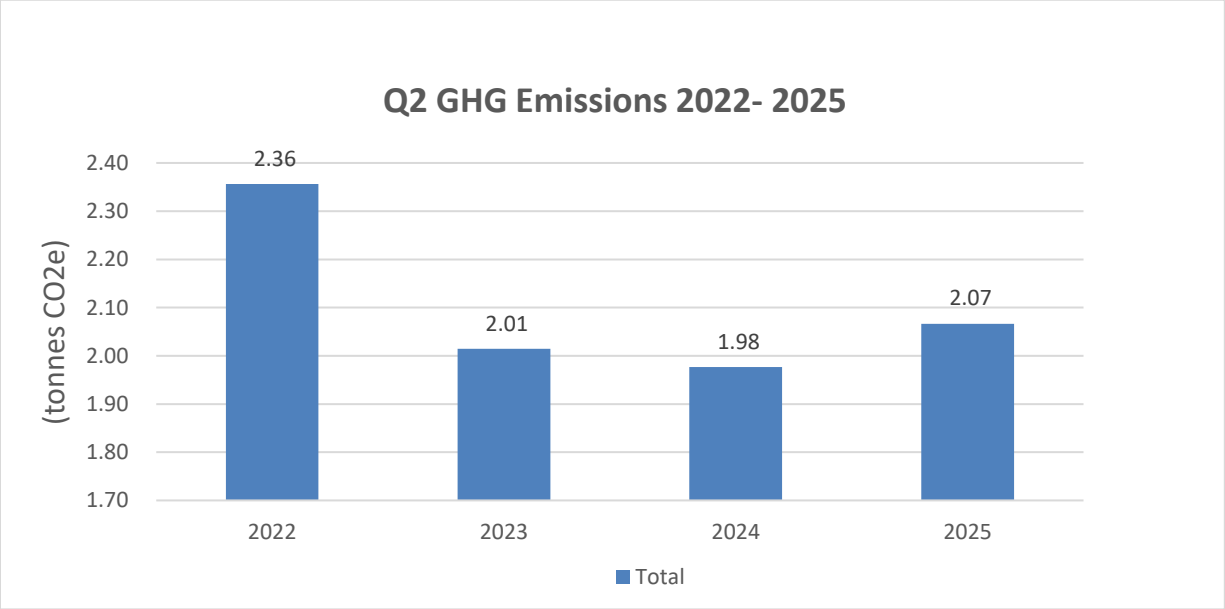

Figure 8: Energy GHG Emissions Analysis for Q2 2022-2025 at Hornepayne WWTP

[2] https://owwa.ca/misc/owwa-weao-greenhouse-gas-emissions-inventory-tool.html

At the Hornepayne WTF with a total electricity consumption of 43,106 kWh in Q2 2025, the estimated GHG emissions amount to approximately 1.5 metric tons (tonnes) of carbon dioxide equivalent (CO_2e), Figure 9. Additionally, these emissions fall under Scope 2 emissions, which are indirect GHG emissions resulting from the purchase of electricity, steam, heat, or cooling.

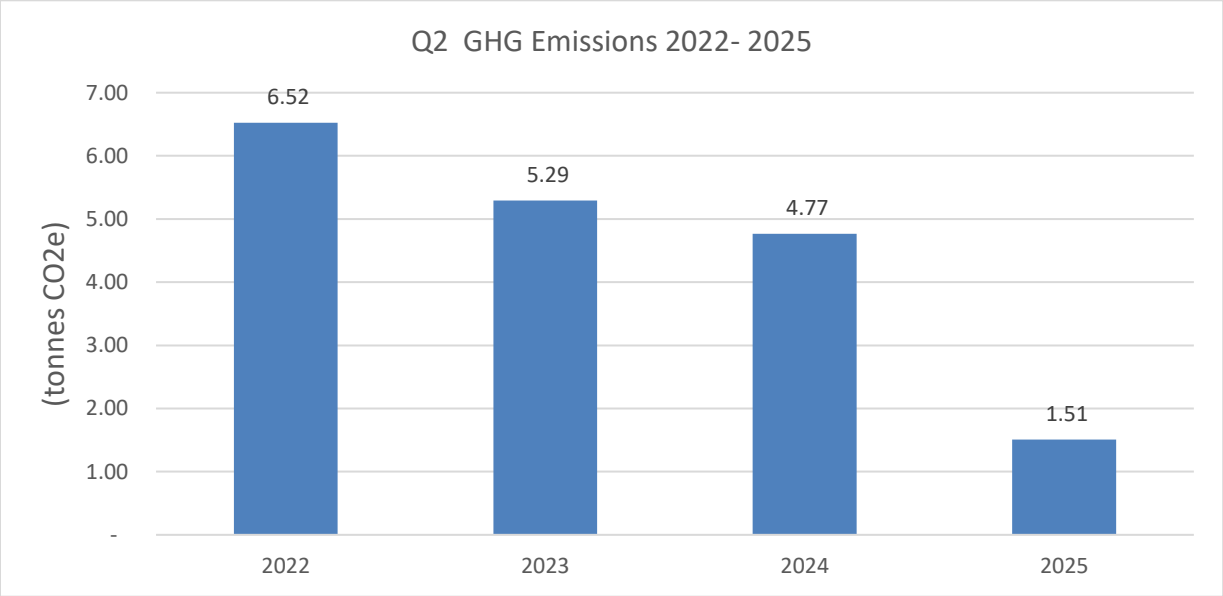

Figure 9 : Energy GHG Emissions Analysis for Q2 2022-2025 at Hornepayne WTP

Recommendations for Energy Efficiency & Cost Management

Optimize Heating & Pumping Systems: Since the facility experiences seasonal variations, reducing energy demand in colder months is key. Enhancing HVAC efficiency and adjusting pumping schedules based on influent flow fluctuations can improve overall performance.

Upgrade Equipment & Technology: With VEI steadily rising, maintaining or replacing aging infrastructure can help sustain energy efficiency and prevent further declines.

Explore Energy Pricing Alternatives: Given the increasing electricity costs despite lower consumption, fixed-price contracts with energy retailers could help stabilize expenses. Delivery charges and fluctuating electricity rates should be closely monitored to identify cost-saving opportunities.

Implement Renewable Energy Solutions: Investing in solar PV or Combined Heat and Power (CHP) can reduce dependency on grid electricity and mitigate financial impacts of rising energy costs.

As of June 30, 2025, the IESO's SaveONenergy Program will introduce new opportunities for energy reduction projects, bringing significant benefits to the facility. Key changes include:

- Higher Incentive Rates – Custom non-lighting measures will see increased incentives, rising from $1,200/kW to $1,800/kW and $0.13/kWh to $0.20/kWh, encouraging greater energy-saving initiatives.
- Adjusted Project Thresholds – The requirement for measurement and verification plans will shift from $80,000 to $120,000, and additional engineering calculations will now only be needed for projects exceeding $15,000 (previously $10,000).
- Regional Adders for Custom Incentives – Updates to qualifying local areas will account for forecasted electricity constraints, introducing targeted incentives.

Additionally, a significant energy efficiency improvement at the facility will be the integration of existing energy monitors into the Schneider suite. This will enable real-time Key Performance Indicator (KPI) monitoring, allowing OCWA to correlate energy data with process performance and enhance monitoring practices for optimized energy consumption.

Application Process: The application must be submitted via the IESO SaveONenergy portal, beginning with a pre-project submission and subject to IESO approval criteria. OCWA brings extensive experience, with over 300 successful custom applications designed and administered to date.

We also welcome discussions with the Township of Hornepayne on additional energy efficiency opportunities as we continue to assess new conservation measures.