



**SAULT  
STE. MARIE**

# Sault Ste Marie Net Zero Pathway Feasibility Study

SUMMARY

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**WALTERFEDY**

# Project Summary

## Overview

- WalterFedy was engaged by the City of Sault Ste. Marie to complete a Net Zero Pathway Feasibility Study at six (6) of the City's facilities
- **Objectives:** Identify and analyze measures that reduce utility use, greenhouse gas (GHG) emissions and utility costs.
- The analysis evaluated multiple GHG reduction pathways, ultimately recommending the **GHG Net Zero Roadmap** as the preferred pathway.
- **The GHG Net Zero Roadmap** seeks to achieve a **50% reduction in operational GHG emissions within 10 years, 80% within 20 years and net zero emissions by 2050.**

## Facilities

- John Rhodes Community Centre (JRCC)
- GFL Memorial Gardens (GFL)
- Public Works Centre
- Transit Admin Building
- East End Wastewater Treatment Plant (EEWWTP)
- Fire Hall 4 RESC Centre

# 2021 GHG EMISSIONS

<b>Building</b>	<b>Electricity use (kWhr/yr)</b>	<b>Natural gas use (m3/yr)</b>	<b>GHG emissions (tCO2e/yr)</b>
JRCC	3,243,771	422,498	964
GFL	2,578,276	327,295	751
Fire Hall	530,200	118,279	252
EEWWTP	4,838,148	353,187	913
Public Works Centre	899,908	210,262	444
Transit Admin Building	217,481	102,542	206
<b>Total</b>	<b>12,307,784</b>	<b>1,534,063</b>	<b>3,530</b>

# Results: John Rhodes Community Centre

## Recommended Measures:

### Capital measures:

- Envelope upgrades
- HVAC low GHG alternatives

### Renewable energy measures:

- Adding on-site renewable energy generation sources

### Carbon offsets:

- Purchase of carbon offsets or renewable energy contracts (RECs)

Measure category	Measure name	Project costs	Lifecycle costs	Emissions reduction	Implementation year
-	-	[\$]	[\$]	[tCO2e/yr]	-
Envelope	Add insulation to exterior walls	2,147,179	19,614,736	19.3	2031
	Add insulation to roof	9,634,068	30,158,342	9.6	2032
	Replace exterior windows and doors	968,437	19,540,337	-21.2	2032
Energy conservation	Interior lighting LED retrofit	77,361	18,300,322	-29	2029
	Pool Cover	153,128	18,388,144	35.6	2029
	Install VFD on competition pool filter circulation pump	51,043	18,290,757	3	2025
Fuel switch	Gas fired boiler to WSHP with existing boiler backup	535,950	19,147,377	359.5	2025
	Gas fired RTU to WSHP with electric backup	1,592,217	19,924,507	193.7	2034
	MTHL- Gas-fired DHW heater to WSHP	382,821	18,822,805	15.4	2035
	MTHL- WSHP for primary heating	803,924	19,362,693	-	2034
	Gas Fired Furnace to WSHP	112,294	18,253,272	154	2035
	Dehumidification system upgrade	1,276,070	21,045,618	13.5	2034
	Geothermal Infrastructure	2,647,846	19,890,335	-	2034
Renewables	Rooftop PV solar	662,281	18,388,144	10.6	2032
	Carbon offsets 80	0	18,729,825	771.2	2044

Note: a negative (1) value denotes an increase

# Results: John Rhodes Community Centre

## Results Summary:

- **Utility use:** The GHG Net Zero Roadmap will result in higher electricity usage but a substantial reduction in natural gas consumption (remaining natural gas use is due to backup heat)
- **Utility costs:** Despite an increase in electricity consumption, the GHG Net Zero Roadmap leverages higher efficiencies and renewable energy measures in conjunction with reduce natural gas use which results in reduced total annual utility costs.
- **GHG emissions:** The GHG Net Zero Roadmap results in net zero emissions by the timeline set out in this study. Note Carbon Offsets can be used to offset the emissions that result from increased electricity use.
- **Financial impact:** The project costs for the GHG net zero roadmap shows an initial investment of \$1.3 million more than the “Business as usual” (BAU) case. BAU represents like-for-like replacements as indicated by the City’s capital management plan.

Section	Description	Unit	Business as usual	GHG net zero roadmap	Variance
Utility use final	Electricity use	[kWh/yr]	3,243,771	3,995,287	751,516
	Natural gas use	[m3/yr]	422,498	56,689	-365,809
Utility cost final	Total utility cost	[\$/yr]	1,362,990	1,255,130	-107,860
GHG emissions	Total GHGs	[tCO2e/yr]	1,101	0	1,101
Financial cumulative	Project cost	[\$]	19,008,305	21,636,169	2,627,864
	Life cycle cost	[\$]	30,944,130	31,078,716	1,345,86

# Results: GFL Memorial Gardens

## Recommended Measures:

### Capital measures:

- Envelope upgrades
- HVAC low G

### Renewable energy measures:

- Adding on-site renewable energy generation sources

### Carbon offsets:

- Purchase of carbon offsets or renewable energy contracts (RECs)

Measure category	Measure name	Project costs [\$]	Lifecycle costs [\$]	Emissions reduction [tCO2e/yr]	Implementation year
Envelope	Add insulation to exterior walls	1,383,350	11,327,726	15	2028
	Add insulation to roof	9,851,184	22,064,504	50	2033
	Replace exterior windows and doors	7,318,787	11,070,814	33	2026
Energy conservation	Interior lighting LED retrofit	868,668	12,996,829	-3.8	2026
	Medium temperature heating loop	810,000	11,571,998	0	2030
	MTHL - Primary heating load and backup	1,620,000	12,082,483	0	2030
	Gas-fired MUA to hydronic	240,975	11,330,974	3.8	2026
	Ice plant upgrade (CIMCO)	3,037,500	14,622,597	14	2028
	Ductwork Condensation Mitigation	66,000	11,103,109	62	2025
Fuel switch	Gas fired boiler to WSHP with existing boiler backup	2,399,625	13,340,769	383	2031
	Gas fired RTU to WSHP with electric backup	717,863	11,822,630	203	2030
	Geothermal Infrastructure	5,791,500	14,711,480	0	2030
	Gas fired DHWH to WSHP	1,032,750	12,229,579	26	2032
Renewables	Rooftop solar PV	789,345	11,888,740	0.0	2034
	Carbon offsets 80	0	11,325,528	601	2044
	Carbon offsets 100	0	11,391,532	100	2044

Note: a negative (1) value denotes an increase

# Results: GFL Memorial Gardens

## Results Summary:

- **Utility use:** The GHG Net Zero Roadmap will result in lower electricity usage as well as a substantial reduction in natural gas consumption (remaining natural gas use is due to backup heat)
- **Utility costs:** Despite an increase in electricity consumption, the GHG Net Zero Roadmap leverages higher efficiencies and renewable energy measures in conjunction with reduce natural gas use which results in reduced total annual utility costs.
- **GHG emissions:** The GHG Net Zero Roadmap results in net zero emissions by the timeline set out in this study. Note Carbon Offsets can be used to offset the emissions that result from increased electricity use.
- **Financial impact:** The project costs for the GHG net zero roadmap shows an initial investment of \$23 million more than the “Business as usual” (BAU) case. BAU represents like-for-like replacements as indicated by the City’s capital management plan

Section	Description	Unit	Business as usual	GHG net zero roadmap	Variance
Utility use final	Electricity use	[kWh/yr]	2,578,276	2,248,737	-329,539
	Natural gas use	[m3/yr]	327,295	42,515	-284,780
Utility cost final	Total utility cost	[\$/yr]	885,878	587,093	-298,785
GHG emissions	Total GHGs	[tCO2e/yr]	859	0	-859
Financial cumulative	Project cost	[\$]	20,065,415	43,435,231	23,369,816
	Life cycle cost	[\$]	25,159,350	40,159,951	15,000,601

# Results: Fire Hall RESC Centre

## Recommended Measures:

### Capital measures:

- Envelope upgrades
- HVAC low GHG alternatives

### Renewable energy measures:

- Adding on-site renewable energy generation sources

### Carbon offsets:

- Purchase of carbon offsets or renewable energy contracts (RECs)

Measure category	Measure name	Project costs [\$]	Lifecycle costs [\$]	Emissions reduction [tCO <sub>2</sub> e/yr]	Implementation year
-	-	-	-	-	-
Envelope	Add insulation to exterior walls - Auxiliary	9,481,050	9,252,383	11	2029
	Add insulation to roof - Primary building	2,606,175	5,885,171	15	2027
	Replace exterior windows and doors	129,600	3,264,407	4	2029
Energy conservation	LED lighting retrofit	1,081,350	5,691,942	-2	2034
Fuel switch	Gas-fired RTU to GSHP with electric backup	751,022	3,922,887	60	2034
	Gas-fired boiler to GSHP with existing boiler backup	1,074,263	4,337,729	65	2044
	Gas-fired radiant heaters to electric	300,713	3,851,077	59	2031
	Gas-fired DHWH to ASHP	85,050	3,094,716	20	2034
	Geothermal Infrastructure	1,559,250	3,691,942	-	2033
Renewables	Rooftop solar PV	162,000	3,199,217	3	2034
	Carbon offsets 80	-	3,237,260	202	2044
	Carbon offsets 100	-	3,260,559	252	2048

Note: a negative (1) value denotes an increase

# Results: Fire Hall RESC Centre

## Results Summary:

- **Utility use:** The GHG Net Zero Roadmap will result in higher electricity usage however, natural gas use would be eliminated.
- **Utility costs:** Despite an increase in electricity consumption, the GHG Net Zero Roadmap leverages higher efficiencies and renewable energy measures in conjunction with reduce natural gas use which results in reduced total annual utility costs.
- **GHG emissions:** The GHG Net Zero Roadmap results in net zero emissions by the timeline set out in this study. Note Carbon Offsets can be used to offset the emissions that result from increased electricity use.
- **Financial impact:** The project costs for the GHG net zero roadmap shows an initial investment of \$17 million more than the “Business as usual” (BAU) case. BAU represents like-for-like replacements as indicated by the City’s capital manageme

Section	Description	Unit	Business as usual	GHG net zero roadmap	Variance
Utility use final	Electricity use	[kWh/yr]	530,200	846,316	314,330
	Natural gas use	[m3/yr]	118,279	0	-118,279
Utility cost final	Total utility cost	[\$/yr]	230,245	212,520	-17,725
GHG emissions	Total GHGs	[tCO2e/yr]	273	0	-273
Financial cumulative	Project cost	[\$]	2,664,861	19,716,601	17,051,740
	Life cycle cost	[\$]	5,028,812	13,207,826	8,179,014

# Results: East End Wastewater Treatment Plant

## Recommended Measures:

### Capital measures:

- Envelope upgrades
- HVAC low GHG alternatives

### Renewable energy measures:

- Adding on-site renewable energy generation sources

### Carbon offsets:

- Purchase of carbon offsets or renewable energy contracts (RECs)

Measure category	Measure name	Project costs	Lifecycle costs	Emissions reduction	Implementation year
-	-	[\$]	[\$]	[tCO2e/yr]	-
Envelope	Add insulation to exterior walls	2,423,925	18,941,064	24	2036
	Replace exterior windows and doors	1,014,525	18,591,071	3.7	2036
Energy conservation	LED lighting retrofit	261,225	17,786,530	-0.91	2025
	UV light replacement	5,040,000	24,342,096	24	2026
	IT Room HVAC Replacement	20,250	17,568,521	0	2026
Fuel switch	Gas-fired equipment to ASHP with existing natural gas backup	6,341,288	24,983,741	361	2030
	Gas-fired unit heater to electric	405,000	18,612,794	55	2030
	Gas-fired water heater to ASHP	182,250	17,336,639	69	2030
Renewables	Ground mount PV solar	797,040	17,960,401	11	2034
	Carbon offsets 50	0	17,746,060	456	2034
	Carbon offsets 100	0	17,867,081	913	2044

Note: a negative (1) value denotes an increase

# Results: East End Wastewater Treatment Plant

## Results Summary:

- **Utility use:** The GHG Net Zero Roadmap will result in higher electricity usage however, there would be a substantial reduction in natural gas use.
- **Utility costs:** Despite an increase in electricity consumption, the GHG Net Zero Roadmap leverages higher efficiencies and renewable energy measures in conjunction with reduce natural gas use which results in reduced total annual utility costs.
- **GHG emissions:** The GHG Net Zero Roadmap results in net zero emissions by the timeline set out in this study. Note Carbon Offsets can be used to offset the emissions that result from increased electricity use.
- **Financial impact:** The project costs for the GHG net zero roadmap shows an initial investment of \$18.3 million more than the “Business as usual” (BAU) case. BAU represents like-for-like replacements as indicated by the City’s capital management plan. *Note: The facility lacks a useable building condition assessment at the time of the study, thus BAU financial metrics appear much lower than what would likely be the case for this facility.*

Section	Description	Unit	Business as usual	GHG net zero roadmap	Variance
Utility use final	Electricity use	[kWh/yr]	4,838,148	5,206,484	368,336
	Natural gas use	[m3/yr]	353,187	63,443	-289,744
Utility cost final	Total utility cost	[\$/yr]	1,332,215	1,216,797	-115,418
GHG emissions	Total GHGs	[tCO2e]	1,116	0	-1,116
Financial cumulative	Project cost	[\$]	369,205	18,855,715	18,486,510
	Life cycle cost	[\$]	17,440,328	39,332,431	21,892,103

# Results: Public Works Centre

## Recommended Measures:

### Capital measures:

- Envelope upgrades
- HVA

### Renewable energy measures:

- Adding on-site renewable energy generation sources

### Carbon offsets:

- Purchase of carbon offsets or renewable energy contracts (RECs)

Measure category	Measure name	Project costs	Lifecycle costs	Emissions reduction	Implementation year
-	-	[\$]	[\$]	[tCO2e/yr]	-
Envelope	Add insulation to exterior walls	1,137,848	6,731,419	13	2025
	Add insulation to roof	2,730,713	8,929,948	2.2	2025
	Replace windows and doors	12,810,555	14,134,600	3.6	2025
Energy conservation	Shops - Interior lighting retrofit	48,000	5,915,326	5	2026
Fuel switch	Admin - Gas-fired RTU to GSHP with electric backup	211,613	6,032,626	128	2025
	Shops - Gas-fired boiler to GSHP with existing boiler backup	1,074,263	7,345,173	7	2030
	Shops - Gas fired unit heaters to hydronic	331,500	6,530,339	9	2025
	Shops - NG heated pressure washers to electric	22,200	6,159,810	8	2027
	Geothermal Infrastructure	5,649,750	9,637,569	0	2025
	Gas fired DHWH to ASHP	43,200	5,978,802	104	2030
Renewables	Rooftop solar PV	1,255,500	6,927,996	15	2028
	Carbon offsets 100	0	6,272,048	444	2034

Note: a negative (1) value denotes an increase

# Results: Public Works Centre

## Results Summary:

- **Utility use:** The GHG Net Zero Roadmap will result in lower electricity usage as well as a substantial reduction in natural gas consumption (remaining natural gas use is due to backup heat)
- **Utility costs:** Despite an increase in electricity consumption, the GHG Net Zero Roadmap leverages higher efficiencies and renewable energy measures in conjunction with reduce natural gas use which results in reduced total annual utility costs.
- **GHG emissions:** The GHG Net Zero Roadmap results in net zero emissions by the timeline set out in this study. Note Carbon Offsets can be used to offset the emissions that result from increased electricity use.
- **Financial impact:** The project costs for the GHG net zero roadmap shows an initial investment of \$25 million more than the “Business as usual” (BAU) case. BAU represents like-for-like replacements as indicated by the City’s capital management plan.

Section	Description	Unit	Business as usual	GHG net zero roadmap	Variance
Utility use final	Electricity use	[kWh/yr]	899,908	848,441	-51,467
	Natural gas use	[m3/yr]	269,882	64,368	-205,514
Utility cost final	Total utility cost	[\$/yr]	531,492	377,892	-153,600
GHG emissions	Total GHGs	[tCO2e/yr]	444	0	-444
Financial cumulative	Project cost	[\$]	500,680	26,020,353	25,519,673
	Life cycle cost	[\$]	7,096,345	23,286,749	16,190,404

# Results: Transit Admin Building

## Recommended Measures:

### Capital measures:

- Envelope upgrades
- HVAC

### Renewable energy measures:

- Adding on-site renewable energy generation sources

### Carbon offsets:

- Purchase of carbon offsets or renewable energy contracts (RECs)

Measure category	Measure name	Project costs	Lifecycle costs	Emissions reduction	Implementation year
-	-	[\$]	[\$]	[tCO2e/yr]	-
Envelope	Add insulation to exterior walls - Admin	64,800	2,435,422	1	2028
	Add insulation to exterior walls - Maintenance	593,325	2,954,880	8	2028
	Add insulation to roof	2,794,500	5,237,948	13	2044
	Replace exterior windows and doors	340,200	2,724,678	1	2036
Energy conservation	HVAC optimization	96,000	2,724,678	2.1	2025
Fuel switch	Gas fired AHU to ASHP with electric backup	1,147,163	3,774,960	69	2029
	Fuel fired heaters to electric	614,588	3,639,529	63	2029
	Gas fired DHWH to ASHP hybrid	47,588	2,386,258	35	2025
Renewables	Rooftop PV solar	708,750	2,757,533	10	2034
	Carbon offsets 80	-	2,444,017	165	2044
	Carbon offsets 100	-	2,462,122	206	2044

Note: a negative (1) value denotes an increase

# Results: Transit Admin Building

## Results Summary:

- **Utility use:** The GHG Net Zero Roadmap will result in higher electricity usage however, natural gas use at the facility would be eliminated.
- **Utility costs:** Despite an increase in electricity consumption, the GHG Net Zero Roadmap leverages higher efficiencies and renewable energy measures in conjunction with reduce natural gas use which results in reduced total annual utility costs.
- **GHG emissions:** The GHG Net Zero Roadmap results in net zero emissions by the timeline set out in this study. Note Carbon Offsets can be used to offset the emissions that result from increased electricity use.
- **Financial impact:** The project costs for the GHG net zero roadmap shows an initial investment of \$3.8 million more than the “Business as usual” (BAU) case. BAU represents like-for-like replacements as indicated by the City’s capital management plan.

Section	Description	Unit	Business as usual	GHG net zero roadmap	Variance
Utility use final	Electricity use	[kWh/yr]	217,481	529,676	312,195
	Natural gas use	[m3/yr]	102,542	0	-102,542
Utility cost final	Total utility cost	[\$/yr]	180,869	186,344	5,475
GHG emissions	Total GHGs	[tCO2e/yr]	215	0	-215
Financial cumulative	Project cost	[\$]	4,285,922	8,105,405	3,819,483
	Life cycle cost	[\$]	3,753,925	6,116,499	2,362,574

# Conclusion

The objective of this project was to assess the facility and create a utility use baseline to identify and analyze various measures that reduce utility use, greenhouse gas (GHG) emissions, and utility costs. The recommended GHG reduction pathway for this project was the **Net Zero Roadmap** which with a combination of capital energy conservation measure, renewable energy measures and carbon offsets was able to achieve net zero GHG emissions by 2050 and reducing natural gas use by 1.3 million m<sup>3</sup>/yr.

Building	Electricity use (kWhr/yr)	Natural gas use (m <sup>3</sup> /yr)	GHG emissions (tCO <sub>2</sub> e/yr)
JRCC	3,995,287	56,589	0
GFL	2,248,737	42,515	0
Fire Hall	846,316	0	0
EEWWTP	5,206,484	63,443	0
Public Works Centre	848,441	64,368	0
Transit Admin Building	529,676	0	0
<b>Total</b>	<b>13,674,941</b>	<b>226,915</b>	<b>0</b>
<b>Variance</b>	<b>1,367,157</b>	<b>-1,307,148</b>	<b>-3,530</b>