WENCK File #1832-0005-06
April 2016

City of Rochester, MN
Energy Action Plan

Prepared for:

CITY OF ROCHESTER
ROCHESTER ENERGY COMMISSION

2122 Campus Drive SE
Suite 100
Rochester, MN 55904

ADOPTED ROCHESTER CITY COUNCIL - JULY 6, 2017

WENCK ASSOCIATES
Responsive partner.
Exceptional outcomes.

Prepared by:

WENCK Associates, Inc.
1802 Wooddale Drive
Woodbury, MN 55125
Phone: 651-294-4580
Fax: 651-228-1969

Table of Contents

1.0 EXECUTIVE SUMMARY 1-1

2.0 GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS 2-1

3.0 INTRODUCTION 3-1

3.1 Purpose of Energy Action Plan 3-1
3.1.1 P2S Comprehensive Plan Supplement 3-1
3.2 About the City of Rochester 3-2

4.0 BACKGROUND 4-1

4.1 Economic Growth Forecast 4-1
4.2 Destination Medical Center (DMC) 4-1
4.3 Updating Rochester's Comprehensive plan (P2S Update) 4-1

5.0 BASELINE - ROCHESTER'S ENERGY USE, MANDATES AND GOALS 5-1

5.1 Rochester Energy Commission 5-1
5.2 City of Rochester Ordinance 19A 5-1
5.3 Rochester's Energy Portfolio 5-1
5.3.1 Suppliers 5-1
5.3.2 Usage 5-3
5.4 Primer on Climate change and Greenhouse gas emissions (GHG) 5-12
5.5 Summary of Completed Baseline Energy and GHG Inventory 5-12
5.6 Established Energy Conservation, Renewable Energy And Carbon Emissions Reduction Goals 5-17
5.7 Applicable Energy-Related Regulations, Mandates, Policies, Procedures 5-18

6.0 ENERGY/EMISSIONS FORECAST 6-1

6.1 Trend 6-1
6.2 P2S Growth Scenarios (2) 6-2
6.3 Final Scenario 6-3

7.0 CITY OF ROCHESTER PARTICIPATION IN NEW ENERGY FOCUS PROGRAMS 7-1

7.1 MN GreenStep Cities 7-1
7.2 Regional Indicators Initiative 7-2
7.3 Additional Comparative Analyses 7-3

8.0 OPPORTUNITIES FOR IMPROVEMENT AND RECOMMENDED BEST PRACTICES 8-1

8.1 Power Generation and Supply 8-1
8.1.1 Utility-Purchased Power (RPU, MISO, SMMPA) 8-1
8.2 Buildings 8-3
8.2.1 City Facilities 8-3
8.3 Water 8-8
8.3.1 Water-Energy Nexus 8-8
8.4 Solid Waste 8-9
8.4.1 Waste Incineration Efficiency Improvements (OWEF) 8-10

8.4.2 Waste-to-Energy Conversion Opportunities 8-10
8.5 Transportation 8-10
8.5.1 Alternative Fuel Vehicles 8-11
8.5.2 City Fleet Opportunities 8-11

9.0 INTEGRATION OF THIS EAP INTO THE COMPREHENSIVE PLAN 9-1

10.0 NEXT STEPS AND POTENTIAL PARTNERS 10-1

10.1 RPU 10-1
10.2 Mayo Medical Center 10-1
10.3 Government 10-2
10.4 Private 10-2
10.5 Non-Profit 10-2

11.0 COMMUNITY ENGAGEMENT 11-1

12.0 REFERENCES 12-1

TABLES

Table 5-1: Community Energy Consumption and GHG Emissions Distribution 5-5
Table 7-1: Sustainability Actions Taken in the City of Rochester 7-1
Table 7-2: Description of Regional Indicators 7-2
Table 7-3: Leading Benchmarked Cities Emissions Comparison 7-4
Table 7-4: Comparable City GHG Inventory Benchmarks 7-5
Table 11-1: Community Engagement Survey Results 11-1

FIGURES

Figure 5-1: Community Electricity GHG Emissions Distribution 5-6
Figure 5-2: City of Rochester GHG Emissions from Purchased Electricity 5-9
Figure 5-3: City of Rochester Natural Gas GHG Emissions 5-10
Figure 5-4: Community Transportation GHG Emissions 5-11
Figure 5-5a: Rochester Community Energy Consumption Distribution 5-13
Figure 5-5b: Rochester Community GHG Emissions Distribution 5-14
Figure 5-6: Community GHG Emissions Distribution 5-15
Figure 5-7: City of Rochester GHG Emissions Distribution 5-16
Figure 6-1: MERC Annual Rochester Flows by Station 6-2
Figure 7-1: Energy Consumption by Source for Minnesota Cities 7-6
Figure 11-1: Survey Responses Chart 11-2

APPENDICES

Appendix A: Executive Summary of the City of Rochester's 2014 GHG Inventory
Appendix B: City of Rochester 2014 Greenhouse Gas Emissions (GHG) Inventory
Appendix C: Benchmarking and Comparison Analysis
Appendix D: Incentives and Alternative Funding Sources

1.0 Executive Summary

PURPOSE

Within the last decade many progressive and growing municipalities have begun incorporating sustainability objectives into their comprehensive planning. The need to conserve and manage energy costs, as well as public concern over climate change, are the primary drivers for this trend.

The City of Rochester is currently updating its Comprehensive Plan through the Planning 2 Succeed (P2S) process. The updated Comprehensive Plan is intended to guide the growth of the community through 2040. Fueled by Destination Medical Center (DMC), growth projections for the City of Rochester are for 50,000 new jobs, 50,000 more residents, and 23,000 more housing units by 2040. To help guide city planners to incorporate sustainability objectives into the planning process, through the Rochester Energy Commission (REC), the City Council authorized preparation of an Energy Action Plan (EAP) in conjunction with the Comprehensive Plan update. Energy and greenhouse gas (GHG, or carbon) reduction initiatives are two significant components that receive detailed focus in the EAP.

The benefits of incorporating energy and carbon reduction objectives into Rochester's growth plans are:

- significant energy cost savings and other economic benefits in the form of price stability and certainty;
- incremental revenue growth as a result of attracting and retaining more residents and employers to a more sustainable community;
- protecting or improving local air and water quality while mitigating climate change impacts and supporting growth, and;
- lower health care costs.

EAP PROJECT COMPONENTS

This EAP project has included:

- contextual consideration of the City's Comprehensive Planning process (P2S);
- comparative "benchmarking" analysis of three leading cities on energy and climate action planning;
- a summary of Rochester's 2014 GHG inventory for Scope 1, 2 and 3 emissions;
- a summary of the City stakeholders with significant influence over the City's carbon footprint;
- recommended actions and strategies to decrease energy demand and accelerate the use of low-carbon energy sources, and;
- a summary of funding opportunities and incentive programs that can be leveraged to enhance economics of carbon mitigating initiatives.

RECOMMENDED ACTIONS

Following is an abbreviated summary of the recommended best practices, actions, and strategies to reduce energy and carbon emissions and help achieve City goals. The full list of recommendations, along with additional support information is provided in the following report. These recommendations for power generation, transportation, buildings, and other assets are highlighted because the City has a high degree of control or influence over them and/or they present an opportunity for high-impact carbon reductions.

CATEGORY I: POWER GENERATION

Significant Impact/Significant Control

RPU investments in renewable and energy efficient power production can deliver significant carbon reductions. In practicality, however, the carbon accounting protocols dictate that those carbon reductions are shared by all buyers of power from MISO, with some ability to attribute the carbon reductions specifically to MISO Zone 1 (see 5.3.1.2 for more detail). Regardless, as RPU and power generators across the country face environmental constraints, the carbon intensity of power sourced from MISO is declining and will continue to decline for decades to come.

As such, while the City will not realize a one-to-one reduction in carbon emissions in its GHG inventory relative to RPU's carbon reductions, RPU's carbon reductions would contribute to the declining regional emissions factor, resulting in carbon reductions. The following recommended actions are discussed in more detail in the text of this EAP.

- **RPU Generation Portfolio –**Continue to shift away from fossil fuels toward renewable resources, including:
  - increased and distributed solar
  - increased hydroelectric
  - geothermal evaluation
  - increased biogas utilization, in particular at the RWRP
  - increased solid waste utilization

- **RPU Supply-Side Efficiency –** Generate more electricity with the same or less fuel through replacement and upgrading of power generating units and reduction of losses through transmission and distribution, thereby reducing inefficiencies and GHG emissions. RPU can conduct energy audits and evaluate current systems, operations, and management controls to continue to increase the efficiency of power generation.

Significant Impact

- **Reduce Demand through Community Education –** As the City of Rochester has limited control over the emissions footprint associated with the portfolio of purchased power, the best approach for the City to realize emissions reductions is by reducing the demand. The City can offer tips and incentivize the public to increase conservation and reduce consumption.

- **Optimization of Community Power Generation -** RPU is a member of the Energy Integration Committee (EIC), a new community group of energy generators and large users created to evaluate opportunities for collaboration in realizing energy efficiency across organizations in the DMC District. The City can support the work of the EIC through RPU's engagement and otherwise.

- **Expansion of Behind the Meter Generation -** In 2030 when the SMMPA contract expires, RPU's obligation to purchase at a contracted rate (contracted rate of delivery, or CROD) power from SMMPA will expire. The expiration of this contract provision provides City agencies like the Wastewater Reclamation Plant flexibility to generate more of their own low-carbon power and directly account for carbon reductions. In addition, RPU will have new flexibility to incentivize more aggressive development of "behind the meter" power generation, such as roof-top and community solar, without being constrained by contractual power purchase obligations.

- **OWEF -** The City of Rochester and Olmsted County have opportunities to reduce the energy used to manage waste and to capture and convert more waste to low-carbon energy. OWEF was expanded in 2010 and OWEF has the capacity to divert substantially more waste from land disposal. The two most promising opportunities are to:
    - source and convert more regional mixed municipal solid waste (MMSW) into steam, and;
    - sell more steam and electricity to community users, recognizing regulated limitations on the number of customers to whom and the amount of power OWEF can sell under the Public Utility Regulatory Policies Act (PURPA).

CATEGORY II: TRANSPORTATION

Given community transportation emissions account for 19.6% of the City's GHG emissions, there is a material opportunity to realize emissions reductions by reducing vehicle miles traveled and promoting conversion to alternative fuel vehicles.

Significant Impact/Significant Control

- **Develop transportation corridors and nodes and parking infrastructure that minimize VMT-** While this opportunity was not evaluated in any detail as part of the development of this EAP, the P2S process includes a detailed analysis of this significant impact, significant control opportunity to minimize VMT and GHG emissions from transportation.

Significant Control

- **Focus on alternative fuel vehicles for City fleets –** The City can shift the demand side by converting city fleets, including buses, to alternative fuel vehicles, including electric, DME and CNG/LNG-powered.

- **Increased Public Transit to Reduce Single Occupancy Trips -** The P2S has a goal of increasing transportation options. Increasing the service options, bus routes, and hours of service could reduce single occupancy vehicle trips and reduce traffic congestion and GHG emissions. Increasing

awareness of RPT and its routes could further increase ridership and reduce VMTs, as could the geographic expansion and/or frequency of RPT's service.

- **Electric charging stations -** There are a few electric vehicle charging stations in the City of Rochester, such as in the parking ramps downtown. The City of Rochester could provide additional electric charging stations and develop incentives and opportunities for residents and employees in the City of Rochester to own electric vehicles.

- **Increased Greenways (pedestrian and bike traffic only) -** Promoting safe ways to make daily travel trips on foot or bike would encourage residents and employees to do so when possible. Adding Greenways could also promote a culture of walkability that may extend sustainable social benefits into other aspects of residents' lives.

Significant Impact

- **Expand Sharing Programs -** If the City of Rochester independently, or in collaboration with employers and community organizations, initiates and expands transportation sharing programs, single passenger vehicle VMT could be reduced and transportation-related GHG emissions and energy expenditures could be reduced.

CATEGORY III: BUILDINGS

Significant Impact/Significant Control

- **Sustainable Building Policies –** The adoption of sustainable building policies that apply to planning, design, construction and commissioning of new and significant modification construction projects present a significant opportunity to mitigate GHG emissions.

- **Retro-Commissioning –** Retro-commissioning could be a cost-effective way for Rochester to reduce energy use and GHG emissions from City and community-owned buildings. Retro-fitting technologies encompass technologies such as upgrading lighting systems to LED lights over conventional lightbulbs or heating upgrades.

Significant Impact

- **Energy Conservation Programs -** Partnering in Energy Solutions provides financing for RPU's commercial customers' energy improvement projects. In 2015, RPU calculated that the Conservation Improvement Program (CIP) saved 19,220,885 kWh, which was 103.7% of RPU's goal. This is the equivalent of 19,221 tons of CO2 saved. Continuing and expanding the Conserve and Save® and CIP programs could help the City of Rochester meet its energy and carbon goals.

- **Efficiency Improvement in Water Consumption to Conserve Energy -** Community water conservation programs have been implemented and have realized water and energy conservation benefits in Rochester. Water efficiency programs have reduced the average customer water use by 28%, and there is a direct, associated energy savings. These programs could be expanded.

GOALS

The Rochester Energy Commission determined that the Energy Action plan be prepared using the goals of the Minnesota Next Generation Energy Act of 2007 (NextGen) (Minn. Stat. 216B.169 Subd. 2a). The three primary NextGen goals include:

- 1.5% annual retail energy savings
- 25% renewable energy by 2025 (25X'25 Renewable Electricity Standard)
- State-wide GHG emissions reductions of
  - 15% by 2015
  - 30% by 2025
  - 80% by 2050

At this time, City of Rochester goals are set on a per capita basis to accurately reflect the impact of growth, efficiencies associated with expanding systems to service that growth, and to place the city within the larger context of NextGen.

Achievement of these goals will be met through a combination of conservation, renewable energy adoption, and carbon intensity reductions. Importantly, the City will evaluate and utilize multiple strategic approaches to meet the reduction goals. The EAP will require significant policy and program advocacy and action by the City Council, Utility Board, Energy Commission, City Staff, and others partners to achieve the results outlined in the EAP. It is recommended that the City work with these partners to develop an EAP Implementation Plan to ensure all parties required to advance various initiatives are engaged, and that the initiatives most likely to succeed are identified, agreed and pursued.

2.0 Glossary of Terms, Acronyms and Abbreviations

(25x'25) – goal of 25% renewable energy by 2025

(B3) – Buildings, Benchmarks, and Beyond

(BOD) – Biological Oxygen Demand

(CA) - California

(CEE) – Center for Energy and the Environment

(CERT) – Clean Energy Resource Team

(CIP) – Conservation Improvement Program

(CNG) – Compressed natural gas

(CO2) Carbon Dioxide

(CO2e) Carbon Dioxide Equivalents

(CPP) – Clean Power Plan

(CROD) – Contracted Rate of Delivery

(DMC) – Destination Medical Center

(DME) – Dimethyl ether

(EAP) – Energy Action Plan

(eGRID) – Emissions & Generation Resource Integrated Database

(EGU) – Electricity Generating Unit

Electric System – RPU Engineering & Operations Report 2014

(EIC) – Energy Integration Committee

(EPA) – Environmental Protection Agency

(ESP) – Energy Solutions Partner

(FOG) – Fats, oils, and grease

(FSE) – Food service establishment

(GHG) - Greenhouse Gas

(GESP) – Guaranteed Energy Services Program

(JCI) – Johnson Controls, Inc.

(kW) - kilowatt

(kWh) – kilowatt hours

(LED) – Light Emitting Diode

(MCF) – thousand cubic feet

(Minn.) Minnesota

(MISO) – Midcontinent Independent System Operator

(MMBtu) Million British Thermal Units

(MMSW) – Mixed municipal solid waste

(MN) - Minnesota

(MERC) – Minnesota Energy Resources

(MROW) – Midwest Reliability Organization West

(MSW) Municipal Solid Waste

(MTCO2e) – metric tons of carbon dioxide equivalents

(MW) Megawatts

(NextGen) – Minnesota Next Generation Energy Act of 2007

(OR) - Oregon

(OWEF) – Olmsted Waste to Energy Facility

(P2S) – Planning to Succeed, Rochester's Comprehensive Plan update

(REC) – Rochester Energy Commission

(RNG) – Renewable natural gas

(RPT) – Rochester Public Transit

(RPU) – Rochester Public Utilities

(RWRP) – Rochester Water Reclamation Plant, used interchangeably with Wastewater Treatment Plant (WWTP)

Scope 1 Emissions – Direct GHG emissions from sources that are owned or controlled by the city

Scope 2 Emissions – Indirect GHG emissions resulting from the generation of electricity, heating and cooling, or steam generated off site, but purchased by the city

Scope 3 Emissions – Indirect GHG emissions from sources not owned or directly controlled by the city but related to the city's activities (materiality/influence)

(scf) – standard cubic feet

(SLP) – Silver Lake Plant

(SMMPA) – Southern Minnesota Municipal Power Agency

(stat.) - Statute

(subd.) - Subdivision

(TOC) – Transit Operation Center

(USEPA) – United States Environmental Protection Agency

(VMT) – vehicle miles traveled

(WWTP) – Wastewater Treatment Plant, used interchangeably with Rochester Water Reclamation Plant Wastewater Treatment Plant (RWRP)

3.0 Introduction

3.1 PURPOSE OF ENERGY ACTION PLAN

Within the last decade many progressive and growing municipalities have begun incorporating sustainability objectives into their comprehensive planning. Energy and greenhouse gas (GHG, hereafter referred to as carbon) reduction initiatives are two significant components that receive detailed focus. The need to conserve and manage energy costs, as well as public concern over climate change, are the primary drivers for this trend. In line with these drivers, and in recognition of the planned, accelerated growth of Destination Medical Center (DMC) and the entire city, an Energy Action Plan (EAP) project was commissioned by the City of Rochester.

This plan encompasses several components, including:

- contextual consideration of the City's Comprehensive Planning process, Planning to Succeed (P2S);
- comparative analysis of three leading cities on energy and climate action planning;
- a summary of Rochester's 2014 GHG inventory;
- a summary of the business, cultural and practical realities of organizations and agencies with significant influence over the City's carbon footprint;
- a summary of funding opportunities and incentive programs that can be leveraged to enhance economics of carbon mitigating initiatives, and;
- recommended actions and strategies to decrease energy demand and accelerate the use of low-carbon energy sources.

Of greatest significance, the EAP identifies and describes potential ways to reduce energy consumption and GHG intensity in order to meet the City's target energy and carbon reduction goals.

3.1.1 P2S Comprehensive Plan Supplement

The City of Rochester is updating its Comprehensive Plan through the P2S process, intended to guide the growth of the community through 2040. During the P2S process, various growth scenarios have been evaluated. The predominant growth projections are for 50,000 new jobs, 50,000 more residents, and 23,000 more housing units for the City of Rochester. The P2S planning process encompasses consideration of the local and regional transportation system (including roads and access to transit), infrastructure, land use, and the location of new housing to support the anticipated increase in jobs and residents.

The Rochester Energy Action Plan is a supplement to the P2S Comprehensive Plan inputs.

3.1.1.1 Economic Benefits

This EAP provides guidance to the City of Rochester and its businesses, institutions, and residents, on how to efficiently use and source low-carbon energy that can result in environmental and economic sustainability. Contained herein is information on potential funding, incentive and grant opportunities that can help the City of Rochester meet its goals in a fiscally responsible manner. Once implemented, the actions and strategies outlined in the EAP can help the City and its stakeholders realize significant energy cost savings and other economic benefits in the form of lower health care costs and incremental revenue

growth, as a result of attracting and retaining more residents and employers to a more sustainable community.

3.1.1.2 Environmental Benefits

The intended environmental benefits of EAP implementation include protecting or improving local air and water quality while mitigating climate change impacts and supporting growth. Reduced air emissions will help protect the health of residents, visitors, and workers as well as other non-human ecosystem inhabitants.

3.1.1.3 Public Relations Benefits

Throughout the development of the EAP, the project team engaged key stakeholder groups with significant control or influence over the City's carbon footprint, as well as the larger community. Input from these stakeholder groups was fundamental to identifying and filtering out the highest impact opportunities for energy and carbon reductions. One anticipated outcome of these stakeholder engagement efforts is that this EAP reflects the community's shared vision and goals. During the EAP development of the EAP, lines of communication have been established or enhanced between organizations, creating an opportunity for collaboration to accomplish the City's energy and carbon goals. In Section 9.0 and woven throughout this document, complete summaries of EAP stakeholder engagement activities can be found.

Looking to the future, the development and implementation of an energy action plan is a significant step toward becoming a sustainable city. Sustainable cities have a competitive advantage attracting and retaining employers and residents. All indications are that Rochester is attracting new residents and employers and will grow with the realization of the DMC vision. As the population grows, sustainable community attributes will help to retain that growth.

3.2 ABOUT THE CITY OF ROCHESTER

The City of Rochester is located in southeastern Minnesota and is the county seat of Olmsted County. In 2014, the Minnesota State Demographic Center estimated the City of Rochester had a population of 111,007 persons in 44,653 households, making Rochester the third largest city in Minnesota (Minnesota State Demographic Center and Metropolitan Council, 2015). The City of Rochester lies along the south fork of the Zumbro River and encompasses approximately 54 square miles.

Rochester's economy is primarily centered on health care, technology, and education. The major employers in Rochester are the Mayo Medical Center, IBM-Rochester, and the Rochester School District. In addition to a population of residents and employees, Rochester welcomes nearly 1.5 million visitors each year, many of whom are seeking care at Mayo Clinic.

4.0 Background

4.1 ECONOMIC GROWTH FORECAST

The economic growth for Rochester is projected to be very robust. The population is forecast to grow to over 164,000 by 2040. Future job growth is expected to be commensurate to support the population growth. By 2040, Rochester could support 50,000 more jobs. Supporting the economic growth is the Mayo Clinic in Rochester, which seeks to become the world's premier destination for health and wellness (DMC, 2016).

4.2 DESTINATION MEDICAL CENTER (DMC)

The key to the population and economic growth of the City of Rochester is the development of the Destination Medical Center (DMC). The DMC vision encompasses the addition of 15,000 highly-paid doctors, researchers, and support staff, as well as 25,000 support jobs. The vision of the DMC is to be A Global Destination for Health and Healing (Post-Bulletin, 2013).

4.3 UPDATING ROCHESTER'S COMPREHENSIVE PLAN (P2S UPDATE)

At the time of the writing of this EAP, the P2S project was not yet complete. Following is a summary of the P2S project approach, accomplishments, areas of EAP overlap and collaboration, and next steps.

The Rochester P2S planning process utilized a custom urban growth model specific to the City of Rochester. It projected hypothetical future land use patterns based on input assumptions about population and employment demand, land supply, spatial attributes, and development constraints. The distribution of land use patterns was then used as the basis for an analysis of a set of indicators that measured how the different growth patterns might impact the community.

The land use outputs, plus the indicators, collectively comprised a series of alternative growth scenarios. This process involved the creation of 3 different scenarios:

(1) **Trends Scenario**: This scenario is a continuation of current trends and planning policies and serves as a comparative baseline for the alternative scenarios.

(2) **Alternative Scenario 1, Multiple Nodes, No Edge Growth**: This scenario assumed that future growth would occur entirely within the current city limits. Several high density transit oriented nodes were identified along key corridors that were determined as best suited for enhanced transit service. More growth was distributed to downtown Rochester consistent with the DMC plan.

(3) **Alternative Scenario 2, Super Nodes, Limited Edge Growth:** This scenario assumed that growth on the edge of the community would occur requiring limited expansions to the current city limits (a middle ground between the trend scenario and alternative 1). The scenario also assumed an enhanced transit system that is supported by higher densities and transit oriented development that would be concentrated within two "super nodes" south of downtown and near 137th and Highway 52. This alternative also included enhanced transit service and development concentrated along a corridor connecting the

nodes. More growth was distributed to downtown Rochester consistent with the Destination Medical Center plan.

Technical analysis of the scenarios was conducted and resulted in the preparation of a series of indicators which helped draw a comparison of the potential implications of alternative growth patterns. The indicators were then used to present an overview of the alternative growth scenarios and their implications to the community through a series of stakeholder meeting presentations.

The EAP project team collaborated with the Comprehensive Plan (P2S) consultant team providing input on indicators and tracking opportunities to infuse energy and carbon content in the community P2S conversation. However, energy and carbon did not rise to the surface as top priority topics to be included in the core content of P2S community workshops hosted in December, 2015. An informational paper and survey regarding the EAP process and energy priorities were disseminated to interested parties during the two community workshops at that time. A complete summary of survey questions and responses can be found in Section 9.0 of this document. Community feedback during this process reinforced the notion that a more concentrated growth pattern that supports transit investments would be a more sustainable and resilient scenario for how the community grows in the future. One aspect of transit sustainability is the mitigation of local air pollution and GHG emissions as a result of increased walkability/bikeability and greater access to transit.

A preferred land use plan scenario is being prepared by the P2S consultant team along with the requisite system plans (transportation, transit, parks, and infrastructure) and the supporting documentation (goals, policies, implementation strategies) that will comprise the draft of the comprehensive plan. This is scheduled to be completed by May, 2016. A stakeholder review process will follow completion of the draft plan, and the final plan will integrate changes reflecting community review and feedback.

The EAP will be finalized in advance of the P2S final deliverables, all of which can be integrated as updates to the City's Comprehensive Plan.

5.0 Baseline - Rochester's Energy Use, Mandates and Goals

5.1 ROCHESTER ENERGY COMMISSION

The Rochester Energy Commission (REC) was created by the Rochester City Council. It is a nine-member group with eight members appointed by the Mayor and one appointed from the Common Council. The General Manager of Rochester Public Utilities is an ex officio member of the REC.

5.2 CITY OF ROCHESTER ORDINANCE 19A

The Rochester City Council established the Rochester Energy Commission through Ordinance 19A. The objective of the REC as defined in Ordinance 19A.03 Subdivision 1 is to take a leadership role in the creation of a sustainable energy future. Specifically, 19A.03 Subdivision 1C charges the REC with developing a local EAP to implement actions that reduce energy use and greenhouse gas (GHG) emissions to targeted levels.

5.3 ROCHESTER'S ENERGY PORTFOLIO

The information referenced in this summary of Rochester's energy portfolio reflects 2014 data, unless otherwise noted.

5.3.1 Suppliers

5.3.1.1 RPU

Rochester Public Utilities (RPU) is a division of the City of Rochester, Minnesota, and is the largest municipal utility in Minnesota. RPU provides power to over 50,000 customers and water service to over 38,000 customers within the limits of the City of Rochester. RPU owns and operates three power generating facilities and related infrastructure (i.e., substations and transmission lines) to deliver power to its residential, commercial and industrial customers. Section 15.05 (Board Powers). Subdivision 1. of the City Charter states "[t]he public utility board shall control, manage, and operate the electric and steam heat facilities and the distribution systems of the City".

RPU currently operates the Silver Lake Plant, Cascade Creek Combustion Turbines, and Lake Zumbro Hydroelectric Plant. RPU has shifted its electric generation from predominantly coal and fuel oil to a mix of natural gas, fuel oil, hydroelectric, and solar power. All of the electricity is sold into the grid as described in Section 3.3.1.2. Specifically, the Silver Lake Plant previously fired coal for generation but has been converted to run on 100% natural gas. The two Cascade Creek Turbines fire natural gas and fuel oil.

RPU's energy portfolio, goals, and plans are established by the RPU Board. RPU constitutes, and will continue to constitute for the foreseeable future, a substantial part of the energy baseline for the City of Rochester. RPU is vital to creating and facilitating future opportunities for energy efficiency and renewable energy growth, and associated GHG emissions mitigation.

As listed in the RPU Engineering & Operations Report (Electric System) 2014, RPU generated 9,064,000 kWh from the combustion turbines at Silver Lake and Cascade Creek. The Lake Zumbro Hydro plant generated 11,687,000 kWh. Total transmission and distribution losses were reported at 1.7% - an exceptionally low loss rate relative to the national average of 6%[1].

The total aggregate output of solar electricity produced in the RPU system was 250,978 kWh.

5.3.1.2 MISO SMMPA

RPU is a member of the Southern Minnesota Municipal Power Authority (SMMPA). There is a contracted rate of delivery (CROD) of 216 megawatts (MW) for the City of Rochester to purchase power off the Mid-Continent Independent System Operator (MISO) grid. MISO is a Regional Transmission Organization providing access to electric power across all or parts of 15 U.S. states and the Canadian province of Manitoba. Essentially, RPU sells the electricity from its electricity generating units (EGUs) to the MISO grid and then buys energy to meet its customers' needs from SMMPA. Therefore, the carbon footprint associated with electricity consumed by the City of Rochester and the residential, commercial, and industrial users reflects both the MISO portfolio of which the RPU generation portfolio comprises a small percentage. Further, MISO comprises a portion of the Emissions & Generation Resource Integrated Database (eGRID) Midwest Reliability Organization West (MROW). eGRID GHG emissions data is tracked and reported by the United States Environmental Protection Agency (USEPA). The MROW is used as an equivalent for tracking the MISO portfolio mix based on publicly available documentation.

RPU's contract with SMMPA contains specific language regarding the energy supplied to, and purchased from, the MISO grid, including the CROD of 216 megawatts. The contract with SMMPA expires in 2030.

5.3.1.3 Minnesota Energy Resources

Minnesota Energy Resources (MERC) supplies natural gas to the City of Rochester as well as residential, commercial, and industrial users. The MERC service area for the City generally falls within the city limits; however, a limited number of customers are located outside that boundary. Additionally, a limited number of residences within the city limits were not served by MERC at the time of this EAP.

MERC delivers natural gas to the city through two main points of entry. At the time of this analysis, the heating value of natural gas averaged 1 million British thermal units (MMBtu) per thousand standard cubic feet (MCF).

5.3.1.4 Liquid Petroleum Fuels

Transportation fuel consists of traditional petroleum-based, liquid fuels. Gasoline and diesel, both on-road and off-road, is supplied by petroleum companies to city-owned tanks or dispensed at retail stations. Aviation gasoline and Jet-A is used for aircraft at the airport.

[1] U.S. Energy Information Agency, *Frequently Asked Questions. How much electricity is lost in transmission and distribution in the United States?* http://www.eia.gov/tools/faqs/faq.cfm?id=105&t=3 (April 27, 2016).

Fuel oil No. 1, No. 2, No. 6, waste oil, and propane are also utilized in vehicles, equipment, and boilers by commercial and industrial users within the City of Rochester. Residents may use heating oil for home heating. Natural gas has replaced a large portion of the residential heat sources; however, a full inventory of heating oil consumption was not available for this analysis.

5.3.1.5 Others

The City of Rochester also consumes energy produced by several other sources as generation and production alternatives continue to develop.

Biogas

The Rochester Water Reclamation Plant (RWRP) treats wastewater for the City of Rochester. The RWRP captures all biogas that is generated during the anaerobic treatment process. The facility consumes the biogas to produce additional energy thereby offsetting other consumption. The biogas is utilized in generators to produce electricity for the facility. Biogas is also used in boilers to heat the facility.

Municipal Solid Waste

Combustion of municipal solid waste (MSW) provides electricity and steam for use at the Olmsted County Waste-to-Energy Facility (OWEF) and by local industrial and commercial users.

5.3.2 Usage

For the purposes of this analysis and as listed in Section 2.0, Appendix A, and Appendix B; the energy consumption and GHG inventory was developed using protocols which adhere to national and international guidance and principles from the International Organization for Standardization (ISO) 14064-1, Intergovernmental Panel on Climate Change (IPCC), United States Environmental Protection Agency (USEPA), World Business Council for Sustainable Development (WBCSD), and World Resources Institute (WRI). Specifically, the GHG Inventory was completed in accordance with the ICLEI-Local Governments for Sustainability Local Government Protocol v1.1 (LGOP) dated May 2010, The Climate Registry (TCR) General Reporting Protocol V2.0 (GRP) dated March 2013, and TCR Electric Power Sector Protocol v1.0 dated 2009. The inventory also incorporates elements and guidance from additional protocols including the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions dated October 2012, Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC) dated 2014, and the Airports Council International (ACI) Airport Carbon and Emissions Reporting Tool v3.0 (ACERT) which follows the ACI Guidance Manual on Airport Greenhouse Gas Emissions Management dated 2009.

GHG emissions were categorized by ownership and control in the following manner:

- **Scope 1** / Direct – GHG emissions from sources that are owned and controlled by the reporting entity (i.e., the City of Rochester)
  - *Stationary – Facilities – Combustion* -natural gas combusted in boilers and other units for facility heat,
  - *Stationary – Facilities – Electric Generation* - natural gas and distillate fuel oil combusted for RPU electricity generation (excluding losses from transmission and distribution (T&D)), and

    - *Stationary – Facilities – WWTP Generation* – biogas generated and combusted as part of the wastewater treatment process
    - *Mobile Fleet* - consumption of liquid fuels, gasoline and diesel, related to city- and RPU-owned fleet.
- **Scope 2** / Indirect – GHG emissions associated with the generation of electricity purchased from the grid
    - *Stationary – Purchased Power* - electricity consumed in city-owned buildings
    - *Stationary – Electric Generation T&D Loss* – transmission and distribution losses associated with RPU-generated electricity.
- **Scope 3** / Indirect and Optional – GHG emissions that are associated with the activities of the reporting entity (i.e., the City) but are emitted from sources that are owned and controlled by others.
    - *Community Combustion – Natural Gas* – natural gas combusted in commercial, industrial, and residential units for heat and processes
    - Community Combustion – Fuel Oil/Other – fuel oils, propane, waste oil, solid waste, and medical waste combusted at facilities for facility and process requirements
    - Community Electric – electricity consumed in commercial, industrial, and residential locations
    - Community Transportation – gasoline, diesel, and jet-a combusted in vehicles, rail cars, and aircraft on city roads.
    - Community Waste – solid waste combusted at the waste to energy facility for steam and electricity production and consumed in facilities and processes.

As provided by the protocols, emission factors and calculation methodologies were used to quantify GHG emissions associated with the City of Rochester. As described in the protocols, carbon emission factors are based on the carbon content of the fuel combusted, per unit volume or per unit energy, in addition to the percent oxidized and the CO_2-to-carbon ratio. Similarly, methane (CH_4) and nitrous oxide (N_2O) are two other Kyoto Protocol GHGs emitted during combustion. The CH_4 and N_2O emission factors provide a mass of constituent per unit volume of fuel consumed. The energy consumption (e.g. standard cubic feet of biogas, therms of natural gas, gallons of diesel or gasoline, kilowatt hours (kWh) of electricity) is multiplied by the respective emission factor and applicable conversion factors to calculate the mass of individual GHGs such as pounds of CO_2, CH_4, and N_2O.

The mass of constituent is then multiplied by its respective global warming potential (GWP) in order to provide an equivalent CO_2e basis. CO_2e equivalent values are based upon the GWP values of one (1) for CO_2, 25 for CH_4, and 298 for N_2O (based on a 100-year period) as presented in the IPCC Fourth Assessment Report. The Fourth Assessment Report is selected over the Fifth Assessment Report to maintain consistency with the USEPA Mandatory Reporting Rule factors as listed in 40 CFR 98. Based on these CO_2e factors, one ton of CH_4 is 25 times more "potent" than one ton of CO_2 and is weighted as such in the GHG emissions inventory.

In general, consumption data was provided by invoices, billings, documented transactions, or publically-available reports. Consumption data, respective emission factors and conversion factors are detailed for each source and cited in Appendix A. Additional information is included in the following sections.

Energy consumption and GHG emissions distribution for the community (Scope 3 emissions) and city (Scope 1 and 2 emissions) sources are presented below in Table 5-1 and detailed in Appendix A.

Table 5-1: Community Energy Consumption and GHG Emissions Distribution

User/Source Category	Scope	2014 GHG (metric tons CO_2e)	% of Total		2014 Energy (MMBtu)	% of Total
City of Rochester Owned/Controlled						
Stationary - Facilities - Combustion	1	3,878	0.2%		73,117	0.3%
Stationary - Facilities - Electric Generation	1	36,988	2.0%		687,912	3.3%
Stationary - Facilities - WWTP Generation	1	5,103	0.3%		97,505	0.5%
Mobile Fleet	1	7,057	0.4%		96,025	0.5%
Scope 1 Subtotal		*53,027*	2.8%		*954,560*	4.5%
Stationary - Purchased Power	2	22,731	1.2%		110,676	0.5%
Stationary - Electric Generation T&D Loss	2	640	0.0%		11,897	0.1%
Scope 2 Subtotal		*23,370*	1.2%		122,573	0.6%
City of Rochester Owned/Controlled		***76,397***	4.1%		***1,077,133***	5.1%
Community Owned/Controlled						
Community Combustion - Natural Gas	3	536,419	28.7%		10,113,572	48.2%
Community Combustion - Fuel Oil/Other	3	7,643	0.4%		92,080	0.4%
Community Electric	3	822,637	44.0%		4,005,428	19.1%
Community Transportation	3	366,712	19.6%		5,054,495	24.1%
Community Waste	3	60,807	3.3%		659,615	3.1%
Scope 3 Subtotal		*1,794,218*	95.9%		*19,925,190*	94.9%
Total		**1,870,615**	100.0%		**21,002,323**	100.0%

Notes: Scopes are defined in Section 5.3 above.
Purchased power includes electricity purchased from the grid for City-owned sources.
T&D losses are losses associated with transmission and distribution of electricity from RPU-generated electricity.

Because energy consumption and GHG emissions are so closely tied, the two distributions have been presented together above for comparison. The community sources (Scope 3) include residential, commercial, and industrial activity within the city limits but not under the City's direct control. For the purposes of the GHG inventory and energy consumption analysis, the City of Rochester sources (Scope 1 and 2) have been excluded from the community totals and shown separately, even though the emissions would be a subset of the respective categories. While the City of Rochester does not have direct control over community sources and consumption, the City can exert influence over the emissions through various mechanisms.

Energy consumption and associated emissions are summarized in the following sections. Practices and recommendations are discussed in Section 6.0. Energy usage and individual source categories are discussed in more detail in the following sections using Table 5-1 as the starting point for breaking down specific categories.

5.3.2.1 RPU's Electricity Generation and Net Metering

At the end of 2014, RPU had 611 kW of renewable energy installed. RPU's net metering report showed that RPU sold 340,422 kWh of renewable based electricity to MISO SMMPA and RPU purchased back 158,153 kWh for local distribution, resulting in a net electric sale of 182,269 kWh. Renewable energy customers are meeting approximately one third of their energy needs through wind and solar production.

RPU's total electricity generation accounted for 36,988 metric tons of carbon dioxide equivalents ($MTCO_2e$) based on consumption of 6,834,760 therms of natural gas and 118,356 gallons of distillate fuel oil. This represents 48% of the City of Rochester's direct GHG emissions. From a community perspective, the emissions comprise 2% of the total emissions. Fuel consumption data for RPU electricity generation was collected from the U.S. Department of Energy, Energy Information Administration (EIA)-923 and EIA-860 reports submitted by RPU.

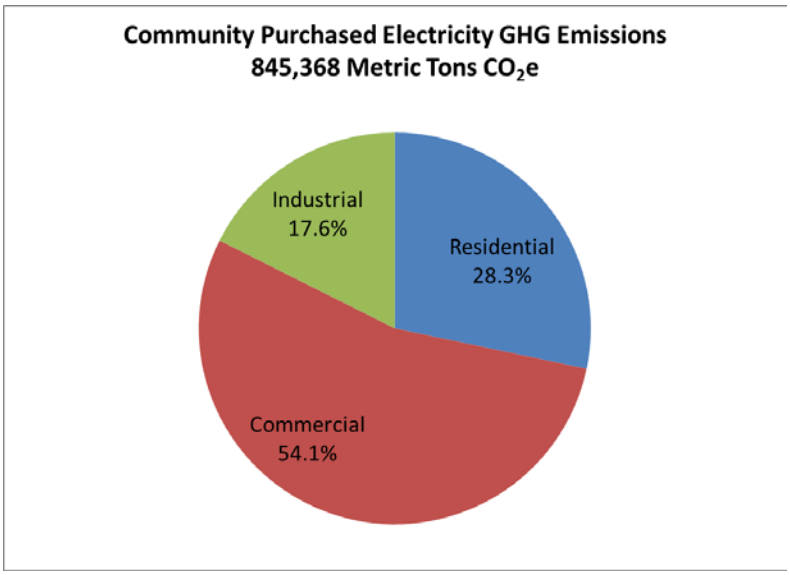
5.3.2.2 Electricity Usage (MISO SMMPA)

Electricity is used for powering residential, commercial, industrial, and City operations and facilities. Usage includes items such as lighting, appliances, processes, pumps, dryers, and other similar sources. Overall, electricity usage within the city for 2014 was comprised of the following:

- Residential: 341,452,000 kWh
- Commercial: 652,612,000 kWh
- Industrial: 212,297,000 kWh

Community electric consumption accounts for 19.1% of total energy consumption and 44.0% of total GHG emissions. As a subset of the total above, the City of Rochester purchased, for City buildings, 32,437,331 kWh of electricity in 2014, equating to 0.5% of total emissions. Consumption data is based on metering and total sales by RPU. Associated emissions distributions within the electricity category are shown in figure 5-1.

Figure 5-1: Community Electricity GHG Emissions Distribution



As indicated in figure 5-1, GHG emissions correlate directly with energy consumption for purchased electricity with commercial sources contributing the largest percentage.

5.3.2.3 Natural Gas Usage (MERC)

Natural gas usage provides facility heat, hot water, and process heat among others. Natural gas consumption within the city for 2014 was comprised of the following:

- Residential: 41,721,168 therms
- Commercial: 66,980,481 therms

Community natural gas consumption represents 48.2% of total energy consumption and 28.7% of the GHG emissions. As a subset of the total above, the City of Rochester consumed 731,165 therms of natural gas in 2014 or 0.2% of city-wide emissions. Consumption data and heating value (for conversion factors) is based on metering data supplied by MERC

5.3.2.4 Liquid Petroleum Fuels

Vehicles on local roads and mobile equipment accounted for the following usage of liquid petroleum fuels:

- Gasoline: 666,599,417 miles traveled (estimated 26,471,607 gallons)
- Diesel: 104,391,178 miles traveled (estimated 13,342,725 gallons)

The vehicle traffic on local roadways accounts for 24.1% of total energy consumption and 19.6% of GHG emissions.

Of the above total consumption, City of Rochester (including RPU) fleet and equipment consumed the following:

- Gasoline: 4,730,475 miles traveled (estimated 202,620 gallons)
- Diesel: 1,834,263 miles traveled (estimated 512,304 gallons)

City consumption comprises 0.5% of energy consumption in the community and 0.4% of GHG emissions. Total fuel purchases and counts were provided by the city and RPU. Emissions were calculated from total fuel purchased split proportionally across vehicle distribution based on the vehicle counts and respective fuel efficiencies. Community emissions were calculated using total vehicle miles traveled (VMT) as provided by MNDOT Roadway Data for the City of Rochester. The total VMT was distributed according to vehicle distribution from the counts and respective fuel efficiencies to calculate total fuel combustion. Rail miles were provided by the city. Aircraft emissions were calculated using the Airport Carbon and Emissions Reporting Tool (ACERT) v3.0 and FAA OPSNET Report. Detailed calculations, methodologies, and assumptions are included in Appendix A.

Additional consumption of liquid fuels within boilers and equipment in the City, primarily at St. Marys (note, the legal name does not include an apostrophe) and Mayo, are as follows:

- Fuel Oil No. 1: 103,710 gallons
- Fuel Oil No. 2: 30,393 gallons
- Fuel Oil No. 6: 203,000 gallons
- Propane: 450 gallons
- Waste Oil: 900 gallons

In total, the liquid fuels account for 0.4% of energy consumption and emissions. Fuels burned are used by Mayo to cogenerate steam, chilled water and electricity at the Franklin Heating Station & Prospect Utility Plant downtown and at the St. Marys Utility Plant. Usage for the Mayo and St. Marys plants were collected from MPCA air permitting reporting for respective permits #1090084 and #10900008.

5.3.2.5 Other Fuels

Biogas

The RWRP consumes the biogas produced from the wastewater treatment process for facility electricity and heat energy. Total production and consumption in 2014 totaled 148,863,000 standard cubic feet (scf) of biogas which constitutes 0.3% of energy consumption and 0.5% of GHG emissions. Biogas production was provided by RWRP.

Municipal Solid Waste

MSW combustion provides heat energy for electricity and steam for use in building and facility systems and processes. In 2014, an estimate 74,907 tons of waste were combusted for energy production. Waste accounted for 3.3% of energy consumption and 3.1% of emissions. Total MSW was reported by the WTE facility. The Rochester community contribution was calculated based on the proportion of city population versus total county population.

5.3.2.6 City of Rochester Owned or Controlled

The top three City-owned or controlled consumers of each fuel source are listed below. As presented in Appendix A, detailed energy and emissions for sources beyond the top consumers listed below allows for further comparison and tracking against goals. The top consumers provide immediate options for potential reductions. Additionally, total cost associated with the natural gas and electricity categories is listed based on contribution to the city totals.

RPU Generation

- Silver Lake (natural gas): 6,014,690 therms
- Cascade Creek (natural gas): 820,070 therms
- Cascade Creek (fuel oil): 116,844 therms

Electricity

- Water Reclamation Plant: 13,780,800 kWh
- Mayo Civic Center: 3,602,200 kWh
- Rec Center: 3,427,213 kWh
- RPU Service Center: 1,868,851 kWh
- Public Works TOC: 1,866,851 kWh
- **Total Electricity Dollars** **$2,837,160**

Natural Gas

- Rec Center: 216,070 therms
- Public Works TOC: 146,057 therms
- Airport Main Terminal: 77,785 therms
- MN BioBusiness Center: 66,554 therms
- Water Reclamation Plant: 51,705 therms
- **Total Natural Gas Dollars** **$625,777**

Figure 5-2 presents the relative GHG emissions from electricity for the City of Rochester sources.

Figure 5-2: City of Rochester GHG Emissions from Purchased Electricity

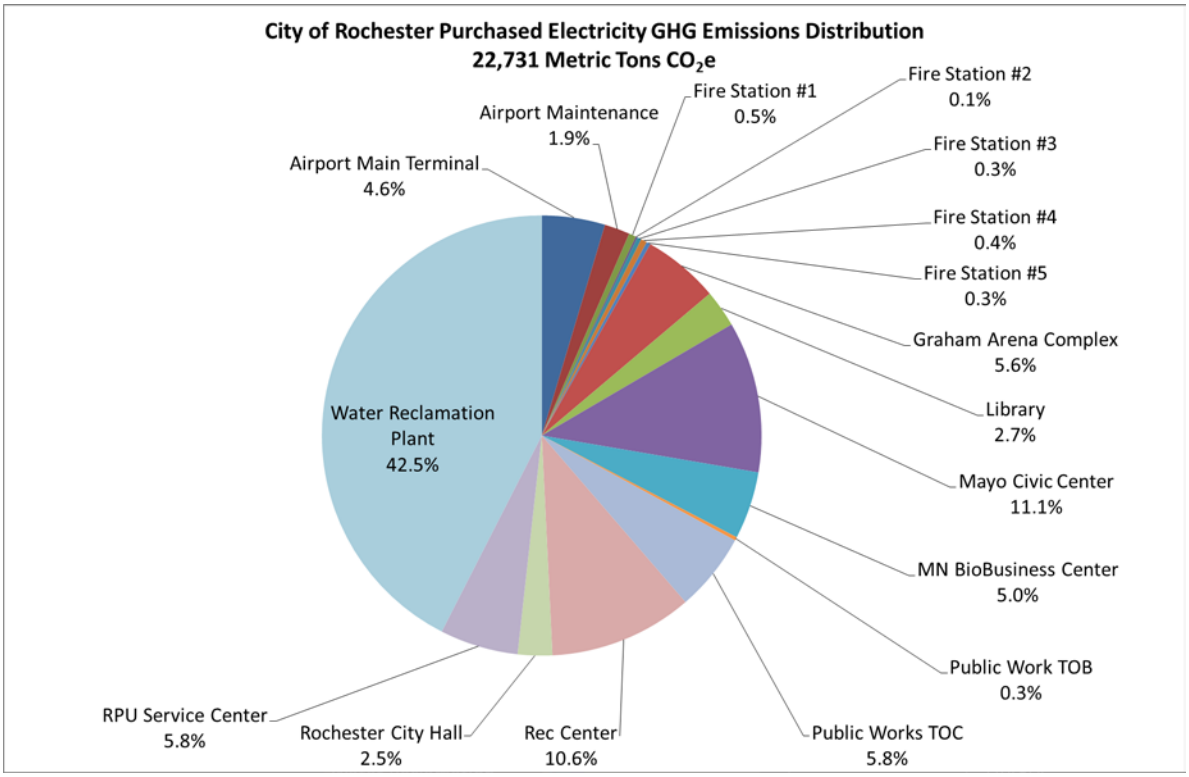
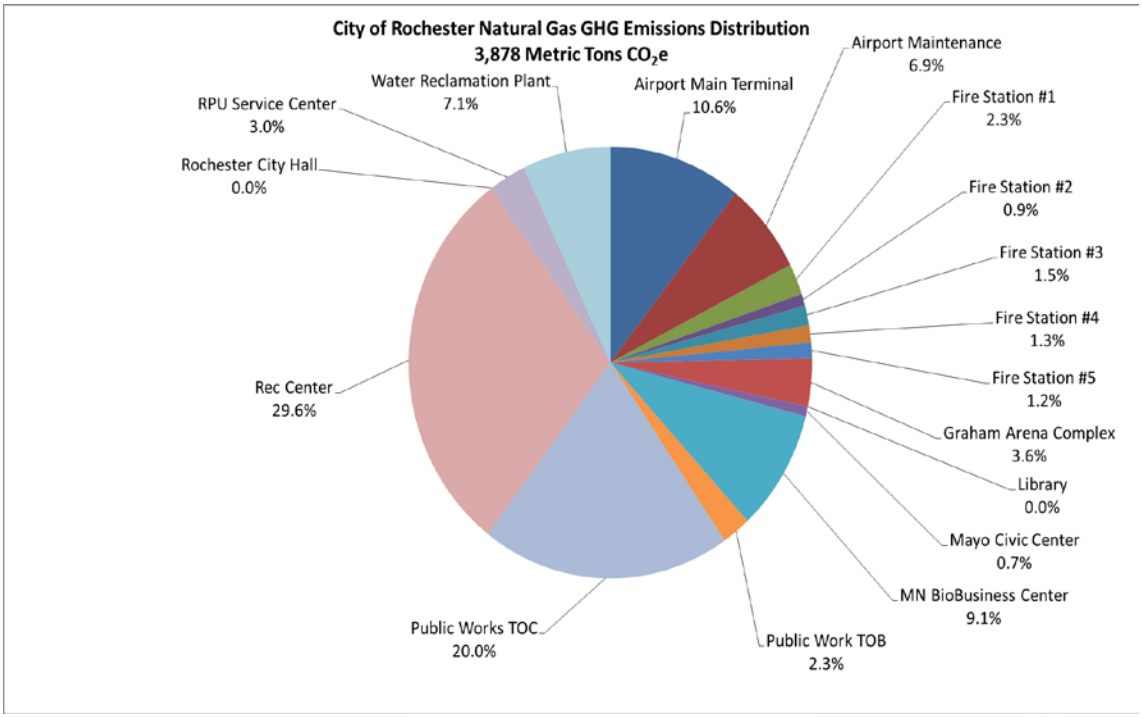


Figure 5-3 presents the graphical representation of relative GHG emissions from natural gas for the City of Rochester sources.

Figure 5-3: City of Rochester Natural Gas GHG Emissions



Liquid Petroleum Fuels (Fleet)

- City Fleet – Misc. – Diesel: 288,473 gallons
- City Fleet – Heavy Trucks – Diesel: 105,144 gallons
- City Fleet – Buses – Diesel: 70,096 gallons

RWRP Biogas: 148,863,000 scf

5.3.2.7 Community Owned or Controlled

Community consumption was analyzed at a higher level. Where data were available, they were incorporated and analyzed. Otherwise, assumptions were used, in adherence with third-party GHG inventory protocols.

The community accounts for 95% of energy consumption in Rochester for 2014. Natural gas combustion accounts for almost 50% of total energy use followed by transportation at 24% and electricity consumption at 19%.

Natural Gas

Within the natural gas combustion category, commercial and industrial sources account for 60% of the energy consumption and GHG emissions with residential sources representing 40%.

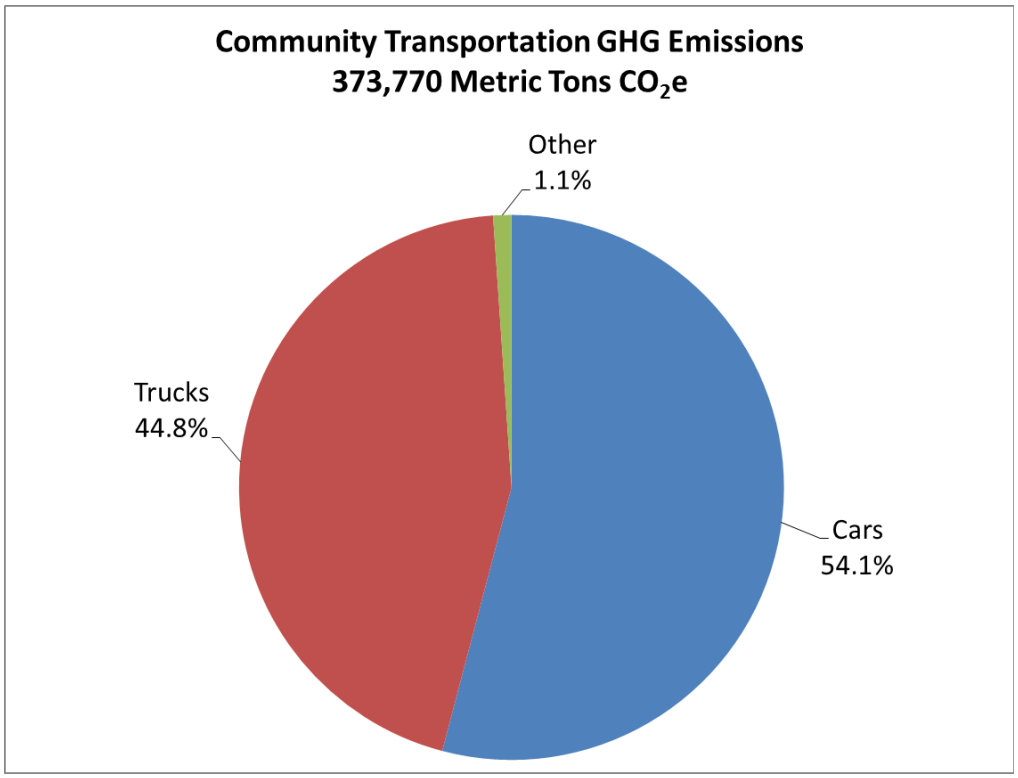
Transportation

In the transportation sector, the largest contributors to energy consumption and emissions are shown below:

- Cars – Gas: 535 million miles travelled
- Heavy Trucks – Diesel: 71 million miles travelled
- Heavy Trucks – Gas: 27 million miles travelled

Figure 5-4 shows the GHG emissions contribution from each form of transportation.

Figure 5-4: Community Transportation GHG Emissions



As indicated in Figure 5-4, cars; which include passenger cars, light duty trucks, SUVs, and vans; account for 54.1% of the emissions. Trucks, which include heavy trucks and buses, account for 44.8% of the emissions. Heavy trucks account 44% of total transportation GHG emissions along, yet only 13% of total miles in the transportation category. Additional detail on contributing sources is included in Appendix A. The remaining vehicle miles traveled include equipment, vans, buses, rail, and aircraft travel.

Electricity

Consumption of electricity is split among the three primary users as indicated in Section 5.3.2.2. Commercial consumption represents 54.1% of the total community consumption with residential accounting for 28.3% and industrial 17.6%.

Detailed consumption data is included in Appendix A.

5.4 PRIMER ON CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS (GHG)

The global, scientific community overwhelmingly believes that human-induced, or anthropogenic, climate change is the result of human activities and human-induced climatic dynamics that have resulted, and will continue to result, in an accumulation of greenhouse gases in the atmosphere. GHGs, while necessary to sustain life on earth, are accumulating at an accelerated rate in the atmosphere that is resulting in the gradual warming of the planet and causing climate change. GHGs include: CO_2, CH_4, N_2O, and fluorinated gases. While CO_2 makes up the majority of anthropogenic GHG emissions (80%+) and is most abundant in the atmosphere, one must also consider how long the various gases remain in the atmosphere and how strongly they impact global temperatures i.e. consider the Global Warming Potential (GWP). The EPA, the National Academies of Science, the Intergovernmental Panel on Climate Change (IPCC), and many other agencies and organizations make publically available reference information on climate change.

For the purposes of this EAP and in the GHG inventory, only anthropogenic sources of GHGs are considered. Further, some sources of anthropogenic GHGs are not captured in the inventory, such as wood burning fireplaces, some medical waste and other incineration, crematories, brush burning, leakage of GHG gases from i.e. natural gas pipelines.

5.5 SUMMARY OF COMPLETED BASELINE ENERGY AND GHG INVENTORY

An executive summary for the GHG inventory and baseline calculations is included in Appendix B. In general, the GHG inventory was completed in accordance with ICLEI-Local Governments for Sustainability *Local Government Operations Protocol.* As stated previously, energy consumption and GHG emissions correlate closely, and opportunities for energy and carbon reductions can be identified in the baseline consumption and inventory analysis. When relative contribution of GHG emissions per unit of energy consumed is considered, source carbon efficiency comparisons can be made.

Table 5-1 presented the 2014 GHG and energy consumption summary for the City of Rochester.

Figure 5-5a and Figure 5-5b relate the GHG emissions analysis to the tabular data displaying community energy consumption and corresponding GHG emissions; respectively.

Figure 5-5a: Rochester Community Energy Consumption Distribution

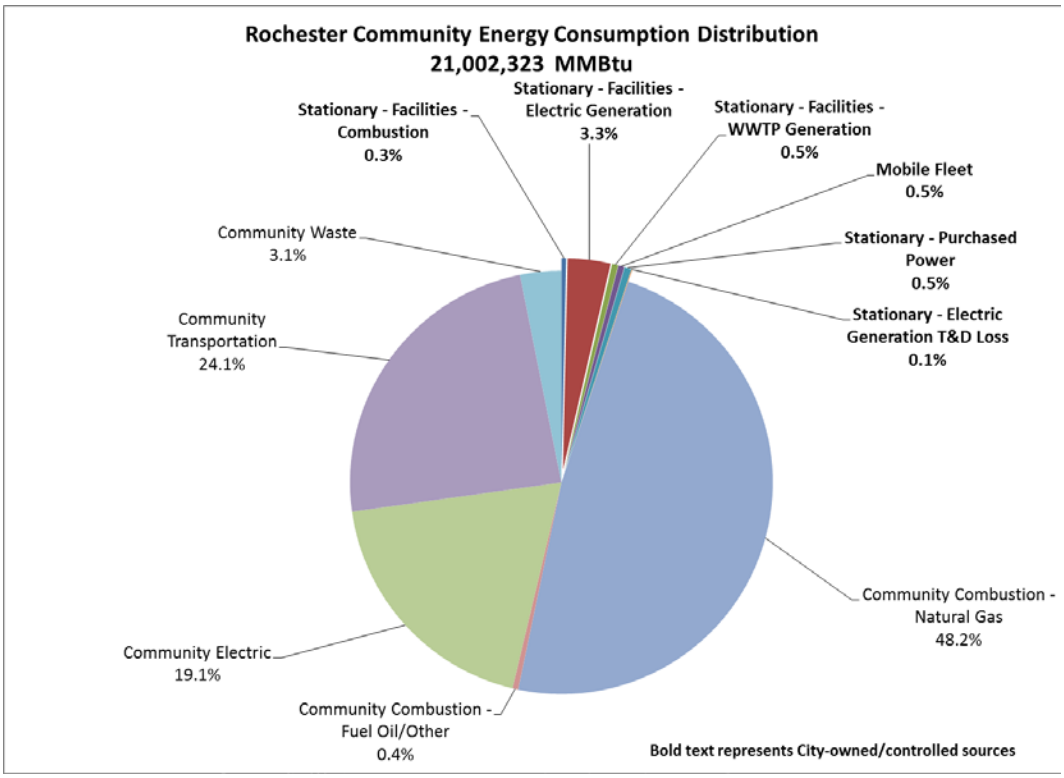
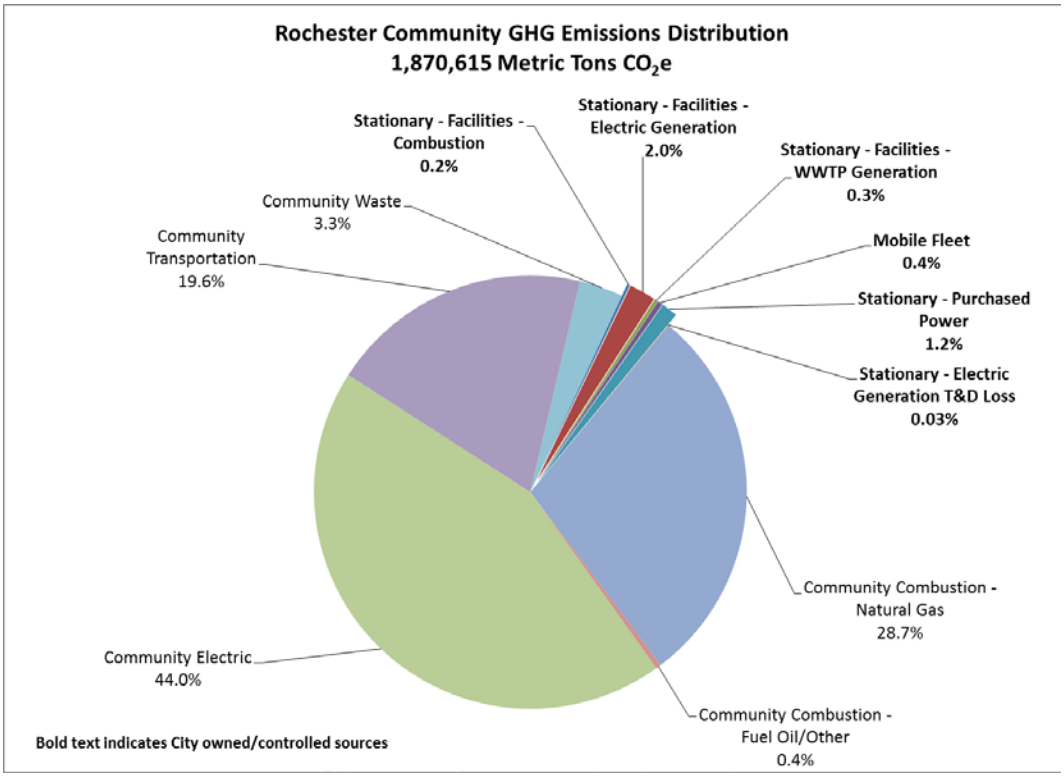


Figure 5-6b: Rochester Community GHG Emissions Distribution



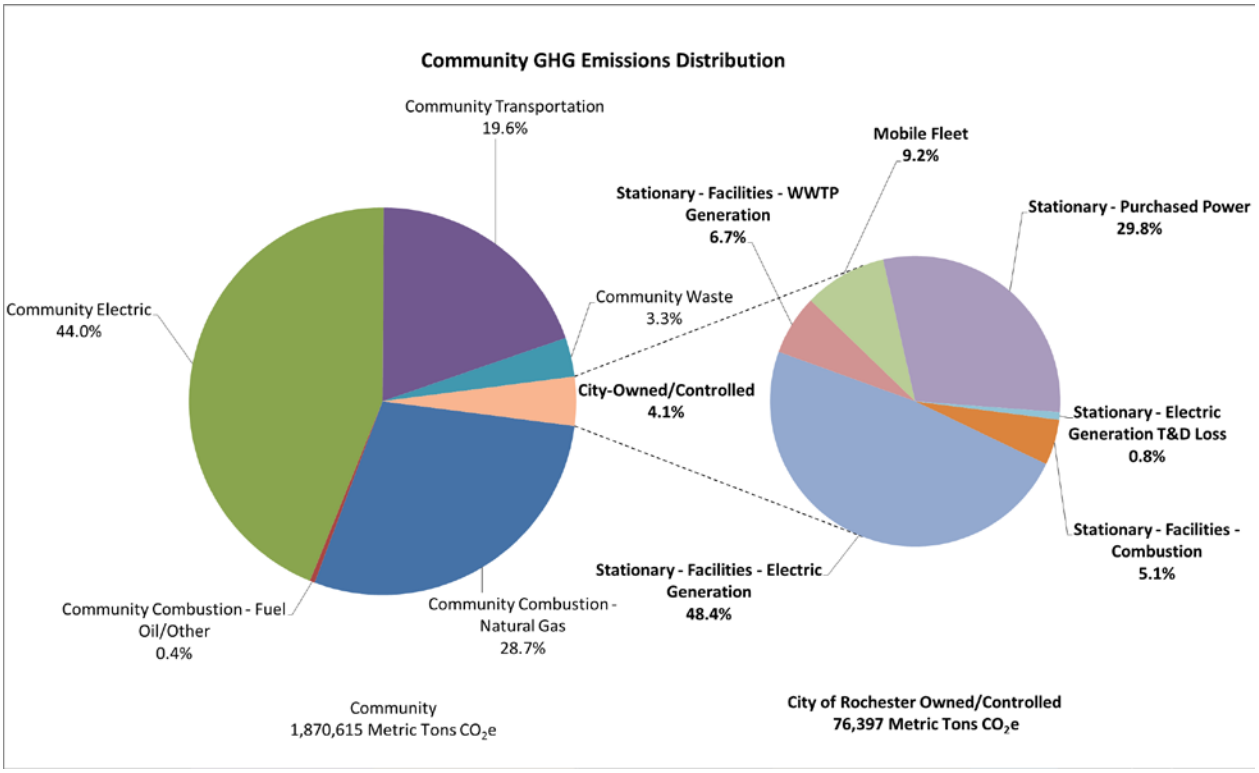
From a relative contribution perspective, the City of Rochester direct emissions (Scope 1) appear relatively efficient considering that GHG emissions contribution is less than total energy contribution for each source category. On the other hand, purchased electricity (Indirect, Scope 2) contributes 1.2% of the total GHG emissions with only 0.5% of the total energy consumption.

On a gross basis, the energy consumption and emissions contribution of community natural gas combustion presents an opportunity for improvement. However, the category also exhibits the emissions efficiency of the source comprising 48.2% of energy consumption but only 28.7% of emissions. Conversely, electricity makes up 19.1% of energy consumption yet contributes 44.0% of emissions. Overall electricity consumption and emissions offers reduction opportunities but the category also offers additional reduction potential based on the relative emissions inefficiency. That is, the current electricity portfolio and source is more carbon intensive than natural gas on an equivalent basis.

As indicated in Section 5.3.3.2, commercial energy consumption contributes the greatest to overall emissions. Commercial consumption represents 54.1% of community electricity emissions and 61.1% of community natural gas emissions. Within the transportation category, heavy trucks, both gas and diesel combined, account for only 12.7% of vehicle miles travelled community yet contribute 44.3% of the GHG emissions. Gasoline passenger cars represent 42% of emissions in the transportation category and 8% of the total community emissions.

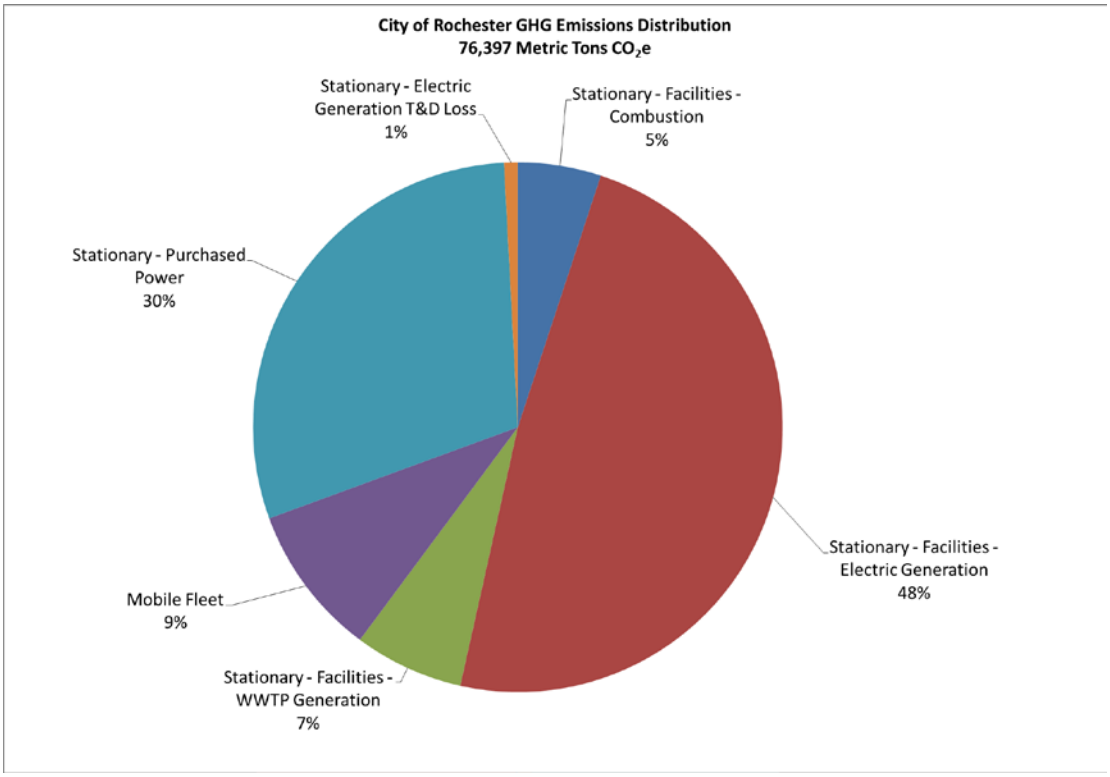
Figure 5-6 displays the City emissions distribution in the context of the community emissions.

Figure 5-7: Community GHG Emissions Distribution



When looking at the City of Rochester direct (Scope 1) and indirect (Scope 2) emissions in more detail, relative contribution for just City sources provides insight for further analysis and potential reductions. Figure 5-7 present the City GHG emissions distribution in more detail.

Figure 5-8: City of Rochester GHG Emissions Distribution



The largest contribution to emissions is electric generation and purchased power. RPU electric generation presents opportunities for reduction as the portfolio continues to incorporate renewable sources and fuels with lower carbon intensity. While not evident in the total GHG emissions in the summary, the RPU generation would be significantly higher at the level of current generation without the solar and hydroelectric contributions. Even though the City does not have a significant amount of influence over the current purchased power portfolio, the relative contribution of the category presents opportunities for reductions through other methods not directly associated with portfolio carbon intensity.

In regard to the RWRP, the emissions related to the source category are comprised of biogenic emissions. Biogenic emissions include CO_2 generated during the combustion or decomposition of biologically-based material. Biogenic emissions have been in the carbon cycle within the global warming potential time horizon and therefore do not contribute additional affects to climate change. As such, the emissions can be viewed as a kind of offset if replacing fossil fuels. Additional biogenic emissions include the OWEF and other solid waste combustion.

Please see Appendices B and C for additional inventory methodology, summary, and analysis information.

5.6 ESTABLISHED ENERGY CONSERVATION, RENEWABLE ENERGY AND CARBON EMISSIONS REDUCTION GOALS

The Rochester Energy Commission determined that the Energy Action plan be prepared using the goals of the Minnesota Next Generation Energy Act of 2007 (Minn. Stat. § 216H.02), hereafter referred to as NextGen. The three primary NextGen goals include:

- 1.5% annual retail energy savings
- 25% renewable energy by 2025 (25X'25 Renewable Electricity Standard)
- State-wide GHG emissions reductions of
  - 15% by 2015
  - 30% by 2025
  - 80% by 2050

As the City continues to grow, aggressive energy and emissions reductions become increasingly difficult on an absolute basis. In recognition of that reality, the City will evaluate its progress toward NextGen goals on a relative basis, accounting for its population and economic growth relative to state averages. That is, the City of Rochester's associated growth and trends will comprise a relative and proportionate contribution of the total reductions.

At this time, goals are set on a per capita basis to accurately reflect the impact of growth, efficiencies associated with expanding systems to service that growth, and to place the city within the larger context of NextGen. That is, the city will track progress using relevant numbers from annual energy and Scope 1, 2 and 3 GHG emissions inventory totals divided by the population of the City to determine the per capita basis. Projecting required emissions reductions and/or considering performance against each of the GHG emissions reduction goals will require use of a formula, as follows for each of the absolute emissions reduction goals. Similar formulas can be developed for the 1.5% energy savings and 25X'25 goals.

$$\frac{\frac{Rochester\ 2005\ emissions - Rochester\ 2025\ emissions}{Rochester\ 2005\ emissions}}{Rochester\ 2025\ population} = \frac{\%\ emissions\ reduction\ (2025)}{capita\ (Rochester)}$$

to be compared to:

$$\frac{\frac{MN\ 2005\ emissions - MN\ 2025\ emissions}{MN\ 2005\ emissions}}{MN\ 2025\ population} = \frac{\%\ emissions\ reduction\ (2025)}{capita\ (MN)}$$

In this case, the City will endeavor to accomplish the same or higher % emissions reduction per capita than the state.

Scope 3 emissions are included in these goals, despite the fact that the City of Rochester's authority and control over these indirect emissions sources is lesser than over Scope 1 and 2 sources. ***Given Scope 3 emissions account for more than 95% of the City's carbon footprint***, and given the City's control over the transportation infrastructure, land use planning and power sources, the City seeks to demonstrate climate and energy leadership by incorporating these emissions sources in its goals.

Goals will be met through a combination of conservation, renewable energy adoption, and carbon intensity reductions. Importantly, the City will evaluate and utilize multiple strategic approaches to meet the reduction goals. Specific actions related to each available tactic are presented in Section 6.0.

5.7 APPLICABLE ENERGY-RELATED REGULATIONS, MANDATES, POLICIES, PROCEDURES

As noted in Section 3.5, while various components of NextGen do not apply to RPU, RPU is obligated to meet the 25X'25 Renewable Energy Standard and has voluntarily committed to the rest of the State's goals. The Renewable Energy Standard mandates utilities, including municipal utilities, to supply a 17% renewable supply in 2016, 20% renewable supply in 2020, and 25% renewable supply in 2025. The Renewable Energy Standard will have a significant, carbon-mitigating impact on power generated by RPU and SMMPA in advance of the expiration of RPU's contract with SMMPA. For further information, Minnesota Statutes § 216H.02 and 216B.1691 describe the State's Renewable Energy Objectives, including the 25X'25 Renewable Energy Standard, in detail.

"The B3 Sustainable Building 2030 (SB 2030) Energy Standard is a progressive energy conservation program designed to significantly reduce the energy and carbon in Minnesota commercial, institutional and industrial buildings. Based on the national Architecture 2030 program, program, SB 2030 has been tailored to the needs of Minnesota buildings. The SB 2030 Energy Standard for all projects built after 2010 is 60 percent below that of an average building. Then in 2015, the standard becomes 70 percent better and so on until net zero energy is reached in 2030. The SB 2030 Energy Standard is required on all projects that receive general obligation bond funding from the State of Minnesota. SB 2030 can also be used on a voluntary basis on any project."[2]

The Clean Power Plan (CPP), if implemented, will substantially reduce the emissions factors associated with power generation nationally, including in the case of MISO and SMMPA. The U.S. EPA estimates CPP will reduce total carbon emissions from power plants by 32% relative to 2005 (EPA, 2015). RPU will not be subject to CPP requirements. However, RPU and other non-regulated power-generating facilities may opt-in and trade emissions reductions, resulting in power factor implications.

In 2015, Mayor Ardell Brede proclaimed that Rochester will strive to set a goal of 100% renewable energy by 2031. This proclamation has not been promulgated into City law, nor is it currently a City of Rochester goal. The timing of the proclamation coincides with the expiration of RPU's contract with SMMPA in 2030.

[2] http://www.b3mn.org/2030energystandard/ Accessed 22 March, 2016.

6.0 Energy/Emissions Forecast

6.1 TREND

This EAP project involved developing a complete GHG inventory analysis for the City of Rochester for 2014. This emissions snapshot limits the City's ability to quantify emissions trends, however overall context can be documented. As presented in Sections 3.3 and 3.4, electricity generation and consumption constitute a significant portion of emissions and energy use for the City of Rochester. Looking at actions completed in recent years, the City is already addressing its most significant carbon source through a number of actions, including:

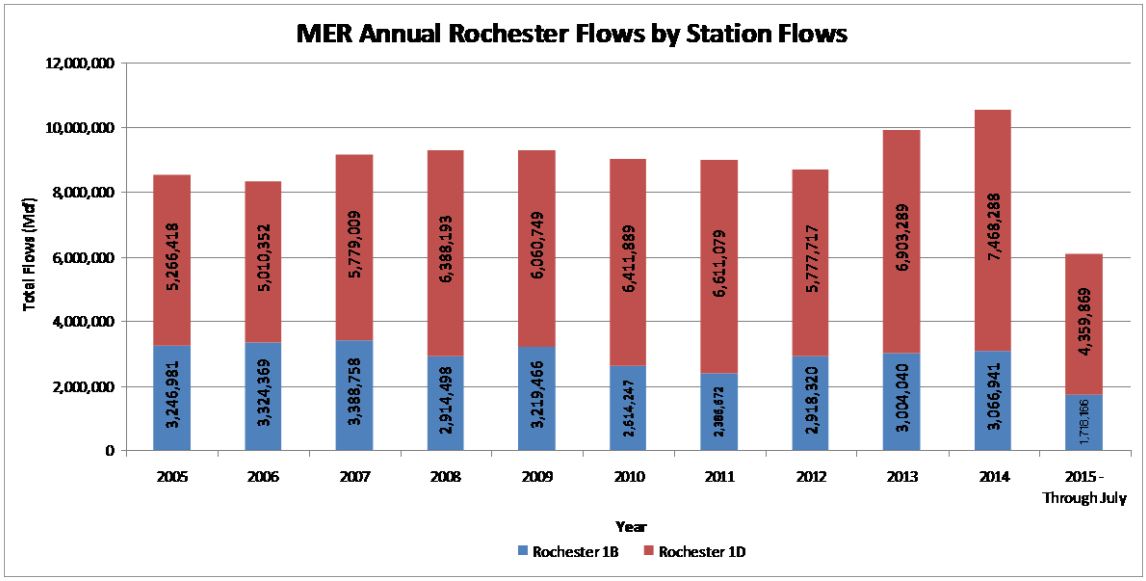
- switching from coal to natural gas electric generation;
- utilizing solar and hydroelectric renewable sources for electric generation;
- utilizing biogas for electricity and heat energy at the RWRP, and;
- completing facility conservation and retrofits.

Additionally, the RPU Engineering & Operations Report (Electric System) 2014 indicates that the average MWHs per residential customer is trending down from just over 7.9 total residential MWHs per total number of residential customers in 2005 to just over 7.4 in 2014. Average MWH per small general service customers also trend down over that same time period. However, medium and large general service customers trend upward from 2005 to 2014 presenting additional opportunity for reductions.

When analyzed within the known context, the existing snapshot would suggest that the City of Rochester is positioned for energy and emissions to trend downward from 2005 levels relative to population. However, with only one year evaluated, the actual projected reduction in relation to goals is not quantified at this time.

For example, natural gas consumption data is available for each year going back to the 2005 baseline year. As shown in Figure 6-1, the natural gas consumption is trending only slightly upward with increased population.

Figure 6-1: MERC Annual Rochester Flows by Station



With that said, the GHG inventory and energy consumption analysis provides a basis for tracking and evaluating future projects, initiatives, and reduction efforts. The relative contributions of source categories and top contributors within those categories point to opportunities for City equipment and fleet fuels along with further facilities improvements.

6.2 P2S GROWTH SCENARIOS (2)

The P2S contemplates two primary growth scenarios for the City of Rochester. The growth scenarios provide a conceptual roadmap with which to consider potential emissions sources, consumption changes, and associated reduction opportunities. The growth scenarios offer alternatives from growth that would be seen under the previous planning cycle. Scenario 1 considers population growth concentrated within the city limits. Scenario 2 considers limited expansion to city limits with two “super nodes” in one corridor.

Each scenario projects changes to populations, housing requirements, vehicle traffic, and land use. While housing and population increase, some anticipated efficiencies associated with actions like public transit expansion project lower vehicle miles travelled. With these changes, energy consumption and GHG emissions can be projected using current metrics and assumed future efficiencies. Accordingly, comparing growth scenarios to the existing baseline provides for further evaluation of reduction opportunities and considerations. While a portion of the reductions may be implied in the growth scenario indicators, specific actions and recommendations within this EAP will provide the basis for associated reductions in energy consumption and emissions.

6.3 FINAL SCENARIO

Based on the two scenarios evaluated, the City must consider a growing population with its reduction strategies. Specifics related to the geographic location of the growth will shift implications associated with that growth. The final scenario for the City of Rochester will provide additional context and constraints for defining recommendations for reducing energy consumption and GHG emissions. As such, the City of Rochester will incorporate the key indicators of the final scenario into projections for future years and progress towards goals in the Comprehensive Plan.

7.0 City of Rochester Participation in New Energy Focus Programs

7.1 MN GREENSTEP CITIES

The Minnesota GreenStep Cities program began in June 2010 with a mission to challenge, assist, and recognize cities that are taking action to achieve their sustainability and quality-of-life goals. In 2015 there were 83 cities in the state of Minnesota participating in the program constituting approximately one-third of the State's population (GreenStep Cities, 2013).

The City of Rochester joined the Minnesota GreenStep Cities program in December 2010. Since that time the City of Rochester began taking the following steps to integrate sustainability initiatives to save energy, reduce GHG emissions, lower City operating costs, and save tax money.

- Building community knowledge and interest
- Approving a city council resolution working toward GreenStep Cities recognition
- Posting information on the GreenStep Cities webpage
- Implementing best practices

Based on the progress to date and the number and type of best practices implemented, the City of Rochester is now ranked a Step Three GreenStep City and is recognized by the program for its significant efforts. Table 7-1 provides a sampling of the actions taken by the City of Rochester resulting in a healthier, greener, and less energy and carbon intensive community. A complete list of detailed actions taken by the City of Rochester can be found at: http://greenstep.pca.state.mn.us/cityInfo.cfm?ctu_code=2396395

Table 7-1: Sustainability Actions Taken in the City of Rochester

EXAMPLES OF SUSTAINABILITY ACTIONS TAKEN CITY OF ROCHESTER	
BEST PRACTICE CATEGORY	**ACTION TAKEN**
Efficient Existing Public Buildings	Made indoor lighting and operational changes to city-owned buildings to reduce energy demand and cost
Efficient Existing Public Buildings	Completed construction of the Minnesota BioBusiness Building which qualifies under the green building and energy framework
Efficient Existing Public Buildings	Took energy efficiency measures by utilizing Olmsted County's Waste to Energy facility to heat and cool most of the Government buildings on campus as well as other city owned buildings

EXAMPLES OF SUSTAINABILITY ACTIONS TAKEN CITY OF ROCHESTER	
BEST PRACTICE CATEGORY	**ACTION TAKEN**
Efficient Outdoor Lighting and Signals	Initiated a project to replace 300-400 175 watt mercury vapor street lights with LED streetlight fixtures All new streetlights are LED and all existing HPS fixtures that fail are replaced with LED fixtures.
Efficient Outdoor Lighting and Signals	On nearly all high traffic streets the signal timing was optimized to minimize car idling at intersections
Efficient City Fleets	Through Project GreenFleet, city owned fleet vehicles have been retrofitted with all new diesel technologies equipped with the latest filter technology, after burn systems, and use of biodiesel blends
Green Business Development	Actively promotes and encourages visitors to the Cascade Meadows wetland demonstration and environmental awareness complex, which is LEED Platinum certified

7.2 REGIONAL INDICATORS INITIATIVE

The Regional Indicators Initiative was developed as a way to track progress and outcomes of cities participating in the GreenStep Cities Program. This project measures annual performance metrics of 22 cities that are committed to improving their overall efficiency and moving the needle toward sustainability. The 22 cities participating in the Regional Indicators Initiative, of which Rochester is a participating city, represent nearly 29% of the Minnesota population. Annual data is collected from each of the following primary indicators and subsequently used to estimate associated GHG emissions and retail consumption costs and related fees back to the consumer.

Table 7-2: Description of Regional Indicators

PRIMARY INDICATOR	DESCRIPTION
Energy	Electricity, natural gas, fuel oil, coal, biomass, and district energy consumed for both residential and commercial/industrial use
Water	Potable water consumption for both residential and commercial/industrial use
Travel	On-road distance traveled by all vehicles within the municipal boundaries
Waste	Total municipal solid waste that has been landfilled, composted, incinerated or recycled

Recording and tracking these performance metrics provides a mechanism to monitor and improve the effectiveness of best management practices implemented through the GreenStep Cities program. Further, the data can also be used to monitor progress toward the State's energy efficiency and GHG reduction goals defined by the Minnesota Next Generation Energy Act of 2007.

Through tracking of this data at a community level, it serves as a resource of information to:

- Highlight opportunities to save resources and money
- Provide a baseline for estimating the effectiveness of sustainability measures
- Enable comparison with peer cities and different time-frames
- Inform subsequent analyses, plans, and policy decisions by the cities and others
- Improve each city's competitiveness for federal and state funding opportunities that are targeted to cities that have taken steps to measure and improve their energy efficiency and reduce their carbon footprints
- Assist in promoting public understanding of the city's effect on climate change.

Trend and comparative data for the 22 participating cities, including Rochester, can be found at: http://www.regionalindicatorsmn.com/

7.3 ADDITIONAL COMPARATIVE ANALYSES

One of the tasks in preparing this EAP involved evaluating and comparing energy and climate action plans implemented by three leading cities, including Minneapolis, MN, Portland OR, and Sacramento, CA. The complete Benchmarking (or Comparative) Analysis report can be found in Appendix C. In short, lessons learned by these three cities' well-established, effective energy and climate mitigation programs provide helpful guidance when contemplating actions and strategies for Rochester.

Across the three benchmarked cities, the following initiatives have resulted in the most significant GHG emissions reductions.

- **Buildings and Energy**: Retrofit existing building infrastructure with energy efficient heating and cooling systems, combined with incentives to achieve this goal. *(Portland, Sacramento, Minneapolis)*
- **Transportation**: Decrease vehicle miles traveled (VMT) through increased walkability and access to public transportation (extend public transportation networks). *(Portland, Sacramento, Minneapolis)*
- **Solid Waste**: Reduce waste and divert organic waste from landfills through incentives and cultural awareness campaigns. *(Portland, Minneapolis)*

Table 7-3 compares the three benchmarked cities and Rochester in terms of GHG emissions per capita by sector.

Table 7-3: Leading Benchmarked Cities Emissions Comparison

	Rochester		GHG/ capita	Minneapolis		GHG/ capita
Population	**111,007**		**16.85**	**400,070**		**12.75**
	Baseline	Current	Change	Baseline	Current	Change
Year	2013	2014		2006	2010	
Total $MTCO_2e$	1,696,834	1,870,615	3%	5,900,000	5,100,000	-3%
Transportation	331,666	373,770	13%	1,711,000	1,479,000	-3%
Solid Waste	34,553	60,807	19%	315,923	279,919	-3%
Electricity	792,550	846,007	7%	2,396,772	2,000,387	-4%
Gasoline	n/a	8,830	0%	904,528	851,981	-1%
Natural Gas	508,558	581,201	14%	1,436,871	1,339,929	-2%
Diesel	[3]	[3]	-	254,812	242,419	-1%
	Portland		**GHG/ capita**	**Sacramento**		**GHG/ capita**
Population	**609,456**		**12.63**	**479,686**		**8.02**
Year	1990	2013		2005	2011	
Total $MTCO_2e$	8,990,000	7,695,000	-0.6%	4,083,239	3,847,864	-1.0%
Transportation	2,979,000	2,830,000	-0.2%	2,013,962	2,009,724	0.0%
Solid Waste	498,000	93,000	-3.5%	241,862	318,497	5.3%
Electricity		3,416,200			721,513	
Gasoline		2,157,600				
Natural Gas		1,618,200			769,608	
Diesel		1,168,700				

[1] data included in commercial calculations

[2] includes wastewater treatment, water related, industrial specific, and municipal operations

[3] data included with gasoline value

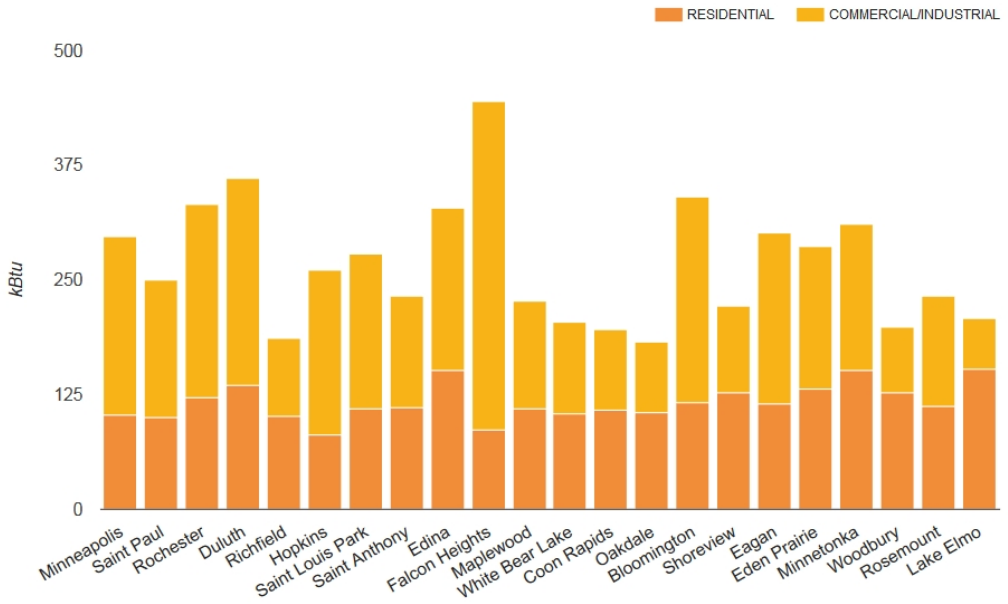
These three cities, while leaders, are dissimilar to Rochester in that they are all major metropolitan areas with substantially larger populations. The economies of scale that come with a large population make it difficult for Rochester to compete when comparing emissions per capita. Given that reality, it is also helpful to understand how Rochester compares to cities of similar size, latitude and constitution. Table 7-4 provides an insightful comparison of the City of Rochester's GHG emissions with three comparable cities, including: Albany, NY, Ann Arbor, MI, and Duluth, MN.

Table 7-4: Comparable City GHG Inventory Benchmarks

City of Rochester					
GHG Inventory Benchmarks					
		Rochester	Albany, NY[1]	Ann Arbor, MI[2]	Duluth, MN[3]
User/Source Category	**Scope**	**2014 GHG (metric tons CO_2e)**	**2009**	**2010**	**2013**
Population		**111,402**	**98,566**	**117,770**	**86,238**
City of Rochester Owned/Controlled					
City Owned/Controlled		***76,397***	*NA*	*NA*	*NA*
Community Owned/Controlled					
Community Combustion - Natural Gas	3	536,419	445,963		
Community Combustion - Fuel Oil/Other	3	7,643	15,550		
Community Electric	3	822,637	441,764		
Community Transportation	3	366,712	276,097		
Community Waste	3	60,807	125,311		
Scope 3 Subtotal		*1,794,218*			
Total		**1,870,615**	**1,304,685**	**2,209,237**	**1,766,457**
Per Capita		16.79	13.24	18.76	20.48
Notes:					
CO2e = Carbon Dioxide Equivalents					
1 - Adapted from Table 1: City of Albany GHG Emissions Inventory Summary by Sector - 2009 Baseline.					
Appendix D. Climate Action Plan, Albany 2030, The City of Albany Comprehensive Plan, 2012.					
2 - Adapted from Table 2: Ann Arbor Community Emissions by Sector. City of Ann Arbor Climate Action Plan 2012.					
3 - Adapted from Regional Inidcators Initiative, www.regionalindicatorsmn.com					
NA - not available					

Within Minnesota, Rochester GHG emissions can be compared against existing data available through the ULI indicators. Figure 7-1 shows the 2013 data, the most recent dataset available at the time of this plan, for cities reporting to the program.

Figure 7-1: Energy Consumption by Source for Minnesota Cities



As more data becomes available for Rochester and other cities, trends and comparisons can be reviewed and analyzed for additional action.

8.0 Opportunities for Improvement and Recommended Best Practices

The following recommended best practices, actions and strategies are highlighted because the City has a high degree of control or influence over them and/or they present an opportunity for high-impact carbon reductions. Top Priority recommendations are highlighted in green boxes below.

8.1 POWER GENERATION AND SUPPLY

8.1.1 Utility-Purchased Power (RPU, MISO, SMMPA)

With electricity comprising 19.6% of community energy consumption and 44.0% of community emissions, recommendations focusing on electricity, including the supply-side portfolio, present the largest opportunity for reductions. As indicated in Sections 3.3, 3.4, and 4.1, the detailed emissions and energy analysis in Appendix A presents the quantitative basis for improvements. When coupled with the knowledge of operations and sources, improvements and best practices can be established. The following improvements and best practices are recommended based on the current analysis.

While the majority of the emissions reductions realized by RPU's direct investment in renewable energy will not be reflected in the City's GHG inventories in the near-term, the City will realize some immediate and near-term emissions reductions as a result of the impact those investments will have on the MROW emissions factor. Further, when RPU's contract with SMMPA expires in 2030, there will be new opportunities to realize direct impacts from efficiency and emissions mitigation efforts.

SIGNIFICANT IMPACT/SIGNIFICANT CONTROL PRIORITY ACTION

- **RPU Generation Portfolio** – The City can prepare for capturing the benefits of its own generation by continuing to shift away from fossil fuels toward renewable resources, including:
  - increased and distributed solar
  - increased hydroelectric
  - geothermal evaluation
  - increased biogas utilization
  - increased solid waste utilization

SIGNIFICANT IMPACT/SIGNIFICANT CONTROL PRIORITY ACTION

- **RPU Supply-Side Efficiency –** Generate more electricity with the same or less fuel through replacement and upgrading of power generating units and reduction of losses through transmission and distribution, thereby reducing inefficiencies and GHG emissions. RPU can conduct energy audits and evaluate current systems, operations, and management controls to continue to increase the efficiency of power generation.

SIGNIFICANT IMPACT PRIORITY ACTION

- **Community Education –** As the City of Rochester has limited control over the emissions footprint associated with the portfolio of purchased power – at least through 2030 when the SMMPA contract expires- the best approach for the City to realize emissions reductions is by reducing the demand. The City can offer tips and incentivize the public to increase conservation and reduce consumption.

- **Facility Conservation and Retrofits** – Again, as the City of Rochester has limited control over the emissions footprint associated with the portfolio of purchased power, the best approach for the City to realize emissions reductions is by reducing the demand. Specific opportunities for City sources are discussed in more detail in following sections.

- **Other Sources of Supply**

The City of Rochester can benefit from additional actions related to energy supply.

SIGNIFICANT IMPACT PRIORITY ACTION

- **Optimization of Community Power Generation -** RPU is a member of the Energy Integration Committee (EIC), a new community group of energy generators and large users created to evaluate opportunities for collaboration in realizing energy efficiency across organizations in the DMC District. The City can support the work of the EIC through RPU's engagement and otherwise.

SIGNIFICANT IMPACT PRIORITY ACTION

- **Expansion of Behind the Meter Generation-** In 2030 when the SMMPA contract expires, RPU's obligation to purchase at a contracted rate (contracted rate of delivery, or CROD) power from SMMPA will expire. The expiration of this contract provision provides City agencies like the Wastewater Reclamation Plant flexibility to generate more of their own low-carbon power and directly account for carbon reductions. In addition, RPU will have new flexibility to incentivize more aggressive development of "behind the meter" power generation, such as roof-top and community solar, without being constrained by contractual power purchase obligations.

SIGNIFICANT IMPACT PRIORITY ACTION

- **OWEF -** The City of Rochester and Olmsted County have opportunities to reduce the energy used to manage waste and to capture and convert more waste to low-carbon energy. OWEF was expanded in 2010 and OWEF has the capacity to divert substantially more waste from land disposal. The two most promising opportunities are to: source and convert more regional mixed municipal solid waste (MMSW) into steam, and; sell more steam and electricity to community users, recognizing regulatory limitations to the amount of power and the number of customers to whom OWEF can sell power under PURPA.

Natural Gas

The City of Rochester does not have significant influence over the natural gas supply. However, collaboration with MERC and related partners could present opportunities for City sources as well as community consumption emissions reductions:

- **Preventative Maintenance / Inspections** – Conduct frequent inspection on distribution systems to reduce losses from leaks.
- **Renewable Sourcing** – Consider sourcing of renewable natural gas and biogas via MERC or other providers in addition to the RWRP. Evaluate other production sources such as landfills not currently supplying the OWEF.

Woody Biomass

The state of Minnesota is rich in wood resources and numerous state-wide analyses have identified wood as potential energy source for the state. The City could work with RPU and other power-generating entities to identify and pursue fuel switching opportunities.

8.2 BUILDINGS

One of the key takeaways from the benchmarking (comparative) analysis is that it would be prudent for the City to develop a strategy for reducing total energy use of existing buildings by increasing energy efficiency. The Cities of Minneapolis, Portland, and Sacramento report realizing a combined reduction of 107,559 MTCO2e through building energy efficiency initiatives. See Section 5.0 and Appendix C of this EAP for more details. A general strategy is to retrofit existing buildings for heating and cooling systems, appliances, lighting, electronics, etc. Additional details are contained in the following sections.

SIGNIFICANT IMPACT / SIGNIFICANT CONTROL PRIORITY ACTION

- **Sustainable Building Policies –** The adoption of sustainable building policies that apply to planning, design, construction and commissioning of new and significant modification construction projects present a significant opportunity to mitigate GHG emissions.

SIGNIFICANT IMPACT / SIGNIFICANT CONTROL PRIORITY ACTION

- **Retro-commissioning** – Retro-commissioning could be a cost-effective way for Rochester to reduce energy use and GHG emissions from City and community-owned buildings. Retro-fitting technologies encompass technologies such as upgrading lighting systems to LED lights over conventional lightbulbs or heating upgrades.

8.2.1 City Facilities

The City of Rochester has significant influence over the operation and potential energy efficiency improvements of city facilities. The work to make city facilities more efficient has already begun. The City has used both internal and external borrowing for energy improvements in City buildings to be paid back with energy cost savings. The results of

these programs have been mixed, and future projects are likely to be financed only if energy savings are certain and the initial capital outlay is less than $2 million.

8.2.1.1 Energy Reduction Activities and Retro-commissioning

Energy conservation education and implementation could save the City money and keep energy expenditures stable as the residential and employee population of Rochester increase.

Retro-commissioning is a systematic process for identifying less-than-optimal performance in existing facilities' equipment, lighting, and control systems and could be a cost-effective way for Rochester to reduce energy use and GHG emissions from City and community-owned buildings. EPA Energy Star has a chapter dedicated to retro commissioning in its Building Upgrade Manual. More information is available here: https://www.energystar.gov/sites/default/files/buildings/tools/EPA_BUM_CH5_RetroComm.pdf.

8.2.1.2 Retro-Fitting Technologies

Rochester has already invested in some emissions and cost saving retro-fitting technologies. In 2006, the City of Rochester partnered with Johnson Controls, Inc. (JCI) conducting an energy efficiency project that focused facility improvement measures on the airport, art center, city hall, Civic Center, Civic Theater, Fire Stations 1 and 4, Graham Arena, the library, Northern Hills Golf Course, park operations, Quarry Hills Nature Center, the Recreation Center, Soldiers Field, traffic operations, traffic signal lights, Plummer House lighting, Mayo Field building lighting, and the National Volleyball Center lighting. The net project cost was $5.3 million with annual savings of $565,000.

Generally, retro-fitting technologies encompass technologies such as upgrading lighting systems to LED lights over conventional lightbulbs or heating upgrades, and they offer another cost-effective opportunity for Rochester to reduce energy use and GHG emissions. Applications could be explored and applied more broadly.

8.2.1.3 Remodeling Efficiency

A recommended best practice is for the City of Rochester and its contractors to identify and implement opportunities to increase efficiency during remodeling projects. The City of Rochester has a high degree of control over the remodeling process for its buildings. The impact of this initiative would vary with each building, but the cumulative effect could be moderate energy and carbon footprint improvements across the City of Rochester.

8.2.1.4 New Construction Efficiency

A recommended best practice is for the City of Rochester and its contractors to identify and implement opportunities to increase efficiency during new construction projects. The City of Rochester has a high degree of control over the remodeling process for its buildings. The impact of this initiative would vary with each building, but the cumulative effect would be moderate energy improvements across the City of Rochester. Policies like those implemented in the City of Saint Paul and the B3 tools and programs serve as examples of best practices the City of Rochester could consider.

In Saint Paul, MN, a sustainable building policy has been adopted that applies to planning, design, construction and commissioning of new construction projects receiving more than $200,000 in City or HRA funding. The program applies to parking structures and to building additions that include HVAC systems. Developers must comply with at least one of four

(developers choice) approved green building rating systems. Other requirements apply. For more information, see https://www.stpaul.gov/departments/planning-economic-development/economic-development/sustainable-building-policy

8.2.1.5 B3 Benchmarking

Buildings, Benchmarks, and Beyond (B3) Benchmarking is a program that helps managers of public buildings evaluate the energy data so improvements can be made in energy efficiency. B3 uses building and meter information to summarize energy consumption, costs, and carbon emissions. Monthly and annual reports provide trend information.

B3's other tools include a comparison benchmark tool that can predict expected energy use, a peer comparison tool to evaluate similar buildings so Rochester can gauge their progress relative to others. B3 also provides a baseline weather-normalized comparison so the City of Rochester could easily track progress. Currently, Rochester inputs data on the B3 website, however the city is not making active or optimal use of this tool.

More information can be found at https://mn.b3benchmarking.com/.

Minnesota B3 tools and programs have been developed to enable the development and retrofitting of more energy efficient, sustainable buildings. While the B3 programs are mandatory under Minnesota statute (SB2030) for Minnesota State bonded building projects, the programs are easily applied to any project. Every five years, the standard for total energy use in buildings is to be reduced, with the ultimate goal of net zero carbon for all new construction by 2030. For more information, see http://www.b3mn.org/2030energystandard/contact.html

8.2.1.6 Green Building Certification Possibilities

The City of Rochester could encourage and direct new construction to meet green building certification, as the City of Saint Paul has done (reference 8.2.1.4). Note, this is a focus area of the recommendations made by the Center for Energy and Environment and Ever-Green Energy with regard to DMC development.

8.2.1.7 Capital Investment and Market Incentives

The capital outlay required for many carbon mitigating actions can be daunting. Attracting investment for the DMC in order to qualify for additional state funds is a priority. The City plans to capitalize on grants and other financial incentive programs. The DMC project in itself, however, is not projected to provide significantly increased revenues for new City annual budget initiatives.

In terms of the process for securing capital, the City Administrator makes recommendations to the Mayor and City Council on policy and budget matters. The City Council looks to RPU for recommendations relating to many energy-related matters. The City annual operating and capital improvement budgets are constrained due to many factors, including reductions in State funding since 2003. There will continue to be increased pressure on property taxes, which is the largest funding source for the annual budget, as there are growing unmet city infrastructure and staffing needs. New energy initiatives can be considered in the City budget process but would be weighed in context with all the other overall annual budget needs.

Given the City's financial realities, targeted market incentives, grants, and loans will help ensure that projects are affordable and fit within the fiscally responsible character of the

City of Rochester. Specific funding programs and incentives relevant to recommendations identified in Section 6.0 are discussed in more detail in sections 6.2.1.7.1 – 4 and in Appendix D.

SIGNIFICANT IMPACT PRIORITY ACTION

- **Energy Conservation Programs -** Partnering in Energy Solutions provides financing for RPU's commercial customers' energy improvement projects. In 2015, RPU calculated that the Conservation Improvement Program (CIP) saved 19,220,885 kWh, which was 103.7% of RPU's goal. This is the equivalent of 19,221 tons of CO2 saved. Continuing and expanding the Conserve and Save® and CIP programs could help the City of Rochester meet its energy and carbon goals.

8.2.1.7.1 RPU Conserve and Save® Rebate and Rotating Funding Programs

The Partnering in Energy Solutions program provides financing for RPU's commercial customers' energy improvement projects. Customers finance their projects at 0% interest over one or two years. Financing is only available for projects completed by an Energy Solutions Partner (ESP). These ESPs promote RPU's Conserve and Save® program and generates even more energy savings. In 2015, RPU calculated that the Conservation Improvement Program (CIP) saved 19,220,885 kWh, which was 103.7% of RPU's goal. This is the equivalent of 19,221 tons of CO_2 saved.

Continuing and expanding the Conserve and Save® and CIP programs could help the City of Rochester meet its energy and carbon goals.

8.2.1.7.2 State and Federal Incentives

Numerous state and federal energy and climate change focused incentive programs exist and can be leveraged to advance Rochester's EAP. As an example, the City of Rochester has used Minnesota Guaranteed Energy Services Programs (GESP) to achieve energy efficiency and cost savings in City-owned buildings and infrastructure (e.g., Civic Center, traffic light conversion to LED). The GESP and other State incentive programs provide assistance that makes it easier to make fiscally responsible decisions and encourage the repayment period to be more favorable. Another potential funding source could include the State of Minnesota's Clean Energy Resource Team (CERT) programs. Specific funding programs and incentives relevant to the recommendations identified in Section 6.0 are listed with more detail in Appendix D.

8.2.1.7.3 Loan and Grant Programs

Numerous state and federal energy and climate change focused loan and grant programs exist and can be leveraged to advance Rochester's EAP. Potentially-applicable loan and grant programs, including the Unites States Department of Energy Loan Guarantee for Renewable Energy & Efficient Energy Projects and the Department of Energy's Energy Efficiency and Conservation Block Grant Program, are listed with more detail in Appendix D.

8.2.1.7.4 Other

The City could also seek out partners to collaborate in identifying and brining to life creative incentive and financing mechanisms that could enable and accelerate energy efficiency and low-carbon conversions investments and initiatives.

8.2.1.8 Education

Community outreach and facilitation of inter-organizational collaboration opportunities can be more effective when there is an individual or group of individuals explicitly responsible for such initiatives. The City of Rochester currently does not have a sustainability coordinator that facilitates inter-organizational communications and education for the entire city. Groups such as RPU, the Police, and Rochester Public Library have personnel who address such needs for their departments. The City of Rochester could mandate and provide budget for the Rochester Energy Commission to take over responsibility for community education. Alternatively, the City could create a position dedicated to sustainability education and communications to advance implementation of this EAP and other sustainability initiatives.

8.2.1.8.1 Energy Audits

The City of Rochester could conduct energy audits on its buildings. Rochester Public Utilities are qualified to provide an analysis of existing usage and recommend action items that improve energy usage and energy efficiency of city and other facilities.
The degree of impact of energy auditing is in large part tied to the availability of low- or no-cost funds to act on energy audit recommendations. Incentive, loan, grant and market-based programs discussed throughout Section 6 and in Appendix D could complement RPU's energy auditing program. Capitalizing on these programs and investing effort to expand uptake of RPU's energy auditing service by individual, commercial and industrial residents could result in material energy and carbon reduction.

8.2.1.8.2 Community and Employee Outreach

The City of Rochester can provide outreach to the community and its employees to promote energy conservation and efficiency. The degree of the City's influence over its own employees is greater than it is over the community as a whole; however the collective impact of community members' actions provides a substantially greater opportunity for improvement.

Needs for community engagement are contemplated throughout Section 6.0 and in Section 9.0.

8.2.1.9 Landscaping Efficiencies

Landscaping efficiencies to preserve water and reduce energy use can be an important part of the City of Rochester's efforts to reduce energy use and improve energy efficiency in City-owned and community buildings and spaces. Landscaping can reduce a building's heating and cooling costs. More information can be found at http://energy.gov/public-services/homes/landscaping.

The City of Rochester has direct influence over the landscaping on its grounds, though the options may be limited by the climate and the amount of space available for landscaping improvements. Outreach and programmatic support is required to substantially influence community behavior in this regard. While Rochester is a "Tree City", due to budget limitations and the onslaught of the Emerald Ash Borer, citywide tree cover is on the decline and likely to get worse. The City Forester could be charged with making recommendations to increase density and consistency of tree cover throughout the City.

8.2.1.9.1 Rain Gardens

If the City of Rochester invested in rain gardens on its grounds and near its buildings, benefits could include more efficient water and associated energy usage and reduction in stormwater runoff and erosion. Outreach and programmatic support is required to substantially influence community behavior in this regard.

8.2.1.9.2 Green Roofs

Adding green roofs to city buildings could substantially reduce energy heating and cooling costs and reduce stormwater runoff. More information is available at http://www.greenroofs.org/. Outreach and programmatic support is required to substantially influence community behavior in this regard.

8.3 WATER

The City of Rochester supplies potable water through Rochester Public Utilities. The Rochester Wastewater Reclamation Plant (RWRP) has invested in innovative energy efficiency improvements and heat recovery/co-generation to save the plant money and to substantially minimize its reliance on fossil fuels. The plant saves approximately $700,000 per year in heat and electricity recovery and $150,000 per year in effluent heat exchange costs.

8.3.1 Water-Energy Nexus

Water management takes energy to pump, heat, or cool. As the population of Rochester increases, the burden on the RWRP will increase.

SIGNIFICANT IMPACT PRIORITY ACTION

- **Efficiency Improvement in Water consumption to produce energy -** Community water conservation programs have been implemented and have realized water and energy conservation benefits in Rochester. Water efficiency programs have reduced the average customer water use by 28%, and there is a direct, associated energy savings. These programs could be expanded to realize additional, significant impacts.

8.3.1.1 Efficiency Improvement in Water consumption to produce energy

Community water conservation programs have been implemented and have realized water and energy conservation benefits in Rochester. The RWRP has seen a reduction in the incoming wastewater load with more widespread community uptake of water conservation actions such as low-flow shower heads and toilets. Water efficiency programs have reduced the average customer water use by 28%, and there is a direct, associated energy savings. The reduction in per capita water usage will help RWRP continue to meet the water reclamation needs of the City of Rochester through the projected population growth of the next 15 years and beyond without plant expansion.

Market incentives and/or additional community outreach and programmatic support is required to further influence community behavior to any significant degree, but could be implemented.

8.3.1.2 Wastewater treatment energy consumption and production potential

The RWRP is already realizing substantial energy savings from various investments made. Two examples of such investments include the water jacket and heat recovery boiler at the plant. Further, RWRP currently produces a substantial portion of the energy required to run the plant by using the biogas produced by the anaerobic digester. All the methane produced on-site is used to heat the water for the hot water loop that heats the digesters 10.5 months out of the year. The other 1.5 months, during cleaning and maintenance, RWRP uses natural gas to produce the heat.

Additional biogas could be used to provide additional fuel for the facility. In 2015, the City of Rochester passed Rochester Ordinance Chapter 76C, requiring food service establishment (FSE) to utilize an approved grease interceptor. This new fats, oils, and greases (FOG) recovery program provides a significant opportunity for increasing renewable fuel sources and decreasing the RWRP's GHG footprint. When FOG are separated from wastewater, RWRP realizes multiple benefits by using the FOG directly in the anaerobic digester to produce more methane to meet on-site energy needs and by decreasing the biological oxygen demand (BOD) load, saving operating costs.

8.3.1.3 Hydroelectric Power Production

The contract between RPU and SMMPA provides an exemption for a defined amount of hydroelectric power generation from the CROD commitment (5MW). Consequently, a small hydroelectric turbine could be added to the current operations, and the clean power generated could be sold directly to RPU customers and the associated emissions reduction reflected in the emissions inventory.

8.4 SOLID WASTE

The City of Rochester and Olmsted County have been working to manage solid waste in accordance with the Minnesota Waste Management Act (Minnesota Statute 115A) and the state hierarchy (Minnesota Rules 7035.0350). The hierarchy organizes waste management practices in the following order:

- Waste reduction and reuse;
- Waste recycling;
- Composting of source-separated compostable materials;
- Resource recovery through MMSW composting or incineration;
- Land disposal which produces no measurable methane or which involves the retrieval of methane gas as a fuel for the production of energy; and
- Land disposal which produces measurable methane and which does not involve the retrieval of methane gas.

The City of Rochester and Olmsted County have opportunities to reduce the energy used to manage waste and to capture and convert more waste to low-carbon energy. In this regard, the two most promising opportunities are to:

(1) source and convert more regional mixed municipal solid waste (MMSW) into steam, and;
(2) sell more steam and electricity to community users.

OWEF was expanded in 2010 and OWEF has the capacity to divert substantially more waste from land disposal.

8.4.1 Waste Incineration Efficiency Improvements (OWEF)

The OWEF is a mass burn facility that uses municipal solid waste (MSW) as fuel to provide district heating, cooling, and/or electricity to nearby buildings, including the Rochester Government Center, City Hall, Library, various Federal Medical Center buildings, and the Mayo Civic Center. OWEF is authorized to sell steam and electricity to additional consumers, up to a limited number.

The OWEF plant is rigorously maintained, so there are limited opportunities for GHG reductions from maintenance improvements.

8.4.2 Waste-to-Energy Conversion Opportunities

The OWEF calculates that their net GHG emissions are negative associated with energy generation. They used EPA-advised methodologies for the calculations. Therefore, the waste-to-energy plant is comparable to a renewable energy source.

Based on information from the MPCA and State Demographers' Office, as well as industry trends, the total waste generated will increase as the population increases and per capita MSW generation increases. Recycling rates will also increase, so OWEF projects waste processing to decrease. Imported waste from outside the county could maintain and/or grow energy generation, providing an increased opportunity to supply low-emission energy to the community.

Olmsted County's next ten-year planning cycle will commence in 2019 and the updated *Olmsted County Solid Waste Management Plan* could incorporate additional strategies for helping meet Rochester's energy goals with respect to the handling of solid waste.

8.5 TRANSPORTATION

One of the City of Rochester's key priorities in developing P2S is the development of transportation options. Optimizing the City's transportation infrastructure and systems during this planning exercise provides an opportunity to substantially reduce emissions associated with community transportation, in addition to enabling the realization of other sustainable city characteristics.

Referencing the benchmarking exercise, the Cities of Minneapolis, Portland, and Sacramento have collectively realized a reduction of 54,848 MTCO2e through a reduction in VMT and an increase in public transit services. Planning land use with the goal of increasing non-auto transportation can contribute substantially to meeting energy goals, as well. Developing complete neighborhoods in which residents can live, shop, and work, in Minneapolis, Portland, and Sacramento, has reduced GHG by 32,909 $MTCO_2e$.

Estimated emissions reductions associated with transit investments under the P2S preferred plan scenario are not yet available for inclusion in this EAP but should be considered during the implementation phase.

SIGNIFICANT IMPACT / SIGNIFICANT CONTROL PRIORITY ACTION

- **Develop transportation corridors and nodes and parking infrastructure that minimize VMT –** While this opportunity was not evaluated in any detail as part of the development of this EAP, the P2S process includes a detailed analysis of this significant impact, significant control opportunity to minimize VMT and GHG emissions from transportation.

While the City does not control supply for liquid petroleum fuels, it can shift the demand side to minimize use of conventional transportation fuels and affect supply portfolios. Given, community transportation emissions account for 20% of the City's GHG emissions, there is a material opportunity to realize emissions reductions.

8.5.1 Alternative Fuel Vehicles

Alternative fuel vehicles have the potential to reduce GHGs from gas and diesel combustion. The City of Rochester could encourage and expand the use of alternative fuel vehicles by purchasing alternative fuel vehicles for the city vehicle fleet(s), by making such vehicles available for citizens and visitors to rent, and by providing electric charging stations for vehicles. Funding programs at the state and federal level could be explored and potentially help to overcome cost concerns.

8.5.2 City Fleet Opportunities

SIGNIFICANT CONTROL PRIORITY ACTION

- **Evaluate Fleet Conversion** – While performance in vehicles and equipment will influence implementation, a number of new fuel sources for all types of fleet vehicles are available. The City can discuss supply options with various providers:
  - **Dimethyl Ether (DME)** - DME is a diesel substitute and can be consumed in heavy equipment, trucks, and buses.
  - **Compressed Natural Gas (CNG) / Renewable NG (RNG)**

While City fleet opportunities exist, as noted in Section 6.5.2, it is noted that financial decisions associated with City vehicle fleets are made in large part by the various departments, e.g., Police, Fire, and Public Transit. As such, decisions to convert fleets are not likely to be made centrally, but rather at the Department level. In addition, it should be noted that, at one point, the City of Rochester purchased vehicles that use E85 as fuel. The experiment did not go well, and the City fleet reverted back to conventional fuel vehicles. Any future alternative fuel vehicles for the City fleet should be vetted to ensure the vehicles would be utilized.

The City has previously evaluated CNG conversion, and is actively considering electric bus fleet conversion – both options would result in emissions reductions from City buses. Concerns associated with cost and cold weather operations will need to be overcome before the City will proceed. Funding programs at the state and federal level could be explored and potentially help to overcome cost concerns. The City of Duluth is currently running a pilot test of an electric bus fleet, the results of which could inform the City of Rochester's cold weather operations concerns.

Project Green Fleet

Project Green Fleet is a voluntary program by Environmental Initiative to provide pollution control equipment to diesel vehicles at low or no cost to fleets. The City of Rochester has converted 40 vehicles, the transit buses, with emission control devices. Further improvement to mobile-source emissions could be made if the City of Rochester enabled operators of heavy duty diesel truck fleets and construction vehicles to install emission control equipment.

More information is available at http://www.environmental-initiative.org/our-work/clean-air/project-green-fleet.

▲ Electric Charging Stations

There are a few electric vehicle charging stations in the City of Rochester, such as in the parking ramps downtown. The City of Rochester could provide additional electric charging stations and develop a potential revenue stream from the sale of electricity at the charging stations, as well as develop incentives and opportunities for residents and employees in the City of Rochester to own electric vehicles. Funding programs at the state and federal level could be explored and potentially help to overcome cost concerns.

SIGNIFICANT CONTROL PRIORITY ACTION

- **Electric Charging / Solar Stations –** Partnerships with electric providers, large fleet owners, and other NGOs can support acceleration of electric vehicle charging infrastructure for large fleet owners and the general public to supply another transportation fuel option that is anticipated to deliver substantial emissions reductions, in particular beyond 2030, in the City's case. Currently the P2S effort does not include an evaluation of how electrification of the transportation system might be facilitated through the City's long-term planning efforts. The City could augment the P2S study with this evaluation and capitalize on a timely opportunity to do so in an optimal and cost-efficient manner.

▲ Busing

Rochester Public Transit (RPT)'s mission is to provide safe and convenient public transportation services to the City of Rochester. According to the City of Rochester information page, RPT carries 1.7 million passengers each year. Increasing awareness of RPT and its routes could further increase ridership and reduce VMTs, as could the geographic expansion and/or frequency of RPT's service.

SIGNIFICANT CONTROL PRIORITY ACTION

1. **Increased Public Transit to Reduce Single Occupancy Trips-** The P2S has a goal of increasing transportation options. There is a widely known shortage of parking in the City of Rochester, which is one way to encourage riders of public transit. Increasing the service options, bus routes, and hours of service could reduce single occupancy vehicle trips and reduce traffic congestion and GHG emissions. The current bus system is primarily designed to move Mayo employees, thus the service has limited operating hours and days. Addressing the needs of the broader and expanding community should be considered.

SIGNIFICANT CONTROL PRIORITY ACTION

- **Greenways (pedestrian and bike traffic only)-** Greenways allowing only pedestrian and bike traffic would increase walking and biking trips within the City of Rochester. Promoting safe ways to make daily travel tips would encourage residents and employees to walk or bike when possible. Adding Greenways could also promote a culture of walkability that may extend into other aspects of residents' lives. The provision of networked bike lanes and public education campaigns to "share the road" are effective means of promoting carbon-free, healthy transport. The Complete Streets standard could be more closely adhered to promote pedestrian and bike traffic, as well.

SIGNIFICANT IMPACT PRIORITY ACTION

- **Expand Sharing Programs**
  If the City of Rochester initiates and expands transportation sharing programs among its employees, single passenger vehicle travel could reduce, VMT could be reduced, and transportation-related GHG emissions and energy expenditures could be reduced.

With regard to the larger community, the City of Rochester could consolidate information on ride sharing programs and distribute the information to increase shared ridership. As the city grows and DMC evolves, ride sharing to reduce the parking burden in the City of Rochester could be a step to reducing VMTs and GHG emissions.

Expand Use of Bicycles

Bike sharing programs such as Nice Ride Minnesota encourage residents and visitors to bike between their destinations. In 2015, in Minneapolis and Saint Paul, 483,233 rides were taken using Nice Ride bikes.

Nice Ride Minnesota and the Rochester Parks and Recreation Department are in discussions to bring Nice Ride bike sharing to Rochester.

Idling Policy

The City of Rochester currently has an idling policy in place. By increasing emphasis on and enforcement of the policy, the City can realize fuel savings and emissions reductions.

For Rent

As noted in 6.5.2, the City of Rochester could provide alternative fuel vehicles, including electric vehicles, available for citizens and tourists to rent.

9.0 Integration of this EAP into the Comprehensive Plan

As discussed in some detail in Section 2.3 of this EAP, the EAP will be finalized in advance of the P2S final deliverables. All of the P2S final deliverables and the EAP can be integrated as updates to the City's Comprehensive Plan.

10.0 Next Steps and Potential Partners

The EAP will require significant policy and program advocacy and action by the City Council, Utility Board, Energy Commission, City Staff, and others partners to achieve the results outlined in the EAP. It is recommended that the City work with these partners to develop an EAP Implementation Plan to ensure all parties required to advance various initiatives are engaged, and that the initiatives most likely to succeed are identified, agreed and pursued.

Many leading cities have created and maintain a sustainability manager role to advance sustainable development plans and programs. Dedicating human resources in this way often facilitates success in accomplishing goals and objectives. The City may consider the creation of a sustainability or climate change manager position to drive implementation of this EAP.

Potential partners in the City's implementation of this EAP include the following organizations.

10.1 RPU

RPU has been involved in the process to develop the Energy Action Plan by meeting with stakeholders and providing information for the GHG inventory and EAP. RPU has an ex officio seat in the Rochester Energy Commission as declared in Rochester City Ordinance 19A. Details of RPU's contractual relationship with SMMPA are described in Section 0.

RPU's 2015 Infrastructure Plan identifies options for power generation and optimized investments. RPU will need to purchase some capacity from the market regardless of which option is ultimately chosen. It is anticipated that market purchases will decrease substantially after the expiration of the current SMMPA contract, which will likely result in substantial emissions reductions in all three Scopes of the City's emissions inventories.

RPU is a member of the Energy Integration Committee (EIC), a new community group of energy generators and large users created to evaluate opportunities for collaboration in realizing energy efficiency across organizations.

RPU is perhaps the City's single most important partner in implementing the EAP. RPU has a significant opportunity to mitigate GHG emissions, and continued involvement and participation in the REC will help Rochester move towards its energy goals.

10.2 MAYO MEDICAL CENTER

The Mayo Clinic is a member of the EIC and is another vital partner in the City's endeavors to mitigate energy and climate impacts associated with Rochester's and the DMC's growth and development. Mayo drives much of the anticipated increase in jobs and residents to Rochester. There are also sources of emissions under the purview of Mayo. RPU's development of infrastructure will be affected and influenced by Mayo, such as whether a new steam plant will be needed to meet Mayo's needs.

Continued participation in common committees and cooperation between the City of Rochester and Mayo will further progress towards energy goals and carbon reductions.

10.3 GOVERNMENT

Various government agencies can assist with the implementation of the EAP. Olmsted County will be a significant partner for solid waste-related activities. Olmsted County has also facilitated funding mechanisms for energy efficiency projects through the St. Paul Port Authority and can help educate its citizens.

The State of Minnesota has set the NextGen goals to encourage citizens, governments, and businesses within the state to consider energy efficiency and low- or no-carbon energy sources. The federal government, in addition to grant and loan funding programs and a wealth of online information, is advocating the CPP to reduce carbon emissions from energy production. These programs and others make it important for the government to be a partner in implementing the EAP recommendations.

10.4 PRIVATE

Generally, private industry and residents are also critical to the success of EAP implementation and can participate in numerous ways. RPU programs to integrate commercial/industrial customers into energy efficiency and renewable programs provide many of those opportunities. Some examples of these opportunities include: the interruptible service program; Energy Solutions revolving financing program; green financing for LEED certification, and; commercial education sector meetings - all of which have a positive impact on carbon emissions.

All customers, including residents, can participate through programs such as the carbon offset program, partner programs (such as yielding control of air conditioning units in the summer), and programs providing financing support for energy efficiency improvements. RPU's net metering program integrates rooftop solar projects with the grid and offers community solar subscriptions.

10.5 NON-PROFIT

Non-profit partners can also be integral to the successful implementation of the EAP through the provision of education resources and technical and communications support.

11.0 Community Engagement

As contemplated throughout this EAP, going forward, community engagement is critical to encouraging residents, workers, and visitors to the City of Rochester to contribute towards reaching the City's carbon and energy action goals.

Reflecting on the development of the EAP, community engagement has been essential. Throughout the EAP process, the project team facilitated numerous community engagement activities to ensure the EAP reflects the community's vision for the City. Much of this engagement leveraged ongoing efforts by the P2S team and RPU to avoid "engagement fatigue". Following is a summary of the key EAP community engagement efforts and associated takeaways, which have been integrated throughout the EAP.

- Technical discussions were hosted with key community stakeholders with substantial influence over EAP implementation, including the City Departments of Finance and Public Works, RWRP, RPU, and OWEF.

- Collaboration with the Center for Energy and the Environment (CEE) and Ever-Green Energy Team on their DMC-focused project included information sharing and a joint, community presentation on November 10, 2015. Community members attending the November meeting supported, by a show of hands, focusing the EAP on energy efficiency for the built environment and transportation.

- Collaboration with the P2S consultant team providing input on indicators and tracking opportunities to infuse energy and carbon content in the community conversation was a project-long activity. While energy and carbon did not rise to the surface as top priority topics to be included in the core content of P2S community workshops hosted in December, an informational paper and survey regarding the EAP process and general energy priorities were disseminated to interested parties during the two community workshops. We received 22 responses to the survey. Table 11-1 provides the survey questions and answers.

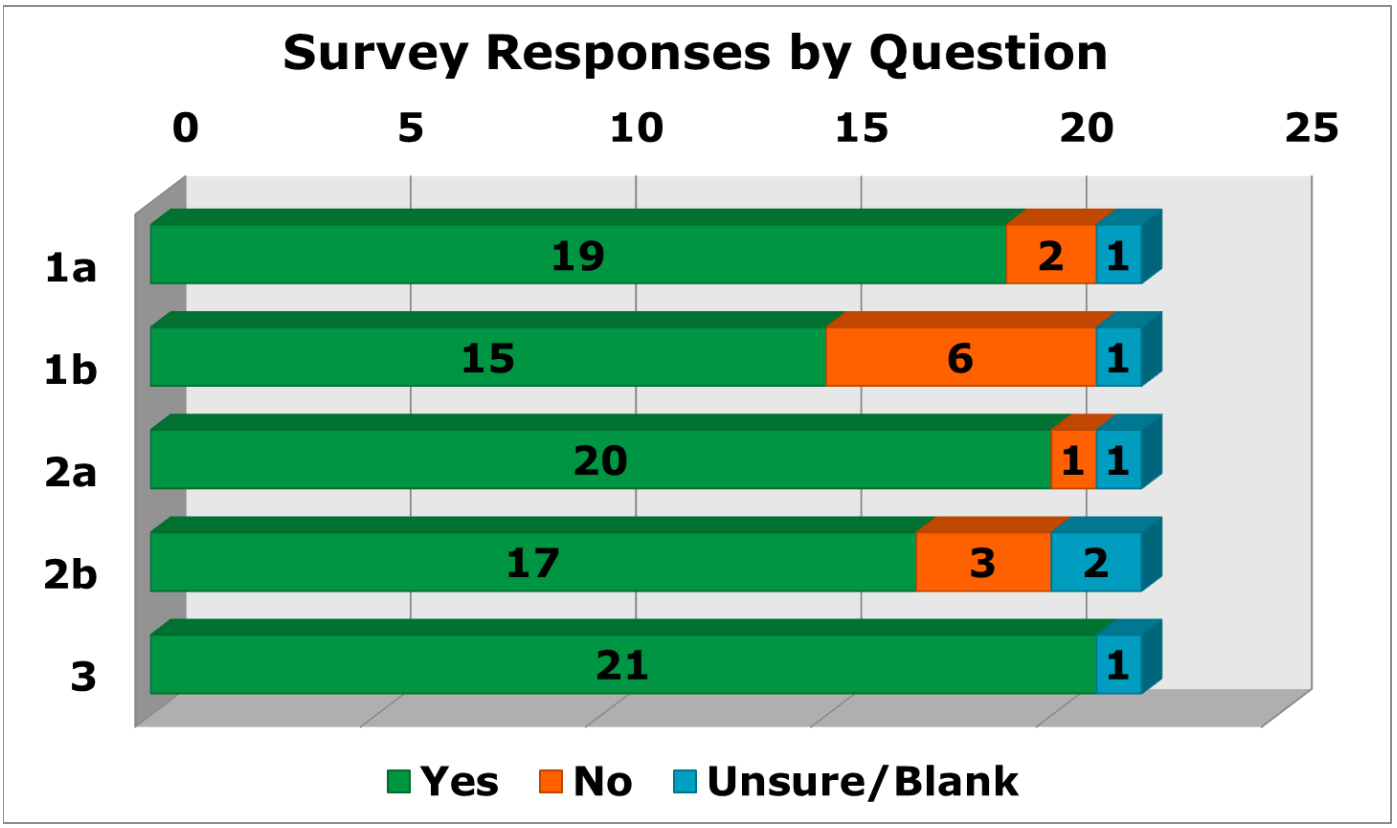
Table 11-1: Community Engagement Survey Results

Survey Question	Yes	No	Unsure / Blank
1) Would you like to see the City implement programs that promote the acceleration of electrification of the transportation system in Rochester?			
a. Public transit (buses), City fleet vehicles (utility vehicles)	19	2	1
b. Personal vehicles (residents, commuters, visitors)	15	6	1
(2) Would you support city initiatives e.g. rebates and incentives, that promote:			
a. Residential energy efficiency retrofits?	20	1	1
b. Commercial/industrial energy efficiency retrofits?	17	3	2

Survey Question	Yes	No	Unsure / Blank
(3) Would you like the City of Rochester to take a proactive role identifying and realizing opportunities for energy generators and commercial and industrial energy users to collaborate on energy optimization?	21		1

Figure 11-1 provides a visual illustration of the survey responses and shows that a majority of survey respondents are in favor of City initiates that support the EAP.

Figure 11-1: Survey Responses Chart



- On January 15, 2016, the Rochester Chamber of Commerce sponsored an energy-focused meeting. Opinions shared during the meeting included:
  - Energy efficiency improvements are the cheapest and best ways to reduce energy consumption.
  - Future challenges and opportunities include fairly structuring rates to maintain infrastructure like power lines while incentivizing energy efficiency and renewable energy, improving opportunities for distributed generations such as local solar projects, and maintaining reliability as renewable energy opportunities and installations increase.
  - Renewable energy has become cost competitive and Midwestern states with high renewable energy portfolios have some of the lowest costs and most stable rates compared to states with smaller renewable energy portfolios.[3]
  - Energy efficiency and energy conservation projects should be done before renewable energy projects so those projects do not require as much investment and infrastructure to meet energy needs.

- RPU has continued to do its own community engagement as well. Relevant responses from RPU's 2015 customer survey show that[4]:
  - 87.8% of residential customers "agreed" that RPU is an environmentally responsible company.
  - 88.2% of commercial customers "agreed" that RPU is an environmentally responsible company.
  - 59.2% of residents and 49.5% of commercial customers reported RPU should be "aggressive" in setting goals to reduce greenhouse gas emissions.
  - 29.0% of residents would be willing to pay 10% more to increase efforts to reduce greenhouse gas emissions and another 25.6% would be willing to pay 5% more.
  - 83.7% of residents and 70.8% of commercial customers support RPU investigating the process of installing and maintaining solar power in homes/businesses.
  - 81.6% of residents support RPU offering smart grid digital meters (only 59.7% of businesses supported).

[3] Efforts were made to validate this claim, however data comparing all of the upper mid-west states across the three criteria identified (current renewable energy generation, price, and price stability) were not readily available or comparable for all states.

[4] * http://blog.rpu.org/?m=201507, accessed 17 January 2016.

12.0 References

Abrams-Cherwony & Associates with Urbitran Associates, Inc., 2006. *City of Rochester, Minnesota Transit Development Plan Final Report.* http://www.rochestermn.gov/home/showdocument?id=4592. Accessed February 28, 2016.

City of Rochester, 2014. *Ordinance 19A: Energy Commission.* https://lf.rochestermn.gov/Documents/0/doc/3384/Electronic.aspx. Updated May 5, 2014. Accessed February 10, 2016.

City of Rochester, 2016. *History of Rochester*. http://www.rochestermn.gov/about-the-city/history-of-rochester. Accessed February 12, 2016.

City of Rochester, 2016. *Planning 2 Succeed: Rochester's Comprehensive Plan Update*. http://www.rochestermn.gov/departments/planning-and-zoning/planning-2-succeed-rochester-s-comprehensive-plan-update . Accessed February 15, 2016.

City of Rochester, 2016. *Rochester Public Transit. http://www.rochestermn.gov/departments/public-transportation. Accessed February 28, 2016.*

Destination Medical Center, 2016. *Creating a global destination for trans and wellness. http://dmc.mn/* Accessed February 29, 2016.

Duluth News Tribune, 2016. *Duluth to receive six electric buses.* Brady Slater, reporter. *http://www.duluthnewstribune.com/news/3670485-duluth-receive-six-electric-buses.* February 3, 2015. Accessed February 28, 2016.

Minnesota GreenStep Cities, 2013. *City of Rochester.* http://greenstep.pca.state.mn.us/cityInfo.cfm?ctu_code=2396395. Accessed February 15, 2016.

Minnesota State Demographic Center and Metropolitan Council, 2015. *2014 Estimates of City and Township Population, Households and Persons per Household*. July 15, 2015. http://mn.gov/admin/demography/data-by-topic/population-data/our-estimates/. Accessed February 11, 2016.

Minnesota Statutes, 2015. Minn. Stat. 216B.1691: Renewable Energy Objectives. Subdivision 2a: *Eligible energy technology standard.*

Nice Ride Minnesota, 2016. *2015 Year in Review.* https://www.niceridemn.org/news/2016/01/22/177/2015_year_in_review. Accessed February 28, 2016.

Olmsted County, 2011. *Olmsted County Solid Waste Division 10-Year Solid Waste Management Plan Update.* November 2011. Revised February 2012. https://www.co.olmsted.mn.us/environmentalresources/garbagerecycling/Documents/COMPLETEcopySWMPU%20.pdf. Accessed February 25, 2016.

Post-Bulletin, 2015. *Is Bike-sharing Coming to Rochester?* http://www.postbulletin.com/news/local/is-bike-sharing-coming-to-rochester/article_4293a5cf-85d3-504c-be21-1d8357ad4949.html. Accessed February 28, 2016.

Rochester Public Utilities, 2015. *Customer survey results provide valuable information for RPU strategic planning.* July 29, 2015. Accessed January 17, 2016.

United States Environmental Protection Agency (USEPA), 2007. *ENERGY STAR ® Building Manual Chapter 5: Retrocommissioning. Revised October 2007.* https://www.energystar.gov/sites/default/files/buildings/tools/EPA_BUM_CH5_RetroComm.pdf. Accessed February 25, 2016.

United States Environmental Protection Agency (USEPA), 2015. *FACT SHEET: Overview of the Clean Power Plan.* http://www.epa.gov/cleanpowerplan/fact-sheet-overview-clean-power-plan. Updated August 6, 2015. Accessed February 28, 2016.

Appendix A

Executive Summary of the City of Rochester Greenhouse Gas (GHG) Emissions Inventory

Appendix A
Executive Summary of the City of Rochester Greenhouse Gas (GHG) Emissions Inventory

A cornerstone of the Energy Action Plan includes the analysis of current energy sources and consumption through a greenhouse gas (GHG) inventory. The GHG inventory provides the City of Rochester a tool with which to track, analyze, and manage both GHG emissions and energy use thereby allowing the City to understand its current progress towards energy and emissions reduction goals.

This GHG Inventory was completed in accordance with the ICLEI-Local Governments for Sustainability Local Government Protocol v1.1 (LGOP) dated May 2010, The Climate Registry (TCR) General Reporting Protocol V2.0 (GRP) dated March 2013, and TCR Electric Power Sector Protocol v1.0 dated 2009. The inventory also incorporates elements and guidance from additional protocols including the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions dated October 2012, Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC) dated 2014, and the Airports Council International (ACI) Airport Carbon and Emissions Reporting Tool v3.0 (ACERT) which follows the ACI Guidance Manual on Airport Greenhouse Gas Emissions Management dated 2009. The protocols adhere to national and international guidance and principles from the International Organization for Standardization (ISO) 14064-1, Intergovernmental Panel on Climate Change (IPCC), United States Environmental Protection Agency (USEPA), World Business Council for Sustainable Development (WBCSD), and World Resources Institute (WRI).

The GHG inventory defines boundaries for the City of Rochester using operational control and the city limits. Within these boundaries, the total emissions for the City of Rochester for calendar year 2014 totaled 1.87 million metric tons of carbon dioxide equivalents ($mtCO_2e$). The data lies within a reasonable margin of error when compared to the emissions published through the Minnesota ULI Regional Indicators Initiative which reports 1.70 million metric tons of CO_2e for calendar year 2013. A comparison of the data is presented in Table ES-1.

Table ES-1
City of Rochester GHG Emissions

User/Source Category	Scope	City of Rochester CY2014 (metric tons CO_2e)	City of Rochester CY2013 ULI Regional Indicator Initiative Data (metric tons CO2e)	% Difference
City - Facilities - Combustion - Natural Gas	1	3,878		
City - RPU Electric Generation - Combustion - Natural Gas	1	35,802		
City - WWTP Electric Generation - Combustion - Biogas	1	5,103		
Community Combustion - Natural Gas	3	536,419		
Combustion - Natural Gas and Biogas		**581,201**	**508,558**	**14.3%**
City - RPU Electric Generation - Combustion - Fuel Oil	1	1,187		
Community Combustion - Fuel Oil/Other	3	7,643		
Combustion - Fuel Oil/Other		**8,830**	No Data	
City - Facilities - Purchased Power	2	22,731		
City - RPU Electric Generation - T&D Loss - Electric	2	640		
Community Electric	3	822,637		
Electric		**846,007**	**792,550**	**6.7%**
City - Fleet	1	7,057		
Community Transportation	3	366,712		
Transportation		**373,770**	**331,666**	**12.7%**
Waste	**3**	**60,807**	**34,533**	**76.1%**
Other (Water and Air)	**3**	Listed in Other Categories	**29,527**	
Total		**1,870,614.76**	**1,696,834**	**10.2%**

In general, the City of Rochester's emissions from electricity purchases are higher than average due to existing contracts in place. The RPU generation of electricity using natural gas, solar, and hydropower reduce the overall emission factor of the electric grid mix. However, the purchase of power from the Midwest grid increases emissions relative to what would be consumed directly from city generation. Biogas utilization at the wastewater treatment plant (WWTP) does reduce overall emissions associated with the destruction of methane and beneficial electric and steam use. Accordingly, biogenic emissions make up 6.6% of the City's Scope 1 and 2 emissions. Overall, biogenic emissions account for 3.7% of the total.

While the two inventories follow similar protocols, the methodologies and data availability created a 10.2% difference in emissions reported. Differences in the methodology are explained in more detail below:

- Natural Gas –
    - The natural gas emission factor used in this inventory is higher across the board based on the specific HHV provided by Minnesota Energy Resources (1.7% difference 54.01 kg/MMBtu vs 53.06)
    - The CH4 and N2O factors are higher in this inventory due to the selection of emission factors able to be assigned to facility categories (commercial vs industrial vs residential)
    - Personnel indicated that a category of sources were omitted from the 2013 data provided to ULI. The omitted sources were included in this inventory.
- Combustion Fuel Oil/Other –
    - Fuel oil or other liquid fuels do not appear to be captured as part of the ULI outside of that which would be embedded in the vehicle miles.

- Electric –
    - This inventory uses MROW eGrid factors. The ULI factor is close to 1.437 lbs/kwh vs MROW 1.536 lbs/kwh. This equates to a difference of 6.9%.
    - Personnel indicated that a category of sources were omitted from the data provided to ULI. These omitted sources were included in this inventory.
- Transportation –
    - This inventory uses the same total vehicle miles traveled since only 2013 data was available at the time.
    - This inventory uses a higher percentage of the heavy trucks reducing overall fuel efficiency associated with the total VMT.
    - The distribution model used in this inventory is a more detailed and conservative for calculation leading to higher CH4 and N2O factors.
- Waste –
    - It appears that the methodology is different for the ULI report. The ULI appears to use tons generated and the methane produced with a different allocation number than beneficial use.
    - This inventory assumes that all city waste is proportionate to the population and is all combusted at the WTE facility. Therefore, this inventory uses 70,600 tons as the total incinerated versus 58,715.35 tons for the ULI (a 20% difference).
    - The ULI data also shows 5,754 tons of waste landfilled where this inventory assumes all waste to be incinerated.
    - This inventory uses an emission factor of 1989 lbs/ton of waste for incineration of MSW versus the ULI factor of 1085 lbs/ton (an 83% difference). The source of the factor has not been identified at this time.
- Water –
    - While it is difficult to determine the exact methodology without more information, the ULI data is most likely just an EF multiplied by water treated. This inventory uses biogas generation, capture, and combustion rather than gallons of water treated.
    - This inventory captures some water treatment-related emissions in the facility natural gas and electric consumption level.

Additional assumptions and details in the inventory methodology are included in the inventory workbook. Assumptions used follow protocol methodologies and make use of available data. Significant assumptions include the following:

- RPU emissions are based on preliminary data from the Energy Information Administration EIA-923 Monthly Generation and Fuel Consumption Time Series File, 2014 Data Early Release August 2015. Emissions were calculated using total fuel purchased for production.
- City WWTP emissions assume all water treated is processed through the anaerobic system and all biogas produced through that system is consumed in the electric and steam generation process.
- City fleet data assumes proportionate fuel consumption and mileage according to counts and fuel efficiency across all vehicles.
- City fleet also assumes that the airport fleet was included in the city counts.
- It was assumed that the airport does not lease or own aircraft.

- All electricity consumption is assumed to use the eGrid MROW factors.
- Electricity and natural gas for the community assumed that customers outside the city limits would offset those customers inside the city limits but not included in the utility's service territory.
- Community transportation used MN Department of Transportation data for the region.
- The community transportation vehicle distribution assumed heavy trucks equaled the region distribution and the average model year was 2010.
- Aircraft fleet mix was assumed to follow daily inbound and outbound status from flightaware.com.
- It was assumed that all waste was incinerated.

Using reported ULI data for other cities, the City of Rochester emissions are the fourth highest with respect to gross emissions. On a per capita basis, emissions are slightly above average. More metrics and indicators are presented in the EAP. Based on one year, the City of Rochester has opportunities for reduction, but has also implemented some existing reduction measures to-date. The first year of data provides a good snapshot of the current status. As more inventories are completed in future years, metrics and indicators will provide the City of Rochester with the ability to continue management and reduction of energy consumption and GHG emissions on a normalized basis.

Appendix B

City of Rochester Greenhouse Gas (GHG) Emissions Inventory

City of Rochester
GHG Inventory

User/Source Category	Scope	2014 GHG (metric tons CO_2e)	% of Category	% of Total	Biogenic Metric Tons CO_2	% of Category	2014 Energy (MMBtu)	Energy % of Category	Energy % of Total
City of Rochester Owned/Controlled									
Stationary - Facilities - Combustion	1	3,878	5.1%	0.2%	-		73,117	6.8%	0.3%
Stationary - Facilities - Electric Generation	1	36,988	48.4%	2.0%	-		687,912	63.9%	3.3%
Stationary - Facilities - WWTP Generation	1	5,103	6.7%	0.3%	5,077		97,505	9.1%	0.5%
Mobile Fleet	1	7,057	9.2%	0.4%	-		96,025	8.9%	0.5%
Scope 1 Subtotal		*53,027*	69.4%	2.8%	*5,077*	9.6%	*954,560*	88.6%	4.5%
Stationary - Purchased Power	2	22,731	29.8%	1.2%	-		110,676	10.3%	0.5%
Stationary - Electric Generation T&D Loss	2	640	0.8%	0.03%	-		11,897	1.1%	0.1%
Scope 2 Subtotal		*23,370*	30.6%	1.2%	-		122,573	11.4%	0.6%
City of Rochester Owned/Controlled		***76,397***	100.0%	4.1%	***5,077***	**6.6%**	***1,077,133***	100.0%	5.1%
Community Owned/Controlled									
Community Combustion - Natural Gas	3	536,419	29.9%	28.7%	-		10,113,572	50.8%	48.2%
Community Combustion - Fuel Oil/Other	3	7,643	0.4%	0.4%	3,887		92,080	0.5%	0.4%
Community Electric	3	822,637	45.8%	44.0%	-		4,005,428	20.1%	19.1%
Community Transportation	3	366,712	20.4%	19.6%	-		5,054,495	25.4%	24.1%
Community Waste	3	60,807	3.4%	3.3%	59,827		659,615	3.3%	3.1%
Scope 3 Subtotal		*1,794,218*	100.0%	95.9%	*63,713*	3.6%	*19,925,190*	100.0%	94.9%
Total		**1,870,615**		100.0%	**68,790**	**3.7%**	**21,002,323**		100.0%

Notes:

CO2e = Carbon Dioxide Equivalents

WWTP = Wastewater Treatment Plant

City of Rochester Stationary - Facilities - Electric Generation includes combustion used to generate electricity and steam. Steam usage is included in this category.

City of Rochester Stationary - Facilities - WWTP Generation includes any steam generation. Steam is assumed to be used in City facilities and included in this category.

Community Combustion includes generation of electricity and consumption of fuel oil and waste

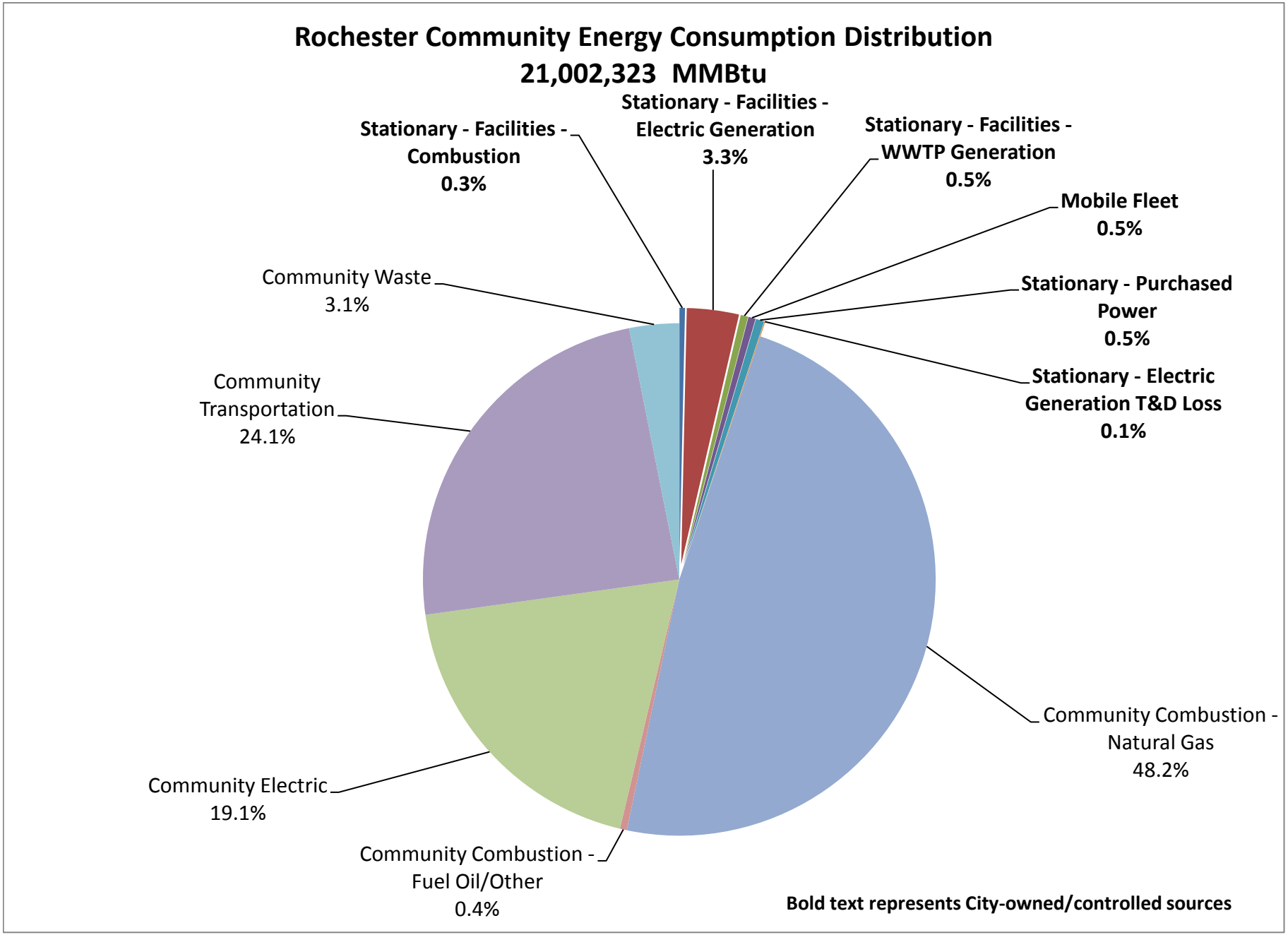
Community Transportation based on 2013 data.

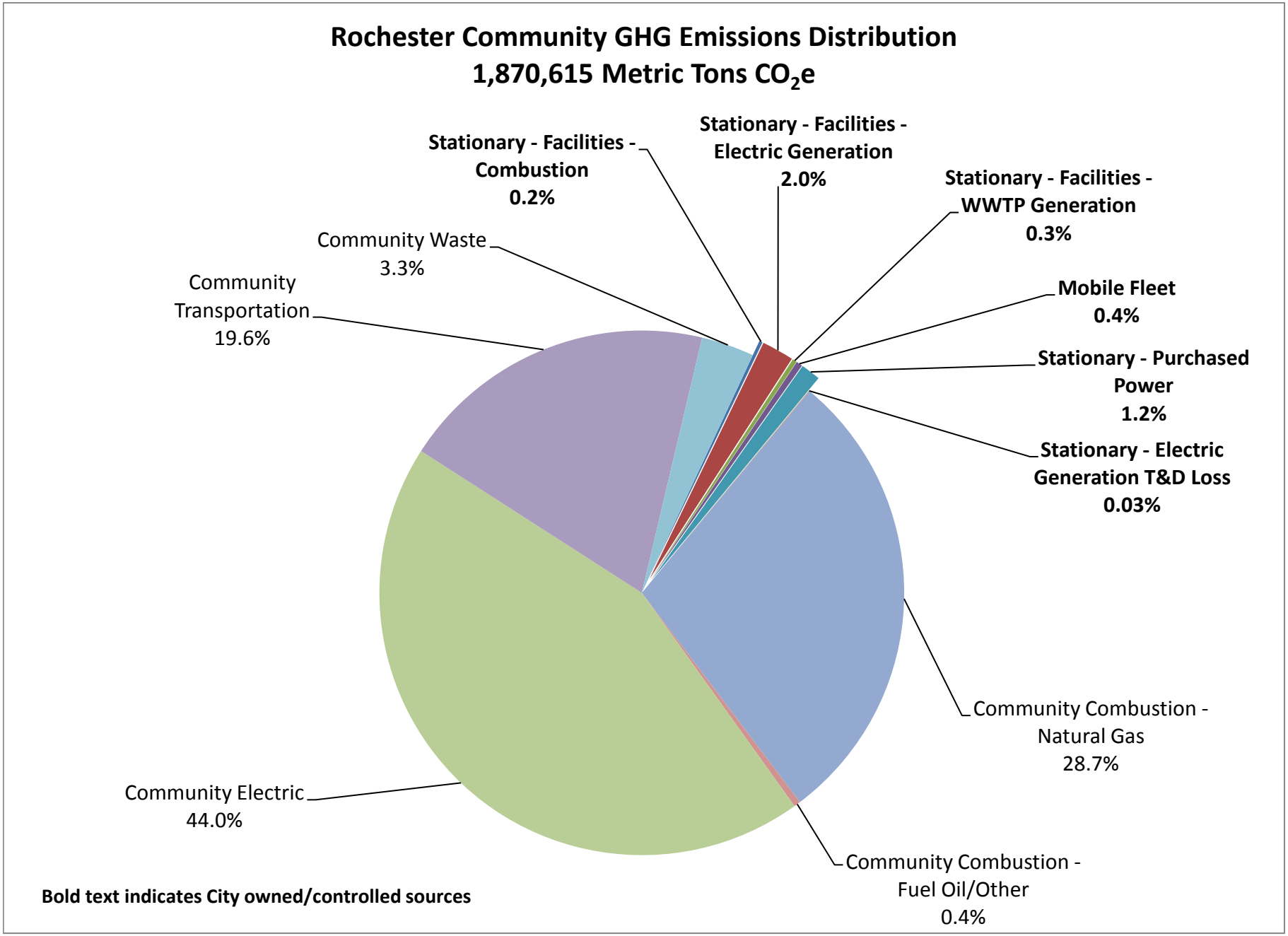
Community Waste includes any steam or electric generation. Steam is assumed to be used in City facilities and included in this category.

Biogenic emissions include CO2 generated during the combustion or decomposition of biologically-based material. Biogenic emissions have been in the carbon cycle within the global warming potential time horizon and therefore do not contribute additional affects to climate change.

Biogenic emissions are included in the total for the 2014 year but also identified separately.

Biogenic emissions do not include the methane and nitrous oxide portion of biogenic source combustion.


Rochester Community Energy Consumption Distribution
21,002,323 MMBtu
Stationary - Facilities - Combustion
0.3%
Stationary - Facilities - Electric Generation
3.3%
Stationary - Facilities - WWTP Generation
0.5%
Mobile Fleet
0.5%
Stationary - Purchased Power
0.5%
Stationary - Electric Generation T&D Loss
0.1%
Community Waste
3.1%
Community Transportation
24.1%
Community Electric
19.1%
Community Combustion - Fuel Oil/Other
0.4%
Community Combustion - Natural Gas
48.2%
Bold text represents City-owned/controlled sources


Rochester Community GHG Emissions Distribution
1,870,615 Metric Tons CO_2e
Stationary - Facilities - Combustion
0.2%
Stationary - Facilities - Electric Generation
2.0%
Stationary - Facilities - WWTP Generation
0.3%
Community Waste
3.3%
Mobile Fleet
0.4%
Community Transportation
19.6%
Stationary - Purchased Power
1.2%
Stationary - Electric Generation T&D Loss
0.03%
Community Combustion - Natural Gas
28.7%
Community Electric
44.0%
Community Combustion - Fuel Oil/Other
0.4%
Bold text indicates City owned/controlled sources

City of Rochester
GHG Inventory

User/Source Category	Scope	City of Rochester CY2014 (metric tons CO_2e)	City of Rochester CY2013 ULI Regional Indicator Initiative Data (metric tons CO2e)	% Difference
City - Facilities - Combustion - Natural Gas	1	3,878		
City - RPU Electric Generation - Combustion - Natural Gas	1	35,802		
City - WWTP Electric Generation - Combustion - Biogas	1	5,103		
Community Combustion - Natural Gas	3	536,419		
Combustion - Natural Gas and Biogas		**581,201**	**508,558**	**14.3%**
City - RPU Electric Generation - Combustion - Fuel Oil	1	1,187		
Community Combustion - Fuel Oil/Other	3	7,643		
Combustion - Fuel Oil/Other		**8,830**	No Data	
City - Facilities - Purchased Power	2	22,731		
City - RPU Electric Generation - T&D Loss - Electric	2	640		
Community Electric	3	822,637		
Electric		**846,007**	**792,550**	**6.7%**
City - Fleet	1	7,057		
Community Transportation	3	366,712		
Transportation		**373,770**	**331,666**	**12.7%**
Waste	**3**	**60,807**	**34,533**	**76.1%**
Other (Water and Air)	**3**	Listed in Other Categories	**29,527**	
Total		**1,870,614.76**	**1,696,834**	**10.2%**

Notes:
CO2e = Carbon Dioxide Equivalents
ULI Data as published at http://www.regionalindicatorsmn.com/energy-chart
Biogenic emissions included in City Total
Differences in inventories summarized in executive summary.

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors			Emissions - By GHG			CO_2e Emissions - By GHG			Total Emissions
					CO_2 lbs CO_2/therm	CH_4 lbs CH_4/therm	N_2O lbs N_2O/therm	CO_2 Metric Tons	CH_4 Metric Tons	N_2O Metric Tons	From CO_2 Metric Tons CO_2e	From CH_4 Metric Tons CO_2e	From N_2O Metric Tons CO_2e	Total Metric Tons CO_2e
Boilers / Heaters / Facilities	Airport Main Terminal	77,785	therms	7,778	11.6645	1.05E-03	1.98E-05	412	0.03695	0.00070	412	0.924	0.209	412.7
	Airport Maintenance	50,323	therms	5,032	11.6645	2.20E-04	2.20E-05	266	0.00503	0.00050	266	0.126	0.150	266.5
	Fire Station #1	17,060	therms	1,706	11.6645	1.05E-03	1.98E-05	90	0.00810	0.00015	90	0.203	0.046	90.5
	Fire Station #2	6,386	therms	639	11.6645	1.05E-03	1.98E-05	34	0.00303	0.00006	34	0.076	0.017	33.9
	Fire Station #3	10,969	therms	1,097	11.6645	1.05E-03	1.98E-05	58	0.00521	0.00010	58	0.130	0.029	58.2
	Fire Station #4	9,337	therms	934	11.6645	1.05E-03	1.98E-05	49	0.00444	0.00008	49	0.111	0.025	49.5
	Fire Station #5	8,699	therms	870	11.6645	1.05E-03	1.98E-05	46	0.00413	0.00008	46	0.103	0.023	46.2
	Graham Arena Complex	26,124	therms	2,612	11.6645	1.05E-03	1.98E-05	138	0.01241	0.00024	138	0.310	0.070	138.6
	Library	0	therms	0	11.6645	1.05E-03	1.98E-05	0	0.00000	0.00000	0	0.000	0.000	0.0
	Mayo Civic Center	5,440	therms	544	11.6645	1.05E-03	1.98E-05	29	0.00258	0.00005	29	0.065	0.015	28.9
	MN BioBusiness Center	66,554	therms	6,655	11.6645	2.20E-04	2.20E-05	352	0.00666	0.00067	352	0.166	0.198	352.5
	Public Work TOB	16,875	therms	1,688	11.6645	1.05E-03	1.98E-05	89	0.00802	0.00015	89	0.200	0.045	89.5
	Public Works TOC	146,057	therms	14,606	11.6645	1.05E-03	1.98E-05	773	0.06938	0.00131	773	1.734	0.392	774.9
	Rec Center	216,070	therms	21,607	11.6645	1.05E-03	1.98E-05	1,143	0.10263	0.00194	1,143	2.566	0.579	1,146.4
	Rochester City Hall	0	therms	0	11.6645	1.05E-03	1.98E-05	0	0.00000	0.00000	0	0.000	0.000	0.0
	RPU Service Center	21,781	therms	2,178	11.6645	1.05E-03	1.98E-05	115	0.01035	0.00020	115	0.259	0.058	115.6
	Water Reclamation Plant	51,705	therms	5,171	11.6645	2.20E-04	2.20E-05	274	0.00517	0.00052	274	0.129	0.154	273.9

Notes:
Climate Registry General Reporting Protocol V2.0
Data based on MN B3 Data
Higher Heating Value (HHV) as reported by Minnesota Energy Resources (MER)
All buildings assumed commercial except for Airport Maintenance and MN BioBusiness Center which are assumed to be the industrial category.
Top three emissions sources are outlined for quick reference.
TOB = Traffic Operations Building
TOC = Transit Operation Center

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
1000	g/kg
10	therm/scf
1000000	Btu/MMBtu
100000	Btu/therm

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 2	10.20648	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon

Table 12.9.1 and 12.9.2 Emission Factors by Fuel Type and Sector

	Methane	Nitrous Oxide	
Natural Gas - Industrial	0.001	0.0001	kg/MMBtu
Natural Gas - Commercial	4.75	0.09	g/MMBtu

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors CO_2 lbs/kWh	Emission Factors CH_4 lbs/kWh	Emission Factors N_2O lbs/kWh	Emissions - By GHG CO_2 Metric Tons	Emissions - By GHG CH_4 Metric Tons	Emissions - By GHG N_2O Metric Tons	CO_2e Emissions - By GHG From CO_2 Metric Tons CO_2e	CO_2e Emissions - By GHG From CH_4 Metric Tons CO_2e	CO_2e Emissions - By GHG From N_2O Metric Tons CO_2e	Total Emissions Total Metric Tons CO_2e
Boilers / Turbines	Silver Lake - Natural Gas	6,014,690	therms	601.469	11.6645	8.38E-04	2.09E-04	31,823	2.28556	0.57139	31,823	57.139	170.274	32,051
	Cascade Creek - Natural Gas	820,070	therms	82,007	11.6645	8.38E-04	2.09E-04	4,339	0.31162	0.07791	4,339	7.791	23.216	4,370
	IBM West - Natural Gas	0	therms	0	11.6645	8.38E-04	2.09E-04	0	0.00000	0.00000	0	0.000	0.000	0
			therms		11.6976	8.38E-04	2.09E-04	0	0.00000	0.00000	0	0.000	0.000	0
					lbs CO_2/gallon	lbs CH_4/gallon	lbs N_2O/gallon							
	Silver Lake - DFO	0	gallons	0	22.4467	2.76E-04	1.23E-04	0	0.00000	0.00000	0	0.000	0.000	0
	Cascade Creek - DFO	116,844	gallons	16,124	22.4467	2.76E-04	1.23E-04	1,190	0.01462	0.00650	1,190	0.365	1.936	1,192
	IBM West - DFO	1,512	gallons	209	22.4467	2.76E-04	1.23E-04	15	0.00019	0.00008	15	0.005	0.025	15

Notes:
Consumption data from early release as listed below:
U.S. Department of Energy, The Energy Information Administration (EIA)
EIA-923 Monthly Generation and Fuel Consumption Time Series File, 2014 Data Early Release August 2015
Sources: EIA-923 and EIA-860 Reports
1.7% T&D Loss
DFO = Distillate Fuel Oil
Top three emissions sources are outlined for quick reference.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
10	therms/mcf
42	gallons/barrel
1000	g/kg

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 1	10.18175	kg CO2/gallon
Fuel Oil No. 2	10.20648	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon

Table 12.5 - Technology Type for Electric Sector

	g Methane/MMBtu	g Nitrous Oxide/MMBtu
Distillate Fuel Oil - Boilers	0.9	0.4
Natural Gas - Gas-Fired Turbines>3MW	3.8	0.95
Natural Gas - Combined Cycle	0.95	2.85

	mmbtu/gal
Fuel Oil No. 1	0.139
Fuel Oil No. 2	0.138
Jet Fuel (Jet A, JP-8)	0.135
Propane	0.091

ND, SD, NE, MN, and IA (MROW)	1536.36	lbs CO2/MWh
ND, SD, NE, MN, and IA (MROW)	0.02853	lbs CH4/MWh
ND, SD, NE, MN, and IA (MROW)	0.02629	lbs N2O/MWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
GRP v2.0, April 2015, Table 14.1. (based on eGrid2012, v1.0, 2010 data) for MROW Region

DFO	0.138	MMBtu/gal

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors CO_2 lbs/kWh	Emission Factors CH_4 lbs/kWh	Emission Factors N_2O lbs/kWh	Emissions - By GHG CO_2 Metric Tons	Emissions - By GHG CH_4 Metric Tons	Emissions - By GHG N_2O Metric Tons	CO_2e Emissions - By GHG From CO_2 Metric Tons CO2e	CO_2e Emissions - By GHG From CH_4 Metric Tons CO_2e	CO_2e Emissions - By GHG From N_2O Metric Tons CO_2e	Total Emissions Total Metric Tons CO_2e
Boilers / Turbines		148,863,000	scf	97,505	0.0752	4.62E-06	9.10E-07	5,077	0.31201	0.06143	5,077	7.800	18.305	5,103

Notes:
Combustion data as provided by Wastewater Treatment Plant (WWTP)
All biogas generated in 2014 consumed in for generation.
Assume that no other gas is consumed for generation. Any other natural gas combustion is used for facility.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
10	therms/mcf
42	gallons/barrel
1000	g/kg
0.000655	MMBtu/scf biogas

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 1	10.18175	kg CO2/gallon
Fuel Oil No. 2	10.20648	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon
Biogas	0.034106	kg CO2/scf

Table 12.9.1 - Biogas

	kg Methane/MMBtu	kg Nitrous Oxide/MMBtu
Industrial	0.0032	0.00063

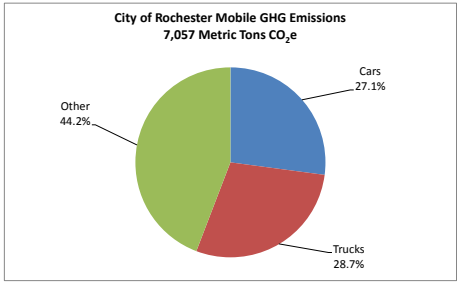
	mmbtu/gal
Fuel Oil No. 1	0.139
Fuel Oil No. 2	0.138
Jet Fuel (Jet A, JP-8)	0.135
Propane	0.091

ND, SD, NE, MN, and IA (MROW)	1536.36	lbs CO2/MWh
ND, SD, NE, MN, and IA (MROW)	0.02853	lbs CH4/MWh
ND, SD, NE, MN, and IA (MROW)	0.02629	lbs N2O/MWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
GRP v2.0, April 2015, Table 14.1. (based on eGrid2012, v1.0, 2010 data) for MROW Region

Source	Description	2014	2014	Units	Energy (MMBtu)	Emission Factors			Emissions - By GHG			CO_2e Emissions - By GHG			Total Emissions
		Gallons	Miles			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	From CO_2	From CH_4	From N_2O	Total
						lbs CO_2/gallon	lbs CH_4/mi	lbs N_2O/mi							
Fleet	City Fleet - Cars - Gas	36,440	1,219,719	gal - mi	4,555	19.3509	4.0811E-05	1.0683E-05	320	0.02258	0.00591	320	0.564	1.761	322
	City Fleet - Light Trucks - Gas	67,778	1,585,827	gal - mi	8,472	19.3509	4.0824E-05	3.3487E-05	595	0.02937	0.02409	595	0.734	7.178	603
	City Fleet - SUV - Gas	46,643	1,091,322	gal - mi	5,830	19.3509	4.0824E-05	3.3487E-05	409	0.02021	0.01658	409	0.505	4.940	415
	City Fleet - Vans - Gas	7,288	170,519	gal - mi	911	19.3509	4.0824E-05	3.3487E-05	64	0.00316	0.00259	64	0.079	0.772	65
	City Fleet - Buses - Gas	0	0	gal - mi	-	19.3509	0.0000E+00	0.0000E+00	0	0.00000	0.00000	0	0.000	0.000	0
	City Fleet - Fire Trucks - Gas	10,203	59,179	gal - mi	1,275	19.3509	1.6111E-04	1.8974E-04	90	0.00432	0.00509	90	0.108	1.518	91
	City Fleet - Heavy Trucks - Gas	1,458	8,454	gal - mi	182	19.3509	1.6111E-04	1.8974E-04	13	0.00062	0.00073	13	0.015	0.217	13
	City Fleet - Misc - Gas	729	NA-EF is lbs/gal	gal - mi	91	19.3509	1.1101E-03	4.9339E-04	6	0.00037	0.00016	6	0.009	0.049	6
	City Fleet - Cars - Diesel	0	0	gal - mi	-	22.5012	0.0000E+00	0.0000E+00	0	0.00000	0.00000	0	0.000	0.000	0
	City Fleet - Light Trucks - Diesel	20,220	473,094	gal - mi	2,790	22.5012	1.9784E-07	2.9676E-07	206	0.00004	0.00006	206	0.001	0.019	206
	City Fleet - SUV - Diesel	0	0	gal - mi	-	22.5012	1.9784E-07	2.9676E-07	0	0.00000	0.00000	0	0.000	0.000	0
	City Fleet - Vans - Diesel	0	0	gal - mi	-	22.5012	1.9784E-07	2.9676E-07	0	0.00000	0.00000	0	0.000	0.000	0
	City Fleet - Buses - Diesel	70,096	466,126	gal - mi	9,673	22.5012	1.1233E-05	1.0573E-05	715	0.00238	0.00224	715	0.059	0.686	716
	City Fleet - Fire Trucks - Diesel	1,348	7,818	gal - mi	186	22.5012	1.1377E-05	1.0708E-05	14	0.00004	0.00004	14	0.001	0.011	14
	City Fleet - Heavy Trucks - Diesel	105,144	609,837	gal - mi	14,510	22.5012	1.1377E-05	1.0708E-05	1,073	0.00335	0.00296	1,073	0.079	0.883	1,074
	City Fleet - Misc - Diesel	288,473	NA-EF is lbs/gal	gal - mi	39,809	22.5012	1.2687E-03	5.6388E-04	2,944	0.16601	0.07378	2,944	4.150	21.987	2,970
	RPU Fleet - Cars - Gas	2,437	82,355	gal - mi	305	19.3509	3.8069E-05	8.0029E-06	21	0.00142	0.00030	21	0.036	0.089	22
	RPU Fleet - Light Trucks - Gas	17,482	417,202	gal - mi	2,183	19.3509	3.5391E-05	1.9855E-05	153	0.00670	0.00376	153	0.167	1.120	155
	RPU Fleet - SUV - Gas	0	0	gal - mi	-	19.3509	3.5391E-05	1.9855E-05	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Vans - Gas	2,437	58,214	gal - mi	305	19.3509	3.5391E-05	1.9855E-05	21	0.00093	0.00052	21	0.023	0.156	22
	RPU Fleet - Buses - Gas	0	0	gal - mi	-	19.3509	0.0000E+00	0.0000E+00	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Heavy Trucks - Gas	6,497	37,685	gal - mi	812	19.3509	9.4851E-05	1.4286E-04	57	0.00182	0.00244	57	0.041	0.728	58
	RPU Fleet - Misc Utility - Gas	0	NA-EF is lbs/gal	gal - mi	-	19.3509	1.1101E-03	4.9339E-04	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Misc Construction - Gas	3,249	NA-EF is lbs/gal	gal - mi	406	19.3509	1.1101E-03	4.9339E-04	29	0.00164	0.00073	29	0.041	0.217	29
	RPU Fleet - Cars - Diesel	0	0	gal - mi	-	22.5012	0.0000E+00	0.0000E+00	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Light Trucks - Diesel	10,134	242,115	gal - mi	1,398	22.5012	2.2026E-06	3.3040E-06	103	0.00034	0.00036	103	0.006	0.108	104
	RPU Fleet - SUV - Diesel	0	0	gal - mi	-	22.5012	2.2026E-06	3.3040E-06	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Vans - Diesel	0	0	gal - mi	-	22.5012	2.2026E-06	3.3040E-06	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Buses - Diesel	0	0	gal - mi	-	22.5012	1.1233E-05	1.0573E-05	0	0.00000	0.00000	0	0.000	0.000	0
	RPU Fleet - Heavy Trucks - Diesel	6,080	35,265	gal - mi	839	22.5012	1.1233E-05	1.0573E-05	62	0.00018	0.00017	62	0.004	0.050	62
	RPU Fleet - Misc Utility - Diesel	5,405	NA-EF is lbs/gal	gal - mi	746	22.5012	1.2687E-03	5.6388E-04	55	0.00311	0.00138	55	0.078	0.412	56
	RPU Fleet - Misc Construction - Diesel	5,405	NA-EF is lbs/gal	gal - mi	746	22.5012	1.2687E-03	5.6388E-04	55	0.00311	0.00138	55	0.078	0.412	56
							lbs/gal	lbs/gal							
	Airport Fleet - General Aviation - Avgas			gallons	-	18.3202	1.5540E-02	2.3545E-04	0	0.00000	0.00000	0	0.000	0.000	0
	Airport Fleet - General Aviation - Jet-A			gallons	-	18.3202	1.5540E-02	2.3545E-04	0	0.00000	0.00000	0	0.000	0.000	0
	Airport Fleet - Commercial - Jet-A			gallons	-	21.4942	0.0000E+00	6.7902E-04	0	0.00000	0.00000	0	0.000	0.000	0

Notes:
Climate Registry General Reporting Protocol V2.0
Data based on total gallons of fuel purchased (gasoline, diesel, and Jet-A), vehicle model year and technology, and equipment type for each fleet (City, RPU)
RPU = Rochester Public Utilities
Mileage and fuel prorated based on equal distribution among fleet sources
Emission factors and fuel efficiency prorated based on equal distribution among fleet sources
Mileage backcalculated from fuel efficiency factors and emission factors average based on model year (MY) distribution
It is assumed that the airport fleet count and fuel purchases were included in City Fleet
It is assumed that the city does not own or lease aircraft.
Top three emissions sources are outlined for quick reference.



Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007
GWP - IPCC Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
454	g/lb

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 2	10.29548	kg CO2/gallon
Aviation Gasoline	8.31	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon
Gasoline	8.7775	kg CO2/gallon

Table 13.7

Avgas	7.0488	g CH4/gallon
Avgas	0.1068	g N2O/gallon
Jet-A	0	g CH4/gallon
Jet-A	0.308	g N2O/gallon

From City Fleet Calculation Tab

	Average EF	
	g CH4/mi	g N2O/mi
City Fleet - Cars - Gas	0.018528	0.00485
City Fleet - Light Trucks - Gas	0.018534132	0.015202994
City Fleet - SUV - Gas	0.018534132	0.015202994
City Fleet - Vans - Gas	0.018534132	0.015202994
City Fleet - Buses - Gas	-	-
City Fleet - Fire Trucks - Gas	0.073142857	0.086142857
City Fleet - Heavy Trucks - Gas	0.073142857	0.086142857
City Fleet - Misc - Gas	0.504	0.224
City Fleet - Cars - Diesel	-	-
City Fleet - Light Trucks - Diesel	8.98204E-05	0.000134731
City Fleet - SUV - Diesel	8.98204E-05	0.000134731
City Fleet - Vans - Diesel	8.98204E-05	0.000134731
City Fleet - Buses - Diesel	0.0051	0.0048
City Fleet - Fire Trucks - Diesel	0.005165385	0.004861538
City Fleet - Heavy Trucks - Diesel	0.005165385	0.004861538
	g CH4/gal	g N2O/gal
City Fleet - Misc - Diesel	0.576	0.256

From RPU Fleet Calculation Tab

	Average EF	
	g CH4/mi	g N2O/mi
RPU Fleet - Cars - Gas	0.017263333	0.003633333
RPU Fleet - Light Trucks - Gas	0.016067347	0.009014286
RPU Fleet - SUV - Gas	0.016067347	0.009014286
RPU Fleet - Vans - Gas	0.016067347	0.009014286
RPU Fleet - Buses - Gas	0	0
RPU Fleet - Heavy Trucks - Gas	0.0430625	0.06485625
	g CH4/gal	g N2O/gal
RPU Fleet - Misc Utility - Gas	0.504	0.224
RPU Fleet - Misc Construction - Gas	0.504	0.224
	g CH4/mi	g N2O/mi
RPU Fleet - Cars - Diesel	0	0
RPU Fleet - Light Trucks - Diesel	0.001	0.0015
RPU Fleet - SUV - Diesel	0.001	0.0015
RPU Fleet - Vans - Diesel	0.001	0.0015
RPU Fleet - Buses - Diesel	0.0051	0.0048
RPU Fleet - Heavy Trucks - Diesel	0.0051	0.0048
	g CH4/gal	g N2O/gal
RPU Fleet - Misc Utility - Diesel	0.576	0.256
RPU Fleet - Misc Construction - Diesel	0.576	0.256

gas	0.125	MMBtu/gal
diesel	0.138	MMBtu/gal
avgas	0.12	MMBtu/gal
Jet A	0.135	MMBtu/gal

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors CO_2 lbs CO_2/kWh	Emission Factors CH_4 lbs CH_4/kWh	Emission Factors N_2O lbs N_2O/kWh	Emissions - By GHG CO_2 Metric Tons	Emissions - By GHG CH_4 Metric Tons	Emissions - By GHG N_2O Metric Tons	CO_2e Emissions - By GHG From CO_2 Metric Tons CO2e	CO_2e Emissions - By GHG From CH_4 Metric Tons CO_2e	CO_2e Emissions - By GHG From N_2O Metric Tons CO_2e	Total Emissions Total Metric Tons CO_2e
Purchased Electricity	Airport Main Terminal	1,506,621	kWh	5,141	1.53636	2.8530.E-05	2.6290.E-05	1,050	0.02	0.02	1,050	0.5	5.4	1,055.8
	Airport Maintenance	605,800	kWh	2,067	1.53636	2.8530.E-05	2.6290.E-05	422	0.01	0.01	422	0.2	2.2	424.5
	Fire Station #1	171,760	kWh	586	1.53636	2.8530.E-05	2.6290.E-05	120	0.00	0.00	120	0.1	0.6	120.4
	Fire Station #2	39,743	kWh	136	1.53636	2.8530.E-05	2.6290.E-05	28	0.00	0.00	28	0.0	0.1	27.9
	Fire Station #3	103,560	kWh	353	1.53636	2.8530.E-05	2.6290.E-05	72	0.00	0.00	72	0.0	0.4	72.6
	Fire Station #4	143,160	kWh	488	1.53636	2.8530.E-05	2.6290.E-05	100	0.00	0.00	100	0.0	0.5	100.3
	Fire Station #5	96,800	kWh	330	1.53636	2.8530.E-05	2.6290.E-05	67	0.00	0.00	67	0.0	0.3	67.8
	Graham Arena Complex	1,822,383	kWh	6,218	1.53636	2.8530.E-05	2.6290.E-05	1,270	0.02	0.02	1,270	0.6	6.5	1,277.1
	Library	888,320	kWh	3,031	1.53636	2.8530.E-05	2.6290.E-05	619	0.01	0.01	619	0.3	3.2	622.5
	Mayo Civic Center	3,602,200	kWh	12,291	1.53636	2.8530.E-05	2.6290.E-05	2,510	0.05	0.04	2,510	1.2	12.8	2,524.3
	MN BioBusiness Center	1,609,800	kWh	5,493	1.53636	2.8530.E-05	2.6290.E-05	1,122	0.02	0.02	1,122	0.5	5.7	1,128.1
	Public Work TOB	83,520	kWh	285	1.53636	2.8530.E-05	2.6290.E-05	58	0.00	0.00	58	0.0	0.3	58.5
	Public Works TOC	1,866,851	kWh	6,370	1.53636	2.8530.E-05	2.6290.E-05	1,301	0.02	0.02	1,301	0.6	6.6	1,308.2
	Rec Center	3,427,213	kWh	11,694	1.53636	2.8530.E-05	2.6290.E-05	2,388	0.04	0.04	2,388	1.1	12.2	2,401.6
	Rochester City Hall	820,520	kWh	2,800	1.53636	2.8530.E-05	2.6290.E-05	572	0.01	0.01	572	0.3	2.9	575.0
	RPU Service Center	1,868,280	kWh	6,375	1.53636	2.8530.E-05	2.6290.E-05	1,302	0.02	0.02	1,302	0.6	6.6	1,309.2
	Water Reclamation Plant	13,780,800	kWh	47,020	1.53636	2.8530.E-05	2.6290.E-05	9,604	0.18	0.16	9,604	4.5	49.0	9,657.0

Notes:
Climate Registry General Reporting Protocol V2.0
Data based on MN B3 Data
Top three emissions sources are outlined for quick reference.
TOB = Traffic Operations Building
TOC = Transit Operation Center
US EPA eGrid Midwest Reliability Organization West (MROW) emission factors used since MISO is a portion of that system and specific, verifiable emission factors are not publicly available.
Top three emissions sources are outlined for quick reference.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
5.306	kg/therm
2.2046	lbs/kg
0.003412	MMBtu/kWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
GRP v2.0, April 2015, Table 14.1. (based on eGrid2012, v1.0, 2010 data) for MROW Region

ND, SD, NE, MN, and IA (MROW)	1536.36	lbs CO2/MWh
ND, SD, NE, MN, and IA (MROW)	0.02853	lbs CH4/MWh
ND, SD, NE, MN, and IA (MROW)	0.02629	lbs N2O/MWh

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors			Emissions - By GHG			CO_2e Emissions - By GHG			Total Emissions
					CO_2 lbs CO_2/therm	CH_4 lbs CH_4/therm	N_2O lbs N_2O/therm	CO_2 Metric Tons	CH_4 Metric Tons	N_2O Metric Tons	From CO_2 Metric Tons CO2e	From CH_4 Metric Tons CO_2e	From N_2O Metric Tons CO_2e	Total Metric Tons CO_2e
	Residential	41,721,168	therms	4,172,117	11.6645	1.05E-03	1.98E-05	220,744	19.81736	0.37549	220,744	495.434	111.895	221,351.8
	Commercial	66,980,481	therms	6,698,048	11.6645	1.05E-03	1.98E-05	354,390	31.81541	0.60282	354,390	795.385	179.640	355,365.2

Notes:
Natural Gas consumption data as reported by Minnesota Energy Resources (MER)
MER service areas include the majority of the city limits as well as a limited number of residences outside the city limits.
Higher Heating Value (HHV) as reported by MER
City of Rochester is a subset of community natural gas.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
10	therms/mcf

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 2	10.20648	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon

Table 12.9.1 and 12.9.2 Emission Factors by Fuel Type and Sector

	kg Methane/MMBtu	kg Nitrous Oxide/MMBtu
Natural Gas - Industrial	0.001	0.0001
Natural Gas - Commercial and Residential	4.75	0.09

gas	0.125	MMBtu/gal
diesel	0.138	MMBtu/gal
avgas	0.12	MMBtu/gal
Jet A	0.135	MMBtu/gal

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors CO_2 lbs/kWh	Emission Factors CH_4 lbs/kWh	Emission Factors N_2O lbs/kWh	Emissions - By GHG CO_2 Metnc Tons	Emissions - By GHG CH_4 Metric Tons	Emissions - By GHG N_2O Metric Tons	CO_2e Emissions - By GHG From CO_2 Metric Tons CO2e	CO_2e Emissions - By GHG From CH_4 Metric Tons CO_2e	CO_2e Emissions - By GHG From N_2O Metric Tons CO_2e	Total Emissions Total Metric Tons CO_2e
Purchased Electricity			kWh 0		1.53636	2.853O.E-05	2.6290.E-05	0	0.0	0.0	0	0	0	0
			kWh 0		1.53636	2.8530.E-05	2.6290.E-05	0	0.0	0.0	0	0	0	0
					lbs CO_2/therm	lbs CH_4/therm	lbs N_2O/therm							
Boilers / Turbines	Mayo Natural Gas	12,745	therms	1,275	11.6645	8.38E-04	2.93E-04	67	0.00484	0.00170	67	0.121	0.505	68
	St. Mary's Natural Gas	9,029	therms	903	11.6645	8.38E-04	2.93E-04	48	0.00343	0.00120	48	0.086	0.358	48
			therms 0		11.6645	8.38E-04	2.93E-04	0	0.00000	0.00000	0	0.000	0.000	0
			therms 0		11.6976	8.38E-04	2.93E-04	0	0.00000	0.00000	0	0.000	0.000	0
					lbs CO_2/gallon	lbs CH_4/gallon	lbs N_2O/gallon							
	Mayo Fuel Oil No. 1	20,130	gallons	2,798	22.4467	2.15E-04	1.23E-04	205	0.00196	0.00112	205	0.049	0.334	205
	St. Mary's Fuel Oil No. 1	83,580	gallons	11,618	22.4467	2.15E-04	1.23E-04	851	0.00813	0.00465	851	0.203	1.385	853
	Mayo Fuel Oil No. 2	20,140	gallons	2,779	22.5012	4.26E-04	9.13E-05	206	0.00389	0.00083	206	0.097	0.248	206
	St. Mary's Fuel Oil No. 2	10,253	gallons	1,415	22.5012	4.26E-04	9.13E-05	105	0.00198	0.00042	105	0.050	0.126	105
	Mayo Fuel Oil No. 6	203,000	gallons	30,450	24.8348	4.63E-04	9.92E-05	2,287	0.04263	0.00913	2,287	1.066	2.722	2,291
	St. Mary's Propane	450	gallons	41	12.6129	1.81E-04	8.04E-04	3	0.00004	0.00016	3	0.001	0.049	3
	Waste Oil	900	gallons	124	22.5134	4.26E-04	9.13E-05	9	0.00017	0.00004	9	0.004	0.011	9
					lbs/ton									
Incinerator	Solid Waste	4286	tons	42,646	1989.5743	2.04E-01	1.30E-01	3,868	0.39575	0.25203	3,868	9.894	75.106	3,953
	Medical Waste	21	tons	209	1989.5743	2.04E-01	1.30E-01	19	0.00194	0.00123	19	0.048	0.368	19

Notes:
Fuel consumption data for 2014 for the Mayo Medical Center –Air Quality Permit # 10900084 (which includes the Franklin Heating Station and the Prospect Utility Plant) and
Saint Marys Hospital – Air Quality Permit # 10900008 received from the MPCA

City of Rochester is a subset of Community Total. The Rochester portion is only subtracted from the community emissions in the summary tables.
Top three emissions sources are outlined for quick reference.
Solid Waste and Medical Waste emissions represent biogenic sources.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
10	therms/mcf
42	gallons/barrel
1000	g/kg
9.95	mmbtu/ton biomass MSW
0.003412	MMBtu/kWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 1	10.18175	kg CO2/gallon
Fuel Oil No. 2	10.20648	kg CO2/gallon
Fuel Oil No. 6	11.265	kg CO2/gallon
Used Oil	10.212	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon
Solid Waste	902.465	kg CO2/ton

Table 12.8 - Commercial

	g Methane/MMBtu	g Nitrous Oxide/MMBtu
Distillate Fuel Oil - Boilers	0.7	0.4
Residual Fuel Oil - Boilers	1.4	0.3
Natural Gas - Gas-Fired Turbines>3MW	3.8	1.33
Natural Gas - Boiler	0.95	0.95
Biomass	9.28	5.91
LPG	0.9	4.01

	mmbtu/gal	
Fuel Oil No. 1	0.139	
Fuel Oil No. 2	0.138	
Fuel Oil No. 6	0.15	
Used Oil	0.138	
Jet Fuel (Jet A, JP-8)	0.135	
Propane	0.091	
Solid Waste	9.95	per ton

ND, SD, NE, MN, and IA (MROW)	1536.36	lbs CO2/MWh
ND, SD, NE, MN, and IA (MROW)	0.02853	lbs CH4/MWh
ND, SD, NE, MN, and IA (MROW)	0.02629	lbs N2O/MWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
GRP v2.0, April 2015, Table 14.1. (based on eGrid2012, v1.0, 2010 data) for MROW Region

Diesel Mobile	10.20648	kg CO2/gallon
Gasoline Mobile	8.7775	kg CO2/gallon
E85 Mobile	1.316625	kg CO2/gallon
Diesel LDT mobile (advanced and MY 2010)	0.001	g/mi CH4
	0.0015	g/mi N2O
Gasoline passenger mobile (EPA Tier 2 and MY 2010)	0.0179	g/mi CH4
	0.0036	g/mi N2O
E85 Mobile	0.049345	g/mi CH4
	0.05749	g/mi N2O
Avg fuel economy gas	22.1	mpg
Avg fuel economy diesel	20.1	mpg
Avg fuel economy E85	22.1	mpg (assume gas)

gas	0.125	MMBtu/gal
diesel	0.138	MMBtu/gal
avgas	0.12	MMBtu/gal
Jet A	0.135	MMBtu/gal
fuel oil 1	0.139	MMBtu/gal
fuel oil 6	0.15	MMBtu/gal
propane	0.091	MMBtu/gal
waste oil	0.138	MMBtu/gal

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors CO_2 lbs CO_2/kWh	Emission Factors CH_4 lbs CH_4/kWh	Emission Factors N_2O lbs N_2O/kWh	Emissions - By GHG CO_2 Metric Tons	Emissions - By GHG CH_4 Metric Tons	Emissions - By GHG N_2O Metric Tons	CO_2e Emissions - By GHG From CO_2 Metric Tons CO2e	CO_2e Emissions - By GHG From CH_4 Metric Tons CO_2e	CO_2e Emissions - By GHG From N_2O Metric Tons CO_2e	Total Emissions Total Metric Tons CO_2e
Electricity	Residential	341,452,000	kWh	1,165,034	1.53636	2.8530.E-05	2.6290.E-05	237,952	4.42	4.07	237,952	110.5	1,213.4	239,275.4
	Commercial	652,612,000	kWh	2,226,712	1.53636	2.8530.E-05	2.6290.E-05	454,793	8.45	7.78	454,793	211.1	2,319.1	457,323.4
	Industrial	212,297,000	kWh	724,357	1.53636	2.8530.E-05	2.6290.E-05	147,946	2.75	2.53	147,946	68.7	754.4	148,768.9

Notes:
Electricity consumption data as reported by RPU
Service areas include the majority of the city limits as well as a limited number of residences outside the city limits.
City of Rochester is a subset of Community Total. The Rochester portion is only subtracted from the community emissions in the summary tables.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
5.306	kg/therm
2.2046	lbs/kg
0.003412	MMBtu/kWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
GRP v2.0, April 2015, Table 14.1. (based on eGrid2012, v1.0, 2010 data) for MROW Region

ND, SD, NE, MN, and IA (MROW)	1536.36	lbs CO2/MWh
ND, SD, NE, MN, and IA (MROW)	0.02853	lbs CH4/MWh
ND, SD, NE, MN, and IA (MROW)	0.02629	lbs N2O/MWh

Source	Description	2014	2014	Units	Energy (MMBtu)	Emission Factors			Emissions - By GHG			CO_2e Emissions - By GHG			Total Emissions
						CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	From CO_2	From CH_4	From N_2O	Total
		Gallons	Miles			lbs CO2/gallon	lbs CH4/mi	lbs N2O/mi							
	Community Fleet - Cars - Gas	17,777,325	525,319,946	gal - mi	2,222,166	19.3509	3.8106E-05	7.9295E-06	156,039	9.07988	1.88945	156,039	226.997	563.057	156,829
	Community Fleet - Light Trucks - Gas	3,804,128	112,411,997	gal - mi	475,516	19.3509	3.5928E-05	1.4548E-05	33,390	1.83194	0.74177	33,390	45.799	221.047	33,657
	Community Fleet - SUV - Gas	0	0	gal - mi	-	19.3509	3.5928E-05	1.4548E-05	0	0.00000	0.00000	0	0.000	0.000	0
	Community Fleet - Vans - Gas	10,067	297,469	gal - mi	1,258	19.3509	3.5928E-05	1.4548E-05	88	0.00485	0.00196	88	0.121	0.585	89
	Community Fleet - Buses - Gas	194,162	1,391,638	gal - mi	24,270	19.3509	7.3348E-05	2.9515E-05	1,704	0.04630	0.01863	1,704	1.157	5.552	1,711
	Community Fleet - Heavy Trucks - Gas	4,685,925	27,178,367	gal - mi	585,741	19.3509	7.3348E-05	2.9515E-05	41,130	0.90423	0.36386	41,130	22.606	108.431	41,261
	Community Fleet - Misc - Gas	0	0	gal - mi	-	19.3509	1.1013E-06	2.2026E-06	0	0.00000	0.00000	0	0.000	0.000	0
	Community Fleet - Cars - Diesel	935,649	27,648,418	gal - mi	129,120	22.5012	1.1013E-06	2.2026E-06	9,550	0.01381	0.02762	9,550	0.345	8.232	9,558
	Community Fleet - Light Trucks - Diesel	200,217	5,916,421	gal - mi	27,630	22.5012	1.1013E-06	2.2026E-06	2,043	0.00296	0.00591	2,043	0.074	1.762	2,045
	Community Fleet - SUV - Diesel	0	0	gal - mi	-	22.5012	1.1013E-06	2.2026E-06	0	0.00000	0.00000	0	0.000	0.000	0
	Community Fleet - Vans - Diesel	530	15,656	gal - mi	73	22.5012	1.1233E-05	1.0573E-05	5	0.00008	0.00008	5	0.002	0.022	5
	Community Fleet - Buses - Diesel	10,219	73,244	gal - mi	1,410	22.5012	1.1233E-05	1.0573E-05	104	0.00037	0.00035	104	0.009	0.105	104
	Community Fleet - Heavy Trucks - Diesel	12,196,110	70,737,439	gal - mi	1,683,063	22.5012	0.0000E+00	0.0000E+00	124,478	0.00000	0.00000	124,478	0.000	0.000	124,478
	Community Fleet - Misc - Diesel	0	0	gal - mi	-	22.5012	0.0000E+00	0.0000E+00	0	0.00000	0.00000	0	0.000	0.000	0
	Rail	1,982		gallons	274	22.5012	1.7621E-03	5.6388E-04	20	0.00158	0.00051	20	0.040	0.151	20
							lbs/gal	lbs/ga							
	Aircraft at RST		34,842	movemen	-	18.3202	1.5540E-02	2.3545E-04	4,007	0.13519	0.00000	4,007	3.380	0.000	4,010
					5,150,521										

Notes:

Climate Registry General Reporting Protocol V2.0

149,226 =2013 Olmsted Co. Population
110,742 = 2013 Rochester Population
74% Rochester contribution to WTE

6.50 rail miles in Rochester per Jeff Ellerbusch
8.00 trips per day (4 round trips)
18980 miles traveled per year
9.57 rail mit/gal - 2013 Table 4-25: Energy Intensity of Class I Railroad Freight Service

City of Rochester Mobile is a subset of Community Transportation
City of Rochester is a subset of Community Total. The Rochester portion is only subtracted from the community emissions in the summary tables.
Top three emissions sources are outlined for quick reference.
Aircraft GHG imported from Airport Carbon and Emissions Reporting Tool (ACERT) V3.0
Aircraft operations (movements) from FAA OPSNET Report: Airport Operations: Standard Report Jan 2014-Dec 2014
Generic Aircraft Movement used for ACERT data input
Flight Aware tracking data used to determine representative aircraft generic categories for ACERT entry
Air Carrier Operations assumed to be Regional Aircraft Category
Air Taxi Operations assumed to be Business Aircraft Category
Civil and General Aviation Operations assumed to be Piston Aircraft Category
25% of Military Operations assumed to be Heli Large Aircraft Category and remaining military assumbed to be Business Aircraft Category
Default taxi times used
No engine runups entered

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199 lbs/metric ton
2.2046 lbs/kg
1 therm = 100,000 Btu
1 MMBtu/Mcf utility-stated HHV for natural gas
454 g/lb

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 2	10.20648	kg CO2/gallon
Aviation Gasoline	8.31	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon
Gasoline	8.7775	kg CO2/gallon

Table 13.7	g CH4/gallon	g N2O/gallon
Avgas	7.0488	0.1068
Jet-A	0	0.308
Rail Locomotives	0.8	0.256

From City Fleet Calculation Tab

	Average EF	
	g CH4/mi	g N2O/mi
Community Fleet - Cars - Gas	0.0173	0.0036
Community Fleet - Light Trucks - Gas	0.016311329	0.006604587
Community Fleet - SUV - Gas	0.016311329	0.006604587
Community Fleet - Vans - Gas	0.016311329	0.006604587
Community Fleet - Buses - Gas	0.0333	0.0134
Community Fleet - Heavy Trucks - Gas	0.0333	0.0134
Community Fleet - Misc - Gas	0.0333	0.0134
Community Fleet - Cars - Diesel	0.0005	0.001
Community Fleet - Light Trucks - Diesel	0.0005	0.001
Community Fleet - SUV - Diesel	0.0005	0.001
Community Fleet - Vans - Diesel	0.0005	0.001
Community Fleet - Buses - Diesel	0.0051	0.0048
Community Fleet - Heavy Trucks - Diesel	0.0051	0.0048
Community Fleet - Misc - Diesel	0.0051	0.0048

gas	0.125	MMBtu/gal
diesel	0.138	MMBtu/gal
avgas	0.12	MMBtu/gal
Jet A	0.135	MMBtu/gal

Source	Description	2014	Units	Energy (MMBtu)	Emission Factors CO_2 lbs/kWh	Emission Factors CH_4 lbs/kWh	Emission Factors N_2O lbs/kWh	Emissions - By GHG CO_2 Metric Tons	Emissions - By GHG CH_4 Metric Tons	Emissions - By GHG N_2O Metric Tons	CO_2e Emissions - By GHG From CO_2 Metric Tons CO2e	CO_2e Emissions - By GHG From CH_4 Metric Tons CO_2e	CO_2e Emissions - By GHG From N_2O Metric Tons CO_2e	Total Emissions Total Metric Tons CO_2e
Boilers / Turbines			therms		11.6645	8.38E-04	2.93E-04	0	0.00000	0.00000	0	0.000	0.000	0
					lbs CO_2/gallon	lbs CH_4/gallon	lbs N_2O/gallon							
			gallons		22.4467	2.15E-04	1.23E-04	0	0.00000	0.00000	0	0.000	0.000	0
					lbs/ton									
Incinerator	Solid Waste	70600	tons	702,470	1989.5743	2.04E-01	1.30E-01	63,713	6.51886	4.15156	63,713	162.971	1,237.164	65,114

Notes:
WTE = Waste To Energy

200	= tpd operating capacity
12	= down days in 2014
70600	= tons processed in 2014
149,226	=2013 Olmsted Co. Population
110,742	= 2013 Rochester Population
74%	Rochester contribution to WTE

It is assumed that only steam was produced for 2014 at the WTE facility based on discussions with personnel.
Steam is assumed ot be used in community facilities.

Global Warming Potentials (GWP)
Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007

CO2	1
CH4	25
N2O	298
HFC-134a	1430

Conversions

2204.62199	lbs/metric ton
2.2046	lbs/kg
1	therm = 100,000 Btu
1	MMBtu/Mcf utility-stated HHV for natural gas
10	therms/mcf
42	gallons/barrel
1000	g/kg
9.95	mmbtu/ton biomass MSW

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf

Natural Gas (1,000-1,025 Btu/scf)	5.291	kg CO2/therm
Fuel Oil No. 1	10.18175	kg CO2/gallon
Fuel Oil No. 2	10.20648	kg CO2/gallon
Fuel Oil No. 6	11.265	kg CO2/gallon
Used Oil	10.212	kg CO2/gallon
Jet Fuel (Jet A, JP-8)	9.7497	kg CO2/gallon
Propane	5.72117	kg CO2/gallon
Solid Waste	902.465	kg CO2/ton

Table 12.8 - Commercial

	g Methane/MMBtu	g Nitrous Oxide/MMBtu	
Distillate Fuel Oil - Boilers	0.7	0.4	0.000837748
Residual Fuel Oil - Boilers	1.4	0.3	0.0038
Natural Gas - Gas-Fired Turbines>3MW	3.8	1.33	0.00095
Natural Gas - Boiler	0.95	0.95	0.000513
Biomass	9.28	5.91	0.000069255
			9.34943E-06

	mmbtu/gal	
Fuel Oil No. 1	0.139	
Fuel Oil No. 2	0.138	
Fuel Oil No. 6	0.15	
Used Oil	0.138	
Jet Fuel (Jet A, JP-8)	0.135	
Propane	0.091	
Solid Waste	9.95	per ton

ND, SD, NE, MN, and IA (MROW)	1536.36	lbs CO2/MWh
ND, SD, NE, MN, and IA (MROW)	0.02853	lbs CH4/MWh
ND, SD, NE, MN, and IA (MROW)	0.02629	lbs N2O/MWh

http://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf
GRP v2.0, April 2015, Table 14.1. (based on eGrid2012, v1.0, 2010 data) for MROW Region

Diesel Mobile	10.20648	kg CO2/gallon	
Gasoline Mobile	8.7775	kg CO2/gallon	
E85 Mobile	1.316625	kg CO2/gallon	
Diesel LDT mobile (advanced and MY 2010)	0.001	g/mi CH4	2.20264E-06
	0.0015	g/mi N2O	3.30396E-06
Gasoline passenger mobile (EPA Tier 2 and MY 2010)	0.0173	g/mi CH4	3.81057E-05
	0.0036	g/mi N2O	7.92952E-06
E85 Mobile	0.049345	g/mi CH4	0.000108689
	0.05749	g/mi N2O	0.00012663
Avg fuel economy gas	22.1	mpg	
Avg fuel economy diesel	20.1	mpg	
Avg fuel economy E85	22.1	mpg (assume gas)	

Organization Name	Site Name	Start Date	End Date	SF	Total kBtu	Total Dollars	Total CO2 Pounds	Total kBtu/SF	Total Dollars/SF	Total CO2 Pounds/SF	Status	Completeness	Avg Outside Air Temp	Electric kWh	Electric kBtu	Electric Dollars	Electric CO2 Pounds	Electric kBtu/SF	Electric Dollars/SF	Electric CO2 Pounds/SF	Natural Gas Therms	Natural Gas kBtu	Natural Gas Dollars	Natural Gas CO2 Pounds	Natural Gas kBtu/SF	Natural Gas Dollars/SF	Natural Gas CO2 Pounds/SF	Steam/Hot Water MMBTu	Steam/Hot Water kBtu	Steam/Hot Water Dollars	Steam/Hot Water CO2 Pounds	Steam/Hot Water kBtu/SF	Steam/Hot Water Dollars/SF	Steam/Hot Water CO2 Pounds/SF	Org ID	Site ID
																$2,837,160.03							$625,777.21					32,514.29								
City, Rochester	**Airport Main Terminal**			**117800**	**12,919,045.85**	**207,827.97**								**1,506,621.00**	**5,140,590.85**	**135,762.12**					**77,784.55**	**7,778,455.00**	**72,065.85**					**0.00**	**0.00**	**0.00**					**694**	**10317**
City, Rochester	Airport Main Terminal	1/1/2014	1/31/2014	117,800	1,960,036.44	$25,462.64	400,411.88	16.64	0.22	3.40	Measured	100.00%	8.00	128,387.00	438,056.44	$11,110.95	222,335.66	3.72	$0.09	1.89	15,219.80	1,521,980.00	$14,351.69	178,076.23	12.92	$0.12	1.51	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	2/1/2014	2/28/2014	117,800	1,876,783.68	$24,641.67	387,010.55	15.93	0.21	3.29	Measured	100.00%	7.00	125,640.00	428,683.68	$10,976.25	217,578.51	3.64	$0.09	1.85	14,481.00	1,448,100.00	$13,665.42	169,432.04	12.29	$0.12	1.44	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	3/1/2014	3/31/2014	117,800	1,356,273.42	$20,060.76	306,314.30	11.51	0.17	2.60	Measured	100.00%	25.00	110,785.00	377,998.42	$10,206.39	191,853.19	3.21	$0.09	1.63	9,782.75	978,275.00	$9,854.37	114,461.11	8.30	$0.08	0.97	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	4/1/2014	4/30/2014	117,800	1,067,515.14	$16,340.15	265,612.80	9.06	0.14	2.25	Measured	100.00%	42.00	105,595.00	360,290.14	$9,866.12	182,865.35	3.06	$0.08	1.55	7,072.25	707,225.00	$6,474.03	82,747.45	6.00	$0.05	0.70	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	5/1/2014	5/31/2014	117,800	805,630.61	$14,300.58	248,304.99	6.84	0.12	2.11	Measured	100.00%	58.00	115,601.00	394,430.61	$10,525.38	200,193.36	3.35	$0.09	1.70	4,112.00	411,200.00	$3,775.20	48,111.63	3.49	$0.03	0.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	6/1/2014	6/30/2014	117,800	490,867.69	$8,615.39	243,555.19	4.17	0.07	2.07	Measured	100.00%	68.00	139,674.00	476,567.69	$8,441.88	241,882.05	4.05	$0.07	2.05	143.00	14,300.00	$173.51	1,673.14	0.12	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	7/1/2014	7/31/2014	117,800	499,790.30	$13,738.88	248,708.74	4.24	0.12	2.11	Measured	100.00%	68.00	142,758.00	487,090.30	$13,578.74	247,222.80	4.13	$0.12	2.10	127.00	12,700.00	$160.14	1,485.94	0.11	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	8/1/2014	8/31/2014	117,800	535,617.60	$14,812.16	266,971.01	4.55	0.13	2.27	Measured	100.00%	70.00	153,317.00	523,117.60	$14,663.27	265,508.47	4.44	$0.12	2.25	125.00	12,500.00	$148.89	1,462.54	0.11	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	9/1/2014	9/30/2014	117,800	490,374.28	$13,725.77	242,875.16	4.16	0.12	2.06	Measured	100.00%	60.00	139,207.00	474,974.28	$13,550.98	241,073.32	4.03	$0.12	2.05	154.00	15,400.00	$174.79	1,801.85	0.13	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	10/1/2014	10/31/2014	117,800	875,565.92	$15,939.39	252,879.09	7.43	0.14	2.15	Measured	100.00%	47.00	112,893.00	385,190.92	$11,792.66	195,503.75	3.27	$0.10	1.66	4,903.75	490,375.00	$4,146.73	57,375.35	4.16	$0.04	0.49	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	11/1/2014	11/30/2014	117,800	1,502,004.40	$19,683.26	321,942.10	12.75	0.17	2.73	Measured	100.00%	25.00	109,717.00	374,354.40	$10,115.61	190,003.67	3.18	$0.09	1.61	11,276.50	1,127,650.00	$9,567.65	131,938.43	9.57	$0.08	1.12	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	12/1/2014	12/31/2014	117,800	1,458,586.36	$20,507.32	334,624.92	12.38	0.17	2.84	Measured	100.00%	24.00	123,047.00	419,836.36	$10,933.89	213,088.05	3.56	$0.09	1.81	10,387.50	1,038,750.00	$9,573.43	121,536.87	8.82	$0.08	1.03	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	1/1/2015	1/31/2015	117,800	1,622,739.78	$20,797.21	358,519.26	13.78	0.18	3.04	Measured	100.00%	18.00	126,565.00	431,839.78	$11,063.23	219,180.39	3.67	$0.09	1.86	11,909.00	1,190,900.00	$9,733.98	139,338.87	10.11	$0.08	1.18	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	2/1/2015	2/28/2015	117,800	1,614,079.55	$20,775.13	333,561.45	13.70	0.18	2.83	Measured	100.00%	9.00	108,596.00	370,529.55	$10,415.03	188,062.37	3.15	$0.09	1.60	12,435.50	1,243,550.00	$10,360.10	145,499.08	10.56	$0.09	1.24	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	3/1/2015	3/31/2015	117,800	1,125,556.34	$16,237.67	255,880.21	9.55	0.14	2.17	Measured	100.00%	33.00	93,195.00	317,981.34	$9,454.88	161,391.51	2.70	$0.08	1.37	8,075.75	807,575.00	$6,782.79	94,488.70	6.86	$0.06	0.80	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	4/1/2015	4/30/2015	117,800	1,343,708.97	$25,104.59	445,533.23	11.41	0.21	3.78	Measured	100.00%	48.00	216,364.00	738,233.97	$20,487.89	374,690.83	6.27	$0.17	3.18	6,054.75	605,475.00	$4,616.70	70,842.39	5.14	$0.04	0.60	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	5/1/2015	5/31/2015	117,800	827,206.02	$14,144.78	262,467.84	7.02	0.12	2.23	Measured	100.00%	58.00	124,335.00	424,231.02	$11,296.49	215,318.56	3.60	$0.10	1.83	4,029.75	402,975.00	$2,848.29	47,149.28	3.42	$0.02	0.40	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	6/1/2015	6/30/2015	117,800	512,870.50	$13,745.48	238,046.35	4.35	0.12	2.02	Measured	100.00%	67.00	133,608.00	455,870.50	$13,272.83	231,377.18	3.87	$0.11	1.96	570.00	57,000.00	$472.65	6,669.17	0.48	$0.00	0.06	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	7/1/2015	7/31/2015	117,800	520,390.98	$14,801.08	257,680.54	4.42	0.13	2.19	Measured	100.00%	70.00	147,682.00	503,890.98	$14,617.19	255,749.99	4.28	$0.12	2.17	165.00	16,500.00	$183.89	1,930.55	0.14	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	8/1/2015	8/31/2015	117,800	512,821.26	$15,027.66	255,049.23	4.35	0.13	2.17	Measured	100.00%	67.00	146,372.00	499,421.26	$14,868.59	253,481.39	4.24	$0.13	2.15	134.00	13,400.00	$159.07	1,567.84	0.11	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	9/1/2015	9/30/2015	117,800	14,000.00	$163.88	1,638.04	0.12	0.00	0.01	Missing	66.67%		0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	140.00	14,000.00	$163.88	1,638.04	0.12	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	Airport Main Terminal	10/1/2015	10/31/2015	117,800	0.00	$0.00	0.00	0.00	0.00	0.00	Missing	0.00%		0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10317
City, Rochester	**Airport Maintenance**			**41400**	**7,099,334.60**	**113,228.18**								**605,800.00**	**2,066,989.60**	**66,424.43**					**50,323.45**	**5,032,345.00**	**46,803.75**					**0.00**	**0.00**	**0.00**					**694**	**10318**
City, Rochester	Airport Maintenance	1/1/2014	1/31/2014	41,400	1,249,702.72	$15,517.50	221,587.84	30.19	0.37	5.35	Measured	100.00%	8.00	56,560.00	192,982.72	$5,534.34	97,948.43	4.66	$0.13	2.37	10,567.20	1,056,720.00	$9,983.16	123,639.41	25.52	$0.24	2.99	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	2/1/2014	2/28/2014	41,400	1,494,408.48	$17,866.42	249,526.22	36.10	0.43	6.03	Measured	100.00%	7.00	56,040.00	191,208.48	$5,560.56	97,047.91	4.62	$0.13	2.34	13,032.00	1,303,200.00	$12,305.86	152,478.31	31.48	$0.30	3.68	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	3/1/2014	3/31/2014	41,400	564,287.24	$9,262.70	132,011.04	13.63	0.22	3.19	Measured	100.00%	25.00	49,520.00	168,962.24	$5,249.78	85,756.83	4.08	$0.13	2.07	3,953.25	395,325.00	$4,012.92	46,254.21	9.55	$0.10	1.12	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	4/1/2014	4/30/2014	41,400	536,110.36	$8,186.90	116,401.52	12.95	0.20	2.81	Measured	100.00%	42.00	40,280.00	137,435.36	$4,513.94	69,755.35	3.32	$0.11	1.68	3,986.75	398,675.00	$3,672.96	46,646.17	9.63	$0.09	1.13	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	5/1/2014	5/31/2014	41,400	330,886.40	$6,592.78	94,948.19	7.99	0.16	2.29	Measured	100.00%	58.00	42,200.00	143,986.40	$4,848.44	73,080.33	3.48	$0.12	1.77	1,869.00	186,900.00	$1,744.34	21,867.86	4.51	$0.04	0.53	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	6/1/2014	6/30/2014	41,400	139,480.00	$4,433.74	69,621.47	3.37	0.11	1.68	Measured	100.00%	68.00	40,000.00	136,480.00	$4,357.67	69,270.46	3.30	$0.11	1.67	30.00	3,000.00	$76.07	351.01	0.07	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	7/1/2014	7/31/2014	41,400	273,576.32	$10,143.94	137,760.20	6.61	0.25	3.33	Measured	100.00%	68.00	79,360.00	270,776.32	$10,069.45	137,432.59	6.54	$0.24	3.32	28.00	2,800.00	$74.49	327.61	0.07	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	8/1/2014	8/31/2014	41,400	163,319.36	$5,736.08	82,111.69	3.94	0.14	1.98	Measured	100.00%	70.00	47,280.00	161,319.36	$5,670.27	81,877.68	3.90	$0.14	1.98	20.00	2,000.00	$65.81	234.01	0.05	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	9/1/2014	9/30/2014	41,400	143,725.92	$5,154.43	70,331.46	3.47	0.12	1.70	Measured	100.00%	60.00	40,160.00	137,025.92	$5,049.13	69,547.54	3.31	$0.12	1.68	67.00	6,700.00	$105.30	783.92	0.16	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	10/1/2014	10/31/2014	41,400	426,147.40	$7,087.04	110,091.66	10.29	0.17	2.66	Measured	100.00%	47.00	45,200.00	154,222.40	$4,763.75	78,275.62	3.73	$0.12	1.89	2,719.25	271,925.00	$2,323.29	31,816.04	6.57	$0.06	0.77	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	11/1/2014	11/30/2014	41,400	928,252.56	$11,568.37	176,408.34	22.42	0.28	4.26	Measured	100.00%	25.00	50,880.00	173,602.56	$5,146.90	88,112.02	4.19	$0.12	2.13	7,546.50	754,650.00	$6,421.47	88,296.31	18.23	$0.16	2.13	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	12/1/2014	12/31/2014	41,400	849,437.84	$11,678.28	177,100.93	20.52	0.28	4.28	Measured	100.00%	24.00	58,320.00	198,987.84	$5,660.20	100,996.33	4.81	$0.14	2.44	6,504.50	650,450.00	$6,018.08	76,104.60	15.71	$0.15	1.84	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	1/1/2015	1/31/2015	41,400	993,058.24	$12,557.42	192,838.91	23.99	0.30	4.66	Measured	100.00%	18.00	57,520.00	196,258.24	$6,003.92	99,610.92	4.74	$0.15	2.41	7,968.00	796,800.00	$6,553.50	93,227.99	19.25	$0.16	2.25	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	2/1/2015	2/28/2015	41,400	1,104,060.72	$13,320.22	196,552.00	26.67	0.32	4.75	Measured	100.00%	9.00	50,560.00	172,510.72	$5,544.50	87,557.86	4.17	$0.13	2.11	9,315.50	931,550.00	$7,775.72	108,994.14	22.50	$0.19	2.63	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	3/1/2015	3/31/2015	41,400	686,422.92	$9,382.25	141,823.92	16.58	0.23	3.43	Measured	100.00%	33.00	46,160.00	157,497.92	$4,920.54	79,938.11	3.80	$0.12	1.93	5,289.25	528,925.00	$4,461.71	61,885.81	12.78	$0.11	1.49	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	4/1/2015	4/30/2015	41,400	476,489.96	$7,459.22	110,491.79	11.51	0.18	2.67	Measured	100.00%	48.00	41,080.00	140,164.96	$4,867.76	71,140.76	3.39	$0.12	1.72	3,363.25	336,325.00	$2,591.46	39,351.03	8.12	$0.06	0.95	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	5/1/2015	5/31/2015	41,400	314,703.24	$5,859.18	93,481.13	7.60	0.14	2.26	Measured	100.00%	58.00	42,520.00	145,078.24	$4,625.77	73,634.50	3.50	$0.11	1.78	1,696.25	169,625.00	$1,233.41	19,846.63	4.10	$0.03	0.48	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	6/1/2015	6/30/2015	41,400	152,815.20	$4,957.03	70,648.71	3.69	0.12	1.71	Measured	100.00%	67.00	39,600.00	135,115.20	$4,761.75	68,577.75	3.26	$0.12	1.66	177.00	17,700.00	$195.28	2,070.95	0.43	$0.00	0.05	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	7/1/2015	7/31/2015	41,400	154,592.80	$5,415.55	77,252.92	3.73	0.13	1.87	Measured	100.00%	70.00	44,400.00	151,492.80	$5,334.95	76,890.21	3.66	$0.13	1.86	31.00	3,100.00	$80.60	362.71	0.07	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	8/1/2015	8/31/2015	41,400	157,395.36	$5,512.80	78,753.47	3.80	0.13	1.90	Measured	100.00%	67.00	45,280.00	154,495.36	$5,436.64	78,414.16	3.73	$0.13	1.89	29.00	2,900.00	$76.16	339.31	0.07	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	9/1/2015	9/30/2015	41,400	2,600.00	$76.66	304.21	0.06	0.00	0.01	Missing	66.67%		0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	26.00	2,600.00	$76.66	304.21	0.06	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	Airport Maintenance	10/1/2015	10/31/2015	41,400	0.00	$0.00	0.00	0.00	0.00	0.00	Missing	0.00%		0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10318
City, Rochester	**Fire Station #1**			**21145**	**2,292,045.12**	**34,096.61**								**171,760.00**	**586,045.12**	**18,480.95**					**17,060.00**	**1,706,000.00**	**15,615.66**					**0.00**	**0.00**	**0.00**					**694**	**9853**
City, Rochester	Fire Station #1	1/1/2014	1/31/2014	21,145	452,551.68	$4,972.28	72,458.40	21.40	0.24	3.43	Measured	100.00%	8.00	14,640.00	49,951.68	$1,416.06	25,352.99	2.36	$0.07	1.20	4,026.00	402,600.00	$3,556.22	47,105.41	19.04	$0.17	2.23	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	2/1/2014	2/28/2014	21,145	425,773.60	$4,896.73	66,873.39	20.14	0.23	3.16	Measured	100.00%	7.00	12,800.00	43,673.60	$1,271.24	22,166.55	2.07	$0.06	1.05	3,821.00	382,100.00	$3,625.49	44,706.85	18.07	$0.17	2.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	3/1/2014	3/31/2014	21,145	210,489.92	$2,943.11	40,831.73	9.95	0.14	1.93	Measured	100.00%	25.00	12,160.00	41,489.92	$1,209.18	21,058.22	1.96	$0.06	1.00	1,690.00	169,000.00	$1,733.93	19,773.51	7.99	$0.08	0.94	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	4/1/2014	4/30/2014	21,145	127,995.52	$1,955.76	29,580.58	6.05	0.09	1.40	Measured	100.00%	42.00	10,960.00	37,395.52	$1,092.80	18,980.11	1.77	$0.05	0.90	906.00	90,600.00	$862.96	10,600.47	4.28	$0.04	0.50	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	5/1/2014	5/31/2014	21,145	109,892.48	$1,746.63	30,234.17	5.20	0.08	1.43	Measured	100.00%	58.00	13,040.00	44,492.48	$1,294.52	22,582.17	2.10	$0.06	1.07	654.00	65,400.00	$452.11	7,652.00	3.09	$0.02	0.36	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	6/1/2014	6/30/2014	21,145	80,789.44	$1,840.87	29,600.72	3.82	0.09	1.40	Measured	100.00%	68.00	15,120.00	51,589.44	$1,541.44	26,184.23	2.44	$0.07	1.24	292.00	29,200.00	$299.43	3,416.49	1.38	$0.01	0.16	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	7/1/2014	7/31/2014	21,145	96,426.72	$2,569.30	36,014.29	4.56	0.12	1.70	Measured	100.00%	68.00	18,560.00	63,326.72	$2,233.15	32,141.49	2.99	$0.11	1.52	331.00	33,100.00	$336.15	3,872.80	1.57	$0.02	0.18	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	8/1/2014	8/31/2014	21,145	90,151.20	$2,407.08	34,000.79	4.26	0.11	1.61	Measured	100.00%	70.00	17,600.00	60,051.20	$2,119.20	30,479.00	2.84	$0.10	1.44	301.00	30,100.00	$287.88	3,521.79	1.42	$0.01	0.17	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	9/1/2014	9/30/2014	21,145	97,326.72	$2,558.42	36,119.59	4.60	0.12	1.71	Measured	100.00%	60.00	18,560.00	63,326.72	$2,233.15	32,141.49	2.99	$0.11	1.52	340.00	34,000.00	$325.27	3,978.10	1.61	$0.02	0.19	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	10/1/2014	10/31/2014	21,145	101,476.16	$2,118.58	30,102.26	4.80	0.10	1.42	Measured	100.00%	47.00	13,680.00	46,676.16	$1,620.82	23,690.50	2.21	$0.08	1.12	548.00	54,800.00	$497.76	6,411.76	2.59	$0.02	0.30	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	11/1/2014	11/30/2014	21,145	254,233.28	$2,903.98	44,990.40	12.02	0.14	2.13	Measured	100.00%	25.00	11,440.00	39,033.28	$1,139.35	19,811.35	1.85	$0.05	0.94	2,152.00	215,200.00	$1,764.63	25,179.05	10.18	$0.08	1.19	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	Fire Station #1	12/1/2014	12/31/2014	21,145	244,938.40	$3,183.87	46,248.15	11.58	0.15	2.19	Measured	100.00%	24.00	13,200.00	45,038.40	$1,310.04	22,859.25	2.13	$0.06	1.08	1,999.00	199,900.00	$1,873.83	23,388.90	9.45	$0.09	1.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9853
City, Rochester	**Fire Station #2**			**9367**	**774,203.12**	**10,768.96**								**39,743.00**	**135,603.12**	**4,530.98**					**6,386.00**	**638,600.00**	**6,237.98**					**0.00**	**0.00**	**0.00**					**694**	**11484**
City, Rochester	Fire Station #2	1/1/2014	1/31/2014	9,367	153,827.78	$1,718.03	23,437.77	16.42	0.18	2.50	Measured	100.00%	8.00	4,082.00	13,927.78	$416.88	7,069.05	1.49	$0.04	0.75	1,399.00	139,900.00	$1,301.15	16,368.72	14.94	$0.14	1.75	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	2/1/2014	2/28/2014	9,367	124,911.55	$1,513.30	19,384.21	13.34	0.16	2.07	Measured	100.00%	7.00	3,579.00	12,211.55	$376.99	6,197.97	1.30	$0.04	0.66	1,127.00	112,700.00	$1,136.31	13,186.24	12.03	$0.12	1.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	3/1/2014	3/31/2014	9,367	64,218.66	$898.81	11,895.19	6.86	0.10	1.27	Measured	100.00%	25.00	3,288.00	11,218.66	$348.77	5,694.03	1.20	$0.04	0.61	530.00	53,000.00	$550.04	6,201.16	5.66	$0.06	0.66	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	4/1/2014	4/30/2014	9,367	41,879.33	$625.33	8,445.92	4.47	0.07	0.90	Measured	100.00%	42.00	2,661.00	9,079.33	$287.97	4,608.22	0.97	$0.03	0.49	328.00	32,800.00	$337.36	3,837.70	3.50	$0.04	0.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	5/1/2014	5/31/2014	9,367	17,920.02	$402.05	5,541.33	1.91	0.04	0.59	Measured	100.00%	58.00	2,585.00	8,820.02	$280.59	4,476.60	0.94	$0.03	0.48	91.00	9,100.00	$121.46	1,064.73	0.97	$0.01	0.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	6/1/2014	6/30/2014	9,367	16,719.48	$414.32	5,674.04	1.78	0.04	0.61	Measured	100.00%	68.00	2,790.00	9,519.48	$310.58	4,831.61	1.02	$0.03	0.52	72.00	7,200.00	$103.74	842.42	0.77	$0.01	0.09	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	7/1/2014	7/31/2014	9,367	19,042.23	$587.94	7,516.88	2.03	0.06	0.80	Measured	100.00%	68.00	3,969.00	13,542.23	$501.06	6,873.36	1.45	$0.05	0.73	55.00	5,500.00	$86.88	643.52	0.59	$0.01	0.07	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	8/1/2014	8/31/2014	9,367	19,978.17	$614.42	7,952.86	2.13	0.07	0.85	Measured	100.00%	70.00	4,214.00	14,378.17	$530.14	7,297.64	1.53	$0.06	0.78	56.00	5,600.00	$84.28	655.22	0.60	$0.01	0.07	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	9/1/2014	9/30/2014	9,367	32,239.30	$747.47	9,801.87	3.44	0.08	1.05	Measured	100.00%	60.00	4,525.00	15,439.30	$567.06	7,836.22	1.65	$0.06	0.84	168.00	16,800.00	$180.41	1,965.65	1.79	$0.02	0.21	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	10/1/2014	10/31/2014	9,367	45,006.91	$649.79	8,432.08	4.80	0.07	0.90	Measured	100.00%	47.00	2,376.00	8,106.91	$300.88	4,114.67	0.87	$0.03	0.44	369.00	36,900.00	$348.91	4,317.41	3.94	$0.04	0.46	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	11/1/2014	11/30/2014	9,367	101,008.22	$1,097.97	15,063.02	10.78	0.12	1.61	Measured	100.00%	25.00	2,435.00	8,308.22	$266.04	4,216.84	0.89	$0.03	0.45	927.00	92,700.00	$831.93	10,846.18	9.90	$0.09	1.16	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	Fire Station #2	12/1/2014	12/31/2014	9,367	137,451.47	$1,499.53	20,398.35	14.67	0.16	2.18	Measured	100.00%	24.00	3,239.00	11,051.47	$344.02	5,609.18	1.18	$0.04	0.60	1,264.00	126,400.00	$1,155.51	14,789.18	13.49	$0.12	1.58	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11484
City, Rochester	**Fire Station #3**			**10427**	**1,450,246.72**	**21,410.23**								**103,560.00**	**353,346.72**	**11,135.39**					**10,969.00**	**1,096,900.00**	**10,274.84**					**0.00**	**0.00**	**0.00**					**694**	**11485**
City, Rochester	Fire Station #3	1/1/2014	1/31/2014	10,427	334,376.64	$3,725.93	53,407.98	32.07	0.36	5.12	Measured	100.00%	8.00	10,720.00	36,576.64	$1,046.18	18,564.48	3.51	$0.10	1.78	2,978.00	297,800.00	$2,679.75	34,843.49	28.56	$0.26	3.34	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	2/1/2014	2/28/2014	10,427	314,801.12	$3,686.31	49,838.34	30.19	0.35	4.78	Measured	100.00%	7.00	9,760.00	33,301.12	$976.90	16,901.99	3.19	$0.09	1.62	2,815.00	281,500.00	$2,709.41	32,936.34	27.00	$0.26	3.16	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	3/1/2014	3/31/2014	10,427	154,333.76	$2,144.22	29,357.51	14.80	0.21	2.82	Measured	100.00%	25.00	8,480.00	28,933.76	$852.29	14,685.34	2.77	$0.08	1.41	1,254.00	125,400.00	$1,291.93	14,672.18	12.03	$0.12	1.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	4/1/2014	4/30/2014	10,427	92,963.36	$1,526.54	23,243.03	8.92	0.15	2.23	Measured	100.00%	42.00	9,280.00	31,663.36	$929.88	16,070.75	3.04	$0.09	1.54	613.00	61,300.00	$596.66	7,172.28	5.88	$0.06	0.69	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	5/1/2014	5/31/2014	10,427	51,621.76	$846.67	16,007.35	4.95	0.08	1.54	Measured	100.00%	58.00	7,480.00	25,521.76	$755.31	12,953.58	2.45	$0.07	1.24	261.00	26,100.00	$91.36	3,053.78	2.50	$0.01	0.29	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	6/1/2014	6/30/2014	10,427	41,933.76	$1,059.57	16,206.38	4.02	0.10	1.55	Measured	100.00%	68.00	8,480.00	28,933.76	$904.44	14,685.34	2.77	$0.09	1.41	130.00	13,000.00	$155.13	1,521.04	1.25	$0.01	0.15	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	7/1/2014	7/31/2014	10,427	43,235.04	$1,241.64	16,944.95	4.15	0.12	1.63	Measured	100.00%	68.00	8,920.00	30,435.04	$1,088.79	15,447.31	2.92	$0.10	1.48	128.00	12,800.00	$152.85	1,497.64	1.23	$0.01	0.14	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	8/1/2014	8/31/2014	10,427	41,009.28	$1,262.49	17,377.45	3.93	0.12	1.67	Measured	100.00%	70.00	9,440.00	32,209.28	$1,150.53	16,347.83	3.09	$0.11	1.57	88.00	8,800.00	$111.96	1,029.63	0.84	$0.01	0.10	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	9/1/2014	9/30/2014	10,427	42,871.52	$1,236.38	16,955.72	4.11	0.12	1.63	Measured	100.00%	60.00	8,960.00	30,571.52	$1,093.54	15,516.58	2.93	$0.10	1.49	123.00	12,300.00	$142.84	1,439.14	1.18	$0.01	0.14	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	10/1/2014	10/31/2014	10,427	46,529.92	$1,058.93	14,985.18	4.46	0.10	1.44	Measured	100.00%	47.00	7,160.00	24,429.92	$834.67	12,399.41	2.34	$0.08	1.19	221.00	22,100.00	$224.26	2,585.77	2.12	$0.02	0.25	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	11/1/2014	11/30/2014	10,427	147,028.64	$1,736.85	26,157.51	14.10	0.17	2.51	Measured	100.00%	25.00	6,720.00	22,928.64	$681.60	11,637.44	2.20	$0.07	1.12	1,241.00	124,100.00	$1,055.25	14,520.07	11.90	$0.10	1.39	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	Fire Station #3	12/1/2014	12/31/2014	10,427	139,541.92	$1,884.70	27,200.41	13.38	0.18	2.61	Measured	100.00%	24.00	8,160.00	27,841.92	$821.26	14,131.17	2.67	$0.08	1.36	1,117.00	111,700.00	$1,063.44	13,069.24	10.71	$0.10	1.25	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11485
City, Rochester	**Fire Station #4**			**16480**	**1,422,161.92**	**24,190.66**								**143,160.00**	**488,461.92**	**15,278.35**					**9,337.00**	**933,700.00**	**8,912.31**					**0.00**	**0.00**	**0.00**					**694**	**11486**
City, Rochester	Fire Station #4	1/1/2014	1/31/2014	16,480	244,613.92	$3,171.65	47,489.43	14.84	0.19	2.88	Measured	100.00%	8.00	14,160.00	48,313.92	$1,387.32	24,521.74	2.93	$0.08	1.49	1,963.00	196,300.00	$1,784.33	22,967.69	11.91	$0.11	1.39	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	2/1/2014	2/28/2014	16,480	236,568.48	$3,041.82	42,390.54	14.35	0.18	2.57	Measured	100.00%	7.00	11,040.00	37,668.48	$1,100.56	19,118.65	2.29	$0.07	1.16	1,989.00	198,900.00	$1,941.26	23,271.90	12.07	$0.12	1.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	3/1/2014	3/31/2014	16,480	138,968.48	$2,132.02	30,971.05	8.43	0.13	1.88	Measured	100.00%	25.00	11,040.00	37,668.48	$1,100.56	19,118.65	2.29	$0.07	1.16	1,013.00	101,300.00	$1,031.46	11,852.40	6.15	$0.06	0.72	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	4/1/2014	4/30/2014	16,480	83,611.84	$1,509.91	23,534.72	5.07	0.09	1.43	Measured	100.00%	42.00	10,320.00	35,211.84	$1,030.73	17,871.78	2.14	$0.06	1.08	484.00	48,400.00	$479.18	5,662.95	2.94	$0.03	0.34	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	5/1/2014	5/31/2014	16,480	64,215.68	$1,419.68	23,024.28	3.90	0.09	1.40	Measured	100.00%	58.00	11,640.00	39,715.68	$1,158.74	20,157.70	2.41	$0.07	1.22	245.00	24,500.00	$260.94	2,866.57	1.49	$0.02	0.17	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	6/1/2014	6/30/2014	16,480	53,669.76	$1,462.28	21,577.16	3.26	0.09	1.31	Measured	100.00%	68.00	11,480.00	39,169.76	$1,293.60	19,880.62	2.38	$0.08	1.21	145.00	14,500.00	$168.68	1,696.54	0.88	$0.01	0.10	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	7/1/2014	7/31/2014	16,480	60,801.92	$1,771.38	24,650.33	3.69	0.11	1.50	Measured	100.00%	68.00	13,160.00	44,901.92	$1,592.12	22,789.98	2.72	$0.10	1.38	159.00	15,900.00	$179.26	1,860.35	0.96	$0.01	0.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	8/1/2014	8/31/2014	16,480	55,227.68	$1,665.23	23,305.20	3.35	0.10	1.41	Measured	100.00%	70.00	12,640.00	43,127.68	$1,530.39	21,889.46	2.62	$0.09	1.33	121.00	12,100.00	$134.84	1,415.74	0.73	$0.01	0.09	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	9/1/2014	9/30/2014	16,480	73,396.80	$1,712.29	23,778.68	4.45	0.10	1.44	Measured	100.00%	60.00	11,400.00	38,896.80	$1,383.19	19,742.08	2.36	$0.08	1.20	345.00	34,500.00	$329.10	4,036.60	2.09	$0.02	0.24	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	10/1/2014	10/31/2014	16,480	64,459.04	$1,449.12	22,093.32	3.91	0.09	1.34	Measured	100.00%	47.00	10,920.00	37,259.04	$1,181.92	18,910.84	2.26	$0.07	1.15	272.00	27,200.00	$267.20	3,182.48	1.65	$0.02	0.19	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	11/1/2014	11/30/2014	16,480	169,423.36	$2,449.90	38,851.82	10.28	0.15	2.36	Measured	100.00%	25.00	14,280.00	48,723.36	$1,414.78	24,729.55	2.96	$0.09	1.50	1,207.00	120,700.00	$1,035.12	14,122.26	7.32	$0.06	0.86	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486
City, Rochester	Fire Station #4	12/1/2014	12/31/2014	16,480	177,204.96	$2,405.38	35,498.14	10.75	0.15	2.15	Measured	100.00%	24.00	11,080.00	37,804.96	$1,104.44	19,187.92	2.29	$0.07	1.16	1,394.00	139,400.00	$1,300.94	16,310.22	8.46	$0.08	0.99	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11486

Organization Name	Site Name	Start Date	End Date	SF	Total kBtu	Total Dollars	Total CO2 Pounds	Total kBtu/SF	Total Dollars/SF	Total CO2 Pounds/SF	Status	Completeness	Avg Outside Air Temp	Electric kWh	Electric kBtu	Electric Dollars	Electric CO2 Pounds	Electric kBtu/SF	Electric Dollars/SF	Electric CO2 Pounds/SF	Natural Gas Therms	Natural Gas kBtu	Natural Gas Dollars	Natural Gas CO2 Pounds	Natural Gas kBtu/SF	Natural Gas Dollars/SF	Natural Gas CO2 Pounds/SF	Steam/Hot Water MMBTu	Steam/Hot Water kBtu	Steam/Hot Water Dollars	Steam/Hot Water CO2 Pounds	Steam/Hot Water kBtu/SF	Steam/Hot Water Dollars/SF	Steam/Hot Water CO2 Pounds/SF	Org ID	Site ID
City, Rochester	**Fire Station #5**			**10997**	**1,200,181.60**	**13,813.37**								**96,800.00**	**330,281.60**	**5,504.08**					**8,699.00**	**869,900.00**	**8,309.29**					**0.00**	**0.00**	**0.00**					**694**	**11487**
City, Rochester	Fire Station #5	1/1/2014	1/31/2014	10,997	220,920.00	$2,263.83	39,173.77	20.09	0.21	3.56	Measured	100.00%	8.00	10,000.00	34,120.00	$566.90	17,317.61	3.10	$0.05	1.57	1,868.00	186,800.00	$1,696.93	21,856.16	16.99	$0.15	1.99	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	2/1/2014	2/28/2014	10,997	219,752.64	$2,350.84	37,331.53	19.98	0.21	3.39	Measured	100.00%	7.00	8,720.00	29,752.64	$495.99	15,100.96	2.71	$0.05	1.37	1,900.00	190,000.00	$1,854.85	22,230.57	17.28	$0.17	2.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	3/1/2014	3/31/2014	10,997	101,158.24	$1,208.37	21,856.57	9.20	0.11	1.99	Measured	100.00%	25.00	7,520.00	25,658.24	$427.74	13,022.85	2.33	$0.04	1.18	755.00	75,500.00	$780.63	8,833.73	6.87	$0.07	0.80	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	4/1/2014	4/30/2014	10,997	65,529.92	$820.12	17,208.24	5.96	0.07	1.56	Measured	100.00%	42.00	7,160.00	24,429.92	$407.26	12,399.41	2.22	$0.04	1.13	411.00	41,100.00	$412.86	4,808.82	3.74	$0.04	0.44	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	5/1/2014	5/31/2014	10,997	47,596.00	$678.01	16,229.25	4.33	0.06	1.48	Measured	100.00%	58.00	8,000.00	27,296.00	$455.04	13,854.09	2.48	$0.04	1.26	203.00	20,300.00	$222.97	2,375.16	1.85	$0.02	0.22	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	6/1/2014	6/30/2014	10,997	42,121.76	$612.82	14,895.83	3.83	0.06	1.35	Measured	100.00%	68.00	7,480.00	25,521.76	$425.46	12,953.58	2.32	$0.04	1.18	166.00	16,600.00	$187.36	1,942.25	1.51	$0.02	0.18	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	7/1/2014	7/31/2014	10,997	45,452.64	$674.23	16,937.91	4.13	0.06	1.54	Measured	100.00%	68.00	8,720.00	29,752.64	$495.99	15,100.96	2.71	$0.05	1.37	157.00	15,700.00	$178.24	1,836.95	1.43	$0.02	0.17	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	8/1/2014	8/31/2014	10,997	45,243.20	$653.55	16,753.50	4.11	0.06	1.52	Measured	100.00%	70.00	8,600.00	29,343.20	$489.17	14,893.15	2.67	$0.04	1.35	159.00	15,900.00	$164.38	1,860.35	1.45	$0.01	0.17	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	9/1/2014	9/30/2014	10,997	40,856.96	$582.50	14,214.82	3.72	0.05	1.29	Measured	100.00%	60.00	7,080.00	24,156.96	$402.71	12,260.87	2.20	$0.04	1.11	167.00	16,700.00	$179.79	1,953.95	1.52	$0.02	0.18	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	10/1/2014	10/31/2014	10,997	54,019.20	$678.50	15,115.22	4.91	0.06	1.37	Measured	100.00%	47.00	6,600.00	22,519.20	$375.41	11,429.63	2.05	$0.03	1.04	315.00	31,500.00	$303.09	3,685.59	2.86	$0.03	0.34	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	11/1/2014	11/30/2014	10,997	147,512.32	$1,466.54	27,066.93	13.41	0.13	2.46	Measured	100.00%	25.00	7,360.00	25,112.32	$418.64	12,745.76	2.28	$0.04	1.16	1,224.00	122,400.00	$1,047.90	14,321.17	11.13	$0.10	1.30	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	Fire Station #5	12/1/2014	12/31/2014	10,997	170,018.72	$1,824.06	32,631.85	15.46	0.17	2.97	Measured	100.00%	24.00	9,560.00	32,618.72	$543.77	16,555.64	2.97	$0.05	1.51	1,374.00	137,400.00	$1,280.29	16,076.21	12.49	$0.12	1.46	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11487
City, Rochester	**Graham Arena Complex**			**162325**	**8,830,370.80**	**195,100.32**								**1,822,383.00**	**6,217,970.80**	**169,543.19**					**26,124.00**	**2,612,400.00**	**25,557.13**					**0.00**	**0.00**	**0.00**					**694**	**10316**
City, Rochester	Graham Arena Complex	1/1/2014	1/31/2014	162,325	1,257,745.87	$23,301.89	419,584.66	7.75	0.14	2.58	Measured	100.00%	8.00	204,439.00	697,545.87	$18,164.55	354,039.58	4.30	$0.11	2.18	5,602.00	560,200.00	$5,137.34	65,545.08	3.45	$0.03	0.40	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	2/1/2014	2/28/2014	162,325	1,124,154.33	$20,716.20	359,942.68	6.93	0.13	2.22	Measured	100.00%	7.00	171,411.00	584,854.33	$15,401.80	296,842.96	3.60	$0.09	1.83	5,393.00	539,300.00	$5,314.40	63,099.72	3.32	$0.03	0.39	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	3/1/2014	3/31/2014	162,325	744,467.40	$15,373.88	264,244.42	4.59	0.09	1.63	Measured	100.00%	25.00	132,933.00	453,567.40	$12,360.21	230,208.24	2.79	$0.08	1.42	2,909.00	290,900.00	$3,013.67	34,036.17	1.79	$0.02	0.21	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	4/1/2014	4/30/2014	162,325	753,346.12	$15,682.65	317,998.82	4.64	0.10	1.96	Measured	100.00%	42.00	172,493.00	588,546.12	$14,027.51	298,716.73	3.63	$0.09	1.84	1,648.00	164,800.00	$1,655.14	19,282.09	1.02	$0.01	0.12	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	5/1/2014	5/31/2014	162,325	363,908.93	$9,036.62	175,758.54	2.24	0.06	1.08	Measured	100.00%	58.00	99,944.00	341,008.93	$8,695.19	173,079.17	2.10	$0.05	1.07	229.00	22,900.00	$341.43	2,679.37	0.14	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	6/1/2014	6/30/2014	162,325	384,916.61	$11,183.22	186,420.99	2.37	0.07	1.15	Measured	100.00%	68.00	106,101.00	362,016.61	$10,821.24	183,741.62	2.23	$0.07	1.13	229.00	22,900.00	$361.98	2,679.37	0.14	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	7/1/2014	7/31/2014	162,325	161,899.42	$6,844.60	76,977.81	1.00	0.04	0.47	Measured	100.00%	68.00	43,552.00	148,599.42	$6,569.73	75,421.67	0.92	$0.04	0.46	133.00	13,300.00	$274.87	1,556.14	0.08	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	8/1/2014	8/31/2014	162,325	233,627.28	$8,924.58	113,227.09	1.44	0.05	0.70	Measured	100.00%	70.00	64,457.00	219,927.28	$8,658.69	111,624.15	1.35	$0.05	0.69	137.00	13,700.00	$265.89	1,602.94	0.08	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	9/1/2014	9/30/2014	162,325	450,221.69	$14,043.48	216,168.84	2.77	0.09	1.33	Measured	100.00%	60.00	122,691.00	418,621.69	$13,620.22	212,471.54	2.58	$0.08	1.31	316.00	31,600.00	$423.26	3,697.29	0.19	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	10/1/2014	10/31/2014	162,325	946,627.45	$21,123.01	422,113.24	5.83	0.13	2.60	Measured	100.00%	47.00	233,654.00	797,227.45	$19,714.64	404,632.99	4.91	$0.12	2.49	1,494.00	149,400.00	$1,408.37	17,480.25	0.92	$0.01	0.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	11/1/2014	11/30/2014	162,325	1,043,415.05	$22,222.11	401,212.69	6.43	0.14	2.47	Measured	100.00%	25.00	209,471.00	714,715.05	$19,306.20	362,753.80	4.40	$0.12	2.23	3,287.00	328,700.00	$2,915.91	38,458.89	2.02	$0.02	0.24	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	Graham Arena Complex	12/1/2014	12/31/2014	162,325	1,366,040.64	$26,648.08	507,941.49	8.42	0.16	3.13	Measured	100.00%	24.00	261,237.00	891,340.64	$22,203.21	452,400.17	5.49	$0.14	2.79	4,747.00	474,700.00	$4,444.87	55,541.32	2.92	$0.03	0.34	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10316
City, Rochester	**Library**			**84000**	**9,808,569.44**	**220,726.38**								**888,320.00**	**3,030,947.84**	**92,804.92**					**0.00**	**0.00**	**0.00**					**6,777.62**	**6,777,621.60**	**127,921.46**					**694**	**10324**
City, Rochester	Library	1/1/2014	1/31/2014	84,000	1,276,836.24	$26,067.51	243,517.98	15.20	0.31	2.90	Measured	100.00%	8.00	71,520.00	244,026.24	$6,950.83	123,855.58	2.91	$0.08	1.47	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	1,032.81	1,032,810.00	$19,116.68	119,662.40	12.30	$0.23	1.42	694	10324
City, Rochester	Library	2/1/2014	2/28/2014	84,000	977,941.00	$21,234.34	202,045.09	11.64	0.25	2.41	Measured	100.00%	7.00	66,400.00	226,556.80	$6,825.69	114,988.96	2.70	$0.08	1.37	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	751.38	751,384.20	$14,408.65	87,056.12	8.95	$0.17	1.04	694	10324
City, Rochester	Library	3/1/2014	3/31/2014	84,000	897,326.84	$20,302.73	187,786.93	10.68	0.24	2.24	Measured	100.00%	25.00	62,720.00	214,000.64	$6,616.37	108,616.08	2.55	$0.08	1.29	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	683.33	683,326.20	$13,686.36	79,170.86	8.13	$0.16	0.94	694	10324
City, Rochester	Library	4/1/2014	4/30/2014	84,000	590,876.84	$13,764.25	149,073.87	7.03	0.16	1.77	Measured	100.00%	42.00	60,320.00	205,811.84	$6,479.86	104,459.85	2.45	$0.08	1.24	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	385.07	385,065.00	$7,284.39	44,614.02	4.58	$0.09	0.53	694	10324
City, Rochester	Library	5/1/2014	5/31/2014	84,000	607,717.36	$14,171.06	162,999.56	7.23	0.17	1.94	Measured	100.00%	58.00	69,280.00	236,383.36	$7,154.72	119,976.43	2.81	$0.09	1.43	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	371.33	371,334.00	$7,016.34	43,023.13	4.42	$0.08	0.51	694	10324
City, Rochester	Library	6/1/2014	6/30/2014	84,000	811,249.68	$18,606.95	201,763.02	9.66	0.22	2.40	Measured	100.00%	68.00	80,640.00	275,143.68	$8,579.74	139,649.24	3.28	$0.10	1.66	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	536.11	536,106.00	$10,027.21	62,113.78	6.38	$0.12	0.74	694	10324
City, Rochester	Library	7/1/2014	7/31/2014	84,000	931,307.36	$21,113.21	237,911.45	11.09	0.25	2.83	Measured	100.00%	68.00	97,280.00	331,919.36	$9,869.26	168,465.75	3.95	$0.12	2.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	599.39	599,388.00	$11,243.95	69,445.69	7.14	$0.13	0.83	694	10324
City, Rochester	Library	8/1/2014	8/31/2014	84,000	901,079.36	$19,963.01	227,994.27	10.73	0.24	2.71	Measured	100.00%	70.00	92,480.00	315,541.76	$9,576.87	160,153.30	3.76	$0.11	1.91	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	585.54	585,537.60	$10,386.14	67,840.97	6.97	$0.12	0.81	694	10324
City, Rochester	Library	9/1/2014	9/30/2014	84,000	750,993.56	$17,835.93	210,605.18	8.94	0.21	2.51	Measured	100.00%	60.00	92,480.00	315,541.76	$9,731.73	160,153.30	3.76	$0.12	1.91	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	435.45	435,451.80	$8,104.20	50,451.88	5.18	$0.10	0.60	694	10324
City, Rochester	Library	10/1/2014	10/31/2014	84,000	515,880.88	$12,829.06	150,434.82	6.14	0.15	1.79	Measured	100.00%	47.00	67,840.00	231,470.08	$7,542.72	117,482.70	2.76	$0.09	1.40	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	284.41	284,410.80	$5,286.34	32,952.12	3.39	$0.06	0.39	694	10324
City, Rochester	Library	11/1/2014	11/30/2014	84,000	719,249.72	$16,381.50	165,871.76	8.56	0.20	1.97	Measured	100.00%	25.00	61,760.00	210,725.12	$6,862.15	106,953.59	2.51	$0.08	1.27	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	508.52	508,524.60	$9,519.35	58,918.17	6.05	$0.11	0.70	694	10324
City, Rochester	Library	12/1/2014	12/31/2014	84,000	828,110.60	$18,456.83	183,616.43	9.86	0.22	2.19	Measured	100.00%	24.00	65,600.00	223,827.20	$6,614.98	113,603.55	2.66	$0.08	1.35	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	604.28	604,283.40	$11,841.85	70,012.88	7.19	$0.14	0.83	694	10324
City, Rochester	**Mayo Civic Center**			**243558**	**29,341,756.40**	**721,289.60**								**3,602,200.00**	**12,290,706.40**	**445,839.48**					**5,440.00**	**544,000.00**	**5,471.72**					**16,507.05**	**16,507,050.00**	**269,978.40**					**694**	**10320**
City, Rochester	Mayo Civic Center	1/1/2014	1/31/2014	243,558	3,449,652.40	$74,493.98	734,657.38	14.16	0.31	3.02	Measured	100.00%	8.00	250,600.00	855,047.20	$32,811.13	433,979.42	3.51	$0.13	1.78	564.00	56,400.00	$586.32	6,598.97	0.23	$0.00	0.03	2,538.21	2,538,205.20	$41,096.53	294,078.99	10.42	$0.17	1.21	694	10320
City, Rochester	Mayo Civic Center	2/1/2014	2/28/2014	243,558	2,878,996.60	$67,425.09	657,333.00	11.82	0.28	2.70	Measured	100.00%	7.00	242,200.00	826,386.40	$32,910.33	419,432.62	3.39	$0.14	1.72	726.00	72,600.00	$797.33	8,494.42	0.30	$0.00	0.03	1,980.01	1,980,010.20	$33,717.43	229,405.96	8.13	$0.14	0.94	694	10320
City, Rochester	Mayo Civic Center	3/1/2014	3/31/2014	243,558	3,531,354.40	$81,530.33	760,954.77	14.50	0.33	3.12	Measured	100.00%	25.00	263,200.00	898,038.40	$34,151.85	455,799.61	3.69	$0.14	1.87	495.00	49,500.00	$551.77	5,791.65	0.20	$0.00	0.02	2,583.82	2,583,816.00	$46,826.71	299,363.51	10.61	$0.19	1.23	694	10320
City, Rochester	Mayo Civic Center	4/1/2014	4/30/2014	243,558	1,479,766.60	$43,410.56	470,854.71	6.08	0.18	1.93	Measured	100.00%	42.00	224,000.00	764,288.00	$31,748.34	387,914.56	3.14	$0.13	1.59	386.00	38,600.00	$416.80	4,516.32	0.16	$0.00	0.02	676.88	676,878.60	$11,245.42	78,423.83	2.78	$0.05	0.32	694	10320
City, Rochester	Mayo Civic Center	5/1/2014	5/31/2014	243,558	1,646,896.60	$48,694.62	514,537.15	6.76	0.20	2.11	Measured	100.00%	58.00	242,200.00	826,386.40	$35,289.69	419,432.62	3.39	$0.14	1.72	345.00	34,500.00	$374.06	4,036.60	0.14	$0.00	0.02	786.01	786,010.20	$13,030.87	91,067.93	3.23	$0.05	0.37	694	10320
City, Rochester	Mayo Civic Center	6/1/2014	6/30/2014	243,558	1,650,007.60	$50,503.31	614,062.64	6.77	0.21	2.52	Measured	100.00%	68.00	316,400.00	1,079,556.80	$41,364.21	547,929.32	4.43	$0.17	2.25	353.00	35,300.00	$378.97	4,130.21	0.14	$0.00	0.02	535.15	535,150.80	$8,760.13	62,003.11	2.20	$0.04	0.25	694	10320
City, Rochester	Mayo Civic Center	7/1/2014	7/31/2014	243,558	2,339,199.80	$58,695.82	845,459.11	9.60	0.24	3.47	Measured	100.00%	68.00	429,800.00	1,466,477.60	$45,417.06	744,311.07	6.02	$0.19	3.06	294.00	29,400.00	$293.43	3,439.89	0.12	$0.00	0.01	843.32	843,322.20	$12,985.33	97,708.15	3.46	$0.05	0.40	694	10320
City, Rochester	Mayo Civic Center	8/1/2014	8/31/2014	243,558	1,623,803.60	$48,288.50	712,057.42	6.67	0.20	2.92	Measured	100.00%	70.00	392,000.00	1,337,504.00	$44,317.84	678,850.49	5.49	$0.18	2.79	315.00	31,500.00	$291.63	3,685.59	0.13	$0.00	0.02	254.80	254,799.60	$3,679.03	29,521.34	1.05	$0.02	0.12	694	10320
City, Rochester	Mayo Civic Center	9/1/2014	9/30/2014	243,558	2,340,493.60	$61,443.67	806,326.02	9.61	0.25	3.31	Measured	100.00%	60.00	400,400.00	1,366,164.80	$46,812.21	693,397.28	5.61	$0.19	2.85	368.00	36,800.00	$348.11	4,305.71	0.15	$0.00	0.02	937.53	937,528.80	$14,283.35	108,623.02	3.85	$0.06	0.45	694	10320
City, Rochester	Mayo Civic Center	10/1/2014	10/31/2014	243,558	2,204,870.00	$49,112.46	667,145.12	9.05	0.20	2.74	Measured	100.00%	47.00	308,000.00	1,050,896.00	$31,875.00	533,382.53	4.31	$0.13	2.19	543.00	54,300.00	$494.85	6,353.26	0.22	$0.00	0.03	1,099.67	1,099,674.00	$16,742.61	127,409.33	4.52	$0.07	0.52	694	10320
City, Rochester	Mayo Civic Center	11/1/2014	11/30/2014	243,558	2,800,029.80	$65,967.71	659,389.86	11.50	0.27	2.71	Measured	100.00%	25.00	250,600.00	855,047.20	$36,524.40	433,979.42	3.51	$0.15	1.78	550.00	55,000.00	$458.05	6,435.17	0.23	$0.00	0.03	1,889.98	1,889,982.60	$28,985.26	218,975.27	7.76	$0.12	0.90	694	10320
City, Rochester	Mayo Civic Center	12/1/2014	12/31/2014	243,558	3,396,685.40	$71,723.55	771,546.86	13.95	0.29	3.17	Measured	100.00%	24.00	282,800.00	964,913.60	$32,617.42	489,742.14	3.96	$0.13	2.01	501.00	50,100.00	$480.40	5,861.85	0.21	$0.00	0.02	2,381.67	2,381,671.80	$38,625.73	275,942.88	9.78	$0.16	1.13	694	10320
City, Rochester	**MN BioBusiness Center**			**110952**	**12,148,037.60**	**217,768.12**								**1,609,800.00**	**5,492,637.60**	**157,889.99**					**66,554.00**	**6,655,400.00**	**59,878.13**					**0.00**	**0.00**	**0.00**					**694**	**11395**
City, Rochester	MN BioBusiness Center	1/1/2014	1/31/2014	110,952	1,323,478.00	$21,238.02	296,767.17	11.93	0.19	2.67	Measured	100.00%	8.00	106,500.00	363,378.00	$12,211.43	184,432.59	3.28	$0.11	1.66	9,601.00	960,100.00	$9,026.59	112,334.58	8.65	$0.08	1.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	2/1/2014	2/28/2014	110,952	1,257,958.80	$18,944.74	280,306.42	11.34	0.17	2.53	Measured	100.00%	7.00	99,900.00	340,858.80	$10,298.21	173,002.97	3.07	$0.09	1.56	9,171.00	917,100.00	$8,646.53	107,303.45	8.27	$0.08	0.97	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	3/1/2014	3/31/2014	110,952	1,019,097.20	$17,477.08	269,948.52	9.19	0.16	2.43	Measured	100.00%	25.00	113,100.00	385,897.20	$11,089.02	195,862.22	3.48	$0.10	1.77	6,332.00	633,200.00	$6,388.06	74,086.30	5.71	$0.06	0.67	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	4/1/2014	4/30/2014	110,952	939,314.40	$16,756.10	291,395.53	8.47	0.15	2.63	Measured	100.00%	42.00	136,200.00	464,714.40	$12,402.92	235,865.91	4.19	$0.11	2.13	4,746.00	474,600.00	$4,353.18	55,529.62	4.28	$0.04	0.50	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	5/1/2014	5/31/2014	110,952	884,162.80	$17,026.13	292,538.15	7.97	0.15	2.64	Measured	100.00%	58.00	141,900.00	484,162.80	$13,358.80	245,736.95	4.36	$0.12	2.21	4,000.00	400,000.00	$3,667.33	46,801.20	3.61	$0.03	0.42	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	6/1/2014	6/30/2014	110,952	857,244.00	$18,431.80	316,172.77	7.73	0.17	2.85	Measured	100.00%	68.00	162,000.00	552,744.00	$15,679.80	280,545.35	4.98	$0.14	2.53	3,045.00	304,500.00	$2,752.00	35,627.41	2.74	$0.02	0.32	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	7/1/2014	7/31/2014	110,952	879,006.80	$19,088.63	307,925.45	7.92	0.17	2.78	Measured	100.00%	68.00	153,900.00	525,106.80	$15,877.22	266,518.09	4.73	$0.14	2.40	3,539.00	353,900.00	$3,211.41	41,407.36	3.19	$0.03	0.37	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	8/1/2014	8/31/2014	110,952	890,655.20	$19,386.93	316,883.87	8.03	0.17	2.86	Measured	100.00%	70.00	159,600.00	544,555.20	$16,491.78	276,389.13	4.91	$0.15	2.49	3,461.00	346,100.00	$2,895.15	40,494.74	3.12	$0.03	0.36	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	9/1/2014	9/30/2014	110,952	809,732.40	$17,983.47	278,232.87	7.30	0.16	2.51	Measured	100.00%	60.00	137,700.00	469,832.40	$15,086.99	238,463.55	4.23	$0.14	2.15	3,399.00	339,900.00	$2,896.48	39,769.32	3.06	$0.03	0.36	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	10/1/2014	10/31/2014	110,952	881,795.20	$15,412.77	275,870.80	7.95	0.14	2.49	Measured	100.00%	47.00	129,600.00	442,195.20	$11,697.12	224,436.28	3.99	$0.11	2.02	4,396.00	439,600.00	$3,715.65	51,434.52	3.96	$0.03	0.46	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	11/1/2014	11/30/2014	110,952	1,149,554.80	$16,976.28	311,596.88	10.36	0.15	2.81	Measured	100.00%	25.00	132,900.00	453,454.80	$11,869.81	230,151.10	4.09	$0.11	2.07	6,961.00	696,100.00	$5,106.47	81,445.79	6.27	$0.05	0.73	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	MN BioBusiness Center	12/1/2014	12/31/2014	110,952	1,256,038.00	$19,046.17	328,852.91	11.32	0.17	2.96	Measured	100.00%	24.00	136,500.00	465,738.00	$11,826.89	236,385.44	4.20	$0.11	2.13	7,903.00	790,300.00	$7,219.28	92,467.47	7.12	$0.07	0.83	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	11395
City, Rochester	**Public Work TOB**			**22250**	**1,972,470.24**	**24,716.87**								**83,520.00**	**284,970.24**	**9,058.40**					**16,875.00**	**1,687,500.00**	**15,658.47**					**0.00**	**0.00**	**0.00**					**694**	**12272**
City, Rochester	Public Work TOB	1/1/2014	1/31/2014	22,250	342,713.60	$3,663.54	50,492.39	15.40	0.16	2.27	Measured	100.00%	8.00	7,800.00	26,613.60	$768.17	13,507.74	1.20	$0.03	0.61	3,161.00	316,100.00	$2,895.37	36,984.65	14.21	$0.13	1.66	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	2/1/2014	2/28/2014	22,250	327,813.60	$3,757.20	48,749.04	14.73	0.17	2.19	Measured	100.00%	7.00	7,800.00	26,613.60	$786.34	13,507.74	1.20	$0.04	0.61	3,012.00	301,200.00	$2,970.86	35,241.30	13.54	$0.13	1.58	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	3/1/2014	3/31/2014	22,250	183,804.16	$2,323.12	31,739.60	8.26	0.10	1.43	Measured	100.00%	25.00	7,680.00	26,204.16	$774.71	13,299.93	1.18	$0.03	0.60	1,576.00	157,600.00	$1,548.41	18,439.67	7.08	$0.07	0.83	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	4/1/2014	4/30/2014	22,250	131,490.88	$1,675.17	23,699.92	5.91	0.08	1.07	Measured	100.00%	42.00	6,240.00	21,290.88	$635.05	10,806.19	0.96	$0.03	0.49	1,102.00	110,200.00	$1,040.12	12,893.73	4.95	$0.05	0.58	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	5/1/2014	5/31/2014	22,250	69,781.44	$1,103.15	16,319.83	3.14	0.05	0.73	Measured	100.00%	58.00	6,120.00	20,881.44	$623.42	10,598.38	0.94	$0.03	0.48	489.00	48,900.00	$479.73	5,721.45	2.20	$0.02	0.26	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	6/1/2014	6/30/2014	22,250	47,919.20	$954.45	14,401.50	2.15	0.04	0.65	Measured	100.00%	68.00	6,600.00	22,519.20	$688.23	11,429.63	1.01	$0.03	0.51	254.00	25,400.00	$266.22	2,971.88	1.14	$0.01	0.13	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	7/1/2014	7/31/2014	22,250	43,275.84	$1,096.45	14,817.65	1.94	0.05	0.67	Measured	100.00%	68.00	7,320.00	24,975.84	$898.86	12,676.49	1.12	$0.04	0.57	183.00	18,300.00	$197.59	2,141.15	0.82	$0.01	0.10	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	8/1/2014	8/31/2014	22,250	47,785.28	$1,131.86	15,505.17	2.15	0.05	0.70	Measured	100.00%	70.00	7,440.00	25,385.28	$913.11	12,884.31	1.14	$0.04	0.58	224.00	22,400.00	$218.75	2,620.87	1.01	$0.01	0.12	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	9/1/2014	9/30/2014	22,250	123,594.72	$1,787.03	24,535.01	5.55	0.08	1.10	Measured	100.00%	60.00	7,560.00	25,794.72	$927.34	13,092.12	1.16	$0.04	0.59	978.00	97,800.00	$859.69	11,442.89	4.40	$0.04	0.51	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	10/1/2014	10/31/2014	22,250	143,172.00	$1,795.00	24,746.84	6.43	0.08	1.11	Measured	100.00%	47.00	6,000.00	20,472.00	$726.51	10,390.57	0.92	$0.03	0.47	1,227.00	122,700.00	$1,068.49	14,356.27	5.51	$0.05	0.65	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	11/1/2014	11/30/2014	22,250	220,181.44	$2,342.06	33,917.08	9.90	0.11	1.52	Measured	100.00%	25.00	6,120.00	20,881.44	$623.42	10,598.38	0.94	$0.03	0.48	1,993.00	199,300.00	$1,718.64	23,318.70	8.96	$0.08	1.05	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	Public Work TOB	12/1/2014	12/31/2014	22,250	290,938.08	$3,087.84	43,155.25	13.08	0.14	1.94	Measured	100.00%	24.00	6,840.00	23,338.08	$693.24	11,845.25	1.05	$0.03	0.53	2,676.00	267,600.00	$2,394.60	31,310.00	12.03	$0.11	1.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12272
City, Rochester	**Public Works TOC**			**319562**	**20,975,395.61**	**326,329.67**								**1,866,851.00**	**6,369,695.61**	**187,498.71**					**146,057.00**	**14,605,700.00**	**138,830.96**					**0.00**	**0.00**	**0.00**					**694**	**12233**
City, Rochester	Public Works TOC	1/1/2014	1/31/2014	319,562	3,877,532.01	$47,206.20	748,910.05	12.13	0.15	2.34	Measured	100.00%	8.00	221,551.00	755,932.01	$19,210.67	383,673.48	2.37	$0.06	1.20	31,216.00	3,121,600.00	$27,995.53	365,236.56	9.77	$0.09	1.14	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	2/1/2014	2/28/2014	319,562	3,969,325.34	$50,429.35	742,541.57	12.42	0.16	2.32	Measured	100.00%	7.00	208,712.00	712,125.34	$19,117.22	361,439.40	2.23	$0.06	1.13	32,572.00	3,257,200.00	$31,312.13	381,102.17	10.19	$0.10	1.19	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	3/1/2014	3/31/2014	319,562	3,103,069.94	$43,077.71	593,948.29	9.71	0.13	1.86	Measured	100.00%	25.00	173,262.00	591,169.94	$17,094.09	300,048.45	1.85	$0.05	0.94	25,119.00	2,511,900.00	$25,983.62	293,899.84	7.86	$0.08	0.92	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	4/1/2014	4/30/2014	319,562	1,558,804.59	$25,018.39	365,631.38	4.88	0.08	1.14	Measured	100.00%	42.00	137,516.00	469,204.59	$14,203.95	238,144.91	1.47	$0.04	0.75	10,896.00	1,089,600.00	$10,814.44	127,486.47	3.41	$0.03	0.40	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	5/1/2014	5/31/2014	319,562	1,012,957.36	$19,075.22	296,787.22	3.17	0.06	0.93	Measured	100.00%	58.00	133,780.00	456,457.36	$13,725.62	231,675.05	1.43	$0.04	0.72	5,565.00	556,500.00	$5,349.60	65,112.17	1.74	$0.02	0.20	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	6/1/2014	6/30/2014	319,562	573,111.78	$15,501.31	243,704.92	1.79	0.05	0.76	Measured	100.00%	68.00	132,565.00	452,311.78	$14,195.20	229,570.96	1.42	$0.04	0.72	1,208.00	120,800.00	$1,306.11	14,133.96	0.38	$0.00	0.04	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	7/1/2014	7/31/2014	319,562	556,873.72	$17,462.48	260,809.81	1.74	0.05	0.82	Measured	100.00%	68.00	146,827.00	500,973.72	$16,772.99	254,269.34	1.57	$0.05	0.80	559.00	55,900.00	$689.49	6,540.47	0.17	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	8/1/2014	8/31/2014	319,562	484,876.32	$14,254.11	224,423.72	1.52	0.04	0.70	Measured	100.00%	70.00	125,843.00	429,376.32	$13,598.84	217,930.06	1.34	$0.04	0.68	555.00	55,500.00	$655.27	6,493.67	0.17	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	9/1/2014	9/30/2014	319,562	591,931.24	$17,058.79	264,192.07	1.85	0.05	0.83	Measured	100.00%	60.00	146,287.00	499,131.24	$16,110.47	253,334.19	1.56	$0.05	0.79	928.00	92,800.00	$948.32	10,857.88	0.29	$0.00	0.03	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	10/1/2014	10/31/2014	319,562	713,489.05	$15,466.63	243,991.00	2.23	0.05	0.76	Measured	100.00%	47.00	120,454.00	410,989.05	$12,699.81	208,597.59	1.29	$0.04	0.65	3,025.00	302,500.00	$2,766.82	35,393.41	0.95	$0.01	0.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	11/1/2014	11/30/2014	319,562	1,680,144.80	$24,567.50	383,671.61	5.26	0.08	1.20	Measured	100.00%	25.00	140,400.00	479,044.80	$14,023.46	243,139.31	1.50	$0.04	0.76	12,011.00	1,201,100.00	$10,544.04	140,532.30	3.76	$0.03	0.44	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	Public Works TOC	12/1/2014	12/31/2014	319,562	2,853,279.45	$37,211.98	573,239.69	8.93	0.12	1.79	Measured	100.00%	24.00	179,654.00	612,979.45	$16,746.39	311,117.87	1.92	$0.05	0.97	22,403.00	2,240,300.00	$20,465.59	262,121.82	7.01	$0.06	0.82	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	12233
City, Rochester	**Rec Center**			**99000**	**33,300,650.76**	**444,402.68**								**3,427,213.00**	**11,693,650.76**	**300,826.13**					**216,070.00**	**21,607,000.00**	**143,576.55**					**0.00**	**0.00**	**0.00**					**694**	**10323**
City, Rochester	Rec Center	1/1/2014	1/31/2014	99,000	3,436,805.22	$40,063.59	792,822.03	34.72	0.40	8.01	Measured	100.00%	8.00	293,202.00	1,000,405.22	$24,136.52	507,755.92	10.11	$0.24	5.13	24,364.00	2,436,400.00	$15,927.07	285,066.11	24.61	$0.16	2.88	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	2/1/2014	2/28/2014	99,000	3,401,392.21	$43,019.28	734,309.34	34.36	0.43	7.42	Measured	100.00%	7.00	252,401.00	861,192.21	$22,078.98	437,098.32	8.70	$0.22	4.42	25,402.00	2,540,200.00	$20,940.30	297,211.02	25.66	$0.21	3.00	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323

Organization Name	Site Name	Start Date	End Date	SF	Total kBtu	Total Dollars	Total CO2 Pounds	Total kBtu/SF	Total Dollars/SF	Total CO2 Pounds/SF	Status	Completeness	Avg Outside Air Temp	Electric kWh	Electric kBtu	Electric Dollars	Electric CO2 Pounds	Electric kBtu/SF	Electric Dollars/SF	Electric CO2 Pounds/SF	Natural Gas Therms	Natural Gas kBtu	Natural Gas Dollars	Natural Gas CO2 Pounds	Natural Gas kBtu/SF	Natural Gas Dollars/SF	Natural Gas CO2 Pounds/SF	Steam/Hot Water MMBTu	Steam/Hot Water kBtu	Steam/Hot Water Dollars	Steam/Hot Water CO2 Pounds	Steam/Hot Water kBtu/SF	Steam/Hot Water Dollars/SF	Steam/Hot Water CO2 Pounds/SF	Org ID	Site ID
City, Rochester	Rec Center	3/1/2014	3/31/2014	99,000	3,450,296.21	$41,553.74	729,370.88	34.85	0.42	7.37	Measured	100.00%	25.00	244,401.00	833,896.21	$21,554.79	423,244.23	8.42	$0.22	4.28	26,164.00	2,616,400.00	$19,998.95	306,126.65	26.43	$0.20	3.09	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	4/1/2014	4/30/2014	99,000	2,624,085.81	$33,203.92	607,116.88	26.51	0.34	6.13	Measured	100.00%	42.00	225,201.00	768,385.81	$20,429.38	389,994.41	7.76	$0.21	3.94	18,557.00	1,855,700.00	$12,774.54	217,122.47	18.74	$0.13	2.19	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	5/1/2014	5/31/2014	99,000	2,359,962.61	$32,452.62	644,706.60	23.84	0.33	6.51	Measured	100.00%	58.00	276,601.00	943,762.61	$23,875.54	479,006.95	9.53	$0.24	4.84	14,162.00	1,416,200.00	$8,577.08	165,699.65	14.31	$0.09	1.67	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	6/1/2014	6/30/2014	99,000	2,330,921.81	$37,415.90	710,068.17	23.54	0.38	7.17	Measured	100.00%	68.00	328,201.00	1,119,821.81	$29,484.70	568,365.84	11.31	$0.30	5.74	12,111.00	1,211,100.00	$7,931.20	141,702.33	12.23	$0.08	1.43	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	7/1/2014	7/31/2014	99,000	2,482,604.21	$42,065.16	794,709.34	25.08	0.42	8.03	Measured	100.00%	68.00	378,401.00	1,291,104.21	$34,160.80	655,300.26	13.04	$0.35	6.62	11,915.00	1,191,500.00	$7,904.36	139,409.07	12.04	$0.08	1.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	8/1/2014	8/31/2014	99,000	1,995,268.21	$35,538.86	667,064.56	20.15	0.36	6.74	Measured	100.00%	70.00	325,401.00	1,110,268.21	$30,316.16	563,516.91	11.21	$0.31	5.69	8,850.00	885,000.00	$5,222.70	103,547.66	8.94	$0.05	1.05	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	9/1/2014	9/30/2014	99,000	2,337,853.01	$35,767.11	721,006.50	23.61	0.36	7.28	Measured	100.00%	60.00	335,801.00	1,145,753.01	$28,524.88	581,527.23	11.57	$0.29	5.87	11,921.00	1,192,100.00	$7,242.23	139,479.28	12.04	$0.07	1.41	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	10/1/2014	10/31/2014	99,000	2,661,271.41	$33,842.29	663,170.54	26.88	0.34	6.70	Measured	100.00%	47.00	264,001.00	900,771.41	$23,305.98	457,186.75	9.10	$0.24	4.62	17,605.00	1,760,500.00	$10,536.31	205,983.78	17.78	$0.11	2.08	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	11/1/2014	11/30/2014	99,000	3,083,516.21	$32,771.18	699,781.99	31.15	0.33	7.07	Measured	100.00%	25.00	254,401.00	868,016.21	$21,935.06	440,561.84	8.77	$0.22	4.45	22,155.00	2,215,500.00	$10,836.12	259,220.15	22.38	$0.11	2.62	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	Rec Center	12/1/2014	12/31/2014	99,000	3,136,673.81	$36,709.03	699,072.34	31.68	0.37	7.06	Measured	100.00%	24.00	249,201.00	850,273.81	$21,023.34	431,556.69	8.59	$0.21	4.36	22,864.00	2,286,400.00	$15,685.69	267,515.66	23.09	$0.16	2.70	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10323
City, Rochester	**Rochester City Hall**			**84480**	**12,029,234.24**	**258,689.92**								**820,520.00**	**2,799,614.24**	**85,566.85**					**0.00**	**0.00**	**0.00**					**9,229.62**	**9,229,620.00**	**173,123.07**						**694**	**4403**
City, Rochester	Rochester City Hall	1/1/2014	1/31/2014	84,480	1,187,681.80	$24,424.49	240,779.46	14.06	0.29	2.85	Measured	100.00%	8.00	77,200.00	263,406.40	$7,314.29	133,691.98	3.12	$0.09	1.58	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	924.28	924,275.40	$17,110.20	107,087.47	10.94	$0.20	1.27	694	4403
City, Rochester	Rochester City Hall	2/1/2014	2/28/2014	84,480	1,226,758.16	$25,869.73	241,671.76	14.52	0.31	2.86	Measured	100.00%	7.00	74,480.00	254,125.76	$7,225.20	128,981.59	3.01	$0.09	1.53	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	972.63	972,632.40	$18,644.53	112,690.16	11.51	$0.22	1.33	694	4403
City, Rochester	Rochester City Hall	3/1/2014	3/31/2014	84,480	778,062.84	$17,867.02	172,899.73	9.21	0.21	2.05	Measured	100.00%	25.00	61,920.00	211,271.04	$6,510.79	107,230.67	2.50	$0.08	1.27	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	566.79	566,791.80	$11,356.23	65,669.06	6.71	$0.13	0.78	694	4403
City, Rochester	Rochester City Hall	4/1/2014	4/30/2014	84,480	649,417.00	$14,807.47	155,963.30	7.69	0.18	1.85	Measured	100.00%	42.00	60,400.00	206,084.80	$6,424.33	104,598.39	2.44	$0.08	1.24	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	443.33	443,332.20	$8,383.14	51,364.91	5.25	$0.10	0.61	694	4403
City, Rochester	Rochester City Hall	5/1/2014	5/31/2014	84,480	1,092,600.12	$23,085.70	217,681.75	12.93	0.27	2.58	Measured	100.00%	58.00	68,160.00	232,561.92	$6,865.72	118,036.86	2.75	$0.08	1.40	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	860.04	860,038.20	$16,219.98	99,644.89	10.18	$0.19	1.18	694	4403
City, Rochester	Rochester City Hall	6/1/2014	6/30/2014	84,480	1,289,872.88	$27,808.69	256,682.21	15.27	0.33	3.04	Measured	100.00%	68.00	80,240.00	273,778.88	$8,862.50	138,956.54	3.24	$0.10	1.64	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	1,016.09	1,016,094.00	$18,946.19	117,725.67	12.03	$0.22	1.39	694	4403
City, Rochester	Rochester City Hall	7/1/2014	7/31/2014	84,480	1,195,288.92	$25,716.07	240,805.50	14.15	0.30	2.85	Measured	100.00%	68.00	76,560.00	261,222.72	$8,206.77	132,583.66	3.09	$0.10	1.57	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	934.07	934,066.20	$17,509.30	108,221.84	11.06	$0.21	1.28	694	4403
City, Rochester	Rochester City Hall	8/1/2014	8/31/2014	84,480	1,300,993.36	$26,623.93	256,153.07	15.40	0.32	3.03	Measured	100.00%	70.00	78,880.00	269,138.56	$8,338.73	136,601.34	3.19	$0.10	1.62	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	1,031.85	1,031,854.80	$18,285.20	119,551.73	12.21	$0.22	1.42	694	4403
City, Rochester	Rochester City Hall	9/1/2014	9/30/2014	84,480	1,124,976.36	$24,293.39	225,602.59	13.32	0.29	2.67	Measured	100.00%	60.00	71,280.00	243,207.36	$7,906.45	123,439.96	2.88	$0.09	1.46	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	881.77	881,769.00	$16,386.94	102,162.64	10.44	$0.19	1.21	694	4403
City, Rochester	Rochester City Hall	10/1/2014	10/31/2014	84,480	770,812.00	$16,755.73	168,424.52	9.12	0.20	1.99	Measured	100.00%	47.00	59,200.00	201,990.40	$6,206.14	102,520.28	2.39	$0.07	1.21	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	568.82	568,821.60	$10,549.59	65,904.24	6.73	$0.12	0.78	694	4403
City, Rochester	Rochester City Hall	11/1/2014	11/30/2014	84,480	706,777.20	$15,517.57	155,659.61	8.37	0.18	1.84	Measured	100.00%	25.00	55,200.00	188,342.40	$5,813.16	95,593.23	2.23	$0.07	1.13	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	518.43	518,434.80	$9,704.41	60,066.37	6.14	$0.11	0.71	694	4403
City, Rochester	Rochester City Hall	12/1/2014	12/31/2014	84,480	705,993.60	$15,920.13	157,974.42	8.36	0.19	1.87	Measured	100.00%	24.00	57,000.00	194,484.00	$5,892.77	98,710.40	2.30	$0.07	1.17	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	511.51	511,509.60	$10,027.36	59,264.01	6.05	$0.12	0.70	694	4403
City, Rochester	**RPU Service Center**			**116023**	**8,552,671.36**	**29,692.19**								**1,868,280.00**	**6,374,571.36**	**9,347.33**					**21,781.00**	**2,178,100.00**	**20,344.86**					**0.00**	**0.00**	**0.00**					**694**	**9937**
City, Rochester	RPU Service Center	1/1/2014	1/31/2014	116,023	1,178,150.08	$5,055.98	414,803.71	10.15	0.04	3.58	Measured	100.00%	8.00	207,840.00	709,150.08	$1,108.33	359,929.30	6.11	$0.01	3.10	4,690.00	469,000.00	$3,947.65	54,874.41	4.04	$0.03	0.47	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	2/1/2014	2/28/2014	116,023	1,161,893.44	$5,204.03	411,942.20	10.01	0.04	3.55	Measured	100.00%	7.00	207,120.00	706,693.44	$1,000.69	358,682.43	6.09	$0.01	3.09	4,552.00	455,200.00	$4,203.34	53,259.77	3.92	$0.04	0.46	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	3/1/2014	3/31/2014	116,023	919,138.40	$4,633.84	325,013.66	7.92	0.04	2.80	Measured	100.00%	25.00	163,200.00	556,838.40	$764.82	282,623.47	4.80	$0.01	2.44	3,623.00	362,300.00	$3,869.02	42,390.19	3.12	$0.03	0.37	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	4/1/2014	4/30/2014	116,023	665,402.88	$2,670.49	254,070.18	5.74	0.02	2.19	Measured	100.00%	42.00	132,240.00	451,202.88	$609.67	229,008.13	3.89	$0.01	1.97	2,142.00	214,200.00	$2,060.82	25,062.04	1.85	$0.02	0.22	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	5/1/2014	5/31/2014	116,023	551,857.44	$1,656.76	236,627.47	4.76	0.01	2.04	Measured	100.00%	58.00	129,120.00	440,557.44	$606.97	223,605.04	3.80	$0.01	1.93	1,113.00	111,300.00	$1,049.79	13,022.43	0.96	$0.01	0.11	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	6/1/2014	6/30/2014	116,023	486,423.84	$901.87	238,565.88	4.19	0.01	2.06	Measured	100.00%	68.00	136,320.00	465,123.84	$671.24	236,073.72	4.01	$0.01	2.03	213.00	21,300.00	$230.63	2,492.16	0.18	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	7/1/2014	7/31/2014	116,023	542,602.08	$999.28	268,485.13	4.68	0.01	2.31	Measured	100.00%	68.00	153,840.00	524,902.08	$801.53	266,414.18	4.52	$0.01	2.30	177.00	17,700.00	$197.75	2,070.95	0.15	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	8/1/2014	8/31/2014	116,023	526,700.00	$1,003.69	261,507.56	4.54	0.01	2.25	Measured	100.00%	70.00	150,000.00	511,800.00	$838.56	259,764.22	4.41	$0.01	2.24	149.00	14,900.00	$165.13	1,743.34	0.13	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	9/1/2014	9/30/2014	116,023	534,588.80	$934.12	265,628.69	4.61	0.01	2.29	Measured	100.00%	60.00	152,400.00	519,988.80	$775.41	263,920.44	4.48	$0.01	2.27	146.00	14,600.00	$158.71	1,708.24	0.13	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	10/1/2014	10/31/2014	116,023	452,206.40	$797.99	222,409.51	3.90	0.01	1.92	Measured	100.00%	47.00	127,200.00	434,006.40	$606.05	220,280.06	3.74	$0.01	1.90	182.00	18,200.00	$191.94	2,129.45	0.16	$0.00	0.02	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	11/1/2014	11/30/2014	116,023	634,280.80	$2,010.76	265,300.03	5.47	0.02	2.29	Measured	100.00%	25.00	143,400.00	489,280.80	$753.11	248,334.59	4.22	$0.01	2.14	1,450.00	145,000.00	$1,257.65	16,965.44	1.25	$0.01	0.15	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	RPU Service Center	12/1/2014	12/31/2014	116,023	899,427.20	$3,823.38	325,905.50	7.75	0.03	2.81	Measured	100.00%	24.00	165,600.00	565,027.20	$810.95	286,779.70	4.87	$0.01	2.47	3,344.00	334,400.00	$3,012.43	39,125.80	2.88	$0.03	0.34	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	9937
City, Rochester	**Water Reclamation Plant**			**355000**	**52,190,589.60**	**1,169,908.44**								**13,780,800.00**	**47,020,089.60**	**1,121,668.73**					**51,705.00**	**5,170,500.00**	**48,239.71**					**0.00**	**0.00**	**0.00**					**694**	**10321**
City, Rochester	Water Reclamation Plant	1/1/2014	1/31/2014	355,000	6,803,707.20	$138,727.66	2,935,591.96	19.17	0.39	8.27	Measured	100.00%	8.00	1,605,600.00	5,478,307.20	$126,673.51	2,780,516.18	15.43	$0.36	7.83	13,254.00	1,325,400.00	$12,054.15	155,075.78	3.73	$0.03	0.44	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	2/1/2014	2/28/2014	355,000	5,644,014.40	$120,098.65	2,540,857.24	15.90	0.34	7.16	Measured	100.00%	7.00	1,411,200.00	4,815,014.40	$112,003.65	2,443,861.76	13.56	$0.32	6.88	8,290.00	829,000.00	$8,095.00	96,995.49	2.34	$0.02	0.27	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	3/1/2014	3/31/2014	355,000	5,978,376.80	$125,821.91	2,733,488.09	16.84	0.35	7.70	Measured	100.00%	25.00	1,526,400.00	5,208,076.80	$118,249.19	2,643,360.68	14.67	$0.33	7.45	7,703.00	770,300.00	$7,572.72	90,127.41	2.17	$0.02	0.25	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	4/1/2014	4/30/2014	355,000	5,273,058.40	$105,855.49	2,113,680.68	14.85	0.30	5.95	Measured	100.00%	42.00	1,123,200.00	3,832,358.40	$92,808.56	1,945,114.46	10.80	$0.26	5.48	14,407.00	1,440,700.00	$13,046.93	168,566.22	4.06	$0.04	0.47	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	5/1/2014	5/31/2014	355,000	3,612,796.80	$84,071.39	1,737,132.64	10.18	0.24	4.89	Measured	100.00%	58.00	986,400.00	3,365,596.80	$81,786.23	1,708,209.49	9.48	$0.23	4.81	2,472.00	247,200.00	$2,285.16	28,923.14	0.70	$0.01	0.08	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	6/1/2014	6/30/2014	355,000	2,964,668.00	$76,332.71	1,498,195.84	8.35	0.22	4.22	Measured	100.00%	68.00	864,000.00	2,947,968.00	$76,127.97	1,496,241.89	8.30	$0.21	4.21	167.00	16,700.00	$204.74	1,953.95	0.05	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	7/1/2014	7/31/2014	355,000	3,169,065.60	$77,359.45	1,608,460.03	8.93	0.22	4.53	Measured	100.00%	68.00	928,800.00	3,169,065.60	$77,303.60	1,608,460.03	8.93	$0.22	4.53	0.00	0.00	$55.85	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	8/1/2014	8/31/2014	355,000	3,046,233.60	$78,374.60	1,546,116.62	8.58	0.22	4.36	Measured	100.00%	70.00	892,800.00	3,046,233.60	$78,318.75	1,546,116.62	8.58	$0.22	4.36	0.00	0.00	$55.85	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	9/1/2014	9/30/2014	355,000	3,488,428.80	$81,618.90	1,770,552.91	9.83	0.23	4.99	Measured	100.00%	60.00	1,022,400.00	3,488,428.80	$81,563.05	1,770,552.91	9.83	$0.23	4.99	0.00	0.00	$55.85	0.00	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	10/1/2014	10/31/2014	355,000	3,390,763.20	$79,079.10	1,720,748.38	9.55	0.22	4.85	Measured	100.00%	47.00	993,600.00	3,390,163.20	$79,018.23	1,720,678.18	9.55	$0.22	4.85	6.00	600.00	$60.87	70.20	0.00	$0.00	0.00	0.00	0.00	$0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	11/1/2014	11/30/2014	355,000	3,355,864.00	$86,666.04	1,687,882.05	9.45	0.24	4.75	Measured	100.00%	25.00	972,000.00	3,316,464.00	$86,269.54	1,683,272.13	9.34	$0.24	4.74	394.00	39,400.00	$396.50	4,609.92	0.11	$0.00	0.01	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
City, Rochester	Water Reclamation Plant	12/1/2014	12/31/2014	355,000	5,463,612.80	$115,902.54	2,577,315.76	15.39	0.33	7.26	Measured	100.00%	24.00	1,454,400.00	4,962,412.80	$111,546.45	2,518,673.85	13.98	$0.31	7.09	5,012.00	501,200.00	$4,356.09	58,641.90	1.41	$0.01	0.17	0.00	0.00	$0.00	0.00	0.00	$0.00	0.00	694	10321
					1,233,490,079.62	**$23,531,923.06**	**329,996,209.90**																														

Fuel Usage Type	Gallons	Dollars	Calculated Miles
Unleaded	170,539	$ 514.616	4,139.246
Diesel	485.281	$ 1.700.182	3.230.025

	Unleaded	Diesel	Unsure	Total	Avg MPG Gas	Avg MPG Diesel	Miles Gas	Miles Diesel	Gallons Gas	Gallons Diesel	Avg EF Gas g CH4/mi	Avg EF Gas g N2O/mi	Avg EF Diesel g CH4/mi	Avg EF Diesel g N2O/mi
Cars	50	0	0	50	33.47	33.47	1,219,718.75	-	36,429.97	-	0.0185	0.0049		
Liqht Trucks	93	15	0	108	23.40	23.40	1,585,827.15	473,093.57	67,778.35	20,220.05	0.0185	0.0152	0.0001	0.0001
SUV	64	0	0	64	23.40	23.40	1,091,321.91	-	46,643.16	-	0.0185	0.0152	0.0001	0.0001
Vans	10	0	0	10	23.40	23.40	170,519.05	-	7,287.99		0.0185	0.0152	0.0001	0.0001
Buses	0	52	0	52	6.65	6.65	-	466.134.55	-	70.096.17			0.0051	0.0048
Fire Trucks	14	1	0	15	5.80	5.80	59,178.51	7,818.42	10,203.19	1,348.00	0.073143	0.086143	0.005165	0.004862
Heavv Truck	2	72	6	80	5.80	5.80	8,454.07	609,836.65	1,457.60	105,144.25	0.073143	0.086143	0.005165	0.004862
Misc	1	19	195	215	5.80	5.80	4,227.04	1,673,141.56	728.80	288,472.68	0.504	0.224 g/gal	0.576	0.256 g/gal
Total	234	159	201	594	24.27	6.65								

	Light Duty Vehicles						mpg		Average mpg by MY Car	Avg mpg by MY LDT		Gasoline cars					LDT					Diesel LDT				
	Cars	Light Trucks	Light Truck (Diesel)	SUVs	Vans	Total	Passenger	LDT			Avg*Total (Calc Cell)	CH4 g/mi	N2O g/mi	EF*Cars	EF*Cars		CH4 g/mi	N2O g/mi	EF*LDTS	EF*LDTS		CH4 g/mi	N2O g/mi	EF*LDT	EF*LDT
1994	-	1		-	-	1.00	28.3	20.8	0.0	20.8	-	0.0631	0.056	-	-		0.0646	0.0982	0.06	0.10		0.0009	0.0014	-	-
1995	-	2		-	-	2.00	28.6	20.5	0.0	41.0	-	0.0298	0.0473	-	-		0.0517	0.0908	0.10	0.18		0.0009	0.0014	-	-
1996	-	1	1	1	-	3.00	28.5	20.8	0.0	62.4	-	0.0272	0.0426	-	-		0.0452	0.0871	0.09	0.17		0.001	0.0015	0.001	0.00
1997	-	1			-	1.00	28.7	20.6	0.0	20.6	-	0.0268	0.0422	-	-		0.0452	0.0871	0.05	0.09		0.001	0.0015	-	-
1998	-	-		-	-	-	28.8	21.0	0.0	0.0	-	0.0249	0.0393	-	-		0.0391	0.0728	-	-		0.001	0.0015	-	-
1999	-	5		-	-	5.00	28.3	20.9	0.0	104.5	-	0.0216	0.0337	-	-		0.0321	0.0564	0.16	0.28		0.001	0.0015	-	-
2000	-	6	2	-	-	8.00	28.5	21.3	0.0	170.4	-	0.0178	0.0273	-	-		0.0346	0.0621	0.21	0.37		0.001	0.0015	0.002	0.00
2001	2	7	2	-	2	13.00	28.8	20.9	57.6	229.9	748.80	0.011	0.0158	0.02	0.03		0.0151	0.0164	0.14	0.15		0.001	0.0015	0.002	0.00
2002	1	6		1	1	9.00	29.0	21.4	29.0	171.2	261.00	0.107	0.0153	0.11	0.02		0.0178	0.0228	0.14	0.18		0.001	0.0015	-	-
2003	1	6	3	-	1	11.00	29.5	21.8	29.5	218.0	324.50	0.0114	0.0135	0.01	0.01		0.0155	0.0114	0.11	0.08		0.001	0.0015	0.003	0.00
2004	1	5		-	-	6.00	29.5	21.5	29.5	107.5	177.00	0.0145	0.0083	0.01	0.01		0.0152	0.0132	0.08	0.07		0.001	0.0015	-	-
2005	2	4	2	5	-	13.00	30.3	22.1	60.6	243.1	787.80	0.0147	0.0079	0.03	0.02		0.0157	0.0101	0.14	0.09		0.001	0.0015	0.002	0.00
2006	1	8		2	-	11.00	30.1	22.5	30.1	225.0	331.10	0.0161	0.0057	0.02	0.01		0.0159	0.0089	0.16	0.09		0.001	0.0015	-	-
2007	1	7		3	1	12.00	31.2	23.1	31.2	254.1	374.40	0.017	0.0041	0.02	0.00		0.0161	0.0079	0.18	0.09		0.001	0.0015	-	-
2008	3	4	1	5	3	16.00	31.5	23.6	94.5	306.8	1,512.00	0.0172	0.0038	0.05	0.01		0.0163	0.0066	0.20	0.08		0.001	0.0015	0.001	0.00
2009	8	5		9	1	23.00	32.9	24.8	263.2	372.0	6,053.60	0.0173	0.0036	0.14	0.03		0.0163	0.0066	0.24	0.10		0.001	0.0015	-	-
2010	5	2	1	4	-	12.00	33.9	25.2	169.5	176.4	2,034.00	0.0173	0.0036	0.09	0.02		0.0163	0.0066	0.10	0.04		0.001	0.0015	0.001	0.00
2011	7	2		6	-	15.00	33.1	24.7	231.7	197.6	3,475.50	0.0173	0.0036	0.12	0.03		0.0163	0.0066	0.13	0.05		0.001	0.0015	-	-
2012	1	8	1	4	-	14.00	35.2	25.0	35.2	325.0	492.80	0.0173	0.0036	0.02	0.00		0.0163	0.0066	0.20	0.08		0.001	0.0015	0.001	0.00
2013	12	5		11	-	28.00	36.0	25.3	432.0	404.8	12,096.00	0.0173	0.0036	0.21	0.04		0.0163	0.0066	0.26	0.11		0.001	0.0015	-	-
2014	5	8	2	5	1	21.00	36.0	25.3	180.0	404.8	3,780.00	0.0173	0.0036	0.09	0.02		0.0163	0.0066	0.23	0.09		0.001	0.0015	0.002	0.00
2015	-	-		8	-	8.00	36.0	25.3	0.0	202.4	-	0.0173	0.0036	-	-		0.0163	0.0066	0.13	0.05		0.001	0.0015	-	-
Totals	50.00	93.00	15.00	64.00	10.00	232.00			33.47	23.40	-	avg gas passenger car		0.0185	0.0049		avg gas LDT		0.0185	0.0152		avg diesel LDG		0.0001	0.0001

mpg from DOT Table 4-23. EF from TCR 2015 Default Emission Factors Table 13.5
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_23.html

Year	Buses	mpg	Buses*mpg
1999	4	6.7	27
2000	4	6.8	27
2001	-	6.9	
2002	-	6.8	
2003	8	7.0	56
2004	6	5.0	30
2005	10	6.2	62
2006	-	5.9	-
2007	4	7.2	29
2008	-	7.2	-
2009	-	7.2	-
2010	5	7.2	36
2011	3	7.1	21
2012	2	7.2	14
2013	-	7.2	-
2014	6	7.2	43
2015	-	7.2	-
Total Buses	52	Avg mpg	6.65

Diesel	
CH4 g/mi	N2O g/mi
0.0051	0.0048

mpg from DOT Table 4-15. EF from TCR 2015 Default Emission Factors Table 13.5, diesel buses
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_15.html

					Gas						Diesel			
Year	Fire Trucks	Heavy Trucks	Total		g CH4/mi	g N2O/mi	EF*Trucks	EF*Trucks			g CH4/mi	g N2O/mi	EF*Trucks	EF*Trucks
1969	0	0	0								0.0051	0.0048	0	0
1970	0	0	0								0.0051	0.0048	0	0
1971	0	1	1								0.0051	0.0048	0.0051	0.0048
1972	0	0	0								0.0051	0.0048	0	0
1975	0	0	0								0.0051	0.0048	0	0
1977	0	0	0								0.0051	0.0048	0	0
1978	0	0	0								0.0051	0.0048	0	0
1979	0	0	0								0.0051	0.0048	0	0
1980	0	0	0								0.0051	0.0048	0	0
1981	0	0	0								0.0051	0.0048	0	0
1982	0	0	0								0.0051	0.0048	0	0
1986	0	0	0								0.0051	0.0048	0	0
1987	0	0	0								0.0051	0.0048	0	0
1988	0	1	1								0.0051	0.0048	0.0051	0.0048
1989	0	1	1								0.0051	0.0048	0.0051	0.0048
1990	0	0	0								0.0051	0.0048	-	0
1991	0	1	1								0.0051	0.0048	0.0051	0.0048
1992	0	0	0								0.0051	0.0048	0	0
1993	1	0	1		0.3246	0.1142	0.3246	0.1142			0.0051	0.0048	0	0
1994	0	1	1		0.3246	0.1142	0	0			0.0051	0.0048	0.0051	0.0048
1995	0	3	3		0.3246	0.1142	0	0			0.0051	0.0048	0.0153	0.0144
1996	0	0	0		0.3246	0.1142	0	0			0.0051	0.0048	0	0
1997	1	1	2		0.0924	0.1726	0.0924	0.1726			0.0051	0.0048	0.0051	0.0048
1998	3	2	5		0.0641	0.1693	0.1923	0.5079			0.0051	0.0048	0.0102	0.0096
1999	2	0	2		0.0578	0.1435	0.1156	0.287			0.0051	0.0048	0	0
2000	1	2	3		0.0493	0.1092					0.0051	0.0048	0.0153	0.0144
2001	0	2	2		0.0528	0.1235	0	0			0.0051	0.0048	0.0102	0.0096
2002	0	6	6		0.0526	0.1307	0	0			0.0051	0.0048	0.0306	0.0288
2003	0	5	5		0.0533	0.124	0	0			0.0051	0.0048	0.0255	0.024
2004	0	2	2		0.0341	0.0285	0	0			0.0051	0.0048	0.0102	0.0096
2005	0	5	5		0.0326	0.0177	0	0			0.0051	0.0048	0.0255	0.024
2006	1	4	5		0.0327	0.0171	0.0327	0.0171			0.0051	0.0048	0.0204	0.0192
2007	0	6	6		0.033	0.0153	0	0			0.0051	0.0048	0.0306	0.0288
2008	1	8	9		0.0333	0.0134	0.0333	0.0134			0.0051	0.0048	0.0408	0.0384
2009	4	4	8		0.0333	0.0134	0.1332	0.0536			0.0051	0.0048	0.0204	0.0192
2010	0	2	2		0.0333	0.0134	0.0666	0.0268			0.0051	0.0048		
2011	0	3	3		0.0333	0.0134	0	0			0.0051	0.0048	0.0153	0.0144
2012	0	1	1		0.0333	0.0134	0	0			0.0051	0.0048	0.0051	0.0048
2013	0	6	6		0.0333	0.0134	0	0			0.0051	0.0048	0.0306	0.0288
2014	1	8	9		0.0333	0.0134	0.0333	0.0134			0.0051	0.0048	0.0408	0.0384
2015	0	5	5		0.0333	0.0134	0	0			0.0051	0.0048	0.0255	0.024
	15	80	95	total trucks		Avg Gas	0.07314286	0.086142857				Avg Diesel	0.005165385	0.004861538

5.8 avg mpg

mpg from GRP V2.0 p.87, EF from TCR 2015 Default Emission Factors Table 13.5

Misc. Equipment/Vehicles
195

Assume Large Truck Utility
5.8 avg mpg

Assume Other Large Utility (Diesel)
CH4 g/gal N2O g/gal
0.576 0.256

mpg from GRP V2.0 p.87, EF from TCR 2015 Default Emission Factors Table 13.7

Fuel Usage Type	Gallons	Dollars		Calculated Miles
Unleaded	35,736	$	-	635,496
Diesel	27,023	$	-	340,074

	Unleaded	Diesel	Unsure	Total	Avg MPG Gas	Avg MPG Diesel	Miles Gas	Miles Diesel	Gallons Gas	Gallons Diesel	Avg EF Gas g CH4/mi	Avg EF Gas g N2O/mi		Avg EF Diesel g CH4/mi	Avg EF Diesel g N2O/mi	
Cars	6.00			6.00	33.80	33.80	82,354.95	-	2,436.54	-	0.0173	0.0036				
Light Trucks	43.00	15		58.00	23.89	23.89	417,201.75	242,114.94	17,461.85	10,133.64	0.0161	0.0090		0.0010	0.0015	
SUV	-			-	23.89	23.89	-	-	-	-	0.0161	0.0090		0.0010	0.0015	
Vans	6.00			6.00	23.89	23.89	58,214.20	-	2,436.54	-	0.0161	0.0090		0.0010	0.0015	
Buses	0			-			-	-	-	-				0.0051	0.0048	
Heavy Gas	16			16.00	5.80	5.80	37,685.10	-	6,497.43	-	0.04306	0.06486		0.0051	0.0048	
Heavy Diesel		9		9.00	5.80	5.80	-	35,265.08	-	6,080.19	0.04306	0.06486		0.0051	0.0048	
Misc Utility	8	8		16.00	5.80	5.80	18,842.55	31,346.74	3,248.72	5,404.61	0.504	0.224	g/gal	0.576	0.256	g/gal
Misc Const	9	8		17.00	5.80	5.80	21,197.87	31,346.74	3,654.81	5,404.61	0.504	0.224	g/gal	0.576	0.256	g/gal
Total	88.00	40.00	-	128.00	17.78	12.58										

	Light Duty Vehicles					mpg							Gasoline cars					LDT					Diesel LDT			
		Light Duty Trucks																								
	Cars	Light Trucks	SUVs	Vans	Total	Passenger	LDT	Average mpg by MY Car	Avg mpg by MY LDT				CH4 g/mi	N2O g/mi	EF*Cars	EF*Cars		CH4 g/mi	N2O g/mi	EF*LDTS	EF*LDTS		CH4 g/mi	N2O g/mi	EF*LDT	EF*LDT
1994					-	28.3	20.8	0.0	0.0				0.0531	0.056	-	-		0.0646	0.0982	-	-		0.0009	0.0014	-	-
1995					-	28.6	20.5	0.0	0.0				0.0358	0.0473	-	-		0.0517	0.0908	-	-		0.0009	0.0014	-	-
1996					-	28.5	20.8	0.0	0.0				0.0272	0.0426	-	-		0.0452	0.0871	-	-		0.001	0.0015	-	-
1997					-	28.7	20.6	0.0	0.0				0.0268	0.0422	-	-		0.0452	0.0871	-	-		0.001	0.0015	-	-
1998					-	28.8	21.0	0.0	0.0				0.0249	0.0393	-	-		0.0391	0.0728	-	-		0.001	0.0015	-	-
1999					-	28.3	20.9	0.0	0.0				0.0216	0.0337	-	-		0.0321	0.0564	-	-		0.001	0.0015	-	-
2000					-	28.5	21.3	0.0	0.0				0.0178	0.0273	-	-		0.0346	0.0621	-	-		0.001	0.0015	-	-
2001					-	28.8	20.9	0.0	0.0				0.011	0.0158	-	-		0.0151	0.0164	-	-		0.001	0.0015	-	-
2002		1		1	2.00	29.0	21.4	0.0	42.8				0.107	0.0153	-	-		0.0178	0.0228	0.04	0.05		0.001	0.0015		
2003		2		3	5.00	29.5	21.8	0.0	109.0				0.0114	0.0135	-	-		0.0155	0.0114	0.08	0.06		0.001	0.0015		
2004		4			4.00	29.5	21.5	0.0	86.0				0.0145	0.0083	-	-		0.0152	0.0132	0.06	0.05		0.001	0.0015		
2005		5			5.00	30.3	22.1	0.0	110.5				0.0147	0.0079	-	-		0.0157	0.0101	0.08	0.05		0.001	0.0015		
2006		5			5.00	30.1	22.5	0.0	112.5				0.0161	0.0057	-	-		0.0159	0.0089	0.08	0.04		0.001	0.0015		
2007		5			5.00	31.2	23.1	0.0	115.5				0.017	0.0041	-	-		0.0161	0.0079	0.08	0.04		0.001	0.0015		
2008	1	1		1	3.00	31.5	23.6	31.5	47.2				0.0172	0.0038	0.02	0.00		0.0163	0.0066	0.03	0.01		0.001	0.0015		
2009		3			3.00	32.9	24.8	0.0	74.4				0.0173	0.0036	-	-		0.0163	0.0066	0.05	0.02		0.001	0.0015		
2010	1	16			17.00	33.9	25.2	33.9	403.2				0.0173	0.0036	0.02	0.00		0.0163	0.0066	0.02	0.01		0.001	0.0015	0.015	0.02
2011	2	3			5.00	33.1	24.7	66.2	74.1				0.0173	0.0036	0.03	0.01		0.0163	0.0066	0.05	0.02		0.001	0.0015		
2012	1	1			2.00	35.2	25.0	35.2	25.0				0.0173	0.0036	0.02	0.00		0.0163	0.0066	0.02	0.01		0.001	0.0015		
2013	1	8			9.00	36.0	25.3	36.0	202.4				0.0173	0.0036	0.02	0.00		0.0163	0.0066	0.13	0.05		0.001	0.0015		
2014		1		1	2.00	36.0	25.3	0.0	50.6				0.0173	0.0036	-	-		0.0163	0.0066	0.03	0.01		0.001	0.0015		
2015		3			3.00	36.0	25.3	0.0	75.9				0.0173	0.0036	-	-		0.0163	0.0066	0.05	0.02		0.001	0.0015		
Totals	6.00	58.00	-	6.00	70.00			33.80	23.89				avg gas passenger car		0.0173	0.0036		avg gas LDT		0.0161	0.0090		avg diesel LDG		0.0010	0.0015

mpg from DOT Table 4-23. EF from TCR 2015 Default Emission Factors Table 13.5
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_23.html

Year	Buses	mpg	Buses*mpg
1999		6.7	-
2000		6.8	-
2001		6.9	
2002		6.8	
2003		7.0	-
2004		5.0	-
2005		6.2	-
2006		5.9	
2007		7.2	-
2008		7.2	-
2009		7.2	-
2010		7.2	-
2011		7.1	-
2012		7.2	-
2013		7.2	-
2014		7.2	-
2015		7.2	-
Total Buses	-	Avg mpg	

Diesel	
CH4 g/mi	N2O g/mi
0.0051	0.0048

mpg from DOT Table 4-15. EF from TCR 2015 Default Emission Factors Table 13.5, diesel buses
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_15.html

	Gas	Diesel			Gas					Diesel			
Year	Heavy Trucks	Heavy Trucks	Total		g CH4/mi	g N2O/mi	EF*Trucks	EF*Trucks		g CH4/mi	g N2O/mi	EF*Trucks	EF*Trucks
1969			0							0.0051	0.0048	0	0
1970			0							0.0051	0.0048	0	0
1971			0							0.0051	0.0048	0	0
1972			0							0.0051	0.0048	0	0
1975			0							0.0051	0.0048	0	0
1977			0							0.0051	0.0048	0	0
1978			0							0.0051	0.0048	0	0
1979			0							0.0051	0.0048	0	0
1980			0							0.0051	0.0048	0	0
1981			0							0.0051	0.0048	0	0
1982			0							0.0051	0.0048	0	0
1986			0							0.0051	0.0048	0	0
1987			0							0.0051	0.0048	0	0
1988			0							0.0051	0.0048	0	0
1989			0							0.0051	0.0048	0	0
1990			0							0.0051	0.0048	0	0
1991			0							0.0051	0.0048	0	0
1992			0							0.0051	0.0048	0	0
1993			0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1994			0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1995			0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1996			0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1997			0		0.0924	0.1726	0	0		0.0051	0.0048	0	0
1998	3		3		0.0641	0.1693	0.1923	0.5079		0.0051	0.0048	0	0
1999	1		1		0.0578	0.1435	0.0578	0.1435		0.0051	0.0048	0	0
2000			0		0.0493	0.1092	0	0		0.0051	0.0048	0	0
2001			0		0.0528	0.1235	0	0		0.0051	0.0048	0	0
2002			0		0.0526	0.1307	0	0		0.0051	0.0048	0	0
2003	2		2		0.0533	0.124	0.1066	0.248		0.0051	0.0048	0	0
2004			0		0.0341	0.0285	0	0		0.0051	0.0048	0	0
2005	1		1		0.0326	0.0177	0.0326	0.0177		0.0051	0.0048	0	0
2006			0		0.0127	0.0171	0	0		0.0051	0.0048	0	0
2007			0		0.033	0.0153	0	0		0.0051	0.0048	0	0
2008	2		2		0.0333	0.0134	0.0666	0.0268		0.0051	0.0048	0	0
2009	2		2		0.0333	0.0134	0.0666	0.0268		0.0051	0.0048	0	0
2010		9	9		0.0333	0.0134	0	0		0.0051	0.0048	0.0459	0.0432
2011	1		1		0.0333	0.0134	0.0333	0.0134		0.0051	0.0048	0	0
2012	1		1		0.0333	0.0134	0.0333	0.0134		0.0051	0.0048	0	0
2013	2		2		0.0333	0.0134	0.0666	0.0268		0.0051	0.0048	0	0
2014	1		1		0.0333	0.0134	0.0333	0.0134		0.0051	0.0048	0	0
2015			0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
	16	9	25	total trucks		Avg Gas	0.0430625	0.06485625			Avg Diesel	0.0051	0.0048

5.8 avg mpg

mpg from GRP V2.0 p.87, EF from TCR 2015 Default Emission Factors Table 13.5

Misc. Equipment/Vehicles	Assume Large Truck Utility	CH4 g/gal	N2O g/gal
Construction/Large Utility Diesel	5.8 avg mpg	0.576	0.256
Construction/Large Utility Gasoline	5.8 avg mpg	0.504	0.224

mpg from GRP V2.0 p.87, EF from TCR 2015 Default Emission Factors Table 13.7

Fuel Usage			
Type	Miles	Gallons	Dollars
Total VMT Annual	770,990,595		$ -
Total less Bus, Trucks	671,609,907.30		$ -

	% of Miles	Total	% Gasoline	Unleaded	Diesel	Unsure	Total
Cars	82.3348%	100,660	95.0000%	95,627.00	5033		100,660.00
Light Trucks	17.6186%	21,540	95.0000%	20,463.00	1077		21,540.00
SUV	0.0000%		95.0000%	-	-		
Vans	0.0466%	57	95.0000%	54.15	2.85		57.00
Buses	0.1900%	1,578	95.0000%	1,499.10	78.9		1,578.00
Heavy Gas	3.5%	3,836	100.0%	3,836.00	-		3,836.00
Heavy Diesel	9.2%	9,984	0.0%	-	9984		9,984.00
Misc Utility							-
Misc Const							
Total				121,479.25	16,175.75	-	137,655.00

Avg MPG		
	Gas	Diesel
	29.55	29.55
	29.55	29.55
	29.55	29.55
	29.55	29.55
	7.17	7.17
	5.80	5.80
	5.80	5.80
	5.80	5.80
	5.80	5.80
	5.80	5.80
	28.52	**14.79**

Miles		
	Gas	Diesel
	525,319,945.74	27,648,418.20
	112,411,997.13	5,916,420.90
	-	-
	297,469.07	15,656.27
	1,391,638.02	73,244.11
	27,178,366.87	-
	-	70,737,438.69
	-	-
	-	-

Gallons		
	Gas	Diesel
	17,777,324.73	935,648.67
	3,804,128.50	200,217.29
	-	-
	10,066.64	529.82
	194,162.26	10,219.07
	4,685,925.32	-
	-	12,196,110.12
	-	-
	-	-

Avg EF Gas			Avg EF Diesel			
	g CH4/mi	g N2O/mi		g CH4/mi	g N2O/mi	
	0.0173	0.0036		0.0005	0.0010	
	0.0163	0.0066		0.0005	0.0010	
	0.0163	0.0066		0.0005	0.0010	
	0.0163	0.0066		0.0005	0.0010	
	0.0333	0.0134		0.0051	0.0048	
	0.0333	0.0134		0.0051	0.0048	
	0.0333	0.0134		0.0051	0.0048	
	0.504	0.224	g/gal	0.576	0.256	g/gal
	0.504	0.224	g/gal	0.576	0.256	g/gal

VMT and vehicle counts used to back calculate mpg averages and then gallons of fuel consumed.
% of miles based on distribution of vehicle counts for cars, light trucks, SUVs, and vans
% of miles based on Nelson Nygaard data for transit (buses) and heavy trucks
% gasoline assumed 95%
Total VMT provided from MNDOT for 2013
VMT and vehicle counts used to back calculate mpg averages and then gallons of fuel consumed.
Miles calculated based on distribution %s above

		Light Duty Vehicles					mpg				Gasoline cars				LDT				Diesel cars			
			Light Duty Trucks																			
		Cars	Light Trucks	SUVs	Vans	Total	Passenger	LDT	Average mpg by MY	Avg*Total (Calc Cell)	CH4 g/mi	N2O g/mi	EF*Cars	EF*Cars	CH4 g/mi	N2O g/mi	EF*LDTS	EF*LDTS	CH4 g/mi	N2O g/mi	EF*LDT	EF*LDT
1994						-	28.3	20.8	24.6	-					0.0646	0.0982	-	-			-	-
1995						-	28.6	20.5	24.6	-	0.0358	0.0473	-	-	0.0517	0.0908	-	-			-	-
1996						-	28.5	20.8	24.7	-	0.0272	0.0426	-	-	0.0452	0.0871	-	-			-	-
1997						-	28.7	20.6	24.7	-	0.0268	0.0422	-	-	0.0452	0.0871	-	-			-	-
1998						-	28.8	21.0	24.9	-	0.0249	0.0393	-	-	0.0391	0.0728	-	-			-	-
1999						-	28.3	20.9	24.6	-	0.0216	0.0337	-	-	0.0321	0.0564	-	-			-	-
2000						-	28.5	21.3	24.9	-	0.0173	0.0273	-	-	0.0346	0.0621	-	-			-	-
2001						-	28.8	20.9	24.9	-	0.011	0.0158	-	-	0.0151	0.0164	-	-			-	-
2002						-	29.0	21.4	25.2	-	0.107	0.0153	-	-	0.0178	0.0228	-	-				
2003						-	29.5	21.8	25.7	-	0.0114	0.0135	-	-	0.0155	0.0114	-	-				
2004						-	29.5	21.5	25.5	-	0.0145	0.0083	-	-	0.0152	0.0132	-	-				
2005						-	30.3	22.1	26.2	-	0.0147	0.0079	-	-	0.0157	0.0101	-	-				
2006						-	30.1	22.5	26.3	-	0.0161	0.0057	-	-	0.0159	0.0089	-	-				
2007						-	31.2	23.1	27.2	-	0.017	0.0041	-	-	0.0161	0.0079	-	-				
2008						-	31.5	23.6	27.6	-	0.0172	0.0038	-	-	0.0163	0.0066	-	-				
2009						-	32.9	24.8	28.9	-	0.0173	0.0036	-	-	0.0163	0.0066	-	-				
2010		100660	21540		57	122,257	33.9	25.2	29.6	3,612,694.35	0.0173	0.0036	1,741.42	362.38	0.0163	0.0066	352.03	142.54	0.0005	0.001	0.0005	0.001
2011						-	33.1	24.7	28.9	-	0.0173	0.0036	-	-	0.0163	0.0066	-	-				
2012						-	36.2	25.0	30.1	-	0.0173	0.0036	-	-	0.0163	0.0066	-	-				
2013						-	36.0	25.3	30.7	-	0.0173	0.0036	-	-	0.0163	0.0066	-	-				
2014						-	36.0	25.3	30.7	-	0.0173	0.0036	-	-	0.0163	0.0066	-	-				
2015						-	36.0	25.3	30.7	-	0.0173	0.0036	-	-	0.0163	0.0066	-	-				
Totals		100,660.00	21,540.00	-	57.00	122,257.00	Avg mpg for LDV		29.56		avg gas passenger car		0.0173	0.0036	avg gas LDT		0.0163	0.0066	avg diesel LDG		0.0005	0.0010

counts based on MNDOT 2014 Motor Vehicle County Summary Report - Olmstead County
mpg from DOT Table 4-23. EF from TCR 2015 Default Emission Factors Table 13.5
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_23.html

Year		Buses	mpg	Buses*mpg
1999			6.7	-
2000			6.8	-
2001			6.8	
2002			6.8	
2003			7.0	-
2004			5.8	-
2005			6.2	-
2006			5.8	
2007			7.2	-
2008			7.2	-
2009			7.2	-
2010		1,578	7.2	11,310
2011			7.1	-
2012			7.2	-
2013			7.2	-
2014			7.2	-
2015			7.2	-
Total Buses		1,578	Avg mpg	7.17

Diesel	
CH4 g/mi	N2O g/mi
0.0051	0.0048

0.19% VMT Miles are transit per Mat Berlow

Gas	
CH4 g/mi	N2O g/mi
0.0333	0.0134

mpg from DOT Table 4-15. EF from TCR 2015 Default Emission Factors Table 13.5, diesel buses
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_15.html

Year		Gas Heavy Trucks	Diesel Heavy Trucks	Total		Gas g CH4/mi	Gas g N2O/mi	Gas EF*Trucks	Gas EF*Trucks		Diesel g CH4/mi	Diesel g N2O/mi	Diesel EF*Trucks	Diesel EF*Trucks
1969				0							0.0051	0.0048	0	0
1970				0							0.0051	0.0048	0	0
1971				0							0.0051	0.0048	0	0
1972				0							0.0051	0.0048	0	0
1975				0							0.0051	0.0048	0	0
1977				0							0.0051	0.0048	0	0
1978				0							0.0051	0.0048	0	0
1979				0							0.0051	0.0048	0	0
1980				0							0.0051	0.0048	0	0
1981				0							0.0051	0.0048	0	0
1982				0							0.0051	0.0048	0	0
1986				0							0.0051	0.0048	0	0
1987				0							0.0051	0.0048	0	0
1988				0							0.0051	0.0048	0	0
1989				0							0.0051	0.0048	0	0
1990				0							0.0051	0.0048	0	0
1991				0							0.0051	0.0048	0	0
1992				0							0.0051	0.0048	0	0
1993				0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1994				0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1995				0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1996				0		0.3246	0.1142	0	0		0.0051	0.0048	0	0
1997				0		0.0924	0.1726	0	0		0.0051	0.0048	0	0
1998				0		0.0641	0.1693	0	0		0.0051	0.0048	0	0
1999				0		0.0578	0.1435	0	0		0.0051	0.0048	0	0
2000				0		0.0493	0.1092	0	0		0.0051	0.0048	0	0
2001				0		0.0528	0.1235	0	0		0.0051	0.0048	0	0
2002				0		0.0526	0.1307	0	0		0.0051	0.0048	0	0
2003				0		0.0533	0.124	0	0		0.0051	0.0048	0	0
2004				0		0.0341	0.0285	0	0		0.0051	0.0048	0	0
2005				0		0.0326	0.0177	0	0		0.0051	0.0048	0	0
2006				0		0.0327	0.0171	0	0		0.0051	0.0048	0	0
2007				0		0.033	0.0153	0	0		0.0051	0.0048	0	0
2008				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
2009				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
2010		3836	9984	13820		0.0333	0.0134	127.7388	51.4024		0.0051	0.0048	50.9184	47.9232
2011				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
2012				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
2013				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
2014				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
2015				0		0.0333	0.0134	0	0		0.0051	0.0048	0	0
		3836	9984	13820	total trucks		Avg Gas	0.0333	0.0134			Avg Diesel	0.0051	0.0048

5.8	avg mpg

12.70% VMT Miles for Trunk Highway

mpg from GRP V2.0 p.87, EF from TCR 2015 Default Emission Factors Table 13.5

Misc. Equipment/Vehicles	Assume Large Truck Utility	CH4 g/gal	N2O g/gal
Construction/Large Utility Diesel	5.8 avg mpg	0.576	0.256
Construction/Large Utility Gasoline	5.8 avg mpg	0.504	0.224

mpg from GRP V2.0 p.87, EF from TCR 2015 Default Emission Factors Table 13.7

OPSNET : Airport Operations : Standard Report

From 01/2014 To 12/2014 | Facility=RST

Facility	Class	Date	Region	Service Area	State	Air Carrier	Itinerant Air Taxi	Itinerant General Aviation	Itinerant Military	Itinerant Total	Local Civil	Local Military	Local Total	Total Operations
RST	Combined TRACON & To	Jan-14	AGL	CT	MN	75	815	733	92	1,715	271	154	425	2,140
RST	Combined TRACON & To	Feb-14	AGL	CT	MN	72	710	753	127	1,662	216	126	342	2,004
RST	Combined TRACON & To	Mar-14	AGL	CT	MN	80	834	924	109	1,947	360	180	540	2,487
RST	Combined TRACON & To	Apr-14	AGL	CT	MN	70	820	1,082	186	2,158	468	370	838	2,996
RST	Combined TRACON & To	May-14	AGL	CT	MN	74	918	1,378	174	2,544	700	534	1,234	3,778
RST	Combined TRACON & To	Jun-14	AGL	CT	MN	57	850	1,385	114	2,406	703	228	931	3,337
RST	Combined TRACON & To	Jul-14	AGL	CT	MN	78	948	1,438	109	2,573	653	230	883	3,456
RST	Combined TRACON & To	Aug-14	AGL	CT	MN	49	821	1,428	67	2,365	573	126	699	3,064
RST	Combined TRACON & To	Sep-14	AGL	CT	MN	168	773	1,622	105	2,668	689	300	989	3,657
RST	Combined TRACON & To	Oct-14	AGL	CT	MN	189	744	1,334	102	2,369	468	226	694	3,063
RST	Combined TRACON & To	Nov-14	AGL	CT	MN	174	765	1,059	58	2,056	492	146	638	2,694
RST	Combined TRACON & To	Dec-14	AGL	CT	MN	209	622	740	90	1,661	363	142	505	2,166
Sub-Total for MN						1,295	9,620	13,876	1,333	26,124	5,956	2,762	8,718	34,842
Sub-Total for CT						1,295	9,620	13,876	1,333	26,124	5,956	2,762	8,718	34,842
Sub-Total for AGL						1,295	9,620	13,876	1,333	26,124	5,956	2,762	8,718	34,842
Sub-Total for Unknown						1,295	9,620	13,876	1,333	26,124	5,956	2,762	8,718	34,842
Sub-Total for RST						1,295	9,620	13,876	1,333	26,124	5,956	2,762	8,718	34,842
Total:						1,295	9,620	13,876	1,333	26,124	5,956	2,762	8,718	34,842

Report created on Mon Nov 2 15:46:06 EST 2015
Sources: The Operations Network (OPSNET)

City of Rochester
GHG Inventory Benchmarks

User/Source Category	Scope	Rochester 2014 GHG (metric tons CO_2e)	Albany, NY[1] 2009	Ann Arbor, MI[2] 2010	Duluth, MN[3] 2013
Population		**111,402**	**98,566**	**117,770**	**86,238**
City of Rochester Owned/Controlled					
City Owned/Controlled		***76,397***	*NA*	*NA*	*NA*
Community Owned/Controlled					
Community Combustion - Natural Gas	3	536,419	445,963		
Community Combustion - Fuel Oil/Other	3	7,643	15,550		
Community Electric	3	822,637	441,764		
Community Transportation	3	366,712	276,097		
Community Waste	3	60,807	125,311		
Scope 3 Subtotal		*1,794,218*			
Total		**1,870,615**	**1,304,685**	**2,209,237**	**1,766,457**
Per Capita		16.79	13.24	18.76	20.48

Notes:

CO2e = Carbon Dioxide Equivalents

1 - Adapted from Table 1: City of Albany GHG Emissions Inventory Summary by Sector - 2009 Baseline.

Appendix D. Climate Action Plan, Albany 2030, The City of Albany Comprehensive Plan, 2012.

2 - Adapted from Table 2: Ann Arbor Community Emissions by Sector. City of Ann Arbor Climate Action Plan 2012.

3 - Adapted from Regional Inidcators Initiative, www.regionalindicatorsmn.com

NA - not available

Appendix C

Benchmarking and Comparison Analysis

WENCK File #1832-0005
October 2015

City of Rochester Energy Action Plan Task 2: Review, Comparison and Evaluation of Three Model Cities Climate Action Plans & Programs




Prepared for:

Rochester-Olmsted Planning Department

2122 Campus Drive
Southeast, Suite 100
Rochester, Minnesota 55904

WENCK ASSOCIATES
Responsive partner.
Exceptional outcomes.

Prepared by:

WENCK Associates, Inc.
1800 Pioneer Creek Center
Maple Plain, MN 55359
Phone: 763-479-4200
Fax: 763-479-4242

Table of Contents

1.0 INTRODUCTION 1-1

2.0 REVIEW, COMPARISON AND EVALUATION OF THREE MODEL CITIES CLIMATE ACTION PLANS AND PROGRAMS 2-1

2.1 Purpose 2-1
2.2 Goals and Strategies 2-2
2.2.1 Buildings and Energy 2-4
2.2.2 Transportation 2-5
2.2.3 Solid Waste 2-7

3.0 CONCLUSION 3-1

4.0 REFERENCES 4-1

TABLES

1. Climate Action Plan Sector Breakout
2. Annual Change in GHG Emissions
3. Near- and Long-term Goals
4. Summary of Goals and Strategies
5. Summary of GHG Reductions (MTCO2e)
6. Buildings and Energy GHGs
   - 6-1 City of Portland Buildings and Energy
   - 6-2 City of Sacramento Buildings and Energy
   - 6-3 City of Minneapolis Buildings and Energy
7. Transportation GHGs
   - 7-1 City of Portland Transportation
   - 7-2 City of Sacramento Transportation
   - 7-3 City of Minneapolis Transportation
8. Solid Waste GHGs
   - 8-1 City of Portland Solid Waste
   - 8-2 City of Sacramento Solid Waste
   - 8-3 City of Minneapolis Solid Waste

1.0 Introduction

Recognition of global climate change has triggered thirty-four states to develop Climate Action Plans (CAPs) related to energy management and greenhouse gas (GHG) reduction (C2ES, 2015). At least twice as many cities in the United States have developed CAPs to advance local progress toward sustainable energy infrastructure (C40, 2015). As cities expand, and demand for energy increases, local governments face new opportunities to develop best practices related to city planning and carbon and energy management.

Climate and energy action plans typically begin with an analysis of total energy consumption and the related GHG emissions (ICLEI, 2013). Consumption and emissions are viewed from different perspectives by assigning them to related categories of sector and source. Sector-related emission categories generally include: buildings and energy, transportation, land use, and waste management. Source-related emissions categories generally include: electricity, gasoline, natural gas, and diesel fuel. Together, sector and source-associated GHG emission goals establish a multifaceted approach to carbon and energy management.

CAP development begins with a GHG inventory to provide for further analysis of energy consumption patterns through a carbon lens. Globally-accepted GHG inventory protocols dictate parsing an organization's GHG emissions into three categories that relate to the amount of control the organization has over emissions:

- Scope 1 / Direct – GHG emissions from sources that are owned and controlled by the reporting entity such as stationary sources and fleet motor vehicles.
- Scope 2 / Indirect – GHG emissions associated with the generation of purchased electricity, heat, or steam.
- Scope 3 / Indirect and Optional – GHG emissions that are associated with the activities of the reporting entity but are emitted from sources that are owned and controlled by others (EPA, 2012).

Scope 1, 2, and 3 inventory categories provide a framework for projecting effective GHG reduction plans based on the level of influence a reporting entity has on emission activities. The GHG inventory also sets a baseline to compare future progress related to CAP goals and strategies. Government programs, policies, and regulation support strategies to accomplish CAP goals relative to the baseline.

Each CAP encompasses unique local opportunities and challenges related to sustainability. Geography, weather, natural resources, and demographics influence carbon management needs particular to a local body of government (Portland CAP, 2015). For example, increased average temperatures have a more severe impact on high risk populations such as aging communities, and individuals with compromised health (Sacramento CAP, 2012). Mitigating energy consumption to avoid blackouts and assure sufficient infrastructure to support hospitals, nursing homes, and assisted living facilities requires special attention throughout CAP development.

2.0 Review, Comparison and Evaluation of Three Model Cities Climate Action Plans and Programs

2.1 PURPOSE

This comparative analysis provides an opportunity to evaluate and compare best management practices (BMPs) of, and lessons learned from, three relatively successful cities related to energy and carbon goals. This document is intended to provide background information for the City of Rochester's yet to be developed Energy Action Plan and will be included as an appendix to the Rochester EAP.

The cities of Portland, Sacramento, and Minneapolis offer forward-thinking CAPs that model best management practices. Each city developed, implemented, and monitored its respective CAP, and demonstrated positive outcomes over a period of approximately five years. Portland, Sacramento, and Minneapolis have similarities and differences that influence common and unique CAP goals, strategies, and actions.

Efforts to mitigate GHG emissions at the city level typically include CAP and GHG inventory development. CAPs and GHG inventories overlap, but do not maintain a one-to-one correlation. CAPs project future goals, strategies, and actions related to municipal (or other) government initiatives. GHG inventories document emissions in a past year(s) based on available and estimated quantitative data. Together, CAPs and GHG inventories based on scope 1, 2, and 3 categories illustrate baseline status, potential to effect change, and monitor progress toward GHG reduction.

While scope 1, 2, and 3 inventory categories indicate a reporting entity's level of control over carbon management and energy consumption, CAPs are typically organized by sector. Sector categories provide a framework for developing CAP goals, strategies, and actions that pinpoint areas of high impact relative to inventory categories. In general, CAPs address at least four broad sector categories that include:

- Buildings and energy
- Transportation
- Land Use
- Solid Waste

Some cities address additional sectors such as water conservation, water supply, waste water treatment, and topics such as climate change adaptation, community outreach and engagement, and implementation. The depth of sector categories used in CAPs appears to be associated with level of influence, program maturity, and contextual challenges/opportunities. Portland, Sacramento, and Minneapolis demonstrate varying degrees of CAP depth and complexity (Table 1).

While CAP goals, strategies, and actions are organized based on sector categories, CAP GHG metrics are organized based on GHG scope 1, 2, and 3 inventory calculations. Inventory calculation models depend on available and estimated quantitative data, and GHG emission reductions are calculated by repeating the inventory procedure and comparing (annual) results. Quantitative metrics for GHG inventory and comparative reduction calculations

depend on variables, including inventory methodology, federal statistical averages, and city-level data. Portland and Sacramento both use the ICLEI inventory method (ICLEI, 2013), and Minneapolis applies the Berkeley CoolClimate model (Renewable and Appropriate Energy Laboratory, 2015). Despite different inventory methods, GHG metric categories appear generally the same (Table 2).

GHG emissions are presented in metric tons of carbon dioxide equivalents ($MTCO_2e$). Carbon dioxide equivalents signify the amount of equivalent global warming impact of all GHGs included in an inventory (carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), nitrogen trifluoride (NF_3) and hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs)), using carbon dioxide as a reference.

Selecting the appropriate inventory model to calculate baseline GHG emissions sets the stage for future success. More cities are moving toward the ICLEI method for developing baseline figures as this is a globally accepted protocol and allows the best opportunity to compare and contrast reported figures across cities nationally, and world-wide (ILCEI, 2013). The ICLEI model encompasses the widest range of entities tracking GHG emissions. Ideally, every city would use the same inventory model which would offer extensive comparative opportunities to further carbon and energy management.

The purpose of a baseline inventory is to establish the starting point from which numeric and sector based reduction goals are measured against. Reduction goals depend on an organization's strategies and associated influence relative to scope 1, 2, and 3 calculations. Many CAPs include a goal to reduce energy consumption and GHG emissions below 2005 levels by 2025 and below 1990 levels by 2050. Inventory baseline and reduction goal years are often 2005, and 1990, reflecting various benchmark years in the global climate change policy debate. However, selecting a year with the best available data may establish more accurate baseline numbers. Comparing and contrasting cities with different baseline years can prove difficult. However, if the baseline can be treated as year-zero then relative comparisons can be made. In Table 2, the average annual percentage change in emissions by sector is referenced to enable comparison across cities.

The following comparative analysis compares and contrasts CAPs and GHG measurements for the cities of Portland, Sacramento, and Minneapolis.

2.2 GOALS AND STRATEGIES

CAP goals are two-tiered. High level city goals are supported by sector goals. Portland, Sacramento, and Minneapolis high level city goals include quantitative near-term and long-term GHG reduction benchmarks (Table 3). Sector goals and strategies identify high impact opportunities to meet near-term and long-term reduction rates. Goals and strategies for Portland, Sacramento, and Minneapolis vary in content and depth, but several common themes appear.

Sector goals are both quantitative and qualitative, but differ in context compared to high level city goals. As previously mentioned, high level city goals are based on inventory calculations that rely on available data sources. These three cities' sector goals take a different form, and are not established based on a direct relationship to inventory calculations. Sector goals tend to align with city departments and reflect changes to program areas and regulations. Together, high level and sector goals provide a framework for evaluating GHG reduction as a system.

Ideally, GHG inventory data support the establishment of sector goals, as well. Emphasis on scope 1, 2, and 3 energy consumption and GHG emission categories can link a reporting entity's influence with departmental organization. This approach may provide the best opportunity to meet high level reduction targets through sector goals and objectives.

To achieve city goals, Portland, Sacramento, and Minneapolis CAPs address three primary sectors: buildings and energy, transportation, and solid waste. These three sectors emit the highest percentage of GHGs and show the largest potential for reduction. Common approaches to reduce GHGs in these sectors include: reduce energy consumption in residential and commercial buildings, decrease vehicle emissions, and increase organics recycling. Common strategies to achieve goals include: offering financial incentives, adopting city building codes, increasing public transit and bike paths, and developing media campaigns for waste management. Best practices leading to high impact results ultimately depend on an organization's level of influence relative to scope 1, 2, and 3 categories. A summary of common high impact practices for buildings and energy, transportation, and solid waste is included in Table 4.

Portland, Sacramento, and Minneapolis use different approaches to sector goal development and monitoring. Sacramento is unique in that it conducted a Gap Analysis prior to CAP development. A Gap Analysis in this context evaluates inventory GHG emissions, calculates projections, and gauges whether high-level city reduction goals are achievable. The Gap Analysis also calculates a reduction potential for each sector. A reduction potential is also assigned to most strategies within a sector. Strategies that cannot be assigned a reduction potential (due to limited GHG inventory data) receive programmatic target number goals e.g. retrofit 1,000 residential homes annually. Unlike Sacramento, Portland and Minneapolis did not conduct a Gap Analysis and do not have quantitative GHG reduction goals for each sector. Portland and Minneapolis use program target numbers to measure sector goals. Regardless of approaches to sector goal development, successful GHG reduction is ultimately reflected in analysis of performance against high-level city goals. As such, conducting a Gap Analysis as a best practice enables cities to reliably focus on specific strategies with the highest GHG reduction potential.

Overall, Portland, Sacramento, and Minneapolis have reduced GHG emissions over their respective baselines based on currently available information. Breakout of emission reductions by sector demonstrates that GHG reduction potential is relative (Table 5). For example, every city reduced GHG emissions generated by buildings and energy sector. However, Portland achieved the highest $MTCO_2e$ reduction but has the highest $MTCO_2e$ emissions; Sacramento achieved the highest percentage reduction and lowest $MTCO_2e$ reduction, but generates the lowest $MTCO_2e$ emissions; and, Minneapolis has the lowest percent reduction but higher $MTCO_2e$ reduction compared to Sacramento. Evaluation of goals and strategies, and high impact practices related to GHG reduction, requires a multifaceted approach to comparative analysis.

Transportation is the second largest GHG generator. However, success in reducing transportation GHGs is quite variable. Minneapolis reduced transportation GHGs at almost the same volume as its buildings and energy reduction. However, Portland and Sacramento have not shown similar progress. A more detailed comparison of outcomes and best practices related to transportation follows.

Solid Waste is the third largest GHG generator. GHG generation and reduction related to solid waste management shows wide variability. Portland shows significant reductions in

Solid Waste GHG emissions (primarily as a result of implementing methane capture at landfills), Sacramento increased GHG emissions, and Minneapolis reduced emissions by eleven percent. Strategies to reduce and capture energy from waste streams are discussed in more detail below.

Portland, Sacramento, and Minneapolis offer several examples of high impact practices related to GHG reduction. Common strategies for reducing GHG emissions, as well as unique approaches to environmental management, provide guidance for CAP development and successful GHG reduction. The following analysis discusses high impact practices from

Portland, Sacramento, and Minneapolis for reducing GHG generation attributed to the top three sectors (buildings and energy, transportation, and Solid Waste), and identifies additional sectors that could present GHG emissions reduction opportunities for the City of Rochester. Ideally, sector strategies and approaches are developed in relation to each scope of emissions i.e., scope 1 direct control; scope 2 indirection control, scope 3indirection and optional.

2.2.1 Buildings and Energy

The first sector under review is buildings and energy. Sector categories may have a variety of titles but tend to use similar units. Regarding buildings and energy, emissions include residential, commercial, and industrial building GHG emissions. Often, commercial and industrial emissions are combined. Building and energy emissions are commonly calculated using the ICLEI GHG inventory method. Buildings consume the largest amount of energy and therefore indirectly generate the largest quantity of GHGs. Correspondingly, buildings also have the highest potential for GHG reduction. Overall, commercial and industrial building emissions tend to be higher than residential. Increasing availability of energy efficient heating and cooling systems, appliances, and lighting, as well as renewable energy sources, offers significant GHG reduction potential. High impact practices to implement energy efficient infrastructure, and incentives to use renewable energy, have proven effective at capturing GHG reduction in this sector. The goals of the three cities related to buildings and energy focus on increasing energy efficiency in existing buildings, adopting energy efficiency regulations for new development, and increasing renewable energy sources.

Overall, Portland, Sacramento, and Minneapolis have reduced GHG emissions from buildings and energy (Table 6). Generally, energy consumption in buildings is most influenced by population, construction characteristics (insulation, framing, size, etc.), climate and weather. Growing populations and more extreme weather resulting from climate change make this sector high priority.

Despite 26% population growth since 1990, Portland realized significant GHG reductions related to buildings and energy. Reduced GHG emissions are attributed to: (1) Clean Energy Work Oregon (CEWO), a non-profit with the dual mission of creating jobs and reducing carbon emissions through whole-home energy remodels; and, (2) increased renewable energy use by government, businesses, and residents. Renewable energy programs and incentives appear to drive the majority of Portland's reductions in energy consumption and GHG emissions in this sector.

Notwithstanding net increases in energy consumption, Sacramento reduced energy-related GHG emissions associated with buildings and energy. Reductions are primarily associated

with a 30% decline in Sacramento Municipal Utility District's (SMUD) emission factor based on SMUD's portfolio composition shifting to incorporate more renewable sources.

Minneapolis also reduced GHG emissions related to buildings and energy. Reductions in GHG emissions were driven by Xcel Energy's increased use of cleaner sources to generate electricity, reduction in the use of natural gas, Community Energy Services program, Energy Efficiency Business Loan Program, and Trillion BTU Program. These incentive programs support GHG reductions associated with energy consumption.

In these cases, GHG emissions reductions for the buildings and energy sector were achieved through a two-pronged approach. First, energy providers expanded their renewable energy portfolios. Second, financial programs provided incentives for building infrastructure retrofits. This approach has demonstrated success in reducing GHGs from the largest contributing sector by addressing factors affecting emissions across all building and energy sources including residential, commercial, and industrial.

Several other CAP goals and strategies show potential for driving reductions in building and energy sector emissions. Policy and regulatory measures related to buildings and energy are typically long-term strategies with high impacts. While Federal, state, and city policies and regulations related to GHG emissions are in beginning stages relative to long-term goals, the potential for large-scale results is significant. Continued efforts and municipal support for state and federal initiatives can drive more aggressive implementation of these programs.

A compilation of high impact practices related to GHG goals and strategies for buildings and energy is provided in Tables 6-1, 6-2, and 6-3.

2.2.2 Transportation

Transportation-related energy consumption is the second largest contributor to GHG emissions (Table 7). The primary goal for GHG reduction associated with transportation includes decreasing vehicle miles travelled (VMT). Measurements for transportation GHGs are calculated based on inventory methods that typically rely on VMT statistics. Transportation and land use are often lumped into one category as community structure and city planning influence VMT through transit availability and commute distance. Therefore, best practices for reducing transportation GHGs necessitates consideration of land use.

Carbon management related to transportation requires development of "complete neighborhoods", increased fuel efficiency, and improved access to public transportation. Complete neighborhoods are designed to significantly reduce or eliminate VMT for non-work needs i.e. all transportation beyond work commutes can be accomplished via bicycle or pedestrian pathways. Fuel efficiency strategies include increasing electric vehicle use and implementing low carbon fuel standards. Combined with increased access to public transportation, these strategies show high impact potential for reducing carbon emissions.

Overall, Portland, Sacramento, and Minneapolis show varying degrees of success related to transportation (Table 7). In 2010, Minneapolis showed the greatest reduction in transportation related GHG emissions by percent and volume compared to its baseline. A recent baseline update reported VMT in Minneapolis rose 1.4% in 2013 compared to 2012 and emissions from on-road sources increased 1%. The baseline update report also

indicated total daily cyclists increased but commuter cyclist numbers dropped. High impact practices related to cultural shifts, including media campaigns and public outreach, can complement infrastructure development. However, short-term strategies will not meet long-term goals.

Long-term strategies are needed to reach GHG reduction goals related to transportation and include support for, and adoption of, Federal regulations to implement low carbon fuel standards. The impact of adopting low carbon fuel standards for GHG reduction will depend on the ratio of vehicle emissions relative to overall GHG emissions and will vary from city to city. The effect of low carbon fuel standards could be substantial as it would influence scope 1, 2 and 3 inventory categories.

Portland attributes citywide transportation GHG reductions to its Urban Growth Boundary (UGB). The UGB is Portland's foundation for developing a low-carbon transportation system. Based on population forecasts, the UGB sets limits on acres for residential and industrial development. In Portland's case, shorter commute distances, urban density, and development limits result in transportation efficiency and reduced GHG emissions. The UGB is unique to Portland and is highly dependent on integration of other city planning and GHG strategies e.g. increased public transit and complete neighborhoods.

Complete neighborhood development is the backbone of VMT reduction. City goals to create neighborhoods where 80% of residents can easily walk or bike to meet all basic daily, non-work needs is a common city planning best practice to support GHG reduction. Safe bike and pedestrian transit routes are necessary for residents to function in complete neighborhoods. Media campaigns to develop awareness about increased access to bike and pedestrian paths can be an effective strategy to promote VMT reduction. Portland, Sacramento, and Minneapolis all have goals to increase development of complete neighborhoods.

Increased access to public transportation reduces VMT and GHG emissions. Portland, Sacramento, and Minneapolis include strategies to increase the number of public transit lines, stops, and extend dedicated transit lines. Each city emphasizes that public transit strategies should focus on neighborhoods that currently depend on public transportation.

Fuel efficiency strategies like increasing electric vehicle usage and low carbon fuel standards share a high potential for GHG reduction. However, improved transportation fuel efficiency tends to be a long-term strategy for the following reasons. Increased electric vehicle usage depends on clean energy sources and development of charging station infrastructure. Further, low carbon fuel standards are typically implemented on a state or national, not regional, level, and only after lengthy administrative processes to determine regulatory measures. Short-term strategies include synchronizing traffic lights to increase traffic flow, dynamic signage, and parking management to reduce trolling for parking space. Combined with short-term strategies, fuel efficiency is a high impact, long-term strategy to support GHG and other sustainability goals. Management practices that include increasing electric vehicles should be considered in the context of energy sources. Specifically, sourcing energy for electric charging stations from renewable energy sources maximizes GHG reductions.

While this long-term strategy has high impact potential, increased fuel efficiency for motor vehicles is not the highest impact objective. Based on information derived from Sacramento's GAP Analysis, increasing fuel efficiency can reduce GHG emissions by approximately 0.2% $MTCO_2e$/year. Higher impact objectives include increased public

transportation (approximately 1.1% $MTCO_2e$/year) and pedestrian/bicycle pathways 0.6% $MTCO_2e$/year).

While energy goals related to transportation have the potential to reduce GHG emissions by 2.0% $MTCO_2e$/year, the impact of this level of reduction is minor compared to energy consumed by airline activities. Some representative figures for CO_2 emissions are provided by LIPASTO's survey of average direct emissions (not accounting for high-altitude radiative effects) of airliners expressed as CO_2 and CO_2 equivalent per passenger kilometre:[20]

- Domestic, short distance, less than 463 km (288 mi): 257 g/km CO_2 or 259 g/km (14.7 oz/mile) CO_2e
- Domestic, long distance, greater than 463 km (288 mi): 177 g/km CO_2 or 178 g/km (10.1 oz/mile) CO_2e
- Long distance flights: 113 g/km CO_2 or 114 g/km (6.5 oz/mile) CO_2e

These emissions are similar to a four-seat car with one person on board;[21] however, flying trips often cover longer distances than would be undertaken by car, so the total emissions are much higher.

https://en.wikipedia.org/wiki/Environmental_impact_of_aviation

http://www.atag.org/facts-and-figures.html

CAPs under review in this comparative analysis indirectly approach airline emissions through support for carbon fuel standards. However, at present it does not appear individual cities have a large influence over this matter.

A summary of short- and long-term strategies to reduce transportation GHG emissions is included in Tables 7-1, 7-2, and 7-3.

2.2.3 Solid Waste

The third sector for review is solid waste. Three primary themes dominate GHG reduction related to waste management: (1) waste reduction; (2) landfill diversion; and, (3) energy recovery. Although solid waste is a relatively small percentage of total GHG emissions, its potential impact is high. Waste can be a source of energy (gas capture) and sequester carbon (composting). Managing solid waste as a resource shows significant ability to reduce GHGs (Table 8).

Emissions associated with solid waste are variable. Portland, Sacramento, and Minneapolis have similar goals and strategies related to solid waste GHG reduction, but outcomes based on GHG measurements are distinct. For example, Portland decreased solid waste GHG emissions by 86% as a result of installing landfill (bio-) gas capture technology at the landfill. In contrast, the municipal solid waste landfill in Sacramento has captured gas since 1999, yet it realized increases in GHG emissions. As increases in solid waste GHGs for

Sacramento are credited to landfill emissions, solid waste management strategies appear to have vastly different impacts[1].

Reducing GHG emissions related to solid waste management relies primarily on source reduction i.e., producing less waste. In addition, capturing energy from waste streams offers opportunities to develop innovative carbon and energy management strategies. For example, diverting organic waste away from landfills to facilities with higher gas capture rates, such as anaerobic digesters, can reduce GHGs while supplementing the energy grid. Furthermore, substrate produced from digesters can be composted i.e., sequestered.

While waste management strategies are not the highest impact actions relative to other sectors, the cultural impact to generate awareness is high. As people encounter waste management systems everywhere (home, work, travel, stores, public places, etc.) it is a highly visual and hands-on activity that permeates every day culture.

A summary of high impact strategies related to solid waste is included in Tables 8-1, 8-2, and 8-3.

[1] Wenck conducted interviews with Portland and Sacramento city sustainability directors and staff regarding solid waste GHG emissions and methane capture. However, attempts to explore the root cause of the difference in results from Portland's and Sacramento's management strategies were unsuccessful.

3.0 Conclusion

Climate Action Plan (CAP) development related to energy consumption and GHG reduction primarily depends on scope 1, 2, and 3 inventory categories. Scope categories will guide effective CAPs based on the relative size of emissions from each scope and level of control an organization has on associated strategies. While several common themes appear in Portland, Sacramento, and Minneapolis CAPs, each city demonstrates slightly different emphasis (e.g. Portland's focus on solid waste methane capture; Sacramento's target on buildings and energy; and, Minneapolis's goals for transportation). Based on the size and specific source of scope 1, 2, and 3 inventory categories, and the relative control the City of Rochester has over reduction potential, CAP development can appropriately set energy and carbon management priorities.

In addition to scope 1, 2, and 3 inventory categories, successful CAPs adapt common GHG reduction and energy efficiency strategies to align with existing municipal department structures. Based on the cities reviewed, actions commonly resulting in positive outcomes for the following sectors include:

- **Buildings and energy**: Retrofit existing building infrastructure with energy efficient heating and cooling systems, combined with incentives to achieve this goal
- **Transportation**: Decrease VMT through increased access to public transportation and extend public transportation networks
- **Solid waste**: Reduce waste and divert organic waste from landfills through incentive and cultural awareness campaigns

As noted in Section 1.0 under Table 5, the buildings and energy sector uses the most energy and therefore provides the largest opportunity to reduce energy consumption and GHGs. Portland, Sacramento, and Minneapolis have realized success in the buildings and energy sector through incentive programs dedicated to retrofitting heating and cooling systems in commercial and residential buildings. Transportation, as shown in Table 5, consumes the second largest amount of energy and GHG emissions. While transportation goals will be unique to every city's context, two actions have demonstrated the most success in reducing VMT, including:

1. Increasing access to public transportation networks, and
2. Extending current public transportation networks.

Finally, despite the relatively small percent of energy consumed by solid waste transport and storage, the impact of waste reduction and organics diversion can be substantial for a community because of the large GHG footprint associated with landfill methane emissions. Where landfill gas can be captured and converted to energy or used in the production of other products, there is a significant opportunity to reduce GHG emissions. In addition, changes in solid waste management tend to effect daily behavior, creating new habits. Establishing new cultural norms around energy consumption and GHG reduction will propel program implementation across the board through the establishment and growth of community support.

Successful CAPs target strategies and actions that influence energy and carbon footprints associated with buildings and energy, transportation, and solid waste across all three scopes of emissions. Identifying where the City of Rochester has control over energy consumption within each sector and scope will serve as a helpful guide in developing attainable EAP goals. Moreover, the establishment and pursuit of EAP goals to tailor fit for the Rochester community will help drive support for sustainable growth for future generations.

4.0 References

C40 Cities. 2015. [World-wide city level information regarding climate action plan development and participation in actions that combat climate change.] *C40 Cities.* Retrieved from < http://www.c40.org/ cities > August 2015.

Center for Climate and Energy Solutions. 2015. [State status tool mapping which states have completed climate action plans.] *Climate Action Plans*. Retrieved from < http://www.c2es.org/us-states-regions/policy-maps/climate-action-plans > August 2015.

City of Minneapolis. 2013. *Climate Action Plan.*< http://www.ci.minneapolis.mn.us/ sustainability/climate/WCMS1Q-066642 >

City of Portland. 2015. *Climate Action Plan.* < https://www.portlandoregon.gov/bps/article/ 531984 >

City of Sacramento. 2012. *Climate Action Plan.* (Resolution 2012-030). < http://www.cityofsacramento.org/Community-Development/ Resources/Online-Library/Sustainability >

ICLEI-Local Governments for Sustainability USA. 2013. [A greenhouse gas emissions inventory protocol for cities to establish credible emissions accounting and reporting practices.] *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions*. Retrieved from < http://icleiusa.org/publications/ us-community-protocol/ > August 2015.

Renewable and Appropriate Energy Laboratory (RAEL). 2015. [Online University of Berkeley, California RAEL CoolClimate Network modeling tool for climate inventory calculations.] *CoolClimate Calculator.* Retrieved from < http://coolclimate.berkeley.edu/calculator > August 2015.

U.S. Environmental Protection Agency. 2012. *Greening EPA, EPA's Greenhouse Gas Emissions Reductions.*< http://www.epa.gov/greeningepa/ghg/ > August 2015.

Tables

1. Climate Action Plan Sector Breakout
2. Annual Change in GHG Emissions
3. Near- and Long-term Goals
4. Summary of Goals and Strategies
5. Summary of GHG Reductions (MTCO2e)
6. Buildings and Energy GHGs
   - 6-1 City of Portland Buildings and Energy
   - 6-2 City of Sacramento Buildings and Energy
   - 6-3 City of Minneapolis Buildings and Energy
7. Transportation GHGs
   - 7-1 City of Portland Transportation
   - 7-2 City of Sacramento Transportation
   - 7-3 City of Minneapolis Transportation
8. Solid Waste GHGs
   - 8-1 City of Portland Solid Waste
   - 8-2 City of Sacramento Solid Waste
   - 8-3 City of Minneapolis Solid Waste

Table 1

Climate Action Plan sector breakout for Portland, Sacramento, and Minneapolis CAPs.

	Portland, OR	**Sacramento, CA**	**Minneapolis, MN**
Population	609,456	479,686	400,070
Sectors	(1) Buildings and energy (2) Urban Form and transportation (3) Consumption and solid waste (4) Food and agriculture (5) Urban forests, natural systems and carbon sequestration (6) Climate change preparation (7) Community engagement, outreach and education (8) Local government operations (9) Implementation	(1) Sustainable land use (2) Mobility and connectivity (3) Energy efficiency and renewable energy (4) Waste reduction and recycling (5) Water conservation and wastewater efficiency (6) Climate change adaptation (7) Community involvement and empowerment	(1) Buildings and energy (2) Transportation and land use (3) Waste and recycling

Table 2

Annual Percent Change in GHG Emissions Relative to Respective Baseline Inventories

	Portland			Sacramento			Minneapolis		
Population	609,456			479,686			400,070		
	Baseline GHG	Most recent GHG inventory	Annual Percent Change	Baseline GHG	Most recent GHG inventory	Annual Percent Change	Baseline GHG	Most recent GHG inventory	Annual Percent Change
Year	1990	2013		2005	2011		2006	2010	
Total $MTCO_2e$	8,990,000	7,695,000	-0.6%	4,083,239	3,847,864	-1.0%	5,900,000	5,100,000	-3%
Residential	1,725,000	1,540,000	-0.5%	748,792	656,472	-2.1%	1,639,000	1,020,000	-9%
Commercial	1,877,000	1,884,000	0.0%	979,777	814,087	-2.8%	2,005,000	2,346,000	4%
Industrial	1,911,000	1,348,000	-1.3%	[1]	[1]	-	[1]	[1]	-
Transportation	2,979,000	2,830,000	-0.2%	2,013,962	2,009,724	0.0%	1,711,000	1,479,000	-3%
Solid Waste	498,000	93,000	-3.5%	241,862	318,497	5.3%	315,923	279,919	-3%
Other[2]	n/a	n/a	n/a	98,846	28,523	-11.9%	n/a	n/a	n/a
Electricity		3,416,200			721,513		2,396,772	2,000,387	-4%
Gasoline		2,157,600					904,528	851,981	-1%
Natural Gas		1,618,200			769,608		1,436,871	1,339,929	-2%
Diesel		1,168,700					254,812	242,419	-1%

[1] data included in commercial calculations

[2]includes wastewater treatment, water related, industrial specific, and municipal operations

Table 3

Near- and long-term GHG reduction goals

	Portland, OR	Sacramento, CA	Minneapolis, MN
Population	609,456	479,686	400,070
City GHG reduction goals	Based on 1990 baseline: -14% in 2013 -40% by 2030 -80% by 2050	Based on 2005 baseline: -15% by 2020 -38% by 2030 -83% by 2050	Based on 2006 baseline: -15% by 2015 -30% by 2025
Baseline GHG	8,989,460 (1990)	4,161,823 (2005)	5,900,000 (2006)
Recent GHG measurement	7,695,000 (2013)	3,847,864 (2011)	5,100,000 (2010)
Percent change relative to baseline	-14.4%	-5.8%	-14%
Average annual percent change	-0.6%	-1.0%	-3.0%

Table 4

Summary of Goals and Strategies for Buildings and Energy, Transportation, and Solid Waste

Sector	Goal Type	Strategy
Buildings and energy	Retrofit Existing Buildings	Incentives and rebates for appliances, lighting, electronics, etc.
		Adopt ordinance requirements for commercial and industrial properties performance standards
	Zero Net Emissions for New Development	Establish minimum performance standard through city building codes
	Increase Renewable Energy	Incentive programs
		Adopt city building codes requiring new development to use a set percentage of renewable energy sources
		Support state initiatives to develop renewable energy markets
Transportation	Fuel Efficiency	Support federal fuel efficiency standards to achieve 54.5 mpg by 2025
		Increase electric vehicles and develop charging station infrastructure
		Improve traffic flow by synchronizing traffic lights
	Reduce VMT	Increase public transit services
		Develop "complete" neighborhoods[1]
		Increase bike paths
Solid waste	Reduce Waste	Media campaigns
	Recycling and Organics	Enforce recycling mandates
		Implement and/or expand composting and organics energy recovery

[1]"Complete" neighborhoods are generally defined as making every day basic needs available by bicycle or pedestrian pathways.

Table 5

Summary of GHG Reductions ($MTCO_2e$) by Sector for Buildings and Energy, Transportation, and Solid Waste.

	Portland, OR	**Sacramento, CA**	**Minneapolis, MN**
Population	609,456	479,686	400,070
Sector	**Buildings and energy**	**Energy Efficiency and Renewable Energy**	**Buildings and energy**
Sector baseline	5,513,000 (1990)	1,728,569 (2005)	3,644,000 (2006)
Recent Sector measurement	4,772,000 (2013)	1,470,559 (2011)	3,366,000 (2010)
Average $MTCO_2e$/year	-32,217	-43,002	-69,500
Average annual percent change	-0.56%	-2.5%	-2.0%
Sector	**Urban form and transportation**	**Mobility and connectivity**	**Transportation and land use**
Sector baseline	2,979,000 (1990)	2,013,962 (2005)	1,711,000 (2006)
Recent Sector measurement	2,830,000 (2013)	2,009,724 (2011)	1,479,000 (2010)
Average $MTCO_2e$/year	-6,478	-706	- 58,000
Average annual percent change	-0.2%	-0.03%	-3.5%
Sector	**Consumption and Solid Waste**	**Waste Reduction and Recycling**	**Waste and Recycling**
Sector baseline	498,000 (1990)	241,862 (2005)	315,923 (2006)
Recent Sector measurement	93,000 (2013)	318,497 (2011)	279,919 (2010)
Average $MTCO_2e$/year	-17,609	+12,773	-9,001
Average annual percent change	-3.5%	+5.3%	-2.75%

Table 6

Buildings and Energy GHG Emission ($MTCO_2e$) Status and Goals for Portland, Sacramento, and Minneapolis*

	Portland	**Sacramento**	**Minneapolis**
Population	609,456	479,686	400,070
City GHG reduction goals	Based on 1990 baseline: -14% in 2013 -40% by 2030 -80% by 2050	Based on 2005 baseline: -15% by 2020 -38% by 2030 -83% by 2050	Based on 2006 baseline: -15% by 2015 -30% by 2025
Baseline GHG	8,989,460 (1990)	4,161,823 (2005)	5,900,000 (2006)
Recent GHG measurement	7,695,000 (2013)	3,847,864 (2011)	5,100,000 (2010)
Average Annual Percent change	-0.6%	-1%	-3%
Sector	Buildings and energy	Energy efficiency and renewable energy	Buildings and energy
Sector baseline	5,513,000 (1990)	1,728,569 (2005)	3,644,000 (2006)
Recent Sector measurement	4,772,000 (2013)	1,470,559 (2011)	3,366,000 (2010)
Average MTCO2e/year	-32,217	-43,002	-69,500
Average annual percent change	-0.56%	-2.5%	-2.0%

*for the purpose of this table, residential, commercial, and industrial emissions are combined.

Table 6-1

City of Portland Buildings and Energy Goals and Strategies

City Status	Sector Goals	Strategy Type	Strategies
Portland Sector 1990: 5,513,000 **Sector 2013:** 4,772,000 **Percent change:** -13%	Reduce total energy use of all buildings built before 2010 by 25%	Policy action leading to mandate	Commercial energy performance benchmarking
		Policy action leading to mandate or incentive	Residential energy performance ratings
		Incentive	Funding- establish a clean energy fund; remove financial barriers
		Policy action leading to mandate or incentive	Residential retrofits- 1,000 home and 1,000 multifamily units per year
		Mandate	Carbon Price- support statewide carbon tax or local carbon pricing mechanism
	Achieve zero net carbon emissions in all new buildings and homes	Mandate	Oregon building code- support to revise code and incorporate performance that targets net-zero energy by 2030
		Mandate	Establish minimum energy performance targets for new construction and major renovations
	Supply 50% of all energy used in buildings from renewable resources, with 10% produced within Multnomah County from on-site renewable sources, such as solar	Policy action leading to mandate or incentive	Electricity supply- partner with agencies, stakeholders, and suppliers to reduce carbon content of electricity by 3% annually
		Policy action leading to mandate or incentive	Add 15 megawatts of installed solar photovoltaic capacity
		Policy action leading to mandate or incentive	Participate in statewide policy discussions to expand the market in Oregon for renewable energy

Table 6-2

City of Sacramento Buildings and Energy Goals and Strategies

City Status	Goals	Sub-sector	Strategy type	Strategies
Sacramento Sector 2005: 1,728,569 **Sector 2011:** 1,470,559 **Percent change:** -15% **Total reduction potential by 2020:** 445,590 $MTCO_2e$/ year	(1) Achieve zero net energy in all new construction by 2030 (2) Achieve an overall 15% reduction in energy usage in all existing residential and commercial buildings by 2020	Energy Demand Management and Conservation *2020 Reduction potential: 155,700 $MTCO_2e$/year*	Policy action leading to mandate or incentive	Support SMUD's Smart Grid program estimated to result in 4% energy savings and 2% transmission savings by 2030 *2020 Reduction potential: 69,215 $MTCO_2e$/year*
			Incentive	Support SMUD's energy efficiency rebate and incentive programs offered for appliances, lighting, electronics, lighting incentives, multi-family retrofits *2020 Reduction potential: 79,384 $MTCO_2e$*
			Incentive	Media campaign *2020 Reduction potential: 5,594 $MTCO_2e$/year*
		Increase Existing Building Energy Efficiency *2020 Reduction potential: 107,559 $MTCO_2e$/year*	Incentive	Work with partners to develop and implement a voluntary rental housing efficiency program. If the program does not achieve an average energy savings of 15% per unit in at least 10,000 homes per year by 2014, the program may switch to mandatory improvements in rental housing. *2020 Reduction potential: 32,887 $MTCO_2e$/year*
			Mandate	Develop and adopt a Commercial Energy Conservation Ordinance (CECO) that requires mandatory energy and water standards for all commercial and

City Status	Goals	Sub-sector	Strategy type	Strategies
				industrial properties, including retrofitting properties where a building permit is pulled over a specified project size *2020 Reduction potential: 50,017 $MTCO_2e$/year*
			Incentive	Develop and adopt a Commercial Property Assessed Clean Energy Financing Program to create a voluntary special assessment district to help finance retrofits for commercial establishments *2020 Reduction potential: 18,225 $MTCO_2e$/year*
		Increase Energy Efficiency in New Buildings *2020 Reduction potential: 39,009 $MTCO_2e$/year*	Policy action leading to mandate or incentive	Increase residential density by achieving target of 39% of the city's housing stock as multifamily by 2020 *2020 Reduction potential: 8,474 $MTCO_2e$/year*
			Mandate	Require Tier I CalGreen Building Code Standards for all new development starting in 2014, resulting in 15% higher energy efficiency above mandatory CalGreen requirements *2020 Reduction potential: 30,535 $MTCO_2e$/year*
		Increase Renewable Energy Generation and Use *2020 Reduction potential: 143,322 $MTCO_2e$/year*	Mandate	Update development Code to require new single-family and multi-family residences of 10 or more units to install photovoltaic systems and participate in SMUD's SolarSmart Homes program with a goal of capturing 84% of new eligible units *2020 Reduction potential: 71,134 $MTCO_2e$/year*

City Status	Goals	Sub-sector	Strategy type	Strategies
			Incentive	Support SMUD's Green Energy Program that allows customers to opt in to pay an additional fee on their utility bill each month to promote renewable energy projects and expand supply *2020 Reduction potential: 70,471 $MTCO_2e$/year*

Table 6-3

City of Minneapolis Buildings and Energy Goals and Strategies

City Status	Cross-cutting strategies	Goals	Strategy type	Strategies
Minneapolis Sector 2006: 5,900,000 **Sector 2010:** 5,100,000 **Percent change:** -14%	Support adoption of the latest International Energy and Conservation Code (IECC) and International Green Construction Code (IGCC) and adopt IGCC locally	15% energy efficiency in residential buildings from 2006 baseline by 2025	Incentive	Work toward 75% of Minneapolis homeowners participating in whole-house retrofit programs by 2025
			Incentive	Work toward 75% of Minneapolis renters and rental property owners participating in retrofit programs by 2025
			Mandate	"Green" the Truth-in-Housing program
			Incentive	Connect and collaborate with other residential energy efficiency efforts
	Identify opportunities to increase conservation efforts within the downtown district heating and cooling system and make the system more efficient using technologies like combined heat and power Identify opportunities to expand use of district heating systems to new and existing buildings	20 % energy efficiency in commercial/ industrial buildings from 2006 baseline by 2025	Mandate	Implement the Building Energy Disclosure policy for medium and large commercial buildings (the recently adopted commercial building energy disclosure policy requires annual benchmarking and data publication)
			Incentive	Develop incentives for "day shift cleaning"; work with janitors to investigate day cleaning standards
			Incentive	Continue to support a loan program to help businesses and industrial companies become energy efficient, focusing on a small number of businesses that consume a large portion of energy

City Status	Cross-cutting strategies	Goals	Strategy type	Strategies
	Require City-financed projects to meet energy efficiency standard, such as Sustainable Buildings 2030 (SB2030)	10% increase (local and direct purchased) in renewable energy consumption by 2025	Policy action leading to mandate or incentive	Support efforts to align utility practices with City and State renewable energy policy
			Incentive	Implement renewable energy incentive programs for businesses
			Policy action leading to mandate or incentive	Investigate large-scale renewable energy purchasing
			Incentive	Encourage "net zero" energy buildings
			Incentive	Support new financing and ownership models for developing Minneapolis's solar resource
	Explore opportunities to restructure the mechanical permit fee schedule and other fee schedules to incentivize energy- and water- efficient products and renewable energy	1.5% annual reduction in municipal GHG emissions	Policy action leading to mandate or incentive	(no additional detail)
	Work with utility providers and the State of Minnesota to conduct a robust energy end-use analysis to inform future energy planning efforts by the City		Policy action leading to mandate or incentive	(no additional detail)

Table 7

Transportation GHG Emission ($MTCO_2e$) Status and Goals for Portland, Sacramento, and Minneapolis.

	Portland	**Sacramento**	**Minneapolis**
Population	609,456	479,686	400,070
City GHG reduction goals	Based on 1990 baseline: -14% in 2013 -40% by 2030 -80% by 2050	Based on 2005 baseline: -15% by 2020 -38% by 2030 -83% by 2050	Based on 2006 baseline: -15% by 2015 -30% by 2025
Baseline GHG	8,989,460 (1990)	4,161,823 (2005)	5,900,000 (2006)
Recent GHG measurement	7,695,000 (2013)	3,847,864 (2011)	5,100,000 (2010)
Percent change	-0.6%	-1%	-3%
Sector	Urban form and transportation	Mobility and connectivity	Transportation and land use
Sector baseline	2,979,000 (1990)	2,013,962 (2005)	1,711,000 (2006)
Recent Sector measurement	2,830,000 (2013)	2,009,724 (2011)	1,479,000 (2010)
Average MTCO2e/year	-6,478	-706	- 58,000
Average annual percent change	-0.2%	-0.03%	-3.5%

Table 7-1

City of Portland Transportation Goals and Strategies

City Status	Sector Goals	Strategy type	Strategies
Portland **Sector 1990:** 2,979,000 **Sector 2013:** 2,830,000 **Percent change:** -5%	Create neighborhoods where 80% of residents can easily walk or bike to meet all basic daily, non-work needs to reduce per capita VMT by 30% below 2008 levels	Incentive	Support for State and City transportation funding sources for: bicycle and pedestrian services and facilities; road usage and fuel efficiency charge; maintain and expand existing transportation system
		Policy action leading to mandate or incentive	Include estimates of carbon emissions in evaluations of major planning scenarios, and partner with jurisdictions to develop modeling tools
		Incentive	Bike sharing, facilities, and greenway development
		Policy action leading to mandate or incentive	In the Portland Transportation System Plan update, include: carbon, and VMT, reduction goals; policy that supports baseline and progress monitoring; and, improved service standards to reflect bicycle, pedestrian, and transit needs and urban congestions thresholds
	Improve freight movement efficiency	Incentive	Protect existing intermodal freight facilities (rail, port, airport, etc.) Support centrally located and regionally significant industrial areas that may provide for future intermodal facilities and efficient local deliveries
	Increase fuel efficiency of passenger vehicles to 40 miles per gallon and manage road systems to minimize emissions	Policy action leading to mandate or incentive	Support federal fuel efficiency standards to achieve 54.5 miles per gallon by 2025 and strengthen standards for medium- and heavy-duty vehicles
		Policy action leading to mandate or incentive	Explore options for managing freeways at optimum speeds and traffic flows through Intelligent transportations systems and freeway management
	Reduce lifecycle carbon emissions of transportation fuels by 20%	Mandate	Low carbon fuel standards
		Policy action leading to mandate or incentive	Add 8,000 electric vehicles and plug-in hybrids and expand charging station infrastructure

Table 7-2

City of Sacramento Transportation Goals and Strategies

City Status	Goals	Sub-sector	Strategy type	Strategies
Sacramento **Sector 2005:** 2,013,962 **Sector 2011:** 2,009,724 **Percent change:** -0.2% **Total reduction potential by 2020:** 107,894 MTCO2e/ year	Reduce total community-wide vehicle miles travelled per capita at a minimum of 7% by 2020 and 16% by 2035	Increased Bicycle Mode Share *2020 Reduction potential: 32,909 $MTCO_2e$/year*	Policy action leading to mandate or incentive	Implement Bikeway Mater Plan to achieve an annual expansion of 5% of the existing system *2020 Reduction potential: 32,909 $MTCO_2e$/year*
		Increased Transit Mode Share *2020 Reduction potential: 54,848 $MTCO_2e$/year*	Policy action leading to mandate or incentive	Increase public transit service (frequency, number of lines and stops, dedicated transit lines, etc.) beyond the Metropolitan Transportation Plan by 5% in 2020 and 10% in 2030 *2020 Reduction potential: 54,848 $MTCO_2e$*
		Connected Transportation System *2020 Reduction potential: 10,431 $MTCO_2e$/year*	Policy action	Improve traffic flow and associated fuel economy of vehicles travelling on city streets by synchronizing the remaining 50% of the city's eligible traffic signals by 2035 *2020 Reduction potential: 10,431 $MTCO_2e$*

Table 7-3

City of Minneapolis Transportation Goals and Strategies

Sector Status	Goals	Sub-Sectors	Strategy type	Strategies
Minneapolis Sector 2006: 1,711,000 Sector 2010: 1,479,000 Percent change: -14%	Increase the share of Minneapolis residents and workers using non-auto modes of transportation	Planning and Land Use	Incentive	Plan and encourage "complete neighborhoods"
			Policy action leading to mandate or incentive	Continue to expand the urban tree canopy and achieve an equitable percentage of tree canopies across residential neighborhoods to reduce urban heat island effects by creating more shade
	Reduce vehicle miles travelled and improve accessibility and increase transportation choices	Transit and Car Sharing	Policy action leading to mandate or incentive	Address gaps in the existing transit network and level of service
	Support livable, walkable, bikeable, safe and growing neighborhoods that meet the needs of all Minneapolis residents	Active transportation	Policy action leading to mandate or incentive	Construct 30 miles of protected on-street bike paths for safe and efficient travel
			Policy action leading to mandate or incentive	Achieve the City's adopted targets for bicycle mode share and bicycle counts and adopt a stretch goal of 15% for 2025
	Support The Metropolitan Council's goals of doubling regional transit ridership by 2030, while improving access and livability for lower income households most reliant on public transit	Parking Management	Policy action leading to mandate or incentive	Develop new information technology to reduce "cruising" for parking with mobile phone apps
			Policy action leading to mandate or incentive	Adjust minimum parking requirements to better promote alternative modes of transportation
	Grow jobs and housing to support a growing economy and non-auto transportation modes	Transportation Demand Management and Intelligent Transportation Systems	Policy action leading to mandate or incentive	Support the Downtown Transportation Management Organization's goal to reduce 4.8 million drive alone trips by 2015

Sector Status	Goals	Sub-Sectors	Strategy type	Strategies
			Incentive	Support the expansion of congestion pricing, dynamic signage and other traffic management techniques on regional highways
			Incentive	Encourage employers to embrace alternative work arrangements for employees
	Through local action and federal and state legislation, support a transition to cleaner fuels and more efficient vehicles	Clean Fuels	Mandate	Explore regulatory incentives to increasing electric vehicle charging infrastructure
			Policy action leading to mandate or incentive	Increase the fuel efficiency of the city's licensed taxi and car service fleet Support increased fuel efficiency in public fleets
			Policy action leading to mandate or incentive	Support new federal fuel efficiency standards
			Policy action leading to mandate or incentive	Support development of alternative jet fuels and ensure Minneapolis-Saint Paul International Airport (MSP) is prepared for increased use
	Promote and strengthen green infrastructure and natural systems that can build resilience, sequester or reduce emissions, and improve neighborhoods	Other Strategies	Policy action leading to mandate or incentive	Support and encourage MSP to be the greenest airport (focus on expanding renewable energy, take-off and landing procedures)
			Policy action leading to mandate or incentive	Continue to shift to LED streetlights

Table 8

Solid Waste GHG Emission ($MTCO_2e$) Status and Goals for Portland, Sacramento, and Minneapolis

	Portland	**Sacramento**	**Minneapolis**
Population	609,456	479,686	400,070
City GHG reduction goals	Based on 1990 baseline: -14% in 2013 -40% by 2030 -80% by 2050	Based on 2005 baseline: -15% by 2020 -38% by 2030 -83% by 2050	Based on 2006 baseline: -15% by 2015 -30% by 2025
Baseline GHG	8,989,460 (1990)	4,161,823 (2005)	5,900,000 (2006)
Recent GHG measurement	7,695,000 (2013)	3,847,864 (2011)	5,100,000 (2010)
Percent change	-0.6%	-1%	-3%
Sector	Consumption and Solid Waste	Waste Reduction and Recycling	Waste and Recycling
Sector baseline	498,000 (1990)	241,862 (2005)	315,923 (2006)
Recent Sector measurement	93,000 (2013)	318,497 (2011)	279,919 (2010)
Average MTCO2e/year	-17,609	+12,773	-9,001
Average annual percent change	-3.5%	+5.3%	-2.75%

Table 8-1

City of Portland Solid Waste Goals and Strategies

City Status	Goals	Strategy type	Strategies
Portland **Sector 1990:** 498,000 **Sector 2013:** 93,000 **Percent change:** -86%	Reduce consumption-related emissions by encouraging sustainable consumption and supporting Portland businesses in minimizing the carbon intensity of supply chains	Policy action leading to mandate or incentive	Develop a sustainable consumption strategy to prioritize local government activities to support a shift to lower-carbon consumption patterns
		Policy action leading to mandate or incentive	Participate in the process to develop state and federal product stewardship programs and legislation
	Reduce food scraps sent to landfills by 90%	Incentive	Reduce food waste
		Policy action leading to mandate or incentive	Expand participation in Portland's Composting Program
	Reduce per capita solid waste by 33%	Incentive	Increase awareness and participation in targeted waste-prevention practices, and research and encourage strategies for reducing use of paper, plastics, and other materials
	Recover 90% of all waste generated	Incentive	Update the Portland Recycles Plan and consider the best end-of-life options for materials
		Incentive	Provide technical assistance and resident waste reduction resources to multifamily property owners, managers, maintenance workers, and on-site staff to reach 50% of multifamily households annually

Table 8-2

City of Sacramento Solid Waste Goals and Strategies

City Status	Goals	Strategy type	Strategies
Sacramento **Sector 2005:** 241,862 **Sector 2011:** 318,497 **Percent change:** +32% **Total reduction potential by 2020:** 79,404 $MTCO_2e$/ year	Sustainable Production and Consumption	Incentive	Supporting actions for this goal include: junk-mail prevention, paperless billing, develop local markets for recycled materials, etc. *No GHG Reduction Potential*
	Source Reduction, Diversion, Recycling, and Reuse	Policy action leading to mandate or incentive	Achieve interim waste reduction goals of 75% diversion from the waste stream by 2020, and 90% diversion by 2030 *2020 Reduction potential: 79,404 $MTCO_2e$/year*
	Greenwaste and Composting	Policy action leading to mandate or incentive	Supporting actions for this goal include: support efforts to produce renewable energy from organic waste, support area wood grinding facilities for mulch and ground cover, and increase food waste recycling programs and composting

Table 8-3

City of Minneapolis Solid Waste Goals and Strategies

City Status	Goals	Sub-sector	Strategy type	Strategies
Minneapolis Sector 2006: 315,923 Sector 2010: 279,919 Percent change: -11%	Achieve a zero percent growth rate in the total waste stream from 2010 levels, with a long-term goal of achieving zero waste	Reduce Waste	Incentive	Undertake public education campaign to inform residents about opt-out opportunities for materials like phonebooks and junk mail
	Recycle 50% of the waste stream in Minneapolis by 2025, with a long-term goal of achieving zero waste	Increase Recycling	Mandate	Enforce the commercial recycling ordinance and undertake an educational campaign to expand recycling options in multifamily housing
			Policy action	Identify barriers to recycling in multifamily buildings
	Increase organics collection by 15% of the waste stream by 2025	Increase Composting and Organics	Incentive	Identify major organic waste producers and conduct a targeted campaign to increase organics recycling
			Policy action leading to mandate or incentive	Expand residential organics recycling
			Incentive	Support more options for local processing of organic waste
	Reduce the flow of wastewater from Minneapolis and support efforts to make wastewater treatment more energy efficient	Reducing Wastewater Treatment Impacts	Policy action leading to mandate or incentive	Work with the Metropolitan Council to achieve their energy use goals and track associated impacts on GHG emissions from Minneapolis contribution to wastewater flows

City Status	Goals	Sub-sector	Strategy type	Strategies
			Policy action leading to mandate or incentive	Achieve 75% participation rate in the Community Energy Services program for eligible Minneapolis properties, which includes low-flow water fixture information installations
			Policy action leading to mandate or incentive	Explore options for expanding the use of greywater systems and water conservation measures in public and private buildings
	Increase awareness of the lifecycle impacts of products to address GHGs occurring outside the community.			

Responsive partner.
Exceptional outcomes.

Toll Free: 800-472-2232 **Email: wenckmp@wenck.com** **Web: wenck.com**

MINNESOTA			COLORADO	GEORGIA	NORTH DAKOTA	SOUTH DAKOTA	WYOMING
Maple Plain	Golden Valley	New Hope	Denver	Roswell	Fargo	Pierre	Cheyenne
763-479-4200	763-252-6800	800-368-8831	602-370-7420	678-987-5840	701-297-9600	605-222-1826	307-634-7848
	Windom	Woodbury	Fort Collins		Mandan		Sheridan
	507-831-2703	651-294-4580	970-223-4705		701-751-3370		307-675-1148

Appendix D

Incentives and Alternative Funding Sources

WENCK File #1832-0005
March 2016

City of Rochester Energy Action Plan - Assessment of Available Incentives and Alternative Funding Sources

Prepared for:

Rochester-Olmsted Planning Department

2122 Campus Drive
Southeast, Suite 100
Rochester, Minnesota 55904

WENCK ASSOCIATES

Responsive partner.
Exceptional outcomes.

Prepared by:

WENCK Associates, Inc.
1800 Pioneer Creek Center
Maple Plain, MN 55359
Phone: 763-479-4200
Fax: 763-479-4242

Table of Contents

1.0 INTRODUCTION 1-1

2.0 AVAILABLE INCENTIVES AND ALTERNATIVE FUNDING SOURCES 2-1

2.1 Recommended Incentives and Alternative Funding Sources 2-1
2.1.1 Department of Energy's Energy Efficiency and Conservation Block Grant Program (EECBG) 2-2
2.1.2 Clean Energy Resource Team (CERT) 2-3
Clean Energy Resource Team (CERT) 2-3
2.1.3 Unites States Department of Energy Loan Guarantee for Renewable Energy & Efficient Energy Projects 2-4
2.1.4 Made in Minnesota (MiM) Solar Incentive Program 2-5
2.1.5 Property Assessed Clean Energy (PACE) 2-6
2.1.6 Guaranteed Energy Savings Program (GESP) 2-7
2.1.7 Energy Savings Partnership Program (ESP) 2-8
2.1.8 Minnesota Conservation Applied Research and Development (CARD) Grant Program 2-9
2.1.9 Local Energy Efficiency Program (LEEP) 2-10
2.1.10 Minnesota Conservation Applied Research and Development (CARD) Grant Program 2-11
2.1.11 McKnight Foundation Midwest Climate & Energy 2-12
2.1.12 Surdna Foundation Sustainable Environments Program - Sustainable Transportation Networks & Equitable Development Patterns 2-13

3.0 REFERENCES 3-1

1.0 Introduction

Many State and Federal programs exist which provide a variety of financial incentives and funding sources for energy reduction initiatives. The City of Rochester can and should capitalize on these programs. This assessment will include a summary of existing opportunities and will highlight the most compelling and relevant opportunities for the City to consider. The following categories were identified as the Rochester Energy Action Plan (EAP) greenhouse gas emission (GHG) mitigation priorities. We have identified funding opportunities that align with these priorities.

1. Built Environment City-Owned;
2. Built Environment Commercial/Industrial;
3. Built Environment Residential;
4. Transportation Network,
5. Electricity Generation; and
6. Rochester Wastewater Reclamation Plant.

2.0 Available Incentives and Alternative Funding Sources

2.1 RECOMMENDED INCENTIVES AND ALTERNATIVE FUNDING SOURCES

Recommended incentives and alternative funding sources for actions recommended by the EAP are listed in this section. For each incentive or funding source the type of funding is defined: public, private, public/private partnership, or other. The Program funding priorities will then be identified along with the agency or required partner if the funding is secured. Finally, a timeline for the incentive or funding source is outlined, including application cycle information and dates.

2.1.1 Department of Energy's Energy Efficiency and Conservation Block Grant Program (EECBG)

Incentive or Funding Source Name	Department of Energy's Energy Efficiency and Conservation Block Grant Program (EECBG)
Information Source	http://energy.gov/eere/wipo/energy-efficiency-and-conservation-block-grant-program
General Description	The EECBG Program provides block state and local governments to develop, promote, implement, and manage energy efficiency and conservation projects that ultimately create jobs. The funding also supports energy audits and energy efficiency retrofits in residential and commercial buildings, the development and implementation of advanced building codes and inspections, and the creation of financial incentive programs for energy efficiency improvements. The grant funds can also go towards transportation programs that conserve energy, projects to reduce and capture methane emissions from landfills, renewable energy installations on government buildings, energy efficient traffic signals and street lights, combined heat and power systems, district heating and cooling systems, and other projects.
Type of Funding	Public
Funding Priorities	Energy efficiency and conservation projects that create jobs.
Agency or Required Partner	The EECBG Program is administered by the Office of Weatherization and Intergovernmental Programs in the Office of Energy Efficiency and Renewable Energy—EERE of the United States Department of Energy
Timeline	As soon as possible: ▲ Register as an applicant in EERE Exchange ▲ Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number ▲ Register with the System for Award Management (SAM) ▲ Register with FedConnect ▲ Register with the Federal Funding Accountability and Transparency Act Subaward Reporting System (FSRS)
Associated EAP Priority	Built Environment City-Owned, Built Environment Commercial/Industrial, Built Environment Residential, Transportation Network, Electricity Generation, Rochester Wastewater Reclamation Plant

2.1.2 Clean Energy Resource Team (CERT)

Incentive or Funding Source Name	Clean Energy Resource Team (CERT)
Information Source	http://rfp.mncerts.org/
General Description	CERT provides funding for limited financial assistance for energy efficiency and/or renewable energy projects requiring technical assistance. Project funding can support technical assistance services (i.e., labor costs only, such as for a consultant, design professional, installer, or student labor) for projects in all seven Minnesota CERT regions: Central, Metro, Northeast, Northwest, Southeast, Southwest, and West Central. CERTs helps identify and implement community-based clean energy projects by encouraging the implementation of community-based energy efficiency and renewable energy projects in Minnesota CERT regions and providing a forum for community education about energy efficiency and renewable energy technologies and their economic, ecological, and community benefits
Type of Funding	Public
Funding Priorities	CERT Seed Grant – Energy Efficiency and Renewable Energy Community Solar Gardens
Agency or Required Partner	Minnesota Department of Commerce and CERTS teams
Timeline	Not currently accepting applications, but applications are expected to be due in the fall of 2016. Funding is provided for labor services only and will be provided on a reimbursement basis.
Associated EAP Priority	Built Environment City-Owned, Built Environment Commercial/Industrial, Built Environment Residential, Transportation Network

2.1.3 Unites States Department of Energy Loan Guarantee for Renewable Energy & Efficient Energy Projects

Incentive or Funding Source Name	Renewable Energy & Efficient Energy Projects Loan Guarantee
Information Source	http://energy.gov/lpo/services/solicitations/renewable-energy-efficient-energy-projects-solicitation
General Description	As much as $4 billion in loan guarantees are available to support innovative, renewable energy and energy efficiency projects in the U.S. that reduce, avoid, or sequester greenhouse gases. These loans are intended to support renewable energy and energy efficiency technologies that are catalytic, replicable, and market ready. The Renewable Energy and Efficient Energy solicitation is authorized by Title XVII of the Energy Policy Act of 2005 through Section 1703 of the Loan Guarantee Program.
Type of Funding	Public
Funding Priorities	Advanced Grid Integration and Storage, Drop-in Biofuels, Waste-to- Energy, Enhancement of Existing Facilities, Efficiency Improvements
Agency or Required Partner	Department of Energy Loan Programs Office
Timeline	Part I funding round has been completed, additional round may be announced in the near future
Associated EAP Priority	Built Environment City-Owned, Built Environment Commercial/Industrial, Built Environment Residential, Transportation Network, Electricity Generation, Rochester Wastewater Reclamation Plant

2.1.4 Made in Minnesota (MiM) Solar Incentive Program

Incentive or Funding Source Name	Made in Minnesota (MiM) Solar Incentive Program
Information Source	http://www.mn.gov/commerce/consumers/your-home/save-energy-money/mim/
General Description	MiM is a solar photovoltaic (PV) and solar thermal incentive program for consumers who install PV and solar thermal systems using solar modules and collectors certified as manufactured in Minnesota.
Type of Funding	Public
Funding Priorities	Solar projects must be located in one of three participating electric investor-owned utility (IOU) service territories and tied directly to an electric meter at the home or business of the host customer of the solar installation. Customers of Xcel Energy, Minnesota Power, and Otter Tail Power are eligible to apply. Solar thermal projects located in the participating IOU territories will be given priority over solar thermal projects located in electric coop or municipal power territories. However, all Minnesota residents and business are eligible to apply for solar thermal projects. Recipients are accepted by lottery
Agency or Required Partner	The Minnesota Department of Commerce and the Minnesota Pollution Control Agency
Timeline	Applications for solar PV are accepted annually from Jan. 1 to Feb. 28 and selected by lottery. Solar thermal project applications are accepted annually from Jan. 1 to Feb. 28 and selected by lottery as well. After all solar thermal applications from IOU customers have been funded, solar thermal applications are accepted on a first-come, first-served basis throughout the year until all funds have been committed.
Associated EAP Priority	Built Environment City-Owned, Built Environment Commercial/Industrial, Built Environment Residential, Electricity Generation,

2.1.5 Property Assessed Clean Energy (PACE)

Incentive or Funding Source Name	Property Assessed Clean Energy (PACE)
Information Source	http://energy.gov/eere/slsc/property-assessed-clean-energy-programs
General Description	PACE is a mechanism for financing energy efficiency and renewable energy improvements on private property. This financing occurs through a voluntary special assessment placed onto the property tax statement. This program was made possible by a grant from the U.S. Department of Energy and the Minnesota Department of Commerce through the American Recovery and Reinvestment Act of 2009 (ARRA).
Type of Funding	Public
Funding Priorities	PACE prioritizes spending in local communities through the installation of energy efficient equipment and implementation of renewable energy measures for commercial and residential properties.
Agency or Required Partner	St. Paul Port Authority, the Minnesota Department of Commerce
Timeline	Immediate funding available Contact information: 612.353.5760 or Info@EutecticsLLC
Associated EAP Priority	Built Environment Commercial/Industrial, Built Environment Residential

2.1.6 Guaranteed Energy Savings Program (GESP)

Incentive or Funding Source Name	Guaranteed Energy Savings Program (GESP)
Information Source	http://www.cleanenergyresourceteams.org/gesp
General Description	GESP is state technical assistance on Energy Savings Performance Contracting, administered by the Department of Commerce Division of Energy Resources. Energy Savings Performance Contracting (ESPC) is a performance-based procurement and financing mechanism that leverages maintenance, operations, and utilities savings achieved through the installation of energy efficiency and renewable energy measures, to finance the cost of the facility retrofit and renewal project, with no bonding or raising taxes. In an energy savings performance contract, the money used to pay for upgrades is repurposed from the existing operations and maintenance budgets as a result of the installation of more efficient equipment. The savings each year go towards paying for the contract over time, until the new equipment is paid off.
Type of Funding	Public
Funding Priorities	County, city, school district or local government facility retrofits to save energy. High potential facilities include: ▲ Schools ▲ Courthouses & City Halls ▲ Ice Arenas ▲ Correctional Facilities ▲ Water & Wastewater Treatment Plants ▲ Recreational Facilities & Pools ▲ Public Works Buildings ▲ Libraries ▲ Liquor Stores
Agency or Required Partner	Minnesota Department of Commerce
Timeline	Immediately Peter Lindstrom Local Gov't Outreach Coordinator Clean Energy Resource Teams (CERTs) plindstr@umn.edu or 612-625-9634 MN Department of Commerce Energy Information Center energysavings.programs@state.mn.us 651-539-1882 or 1-800-657-3710
Associated EAP Priority	Built Environment City-Owned, Rochester Wastewater Reclamation Plant

2.1.7 Energy Savings Partnership Program (ESP)

Incentive or Funding Source Name	Energy Savings Partnership Program (ESP)
Information Source	http://sppa.com/wp-content/uploads/2014/03/newESP2014.pdf
General Description	The ESP, provided by the St. Paul Port Authority, with a grant from the Minnesota Department of Commerce, is a municipal leasing program with U.S. Bank that can offer reduced interest rate loans to participants. The repayment schedule can be set by the participant and extend from one year to fifteen years. Each payment is invested in the participant's ownership of the asset. There is no end-of-lease term payment. Minimum loan size is $50,000. Financing is available to local or regional units of government or schools. Qualified participants can work independently, with an outside consultant, or with an energy services company to develop the needed information to establish the loan amount and savings. For the loan, a short two-page application form needs to be completed. Qualified participants include cities and counties, public schools and regional governmental entities. Any project that provides energy efficiencies, energy savings or renewable energy can be funded. Multiple projects can be grouped together for one loan even with different energy savings pay-back schedules.
Type of Funding	Public/Private Partnership
Funding Priorities	Any project that provides energy efficiencies, energy savings or renewable energy. Multiple projects can be grouped together for one loan.
Agency or Required Partner	The St. Paul Port Authority (SPPA), U.S. Bank
Timeline	Funding available with in days of a completed application. Pete Klein, Vice President for Finance, Saint Paul Port Authority (651) 204-6211 TOLL FREE (800)328-8417.
Associated EAP Priority	Built Environment City-Owned, Rochester Wastewater Reclamation Plant

2.1.8 Minnesota Conservation Applied Research and Development (CARD) Grant Program

Incentive or Funding Source Name	Minnesota Conservation Applied Research and Development CARD Grant Program
Information Source	https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/
General Description	CARD grant are available to individual, public or private entities who are actively involved in electricity and/or natural gas efficiency program design, implementation or research and development. Minnesota residency is not a requirement for eligibility but responders must demonstrate that they have an understanding of Minnesota issues related to utility Conservation Improvement Programs (CIP). CARD projects quantify the savings, cost-effectiveness and field performance of advanced technologies; characterize market potential of products and technologies in the State; and investigate and pilot innovative program strategies. Completed CARD projects provide utilities with informative and timely information to enhance energy efficiency program designs within their CIP portfolios.
Type of Funding	Public
Funding Priorities	Eligible projects are those that reflect the funding topics and standards detailed in the specific RFP.
Agency or Required Partner	Minnesota Department of Commerce
Timeline	The RFP for 2016 is currently under early development.
Associated EAP Priority	Electricity Generation

2.1.9 Local Energy Efficiency Program (LEEP)

Incentive or Funding Source Name	Local Energy Efficiency Program (LEEP)
Information Source	https://mn.gov/commerce/industries/energy/technical-assistance/
General Description	LEEP helps local units of government and school districts identify, study, implement, and finance energy efficiency and recommissioning projects. LEEP makes it easy to identify site-specific goals, find high-quality firms to perform an investment grade audit, and gain access to low-interest lease-purchase financing. Participants gain access to technical assistance through each stage of the process, ensuring a comprehensive, cost-effective, quality project. LEEP provides a standardized process for project development, preliminary analysis, and energy study findings along with the means to access financing for viable projects once the Local Unit of Government has received engineering design and construction/implementation bids have been sought. LEEP defines roles and responsibilities between Participants and Providers, formalizes process steps, and provides standard contract documents.
Type of Funding	Public
Funding Priorities	Energy Studies to be used in cost-effective energy-savings projects
Agency or Required Partner	St Paul Port Authority provides financing agreements for LEEP participants through ESP
Timeline	Proposals Due – Monday, April 04, 2016 by 11:59 pm CT RFP Questions Due - Monday, March 14, 2016 RFP Questions Response Posted - Monday, March 21, 2016
Associated EAP Priority	Built Environment City-Owned, Transportation Network, Electricity Generation

2.1.10 Minnesota Conservation Applied Research and Development (CARD) Grant Program

Incentive or Funding Source Name	Minnesota Conservation applied Research and Development (CARD) Grant Program
Information Source	https://mn.gov/commerce/industries/energy/utilities/cip/applied-research-development/
General Description	The Next Generation Energy Act of 2007 established energy conservation as a primary resource for meeting Minnesota's energy needs while reducing greenhouse gases and other harmful emissions. To help utilities reach their energy savings goal, the Act authorizes the commissioner to assess utilities annually for grants for applied research and development projects. CARD projects quantify the savings, cost-effectiveness and field performance of advanced technologies; characterize market potential of products and technologies in the State; and investigate and pilot innovative program strategies. Completed CARD projects provide utilities with informative and timely information to enhance energy efficiency program designs within their CIP portfolios.
Type of Funding	Public
Funding Priorities	Eligible responders to CARD RFPs may be any individual, public or private entity who is actively involved in electricity and/or natural gas efficiency program design, implementation or research and development. Minnesota residency is not a requirement for eligibility but responders must demonstrate that they have an understanding of Minnesota issues related to utility CIP programs. Responders may seek appropriate collaborators or partners. Eligible projects are those that reflect the funding topics and standards detailed in the specific RFP.
Agency or Required Partner	Minnesota Department of Commerce
Timeline	The request for Proposal for CARD 2016 is under development. Currently.
Associated EAP Priority	Electricity Generation, Rochester Wastewater Reclamation Plant

2.1.11 McKnight Foundation Midwest Climate & Energy

Incentive or Funding Source Name	McKnight Foundation
Information Source	https://www.mcknight.org/grant-programs/midwest-climate-and-energy
General Description	"McKnight's climate-related work engages the region's public and private leaders, decision makers, and citizens in building low-carbon communities and economies that are vibrant, equitable, and resilient. Through grants, investments, convening and community engagement, we're working to galvanize and maximize Midwest success. We seek to help community leaders develop, cultivate, and advance replicable and scalable local solutions that demonstrate what is possible and deliver real economic, social, and environmental benefits. We seek to showcase these examples in order to catalyze actions and investments in other communities. We advocate for strategic policy reform and infrastructure that encourage and make it easier for others to replicate, adapt, and scale solutions, contributing to a virtuous cycle of transformation over time. Ultimately, we will see the evidence of our success in mitigating greenhouse gas emissions and enhancing resilience to climate change on the ground in communities and local economies—where people live and work. Given the scope of the problems and opportunities related to climate change in the Midwest, we know we cannot move the needle in every sector. Power generation is the largest source of emissions in the Midwest, and is also the sector with the greatest economic opportunities- clean energy is the gateway to a clean economy."[1]
Type of Funding	Private Foundation
Funding Priorities	GHG Mitigation and Climate Resilience through Clean Energy
Agency or Required Partner	McKnight Foundation
Timeline	The Midwest Climate & Energy program uses a closed application process; proposals for funding are accepted only from organizations that are invited by Foundation staff to apply. Aimee Witteman, Program Director - awitteman@mcknight.org
Associated EAP Priority	Built Environment City-Owned, Built Environment Commercial/Industrial, Built Environment Residential, Electricity Generation, Rochester Wastewater Reclamation Plant

2.1.12 Surdna Foundation Sustainable Environments Program - Sustainable Transportation Networks & Equitable Development Patterns

Incentive or Funding Source Name	Surdna Foundation
Information Source	http://www.surdna.org/what-we-fund/sustainable-environments/4-what-we-fund-/what-we-fund-/480-sustainable-transportation-networks-a-equitable-development-patterns.html
General Description	The Surdna Foundation Sustainable Environments Program supports transportation systems and transit solutions that give people affordable and reliable options to get to work, school, and home while minimizing impacts on the environment and maximizing equitable economic opportunities. The Foundation seeks funding opportunities that: ▲ Strengthen and expand the use of transportation project performance standards that improve transportation options, increase access and mobility, reduce vehicle miles traveled and greenhouse gas emissions, and advance climate resilient strategies; ▲ Strengthen procurement and other policies so that the public funds spent on transportation help create quality jobs and deliver the broadest possible public benefits to nearby communities; ▲ Support innovative revenue models to build out sustainable transportation networks and ensure public benefits; ▲ Promote regional transportation and land use practices that integrate light rail, transit, and urban-suburban connections.
Type of Funding	Private Foundation
Funding Priorities	Improve conditions and opportunities for communities that rely on public transportation; Integrate transportation system improvements with other infrastructure needs (for example, transportation solutions that provide for stormwater management and/or help with regional food supply distribution and delivery); Build next generation infrastructure capacity and expertise among state and local leaders; Collect and distribute success stories and lessons learned to key leaders.
Agency or Required Partner	Surdna Foundation
Timeline	Immediately Submit an Online Letter of Inquiry https://surdna.fluxx.io/lois/new?utf8=%E2%9C%93&commit=Submit+a+Surdna+LOI
Associated EAP Priority	Transportation Network

3.0 References

1 https://www.mcknight.org/grant-programs/midwest-climate-and-energy

Responsive partner.
Exceptional outcomes.

Toll Free: 800-472-2232 **Email: wenckmp@wenck.com** **Web: wenck.com**

MINNESOTA			COLORADO	GEORGIA	NORTH DAKOTA	SOUTH DAKOTA	WYOMING
Maple Plain	Golden Valley	New Hope	Denver	Roswell	Fargo	Pierre	Cheyenne
763-479-4200	763-252-6800	800-368-8831	602-370-7420	678-987-5840	701-297-9600	605-222-1826	307-634-7848
	Windom	Woodbury	Fort Collins		Mandan		Sheridan
	507-831-2703	651-294-4580	970-223-4705		701-751-3370		307-675-1148

Responsive partner.
Exceptional outcomes.

Toll Free: 800-472-2232 **Email: wenckmp@wenck.com** **Web: wenck.com**

MINNESOTA
Maple Plain 763-479-4200
Golden Valley 763-252-6800
New Hope 800-368-8831
Windom 507-831-2703
Woodbury 651-294-4580

COLORADO
Denver 602-370-7420
Fort Collins 970-223-4705

GEORGIA
Roswell 678-987-5840

NORTH DAKOTA
Fargo 701-297-9600
Mandan 701-751-3370

SOUTH DAKOTA
Pierre 605-222-1826

WYOMING
Cheyenne 307-634-7848
Sheridan 307-675-1148