Workbook Introduction and Guide

Legend for Data Entry and Inventory Year

Legend for data entry	Legend for data e
Do not edit	Do not edit; this cell is a
May need to be updated	These cells may need to be updated
Needs to be updated each inventory	These cells require manual entry each y

Lead Coordinator and Lead Consultant

Lead Coordinator	
Jurisdiction	Town of Erie
Name	Tyler Kesler
Title	Sustainability Manager
Telephone	303.926.2880
Email	tkesler@erieco.gov

Spreadsheet Contents

Source/Activity	Worksheet
All	Workbook Intro
	Emission Summary
	Inventory Data Checklist (IDC)
	Conversion Factors and GWP
	Municipal Indicators
Energy Use	Stationary Energy
On-Road Vehicles	Vehicle Fleet Data
	Bus Travel and EMP Commute Data
Aviation	Aviation
Off-Road	Off-Road
Solid Waste Generation	Waste_Recycling Data
Wastewater Treatment	Wastewater Data
Refrigerant leaks	Refrigerant Data
Consumption Data	Consumption Data

ntry
formula.
depending on if new
ear due for data that is

	Lead Co
Company	
Name	
Title	
Telephone	
Email	

Overview of workbook
Provides all summary information for the inventory, including emission
Identifies required data and provides a place to store contact informat
Provides standard conversion factors and the most recent 100-year Gl
Includes general municipal characteristics used to complete GPC Table
Calculates the total emissions for each source of utility fuels and electi
Estimates mobile fuel consumption and emissions from VMT of munici
Estimates mobile fuel consumption and emissions from VMT of employ
Estimates emissions from the municipal owned airport.
Estimates mobile emissions from fuel use of municipal-owned off-road
Estimates emissions from community generated waste sent to landfill
Estimates total emissions from wastewater treatment processes.
Estimates emissions from refrigerant use.
Estimates emissions from paper use.

Inventory Year
2021

nsultant
Lotus Engineering and Sustainability
Rachel Meier
Senior Associate
612.558.6296
rachel@lotussustainability.com

Description
ıs by scope, sector, and source.
:ion for relevant community inventory sources and sectors.
obal Warming Potential values.
ɛ 4.1 and to calculate GHG emission metrics.
ricity.
pal-owned vehicles.
yee-owned vehicles and business travel.
l vehicles.
or composting facility and avoided emissions from recycling.

Emissions Summary

Emission Inventory Summary

Scope
Scope 1
Scope 2
Scope 3
Total

Emission Inventory Summary without Co

Scope
Scope 1
Scope 2
Scope 3
Total

All Emissions by Sector

Emission Sector
Stationary Energy
Transportation
Waste + Wastewater
Consumption Based
Total

All Emissions by Sector without Consump

Emission Sector
Stationary Energy
Transportation
Waste + Wastewater
Total

All Emissions by Source

Emission Source
Stationary and mobile electricity
Stationary fossil fuels
On-road fossil fuel vehicles
Off-road fossil fuel vehicles
Mobile equipment
Aviation
Solid Waste
Wastewater Treatment
Paper
Asphalt
Cement
Food
Computers

Fertilizer
Well-to-wheel
Total

All Emissions by Source without Consump

Emission Source
Stationary and mobile electricity
Stationary fossil fuels
On-road fossil fuel vehicles
Off-road fossil fuel vehicles
Aviation
Mobile equipment
Solid Waste
Wastewater Treatment
Total

Detailed Emissions Breakdown by Sector

Stationary Energy
Fuel Combustion within the City Boundary
Grid Supplied Electricity
Total Stationary Energy
Transportation
On-road Vehicles
Emissions from fuel combustion on-road transportation occurring in the city
Emissions from grid-supplied energy consumed in the city for on-road transportation
Emissions from fuel combustion from equipment used in the city
Emissions from aviation
Off-Road
Emissions from off-road vehicle fuel use
Total Transportation
Waste
Community Solid Waste
Landfilled waste
Wastewater Treatment and Discharge
Wastewater Generated and Treated

Total Waste
Consumption Based
Paper
Asphalt
Cement
Food
Computers
Fertilizer
Well-to-wheel
Total Consumption Based
Total Emissions Without Consumption-Based Sources
Total Emissions with Consumption-Based Sources

Information Only Breakdown by Sector

Information Only
Energy Related
Xcel-owned Renewable Energy Credits
Erie-owned Renewable Energy Credits
Total Energy-Related
Refrigerants
Refrigerant Leaks
Total Industrial Processes and Product Use
Recycling
Recycling
Total Recycling
TOTAL INFORMATION-ONLY

Emissions (mt CO_2e)	% of Total
4,661	30%
10,287	67%
391	2.5%
15,338	**100%**

nsumption Based

Emissions (mt CO_2e)	% of Total
4,661	31%
10,287	68%
179	1.2%
15,126	**100%**

Emissions (mt CO_2e)	% of Total
13,011	85%
1,978	12.9%
138	1%
212	1.4%
15,338	**100%**

tion-Based

Emissions (mt CO_2e)	% of Total
13,011	86%
1,978	13.1%
138	1%
15,126	**100%**

Emissions (mt CO_2e)	% of Total
10,287	67%
2,726	17.8%
510	3.3%
7	0.05%
134	0.9%
1,325	8.6%
8	0.1%
130	1%
0	0%
0.5	0.003%
0	0%
0	0%
16	0.1%

34	0.2%
161	1.1%
15,338	**100%**

tion-Based

Emissions (mt CO_2e)	% of Total
10,288	67.1%
2,726	17.8%
510	3.3%
7	0.05%
1,325	8.6%
134	0.9%
8	0.1%
130	1%
15,128	**100%**

Type	GHG Emissions (mt CO_2e)
Erie Facilities	2,722
Erie Facilities	4
Erie Facilities	10,285
	13,011

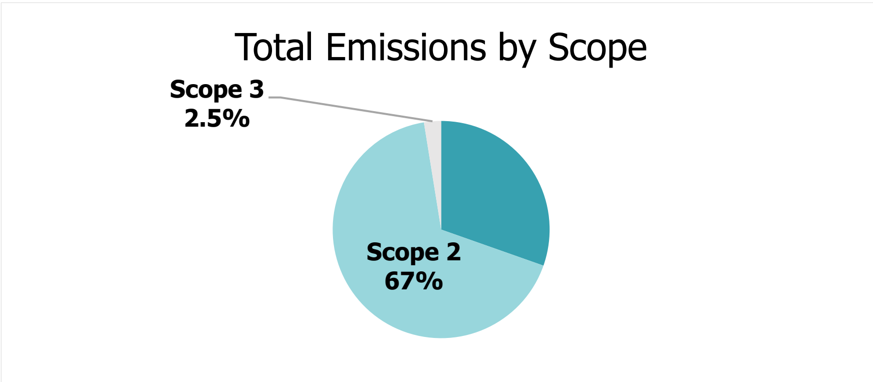
Type	GHG Emissions (mt CO_2e)
Municipal Vehicles	340
Business Travel	0
Employee Commuting (includes travel by bus)	170
Municipal Vehicles	2
Employee Commuting	0
Municipal Equipment	134
Jet Fuel and Aviation Gasoline	1,325
Type	**GHG Emissions (mt CO_2e)**
Airport Equipment	7
	1,978

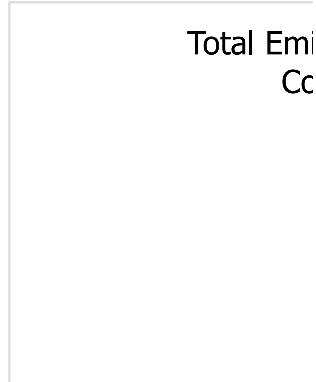
Type	GHG Emissions (mt CO_2e)
Waste	8

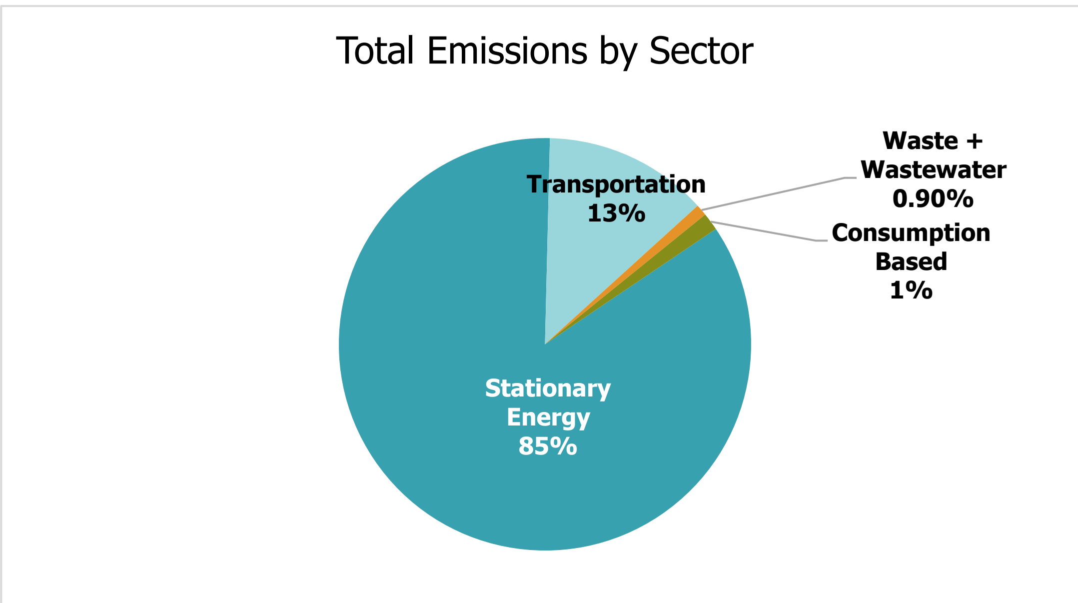
Type	GHG Emissions (mt CO_2e)
Wastewater Treatment	130

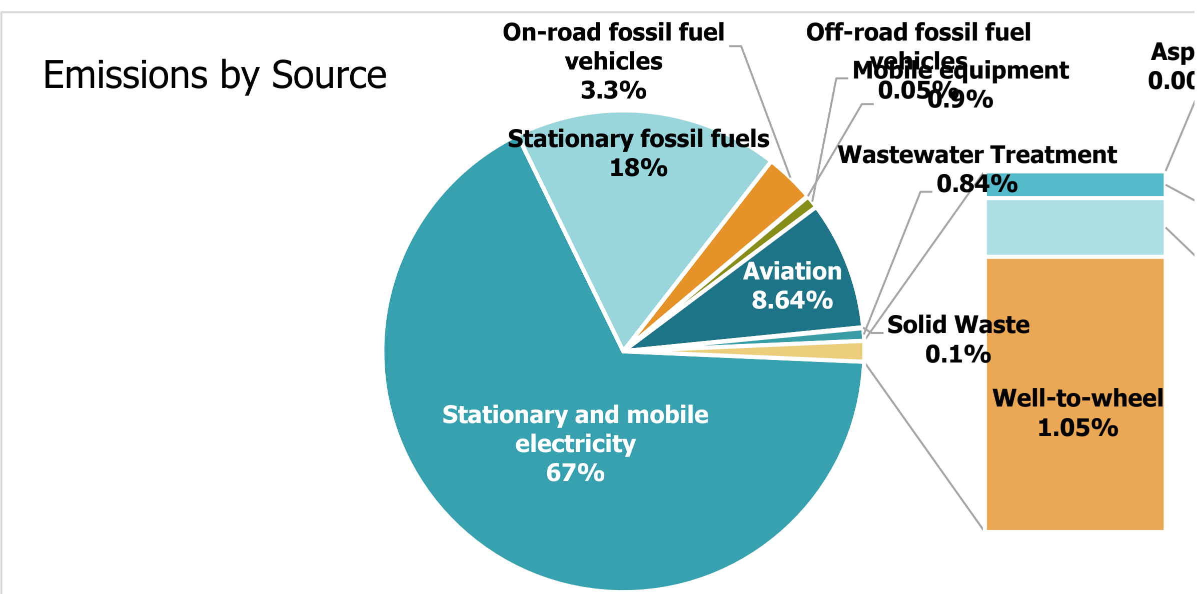
	138
Type	**GHG Emissions (mt CO_2e)**
Paper	0
Asphalt	0.5
Cement	0
Food	0
Computers	16
Fertilizer	34
Well-to-wheel	161
	212
	15,126
	15,338

Type	**Avoided GHG Emissions (mt CO_2e)**
Grid Supplied Renewables	0
Renewable*Connect and Rooftop Solar	0
	0
Type	**GHG Emissions (mt CO_2e)**
R-22	67
R-410A	64
	131
Type	**Avoided GHG Emissions (mt CO_2e)**
All	(13)
	(13)
Avoided Emissions	**(13)**
Refrigerant Emissions	**131**


Total Emissions by Scope
Scope 3
2.5%
Scope 2
67%


Total Emi
Co


Total Emissions by Sector
Waste +
Wastewater
0.90%
Transportation
13%
Consumption
Based
1%
Stationary
Energy
85%


Emissions by Source
On-road fossil fuel
vehicles
3.3%
Off-road fossil fuel
vehicles
0.05%
Mobile equipment
0.9%
Asp
0.00
Stationary fossil fuels
18%
Wastewater Treatment
0.84%
Aviation
8.64%
Solid Waste
0.1%
Well-to-wheel
1.05%
Stationary and mobile
electricity
67%

Scope	Value	Unit
1	521,613	therms
1	400	gallons
2	18,284,398	kWh

Scope	Value	Unit
1	913,742	VMT
3	0	VMT
3	443,526	VMT
2	2,240	kWh
3	0	kWh
1	13,032	Gallons of Fuel
1	141,187	Gallons fuel

Scope	Value	Unit
1	680	Gallons of fuel

Scope	Value	Unit
3	31	Tons Waste

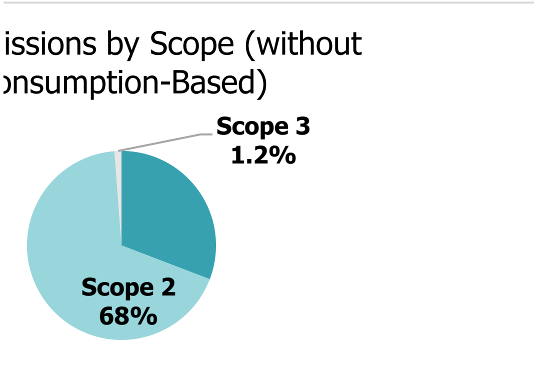
Scope	Value	Unit
1	30,000	Population Served

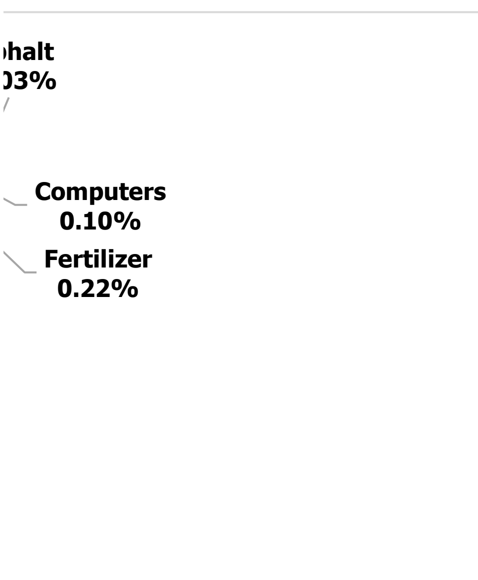
Scope	Value	Unit
3	0	Pounds purchased
3	4	tons of Asphalt
3	0	yd^3 of cement
3	0	$ spent
3	622	Pounds purchased
3	15,260	lbs applied
3	70,151	gallons consumed

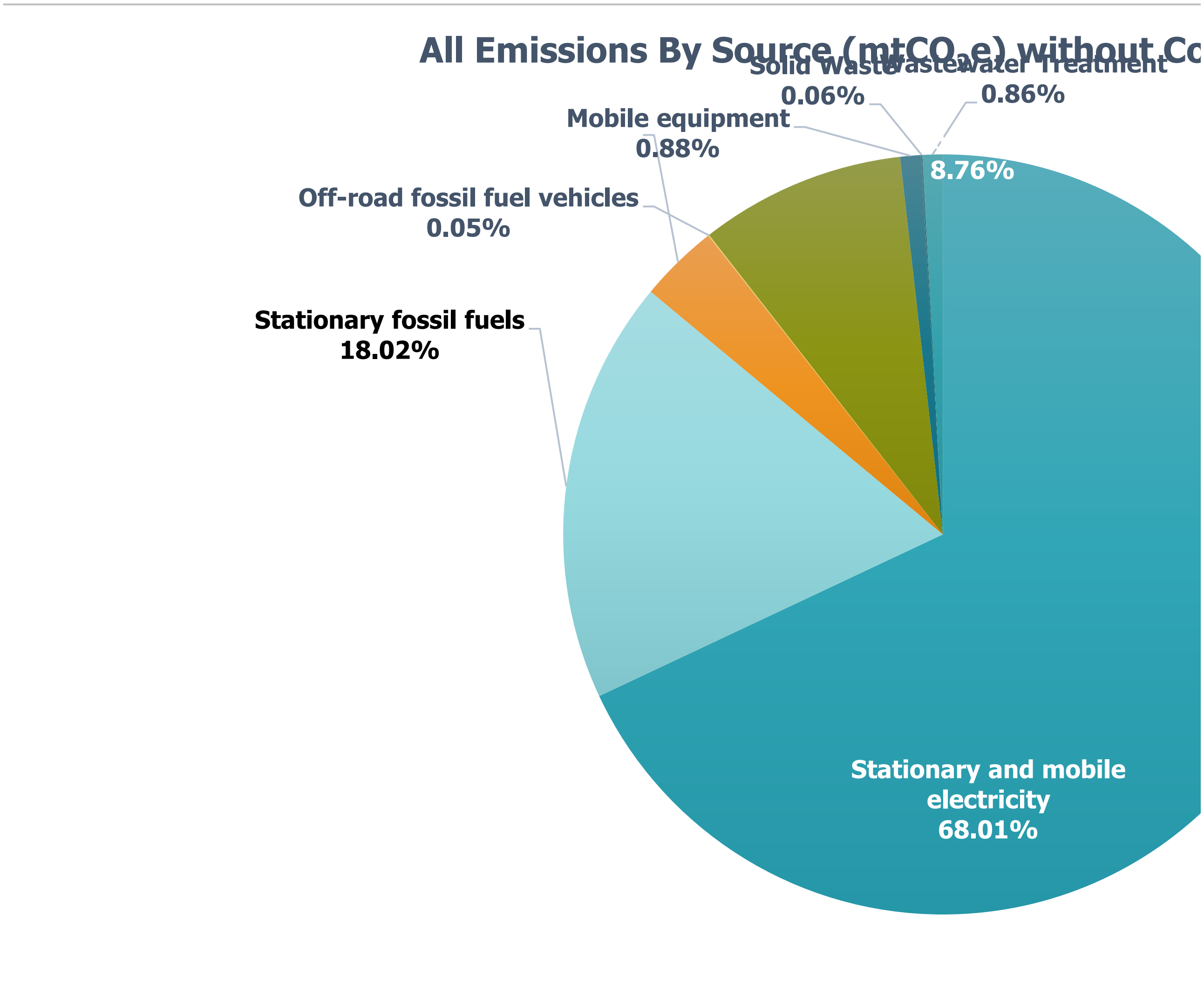
Scope	Value	Unit
N/A	0	kWh
N/A	0	kWh
	0	

Scope	Value	Unit
1	37	kg
1	31	kg

Scope	Value	Unit
N/A	5	Tons


issions by Scope (without
onsumption-Based)
Scope 3
1.2%
Scope 2
68%


halt
03%
Computers
0.10%
Fertilizer
0.22%


All Emissions By Source (mtCO2e) without Co
Solid Waste
0.06%
Wastewater Treatment
0.86%
Mobile equipment
0.88%
Off-road fossil fuel vehicles
0.05%
Stationary fossil fuels
18.02%
8.76%
Stationary and mobile electricity
68.01%

onsumption Based

Inventory Data Checklist for Municipal GHG Invento

Data Contacts

Municipal Indicators

Emissions Source	Data Source
Facility square feet	Town of Erie
Number of employees	Town of Erie

Stationary Energy

Emissions Source	Data Source
Electricity	Town of Erie
Natural Gas	Town of Erie
Diesel for facilities	Town of Erie
Propane	Town of Erie

Emissions Source	Data Source
Solar	Town of Erie

Mobile Energy

Emissions Source	Data Source
Fleet fuel consumed or vehicle miles traveled, vehicle details	Town of Erie

Fleet electric vehicles	Town of Erie
Off-road vehicles fuel consumed or vehicle miles traveled [at Municipal Airport]	Town of Erie
Mobile equipment fuel consumed or vehicle miles traveled, equipment type	Town of Erie
Aviation [Municipal Airport]	Town of Erie
Emissions Source	**Data Source**
Employee commuting	Town of Erie
Business travel	Town of Erie

Solid Waste Facilities

Emissions Source	**Data Source**
Tons of waste landfilled	Town of Erie

Tons of waste recycled	Town of Erie
Tons of waste composted	Town of Erie
Waste and Wastewater Treatment Facilities	
Emissions Source	**Data Source**
Amount of gas combusted and flared	Town of Erie
Nitrogen discharged	Town of Erie
Service Area Population	Town of Erie
Process and Fugitive Emissions	
Emissions Source	**Data Source**
Type and tons of refrigerant used in buildings	Town of Erie
Type and tons of refrigerant used in vehicle fleet	Town of Erie
Materials	
Emissions Source	**Data Source**
Tons of paper consumed	Town of Erie
Asphalt and cements	Town of Erie
Food purchases	Town of Erie
Fertilizer	Town of Erie
Computers/Hardware	Town of Erie

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Contact Information
Dennis Buck dbuck@erieco.gov
Tracy Schoenebeck HR Operations Manager tschoenebeck@erieco.gov 303-926-2745

Contact Information
Bill Meier bmeier@unitedpower.com Lexi Johnson E: alexandra.l.johnson@xcelenergy.com
Lexi Johnson E: alexandra.l.johnson@xcelenergy.com Maria Garduna Maria.Garduna@blackhillscorp.com
Dennis Buck dbuck@erieco.gov
N/A

Contact Information
N/A

Contact Information
Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov

Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov
Todd Fessenden tfessenden@erieco.gov Jason Hurd jason@vectorair.net
Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov
Todd Fessenden tfessenden@erieco.gov Jason Hurd jason@vectorair.net

Contact Information
Tyler Kesler tkesler@erieco.gov Adam Nettesheim anettesheim@erieco.gov Tracy Schoenbeck tschoenebeck@erieco.gov Gabi Rae grae@erieco.gov
Tyler Kesler tkesler@erieco.gov Adam Nettesheim anettesheim@erieco.gov Tracy Schoenbeck tschoenebeck@erieco.gov Gabi Rae grae@erieco.gov

Contact Information
Todd Fessenden

tfessenden@erieco.gov

Contact Information
Jon Coyle jcoyle@erieco.gov

Hydro

Contact Information
Dennis Buck Facilities Division Manager dbuck@erieco.gov 303.926.2560
Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov

Contact Information
Amy Teetzel ateetzel@erieco.gov
Scott Brown sbrown@erieco.gov
N/A
Mike McGill mmcgill@erieco.gov
Denise Jakan djakan@erieco.gov

Town-Wide

Status
On file
On file

Buildings and Facilities

Status
On file
On file
On file
N/A

Renewable Energy

Status
N/A

Vehicle Fleet

Status
On file

On file
On file
On file
On file

Employees

Status
On file
Not available

Municipal Solid Waste

Status

Will estimate

Wastewater Treatment

Status
On file

fluorocarbon and Refrigerants

Status
On file
Not Available

Other

Status
Not Available
On file
N/A
On file
On file

Notes

Notes
No propane used at Erie facilities.

Notes

Notes

Notes

Notes

Notes
Notes
Notes
De minimis

Conversion Factors and Global Warming Potential (G

Constants

Conversion Factors	
2,204.62	lbs
2,000.00	lbs
1,000.00	kWh
1.00	kBTU of electricity
1,000.00	kg
1,000,000.00	g
1.00	MMBtu of electricity
0.1000	MMBtu of natural gas
1,000.00	kBtu of natural gas
12,000.00	BTU of electricity
1.00	kg

Global Warming Potentials	
Common Name	**Formula**
Carbon Dioxide	CO_2
Methane	CH_4
Nitrous Oxide	N_2O
Refrigerants	R-134A
	R-22
	R-11
	R-12
	R514
	R407c
	R410a

1
1
1
0.293071
1
1
1
1
1
1
2.20462
GWP
1
29.8
273
1,526
1,810
4,750
10,900
2
1,774
2,088

metric ton
US ton
MWh
kWh
metric ton
metric ton
MLB Steam
therm
MMBtu of natural gas
Ton-hour chilled water
lbs.
Source
IPCC Sixth Assessment Report; document can be found at: https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/.
https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

Municipal Indicators

Data Sources and Assumptions

1) Data for number of employees were provided by Tracy Schoenebeck. Email on file.

2) Facility square footage and quantity data were provided by Dennis Buck. Email and PDF on f
were removed from the square footage total.

Municipal Indicators

Municipal Indicator	Value
Total facility square feet	219,392
Number of buildings	79
Facilities owned and occupied	*79*
Facilities owned but leased to other organizations	*0*
Full-time employees	206
Part-time employees	260
Temporary/Seasonal	5
Total number of Town employees	471

file. Spreadsheet with calculations on file. Square footage of dugouts, picnic shelters, and other r structures that are not buildings

Stationary Energy Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	2,726
Scope 2	10,285
Scope 3	0
Total	**13,011**
Information-Only Avoided Emissions	0

Data Sources and Assumptions

1) Electricity data was provided in United Power's 2021 Franchise Report for the Town of
2) Natural gas data and additional electricity data were provided by Xcel Energy. Spreads
3) Stationary diesel data were provided by Dennis Buck. Email on file.
4) There are no renewable energy programs in Erie. Confirmed via phone call.
5) Propane is not used in any buildings.
6) The North Water Treatment Facility is serviced by Black Hills Energy for natural gas. T

Emission Factors

Electricity

Utility/Method	Greenhouse Gas
United Power	CO_2
Xcel Energy	CO_2
N/A	CH_4
N/A	N_2O

Natural Gas

Utility	Greenhouse Gas
Xcel Energy	CO_2
N/A	CH_4
N/A	N_2O

Stationary Diesel

Utility	Greenhouse Gas
Various	CO_2
Various	CH_4
Various	N_2O

Emissions Calculations

Energy Consumption

Electricity	Electricity Provided by United Power (kWh)
Facilities	**6,676,693**
Erie Facilities	5,779,502
Irrigation Sales	79,901
Public Street and Highway Lighting	817,290

Total	**6,676,693**
Natural Gas	**Natural Gas Provided by Xcel Energy (th)**
Facilities	**472,318**
Erie Facilities	472,318
Total	**472,318**
Stationary Diesel	**Gallons of Diesel**
Erie Facilities	400
Total	**400**
Renewable Energy Generation and Renewable Energy Credits	
Grid Supplied Renewables (Xcel-owned RECs)	**Total Generation (kWh)**
Erie Facilities	0
Total	**0**
Renewable*Connect and Rooftop Solar (Erie-owned RECs)	**Total Generation (kWh)**
Erie Facilities	0
Total	**0**
TOTAL RENEWABLE ENERGY	**0**

Erie. PDF on file.
sheet on file. Metered streetlight data for Erie owned streetlights and traffic s

hey provided the natural gas usage data for that building. Spreadsheet on fi

Value	Units
0.712	mt CO_2/MWh
0.470	mt CO_2/MWh
0.00006	mt CH_4/MWh
0.00001	mt N_2O/MWh

Value	Units
0.0052	mt CO_2/th
0.0000005	mt CH_4/th
0.00000001	mt N_2O/th

Value	Units
0.0102	mt CO_2/gal
0.0000004	mt CH_4/gal
0.0000001	mt N_2O/gal

Electricity Provided by Xcel Energy (kWh)	Emissions (mt CO_2)
11,607,705	**10,209**
11,600,777	9,567
0	57
6,928	585

11,607,705	**10,209**
Natural Gas Provided by Black Hills (th)	**Emissions (mt CO_2)**
49,295	**2,712**
49,295	2,712
49,295	**2,712**
Emissions (mt CO_2)	**Emissions (mt CH_4)**
4	0.0002
4	**0.0002**
Emissions (mt CO_2)	**Emissions (mt CH_4)**
0	0
0	**0**
Emissions (mt CO_2)	**Emissions (mt CH_4)**
0	0
0	**0**
0	**0**

signals was provided in the Xcel Community Energy Report for the Town of E

le.

Source
Tri-State's Carbon Rate 2021: 1,570 lb/MWh. PDF on file. Pounds converted
Provided in Xcel Energy's 2021 Community Energy Report for Erie https://w
EPA's eGrid: eGRID 2018 summary tables, table 1, sub region RMPA. https:/ 01/documents/egrid2018_summary_tables.pdf.

Source
Xcel Energy's Community Energy Report: https://www.xcelenergy.com/work
ICLEI’s U.S. Community Protocol for Accounting and Reporting of Greenhous Environment Emission Activities and Sources, Version 1.1, July 2013: http://

Source
ICLEI’s U.S. Community Protocol for Accounting and Reporting of Greenhous Environment Emission Activities and Sources, Version 1.1, July 2013: http:// and that diesel is primarily used in generators by the industrial sector.

Emissions (mt CH_4)	Emissions (mt N_2O)
1	**0.2**
0.97	0.16
0.004	0.001
0.05	0.01

1	**0.2**
Emissions (mt CH_4)	**Emissions (mt N_2O)**
0.3	**0.005**
0.3	0.005
0.3	**0.005**
Emissions (mt N_2O)	**Emissions (mt CO_2e)**
0.00004	4
0.00004	**4**
Emissions (mt N_2O)	**Emissions (mt CO_2e)**
0	0
0	**0**
Emissions (mt N_2O)	**Emissions (mt CO_2e)**
0	0
0	**0**
0	**0**

:rie, spreadsheet on file.

to metric tons using unit conversions.
ww.xcelenergy.com/community_energy_reports
//www.epa.gov/sites/production/files/2020-

:ing_with_us/municipalities/community_energy_reports
se Gas Emissions (Community Protocol) – Appendix C: Built /icleiusa.org/ghg-protocols/.

se Gas Emissions (Community Protocol) – Appendix C: Built /icleiusa.org/ghg-protocols/. Assumes distillate fuel oil number 2

Emissions (mt CO_2e)
10,285
9,639
57
589

10,285
Emissions (mt CO_2e)
2,722
2,722
2,722

Vehicle Fleet Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	474
Scope 2	2
Scope 3	N/A
Total	**476**

Data Sources and Assumptions

1) Vehicle fleet provided by Richard Lucas. Spreadsheets on file. Vehicles/equipment we
2) Fuel efficiencies were taken from the EPA State Inventory Tool.
3) On a call with Tyler Kesler (11/15), Tyler noted that the Town's 2 electric vehicles ar

Emission Factors

Gasoline

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.009
CH_4	Passenger Vehicle	0.020
CH_4	Light Truck	0.023
CH_4	Heavy Truck	0.033
CH_4	Motorcycle	0.007
CH_4	Heavy Vehicle (bus)	0.030
N_2O	Heavy Vehicle (bus)	0.002
N_2O	Passenger Vehicle	0.017
N_2O	Light Truck	0.025
N_2O	Heavy Truck	0.013
N_2O	Motorcycle	0.068

Gasoline (equipment)

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.009
CH_4	Lawn and Garden Equipment	10.71
N_2O	Lawn and Garden Equipment	3.01

Diesel		
Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.010
CH_4	Passenger Vehicle	0.001
CH_4	Light Truck	0.001
CH_4	Heavy Truck	0.005
N_2O	Passenger Vehicle	0.001
N_2O	Light Truck	0.002
N_2O	Heavy Truck	0.005
Diesel (equipment)		
Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.010
CH_4	Lawn and Garden Equipment	0.335
N_2O	Lawn and Garden Equipment	0.466
Ethanol		
Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.006
CH_4	Light Duty	0.010
CH_4	Heavy Duty	0.075
N_2O	Light Duty	0.009
N_2O	Heavy Duty	0.028
Biodiesel		
Greenhouse Gas	Vehicle Type	Value
Biogenic CO_2	All	0.009
CH_4	Light Duty	0.023
CH_4	Heavy Duty	0.009
N_2O	Light Duty	0.014
N_2O	Heavy Duty	0.043
Stationary Diesel		
Greenhouse Gas	Vehicle Type	Value
CO_2	Equipment	0.0102
CH_4	Equipment	0.0000004

N_2O	Equipment	0.0000001
Propane (Equipment)		
Greenhouse Gas	**Vehicle Type**	**Value**
CO_2	Equipment	0.0057
CH_4	Equipment	0.35
N_2O	Equipment	0.41
Propane (Heavy-Duty Trucks)		
Greenhouse Gas	**Vehicle Type**	**Value**
CO_2	All	0.0057
CH_4	Heavy Duty	0.013
N_2O	Heavy Duty	0.026
Liquid CNG (Heavy Duty Trucks)		
Greenhouse Gas	**Vehicle Type**	**Value**
CO_2	All	0.0045
CH_4	Heavy Duty	3.7
N_2O	Heavy Duty	0.001

Emissions Calculations

Emissions Summary

	Gallons	**kWh**
Total Vehicles	**42,184**	**2,240**
Gasoline	37,217	
Ethanol	4,135	
Diesel	832	
Biodiesel	0	
Propane	0	
CNG	0	
Electric		2,240
Total Equipment	**13,032**	**0**
Gasoline	2,416	
Ethanol	0	
Diesel	10,617	
Biodiesel	0	
Propane	0	
Total Stationary Diesel	**0**	**0**
Total	**55,216**	**2,240**

Vehicle Fuel Efficiencies

Vehicle Type	**MPG**
Gas cars	24.1
Gas hybrid vehicles	56.0
Gas light trucks	18.5
Diesel cars	32.4
Diesel light trucks	22.1
Gas freight trucks	7.1

Diesel freight trucks	6.6
Gas single unit truck	7.1
Diesel single unit trucks	6.6
Diesel bus (paratransit)	7.7
Gas bus	14.0

Constants

Vehicle Type	kWh/mile
Electric vehicle	0.32

Emissions Calculations

Gasoline

	Total Gasoline Miles	Gasoline (gals)
Passenger Vehicles	**562,051**	**20,989**
Fleet	562,051	20,989
Light Duty Trucks	**333,557**	**16,227**
Fleet	333,557	16,227
Heavy Duty Trucks	**0**	**0**
Fleet	0	0
Buses	**0**	**0**
Fleet	0	0
Equipment	**0**	**2,416**
Fleet	0	2,416
Total Gasoline	**895,607**	**39,632**

Diesel

	Total Standard Diesel Miles	Diesel (gals)
Light Duty Trucks	**18,029**	**816**
Fleet	18,029	816
Heavy Duty Trucks	**106**	**16**
Fleet	106	16
Equipment	**0**	**10,617**
Fleet	0	10,617
Total Diesel	**18,135**	**11,448**

E-85

	Total E85 Miles	Gasoline (gals)
Passenger Vehicles	**0**	**0**
Fleet	0	0

Total E85	**0**	**0**
CNG		
	CNG Miles	**CNG (gals)**
Heavy Duty Trucks	**0**	**0**
Fleet	0	0
Total CNG	**0**	**0**
Propane		
	Propane (gals)	**Propane (miles)**
Heavy Duty Trucks	**0**	**0**
Fleet	0	0
Equipment	**0**	
Fleet	0	
Total Propane	**0**	**0**
Stationary Diesel		
	Diesel (gals)	**Emissions (mt CO_2)**
Stationary Diesel	**0**	**0**
Fleet	0	0
Total Stationary Diesel	**0**	**0**
Electricity		
	Number of Cars	**VMTs**
Electric Passenger Vehicles	**2**	**7,000**
Fleet	2	7,000
Total Electricity	**2**	**7,000**

ere recategorized based on fuel type and EPA Gross Vehicle Weight Rating (GVWR) to align with emis

e estimated to drive 3,500 miles per year. This information is reported in the electric vehicles calculat

Units	Source
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	2021 Climate Registry, Table 2.4 (https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8) - "EPA Tier 2" category
g N_2O/mile	2021 Climate Registry, Table 2.4 (https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8) - "EPA Tier 2" category
g N_2O/mile	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g N_2O/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors, Tables 2.1 & 2.7: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8. NOTE: An average for gasoline commercial 2-stroke and 4-stroke engines was used.
g CH_4/gallon fuel	
g N2O/gallon fuel	

Units	Source
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	
g N_2O/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors, Tables 2.1 & 2.7: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8.
g CH_4/gallon fuel	
g N2O/gallon fuel	

Units	Notes
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	2021 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8. NOTE: An average for Ethanol Flex-Fuel ICE values for light duty cars and light duty
g CH_4/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt biogenic CO_2(b)/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	2021 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8. NOTE: An average for Biodiesel for light duty cars, light duty trucks, and medium duty
g CH_4/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix C: Built Environment Emission Activities and Sources, Version 1.1, July 2013:
mt CH_4/gal	

mt N_2O/gal	Environment Emission Activities and Sources, Version 1.1, July 2013. http://icleiusa.org/ghg-protocols/. Assumes distillate fuel oil number 2 and

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf CO2 Emissions factors source from Table 2.1 for 'Propane'. CH4 and N2O
g CH_4/gal	
g N_2O/gal	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf CO2 Emissions factors source from Table 2.1 for 'Propane'. CH4 and N2O
g CH_4/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf CO2 Emissions factors source from Table 2.1 for 'Liquefied Natural Gas'. CH4
g CH_4/mile	
g N_2O/mile	

VMT	Biogenic Emissions (mt CO_2(b))
920,742	**24**
806,047	
89,561	24
18,135	
0	0
0	
0	
7,000	
Not Applicable	**0**
	0
	0
	0
920,742	**24**

Fuel Additives	
% of ethanol in standard gasoline	10%
% of ethanol in E85 gasoline	85%
% biodiesel in standard diesel	0%

Ethanol (gals)	Estimated VMT Gasoline
2,332	**505,846**
2,332	505,846
1,803	**300,201**
1,803	300,201
0	**0**
0	0
0	**0**
0	0
0	
0	
4,135	**806,047**

Biodiesel (gals)	Estimated VMT Diesel
0	**18,029**
0	18,029
0	**106**
0	106
0	
0	
0	**18,135**

Ethanol (gals)	Estimated VMT Gasoline
0	**0**
0	0

0	**0**

Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**
0	0
0	**0**

Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**
0	0
0	**0**
0	0
0	**0**

Emissions (mt CH_4)	Emissions (mt N_2O)
0	**0**
0	0
0	**0**

Electricity (kWh)	Emissions (mt CO_2)
2,240	**2**
2,240	2
2,240	**2**

ssions factors.

tion section of this tab.

Fossil Emissions (mt CO_2)	Emissions (mt CH_4)	Emissions (mt N_2O)	Emissions (mt CO_2e)
336.85	**0.02**	**0.02**	**342.00**
326.76	0.02	0.02	331.66
	0.0009	0.0008	0.23
8.49	0.000019	0.000028	8.50
	0	0	0
0	0	0	0
0	0	0	0
2	0.0001	0.00002	2
129.61	**0.03**	**0.01**	**133.82**
21.21	0.03	0.01	23.97
	0	0	0
108.39	0.004	0.005	109.85
	0	0	0
0	0	0	0
0	**0**	**0**	**0**
466	**0.05**	**0.03**	**476**

Estimated VMT Ethanol	Biogenic Emissions (mt CO_2(b))	Fossil Emissions (mt CO_2)	Emissions (mt CH_4)
56,205	**13**	**184**	**0.011**
56,205	13	184	0.011
33,356	**10**	**142**	**0.007**
33,356	10	142	0.007
0	**0**	**0**	**0**
0	0	0	0
0	**0**	**0**	**0**
0	0	0	0
	0	**21**	**0.026**
	0	21	0.026
89,561	**24**	**348**	**0.044**

Estimated VMT Biodiesel	Biogenic Emissions (mt CO_2(b))	Fossil Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**	**8**	**0.00002**
0	0	8	0.00002
0	**0**	**0.2**	**0.000001**
0	0	0.2	0.000001
	0	**108**	**0.004**
	0	108	0.004
0	**0**	**117**	**0.004**

Estimated VMT Ethanol	Biogenic Emissions (mt CO_2(b))	Fossil Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**	**0**	**0**
0	0	0	0

0	**0**	**0**	**0**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0	**0**
0	0
0	**0**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0	**0**
0	0
0	**0**
0	0
0	**0**

Emissions (mt CO_2e)
0
0
0

Emissions (mt CH_4)	Emissions (mt N_2O)	Emissions (mt CO_2e)
0.0001	**0.00002**	**2**
0.0001	0.00002	2
0.0001	**0.00002**	**2**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0.009	**187**
0.009	187
0.008	**145**
0.008	145
0	**0**
0	0
0	**0**
0	0
0.007	**24**
0.007	24
0.024	**356**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0.00003	**8**
0.00003	8
0.000001	**0.2**
0.000001	0.2
0.005	**110**
0.005	110
0.005	**118**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0	**0**
0	0

0	0

Business Travel and Employee Commuting Da

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	N/A
Scope 2	N/A
Scope 3	170
Total	**170**

Data Sources and Assumptions

1) Erie full-time and part-time commuting miles were provided by Gabi Rae. To ca office/in person in 2021 and assume all 5 seasonal employees worked in person ir roundtrip commute of 28.88 miles for full time employees and 12.36 miles for par

2) Erie does not track reimbursed business travel via passenger vehicle or airplane

Emission Factors

Public Transit Using Diesel

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Heavy Vehicle
N_2O	Heavy Vehicle

Gasoline

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Passenger Vehicle
CH_4	Light Truck
CH_4	Heavy Truck
CH_4	Motorcycle
N_2O	Passenger Vehicle
N_2O	Light Truck
N_2O	Heavy Truck
N_2O	Motorcycle

Diesel

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Passenger Vehicle
CH_4	Light Truck
CH_4	Heavy Truck
N_2O	Passenger Vehicle
N_2O	Light Truck
N_2O	Heavy Truck

Ethanol

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Light Duty
CH_4	Heavy Duty
N_2O	Light Duty
N_2O	Heavy Duty

Biodiesel

Greenhouse Gas	Vehicle Type
Biogenic CO_2	All
CH_4	Light Duty
CH_4	Heavy Duty
N_2O	Light Duty
N_2O	Heavy Duty

Electric and Hybrid Vehicles

Vehicle Type	Value
Electric Vehicle (EV)	0.320
Hybrid Electric Vehicle (HEV)	44.4
Plug-in-Hybrid Electric Vehicle (PHEV)	0.367

Jet Fuel (Aviation)

Variable	Value
Short-haul travel	0.225
Medium-haul travel	0.136
Long-haul travel	0.166
Short-haul travel	0.004
Medium-haul travel	0.001
Long-haul travel	0.001
Short-haul travel	0.007
Medium-haul travel	0.004
Long-haul travel	0.005

Emissions Calculations

Business Travel and Employee Commuting Breakdown

Passenger Vehicle Fuel Type	Employee Commuting (Passenger and Carpool) (%)
Gasoline	100%
Hybrid	0%
EV	0%
PHEV	0%
Diesel	0%
Total	**100%**

Emissions from Reimbursed Miles for Car Business Travel

Gasoline Vehicles

	Total Fuel Used (gal)
Gasoline Vehicles	0
Gasoline	*0*
Ethanol	*0*
Total	**0**

Emissions from Employee Commuting

Gasoline, Hybrid, and Diesel Vehicles

	Total Fuel Used (gal)
Gasoline Vehicles	**21,189**
Passenger Vehicles (Gasoline)	*8,282*
Passenger Vehicles (Ethanol)	*920*
Light Duty Trucks (Gasoline)	*10,788*
Light Duty Trucks (Ethanol)	*1,199*
Diesel Bus	**0**
Diesel	*0*
Biodiesel	*0*
Diesel Vehicles	**0**
Diesel	*0*
Biodiesel	*0*
Total	**21,189**

EV and PHEV Vehicles

	Total kWh
EV	0
PHEV: Electric	0
Total	**0**

Emissions from Air Travel

Travel Type	Miles Traveled

Domestic	**0**
Short-Haul	0
Medium-Haul	0
Long-Haul	0
International	**0**
Short-Haul	0
Medium-Haul	0
Long-Haul	0
Total	**0**
Short-Haul	0
Medium-Haul	0
Long-Haul	0
Total	**0**

ılculate employee commuting values, several assumptions were made. L
ı 2021; 2) assume all employees who worked in office/in person workec
t time and seasonal employees; and 4) assume a 50/50 split for employ

e, so this number is assumed to be de minimis.

Value	Units
0.010	mt CO_2/mile
0.005	g CH_4/mile
0.0048	g N_2O/mile

Value	Units
0.009	mt CO_2/gal
0.020	g CH_4/mile
0.023	g CH_4/mile
0.033	g CH_4/mile
0.007	g CH_4/mile
0.017	g N_2O/mile
0.025	g N_2O/mile
0.013	g N_2O/mile
0.068	g N_2O/mile

Value	Units
0.010	mt CO_2/gal
0.001	g CH_4/mile
0.001	g CH_4/mile
0.005	g CH_4/mile
0.001	g N_2O/mile
0.002	g N_2O/mile
0.005	g N_2O/mile

Value	Units
0.006	mt CO_2/gal
0.010	g CH_4/mile
0.075	g CH_4/mile
0.009	g N_2O/mile
0.028	g N_2O/mile

Value	Units
0.009	mt biogenic CO_2(b)/gal
0.023	g CH_4/mile
0.009	g CH_4/mile
0.014	g N_2O/mile
0.043	g N_2O/mile

Units	Source
kWh/VMT	US Department of Energy - Energy Efficiency and Renewable Energy, Alternative Fuels Data Center.
mpg	
kWh/VMT	

Units	Source
kg CO_2/passenger mile	Table 8 Business Travel and Employee Commuting: https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf
kg CO_2/passenger mile	
kg CO_2/passenger mile	
g CH_4/passenger mile	
g CH_4/passenger mile	
g CH_4/passenger mile	
g N_2O/passenger mile	
g N_2O/passenger mile	
g N_2O/passenger mile	

Employee Commuting (Bus) (%)	Estimated Employee Commute VMT (Passenger)
0%	443,526
0%	0
0%	0
0%	0
0%	0
0%	**443,526**

Biofuel Percentage	Estimated VMTs
10%	0
	0
	0
	0

Biofuel Percentage	Estimated VMTs
10%	**443,526**
	199,587
	22,176
	199,587
	22,176
0%	**0**
	0
	0
0%	**0**
	0
	0
	443,526

Estimated VMTs	Emissions (mt CO2)
0	0
0	0
0	**0**

% Flights	Emissions (mt CO2)

0%	**0**
0%	0
0%	0
0%	0
0%	**0**
0%	0
0%	0
0%	0
0%	**0**
0%	0
0%	0
0%	0
0%	**0**

.otus worked with Tyer Kesler to form these assumptions: 1) assume 20% of the 2
I the entirety of the 2021 calendar year in person, but subtract a standard 2 weeks
ee vehicles between gasoline passenger vehicles (i.e., sedans) and gasoline light d

Notes
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1.

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Source
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2020 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd450

Notes
ICLEI’s U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
2020 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd450

Estimated Employee Commute VMT (Public Transit)
0
0
0
0
0
0

Emissions (mt CO_2)	Emissions (mt CH_4)
0	0
0	*0*
--	*0*
0	**0**

Emissions (mt CO2)	Emissions (mt CH4)
167	**0.0090**
73	*0.0040*
--	*0.0002*
95	*0.0046*
--	*0.0002*
0	**0**
0	*0*
0	*0*
0	**0**
0	*0*
0	*0*
167	**0.01**

Emissions (mt CH4)	Emissions (mt N2O)
0	0
0	0
0	**0**

Emissions (mt CH4)	Emissions (mt N2O)

0	**0**
0	0
0	0
0	0
0	**0**
0	0
0	0
0	0
0	**0**
0	0
0	0
0	0
0	**0**

06 full time employees and 20% of the 260 part time employees worked in the
of vacation and 10 standard holidays (240 total work days); 3) assume an average
uty trucks.

Constants

Vehicle Type	Fuel Efficiency (mpg)	Fuel Additives	
Gas cars	24.1	% of ethanol in gasoline	10%
Diesel cars	32.4	% of biodiesel in Blend	0%
Diesel trucks	22.1		
Diesel bus	6.6		
Hybrid Vehicle	44.4		
Gas light trucks	18.5		

Emissions (mt N_2O)	Emissions (mt CO_2e)	Biogenic Emissions (mt $CO_2(b)$)
0	0	0
0	*0*	--
0	*0*	*0*
0	**0**	**0**

Emissions (mt N2O)	Emissions (mt CO2e)	Biogenic Emissions (mt CO2(b))
0.0088	**170.10**	
0.0034	*73.76*	--
0.0002	*0.06*	*5*
0.0050	*96.22*	--
0.0002	*0.06*	*7*
0	**0**	
0	*0*	--
0	*0*	*0*
0	**0**	
0	*0*	--
0	*0*	*0*
0.01	**170**	**0**

Emissions (mt CO_2e)
0
0
0

Emissions (mt CO2e)

0
0
0
0
0
0
0
0
0
0
0
0
0

Aviation Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	1,325
Scope 2	N/A
Scope 3	N/A
Total	**1,325**

Data Sources and Assumptions

1) Aviation data were provided by Jason Hurd with Erie Municipal Airport. PDF on file. Jason estimates tl

Emission Factors

Jet Fuel

Greenhouse Gas	Value	Units
CO_2	0.0098	mt CO2/gal
CH_4	0	mt CH4/gal
N_2O	0.0000003	mt N2O/gal

Aviation Gasoline

Greenhouse Gas	Value	Units
CO_2	0.0083	mt CO2/gal
CH_4	0.000007	mt CH4/gal
N_2O	0.0000001	mt N2O/gal

Data Calculations

Aviation Emissions

Source	Emissions (mt CO2)	Emissions (mt CH4)
Erie Municipal Airport	1,305	0.3

Transboundary Aviation	Local/ Itinerant	Scope
Erie Municipal Airport	Itinerant	1
Erie Municipal Airport	Itinerant	1
Aviation Gasoline Itinerant		
Jet Fuel Itinerant		

hat 65% of fuel was Jet Fuel and 35% was Aviation Gas.*

Source
The Climate Registry 22021 Default Emission Factors, Table 2.1 for CO_2 and Table 2.7 for CH_4 and N_2O: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf.

Source
The Climate Registry 2021 Default Emission Factors, Table 2.1 for CO_2 and Table 2.7 for CH_4 and N_2O: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf.

Emissions (mt N2O)	Emissions (mt CO2e)
0.03	1,325

% of all fuel	Total System Usage (gal)	Fuel Type
65%	91,772	Jet fuel
35%	49,415	Aviation gasoline
141,187	**49,415**	
	91,772	

Off-Road Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	7
Scope 2	0
Scope 3	0
Total	**7**

Data Sources and Assumptions

1) Off-road data were provided by Jason Hurd with Erie Municipal Airport. PDF on file.

2) Propane use is reported in pounds used. One gallon of propane weighs 4.2 pounds.

3) CNG use is reported in gallons of gasoline equivalent (GGE). There are 0.877 GGE in one hund

Emission Factors

Fuel	Greenhouse Gas	Vehicle Type
Gasoline	CO_2	All
Diesel	CO_2	All
CNG	CO_2	Heavy Duty Vehicle
Propane	CO_2	All

Data Calculations

Fuel Used (Airport Owned Vehicles)	Emissions (mt CO2)	Emissions (mt CH4)
Gasoline	0	0
Diesel	7	0
CNG	0	0
Propane	0	0
Total	**7**	**0**

Off-Road Vehicle and Equipment Data

Fuel Type	Fuel Used (Airport Owned Vehicles)	Total Fuel Used
Gasoline (gal)	0	0
Diesel (gal)	680	680
CNG (GGE)	0	0
Propane (lbs)	0	0

red cubic feet of CNG (per the U.S. DOE Alternative Fuels Data Center, https://ep

Value	Units	
0.00878	mt CO_2/gal	ICLEI's U.S. Community Protocol for Protocol) – Appendix D: Transportat 2013: http://icleiusa.org/ghg-protoc
0.01021	mt CO_2/gal	
0.000054440	mt CO_2/standard cubic foot	(1) CNG CO2 emission factor from: Greenhouse Gas Emissions (Commu Activities and Sources, Version 1.1,
0.00572	mt CO_2/gal	2020 Climate Registry Default Emiss content/uploads/2021/05/2021-Defa

Emissions (mt N2O)	Emissions (mt CO2e)
0	0
0	7
0	0
0	0
0	**7**

act.energy.gov/fuel-conversion-factors).

Source
Accounting and Reporting of Greenhouse Gas Emissions (Community tion and Other Mobile Emission Activities and Sources, Version 1.1, July ols/
ICLEI's U.S. Community Protocol for Accounting and Reporting of nity Protocol) – Appendix D: Transportation and Other Mobile Emission July 2013; http://icleiusa.org/ghg-protocols/. (2) CNG CH_4 and N_2O
sions Factors: https://www.theclimateregistry.org/wp- ault-Emission-Factor-

Waste and Recycling Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	0
Scope 2	N/A
Scope 3	8
Total (Scope 1 and 3)	**8**
Information-Only Avoided Emissions	(13)

Data Sources and Assumptions

1) Erie does not have data on waste and recycling collected at municipal facilities, there
include recycling). (https://www.wastecare.com/usefulinfo/Waste_Generated_by_Indus
employees regularly worked in-office (20% of 240 days). The value for average days in-

2) Recycling diversion rate was taken from the Colorado Department of Public Health &

3) MSW characterization and Materials Recovery characterizations were taken from the

Emission Factors

Landfilled Waste

Waste Component	Value
MSW	0.06
Newspaper	0.043
Office paper	0.203
Corrugated containers	0.12
Magazines/third-class mail	0.049
Food scraps	0.078
Grass	0.038
Leaves	0.03
Branches	0.062
Dimensional lumber	0.062
Oxidization factor	10%
Collection efficiency rate for landfills with gas collection systems	75%

Composted Waste

Value	Description
0.00050	mt CH_4/ton waste
0.00023	mt N_2O/ton waste

Recycled Materials

Waste Component	From using recycled inputs instead of virgin inputs (mtCO2e/short ton)
Paper and paperboard (mixed paper)	3.52
Newspaper	2.78
Office paper	2.85
Magazines/third-class mail	3.07
Glass	0.28
Metals (mixed)	3.97
Plastics (mixed)	0.98
Mixed recyclables	2.80

Data Calculations

Emissions Summary

	Waste Generated
Tons of Waste Landfilled	31
Tons of Waste Composted	0
Tons of Recycling Recycled	5
Totals	**36**

Diversion Rates

Recycling Rate	16%

Emissions from Landfilled Waste

Source	Waste Generated (tons)
Tons of Waste Landfilled	**31**
Avoided Emissions from Tons of Recycling Recycled	5
Total from Landfilled Waste and Recycling	**36**

MSW Characterization

	Paper and Paperb
Newspaper	**Office Paper**
1.5%	1.7%

Materials Recovery Characterization

Glass Containers	Aluminum

20%	2%

fore estimates were used to calculate waste and recycling data. According to the National Solid
try.htm) The calculated value assumes an office with full-time employees working 5 days a wee
-office was multiplied by municipal square footage and 1lb waste/100 square feet to estimate to

Environment (CDPHE) webpage on 2021 Colorado recycling totals: https://cdphe.colorado.gov/

2021 Countywide Waste Composition Study for Boulder County.

Description	Sou
mt CH_4/ton waste	ICLEI's U.S. Community Protocol for Accounting and Reporting of Gr Waste Emission Activities and Sources, Version 1
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	

Source
Documentation for Greenhouse Gas Emissions and Energy Factors Used in the Waste Reductior 03/documents/warm_v14_management_practices.pdf. Assumes green waste. Values are adjus

Landfill with gas collection but no energy recovery (mtCO2e/short ton)	Total avoided emission factor (mtCO2e/ton recycled)	
0.57	4.09	ICLEI's U.S. Community Protocol for Accounting Recycling and Composting Emissions Protocol, factors represent those for avoided emissions fr
0.24	3.02	
1.00	3.85	
0.27	3.34	
0.04	0.32	
0.04	4.01	
0.04	1.02	
0.47	3.27	

Units	Scope	Emissions (mt CH4)	Emissions (mt N2O)
Tons	3	0.3	0
Tons	3	0	0
Tons	N/A	0	0
Tons		**0.3**	**0**

Scope	Emissions (mt CH_4)	Emissions (mt N_2O)	Emissions (mt CO_2e)
3	0.3	0	8
N/A	0	0	(13)
	0	**0**	**8**

oard			
Magazines and Mixed Paper/Junk Mail	Cardboard/Kraft and Chip/Paperboard	Other Paper (low-grade), To-Go Cups, and Aseptic Containers	Glass
4.4%	5.9%	7.2%	5.5%

		P	
Steel/Tin	ttles, Rigid Contain	Newspaper	Office Paper

2%	11%	7.9%	4.2%

Waste Association, Office Buildings generate 1 lb. of waste per 100 square feet of office space
k for 50 weeks a year with 10 standard holidays deducted (i.e., 240 days). It was assumed tha
otal waste.

/colorado-recycling-totals. Screenshot on file.

rce
reenhouse Gas Emissions (Community Protocol) – Appendix E: Solid .1, July 2013: http://icleiusa.org/ghg-protocols/.

n Model (WARM): https://www.epa.gov/sites/production/files/2016- ted to CH_4 and N_2O emission factors.

Source
g and Reporting of Greenhouse Gas Emissions (Community Protocol) – Version 1.0, July 2013: http://icleiusa.org/ghg-protocols/. Emission rom a facility with landfill gas capture but no energy production.

Emissions (mt CO2e
8
0
(13)
8

Metals	Plastics	Orga	
		Food	Yard Waste
2.5%	12.8%	18.6%	16.5%

aper and Paperboard			Styrofoam, To-Go Cups, and Contaminants
Magazines and Mixed Paper/Junk Mail	Cardboard/Kraft and Chip/Paperboard	Aseptic Containers	

15.5%	26.0%	0.7%	10.4%

per day (does not
t 20% of these

nics		Miscellaneous	
Clean Wood	Other	Textiles	C&D Debris
0.7%	12.1%	2.9%	4.1%

s Other Waste	
Composites	Other
2.2%	1.4%

Wastewater Data

Emissions Summary

Scope
Scope 1
Scope 2
Scope 3
Total

Data Sources and Assumptions

1) Wastewater treatment plant data were supplied by Jon Coyle with Town of Erie Public Works. Ema
digester gas are not applicable. The plant therefore does not use anaerobic processes, but does use n

2) Septic tanks were not included in this inventory as very few are located in the Town of Erie and the

Emission Factors

Municipal Wastewater Treatment

Source
Process N_2O emissions for WWTPs with nitrification and denitrification
Fugitive N_2O Emissions from Effluent Discharge
Combustion gas
Combustion gas
Days Year
Density of methane
Conversion
Methane Destruction Efficiency
Molecular weight ratio of N_2O to N_2
Industrial Commercial Discharge Multiplier

Data Calculations

GHG Emissions By Process

Process N2O Emissions for WWTPs with Nitrification and Denitrifi
Emissions as mt N_2O
Total Process N_2O from Nitrification and Denitrification Emissions (mt CO_2e)

Fugitive N2O Emissions from Effluent Discharge
Emissions as mt N_2O
Total Process N_2O from Nitrification and Denitrification Emissions (mt CO_2e)

Combustion Gas Emissions
Emissions as mt CH_4
Emissions as mt N_2O
Total Combustion Gas Emissions (mt CO_2e)

Flared Gas Emissions
Emissions as mt CH_4
Total Flared Gas Emissions (mt CO_2e)

Total

Input Data
Municipal Wastewater Treatment
Plant uses nitrification/denitrification
Plant uses anaerobic processes
Erie's population served by the plant
Average total nitrogen discharged by plant (kg N/day)
Digester gas produced (scfd)
Digester gas flared (scfd)
Methane content of digester gas

Emissions (mt CO_2e)
130
N/A
N/A
130

ils on file. The plant does not use digesters, so the values for digester gas produced, digeste
itrification/denitrification.

eir impact would be negligible.

Greenhouse Gas	Value	Units
N_2O	7	g N_2O/person/year
N_2O	0.005	kg N_2O-N/kg sewage-N
CH_4	0.003	kg CH_4/MMBtu
N_2O	0.001	kg N_2O/MMBtu
N/A	365.25	Days
N/A	662	Grams per cubic meter
N/A	0.03	m^3/ft^3
N/A	99%	
N/A	1.57	44/28
N/A	1.25	

cation
0.26
72
0.21
58
0
0
0
0
0

130

Input Data
Yes
No
30,000
73.94
0
0
0%

er gas flared, and methane content of

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix F: Wastewater and Water Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
Standard assumption

Refrigerants Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	0
Total	**0**
Information Only	131

Data and Assumptions

1) Refrigerant data were provided by Dennis Buck and Kim Hervey. Email and PD

2) Erie uses R-22, R-12, R-11, and R-410a refrigerants in its municipal buildings. required to report to TCR because they are either hydrochlorofluorocarbons (HCF under the Montreal Protocol, and as a result, are not classified as GHGs under th

Emissions Calculations

Emissions Summary

Refrigerant Type	Emissions (mt CO_2e)
R-134A	0
Total	**0**
R-11 (Information Only)	0
R-12 (Information Only)	0
R-22 (Information Only)	67
R407c (Information Only)	0
R410a (Information Only)	64
R514 (Information Only)	0
Subtotal	**131**
Total	**131**

Refrigerant Data Inputs

Refrigerant Type	Weight (kg)
MVAC R-134a use	0
R-134A	0
R-11 (Information Only)	0
R-12 (Information Only)	0
R-22 (Information Only)	37
R407c (Information Only)	0
R410a (Information Only)	31
R514 (Information Only)	0

)F on file. Refrigerants are reported in lbs and converted in this tab to kg.

Common refrigerants R-22, R-12, R-410a, and R-11 are not included in the GHGs
=Cs) or chlorofluorocarbons (CFCs), the production of which is being phased out
e Kyoto Protocol.

Weight (Metric Tons)
0
0
0
0
0.037
0
0.031
0

Consumption-Based Calculations

Emissions Summary

Source	Emissions (mt CO_2e)
Asphalt	0.5
Cement	0
Paper	0
Food	0
Computers	16
Fertilizer	34
Well-to-wheel	161
Total	**212**

Data and Assumptions

1) Asphalt data were provided by Scott Brown. Email on file. Data were provi

2) Erie does not track cement, paper, or food data.

3) Computers and hardware data were provided by Denise Jakan. Email and s calculated using the total amount Erie spent on each category, the average p

4) Fertilizer data were provided by Mike McGill. Email on file.

5) All emission factors represent the "life-cycle" or "net" impact of materials. (

6) Well-to-wheel emissions for diesel and gas vehicles were calculated using c

Emission Factors

Cement and Asphalt

Variable	Value
Asphalt	0.11
Cement	1.0

Food

Variable	Value
Food consumption	1.60

Computers and Hardware

Variable	Value
Personal computers	50.49

Fertilizer

Variable	Value

tons N_2O-N/tons input-N	0.0117
Molecular Weight Ratio N_2O to N_2O-N	1.57
Leaching/runoff, kg N2O-N/kg N leaching/runoff	0.0075
Fraction of losses by leaching/runoff where irrigation is applied	0.03
Well-to-Wheel	
Variable	**Value**
Diesel Emission Factor	2.30
Gasoline Emission Factor	2.30

Emissions Calculations

Asphalt	
Total Asphalt Purchased (tons)	**Total Emissions from Asphalt ($mtCO_2e$)**
4	0.5
Cement	
Total Concrete Purchased (yd^3)	**Conversion to lb./cubic yard**
0	4,054
Paper	
Paper Type	**% Recycled**
Uncoated Free Sheet	0%
Uncoated Free Sheet	10%
Uncoated Free Sheet	30%
Uncoated Free Sheet	50%
Uncoated Free Sheet	75%
Uncoated Free Sheet	100%
	Total
Food	
Food Purchase ($) 2021	**2021 to 2002 Inflation Rate**
$0.00	-51%
Computers and Hardware	
Computers and Hardware Purchases ($) 2021	**Total lbs Purchased 2021**
$37,550	622.13
Fertilizer	
Location of Fertilizer Application	**% Nitrogen**
Golf Courses	20%
	Total
Well-to-Wheel	
Emissions Source	**Fuel Consumed (gal)**

City-Owned Gasoline Vehicles and Equipment (excluding ethanol)	39,632
City-Owned Diesel Vehicles and Equipment	11,448
Employee Commute--Gasoline Vehicles (excluding ethanol)	19,070
Employee Commute--Diesel Vehicles	0
Business Travel--Gasoline Vehicles (excluding ethanol)	0
Business Travel--Diesel Vehicles	0
Total Gasoline	**58,702**
Total Diesel	**11,448**

ded in pounds and converted to tons.

spreadsheet on file. The following categories were used in the inventory: iPads, Laptops/Computers, r
rice of items in each category, and the average weight of items in each category. Data calculations or

Consumption-based sources are not assigned a "scope".
data provided by Town of Erie regarding fleet and employee commuting activity and a well-to-wheel e

Units	Notes
mt CO_2e/mt asphalt	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix H: Emissions Associated with the Community's Use of Materials and
mt CO_2e/mt cement	

Units	Notes
kg CO_2e/2002 dollar	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix H: Emissions Associated with the Community's Use of Materials and Services, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Units	Notes
mt CO_2e/short ton	Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model; Durable Goods Materials Chapter. February 2016: https://www.epa.gov/warm/documentation-chapters-greenhouse-gas-emission-and-energy-factors-used-waste-reduction-model. Emissions represent savings from source reduction.

Units	Notes

ton N_2O-N/ton input-N	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Chapter 11.EF1 for N additions from mineral fertilizers, organic amendments and crop residues, and N mineralized from mineral soil as a result of loss of soil carbon.
mol/mol	
kg N_2O-N/kg N leached	
kg N leached/kg N applied	

Units	Notes
kg CO_2/gal	From previous inventories conducted by McKinstry: See Hillman, T. and Ramaswami A. "Greenhouse Gas Emission Footprints and Energy Use Benchmarks for Eight U.S. Cities." Environment
kg CO_2/gal	

metric tons/lb.	Concrete (mt)
0.000453592	0

$ Spent	Weight Purchased (lbs.)
$0.00	0
$0.00	0
$0.00	0
$0.00	0
$0.00	0
$0.00	0
$ -	**0**

2002 Dollars	Total Emissions from Food ($mtCO_2e$)
$ -	0

Total Short Tons Purchased	Total Emissions from Computers & Hardware ($mtCO_2e$)
0.31	16

Fertilizer Applied (lbs.)	Fertilizer Applied (tons)
15,260	8
15,260	**8**

CO_2 Emissions (kg)	CO_2 Emissions (tons)

91,154	91
26,331	26
43,861	44
0	0
0	0
0	0
135,016	**135**
26,331	**26**

Monitors, ReMarkables, and SurfacePros. Computer and hardware purchase amount is reflectiv
n file.

emissions factor drawn from Lotus' experience with previously completed municipal inventories

15% cement (mt)
0

Total Emissions from Paper ($mtCO_2e$)
0.00
0.00
0.00
0.00
0.00
0.00
0.00

Nitrogen in Fertilizer Applied (tons)	Direct N_2O (tons)	Direct N_2O (kg)	Indirect N_2O (run-off) (kg)
2	0.03	123.71	2
2	**0.03**	**124**	**2**

/e of these categories. Total pounds purchased was

;.

Total N_2O (kg)	CO_2e (kg)	Total Emissions from Fertilizer ($mtCO_2e$)
126	34,422	34
126	**34,422**	**34**