City of Brentwood, Missouri
Community and Local Government Operations
Greenhouse Gas Emissions Inventory
2010

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Sincerely,

Ron Morlen
Climate Action Intern
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Table of Contents

Executive Summary 7

Introduction 9

- Local Government Sustainability Metro St. Louis 9
- The City of Warmth 10
- Climate Change 13
- Understanding a GHG Inventory 14
  - ICLEI protocols 14
  - Benefits to conducting a GHG inventory 16

Inventory Methodology 17

- Quantifying GHG Emissions 17
  - Establishing a Baseline 17
  - Establishing Boundaries 17
  - Types of GHG Emissions 18
- Quantification methods 19
  - Calculations with Clean Air and Climate Protection (CACP) 19
  - Evaluating by Sector 19
  - Evaluating by Scope 20

Community-Wide GHG Inventory 21

- Built Environment 23
- Transportation 24
- Wastewater 26
- Potable Water 26
- Solid Waste 27

Local Government Operations Inventory 28

- Buildings and Facilities 28
- Lighting 30
- Vehicle Fleet 30
- Employee Commute 32
- Refrigerants 32

Conclusions 33

Municipal comparisons 34
Appendix A: List of Abbreviations and Acronyms 36
Appendix B: Community-Wide and LGO Inventory Details 37

List of Figures

Figure 1: City of Brentwood Community-Wide GHG Emissions, 2010 7
Figure 2: City of Brentwood Local Government Emissions, 2010 8
Figure 3: FOCUS St. Louis Roadmap 9
Figure 4: USGBC Missouri Gateway Chapter 9
Figure 5: ICLEI Process 15
Figure 6: ICLEI Protocol Boundaries 17
Figure 7: CO_2e Flow Chart 18
Figure 8: Greenhouse Gas Emissions Scope 20
Figure 9: Community Emissions by Sector 21
Figure 10: Community Emissions by Source 22
Figure 11: Community-Wide Electricity and Natural Gas Emissions 24
Figure 12: City of Brentwood Streets 25
Figure 13: Local Government Operations (LGO) Emissions 28
Figure 14: CO_2e Emissions by Building 30
Figure 15: Municipality Comparison by Major Emissions Sector 35

List of Tables

Table 1: Global Warming Potential of Greenhouse Gases 18
Table 2: Total Community Emissions in mt CO_2e 22
Table 3: Community Electricity and Natural Gas 23
Table 4: Energy used for Wastewater 26
Table 5: Potable Water by Sector 26
Table 6: Energy Use and Cost by Government Building 29
Table 7: Government Buildings by Emissions and Cost 29
Table 8: Fuel Consumption of Vehicle Fleet 31
Table 9: Fuel Cost of Vehicle Fleet 31
Table 10: Employee Commute Distance to Work 32
Table 11: Municipality Greenhouse Gas Emissions 34
Table 12: Municipality Greenhouse Gas Emissions by Sector 35
Table 13: Community E10 Consumption 37
Table 14: Community Diesel Consumption 37
Table 15: Percentage Breakdown of Solid Waste by Type 37
Table 16: Breakdown of Street Lighting by Lamp 38
Table 17: Lighting Hours of Operation by Month 38
Table 18: Planning Department Fuel Use by Month 39
Table 19: Police Department Fuel Use by Month 39
Table 20: Public Works Department Gasoline Use in Vehicles by Month 40
Table 21: Public Works Department Off Road Gasoline and Diesel Use by Month 40
Table 22: Recreation Department Fuel Use by Month 41
Table 23: Fire Department Fuel Use by Month 41

Executive Summary

This report was created to serve as a Greenhouse Gas Inventory for the City of Brentwood, Missouri. It was compiled under the guidelines set by the International Council for Local Environmental Initiatives (ICLEI) Local Governments for Sustainability protocols. This Greenhouse Gas (GHG) Inventory represents the first step of five in the ICLEI process designed to guide communities toward the reduction of GHG emissions. Research began on September 2013 and was completed in December 2013. The year of 2010 was selected as a baseline and was chosen to benchmark the City of Brentwood's GHG emissions.

The report is divided into two major sections, the emissions of the community as a whole and the emissions created by the activities of the local government. The emissions of the local government are included within the Community-Wide emissions assessment and represent a subset of the city's total emissions. They are reported separately so that emission reducing policies can be created to address both municipal operations and the community as a whole.

The data included within this report was collected to assist in the formulation of a Climate Action Plan. The report highlights sectors of major GHG emissions but does not include a formal Action Plan. Future analysis and collaboration is necessary to effectively implement emission reducing measures.

Figure 1 illustrates the percentage of GHG emissions of the community as a whole. It is evident that the majority of GHG emissions are a result of the consumption of electricity within the built environment. This percentage includes electricity consumed within the Residential, Commercial, Industrial, and Street and Highway Sectors. This represents over 200,000,000 kWh of electricity. 17% of total community emissions came from the combustion of gasoline and diesel by vehicles traveling on the roadways of Brentwood. The 10%, or over 4,370,000 therms of natural gas, were consumed within the homes, stores, factories, and other buildings within the Brentwood boundaries.

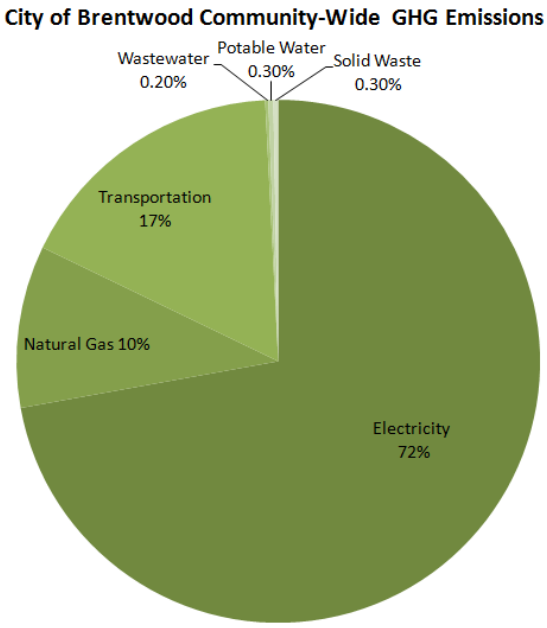

Figure 1: City of Brentwood Community-Wide GHG Emissions, 2010

Figure 2 represents the breakdown by percentage of GHG emissions caused specifically by the operations of the local government. Again the major contributor to GHG emissions is the consumption of electricity. This accounts for the electricity usage of the major buildings utilized for local government operations. Primarily these buildings are: City Hall, Fire Station, Police Station, Recreation Center, and the Public Works Building. Other minor facilities are included as well. Accounting for 9.7% of total GHG emissions is electricity consumption for lighting. This includes lighting for parks, street lights, and traffic lights operated by the local government. The small percentage of natural gas is a result of heating the buildings under the local government's control with the exception of the Police Station and Recreation Center. These facilities are not heated by natural gas.

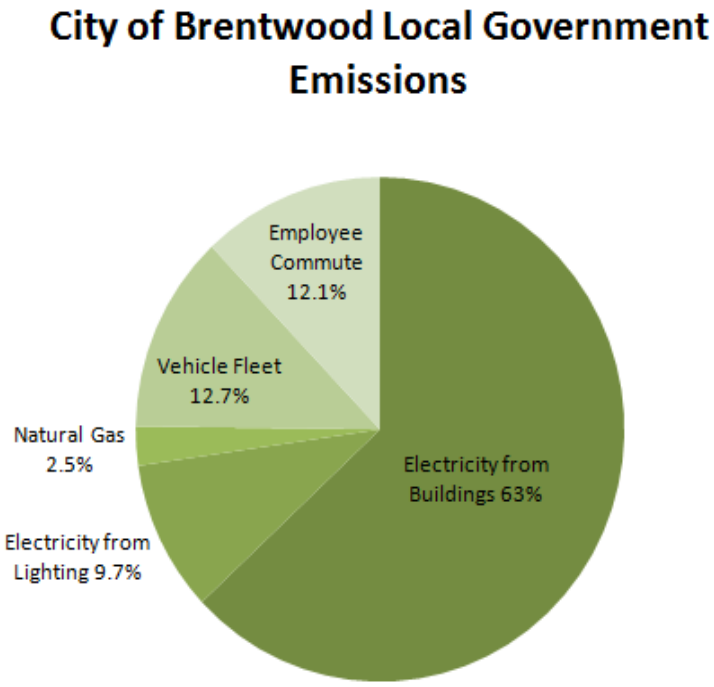

Figure 2: City of Brentwood Local Government Emissions, 2010

A total of 12.7% of the government's emissions are a result of combustion of ether gasoline or diesel consumed by the vehicle fleet. This total includes all vehicles owned and operated by the Brentwood government and were calculated using the City's fuel records. The employee commute also makes up about 12% of emissions and is a product of government employees' drive to and from work. In total, the operations of Brentwood's government resulted in 3,291 metric tons of CO_2e in 2010. This is around 2% of Brentwood total GHG emissions. Although the Local Government Operations only account for a small percentage of total Community emissions, they represent a huge opportunity to implement environmentally responsible changes and begin to influence the community as a whole.

Introduction

Local Government Sustainability Metro St. Louis

With the completion of this greenhouse gas inventory, the City of Brentwood joins many other sustainably responsible communities across the St. Louis region. The St. Louis metropolitan area is full of dedicated, proactive organizations that strive toward the advancement of sustainability within urban communities. One example of such an organization is FOCUS St. Louis[1]. Specifically, FOCUS St. Louis works to promote exceptional leaders in many fields, including sustainability. They created an *Environmental Sustainability Roadmap: A Toolkit for Local Governments* in 2009 which highlights five key steps necessary for a local government to successfully integrate environmentally responsible policies. More recently, FOCUS St. Louis along with East West Gateway Local Council of Governments and 10 other consortium partners completed OneSTL[2], a regional plan for sustainable development. The plan was funded through a Sustainable Communities Initiative grant and is intended to be implemented on a voluntary basis by municipalities and agencies across the nation.

Focus St. Louis
Key Steps to Environmental Sustainability

1. Commit to Action
2. Assess the Situation
3. Make Plans
4. Implement
5. Measure to Celebrate Success

Figure 3: FOCUS St. Louis Roadmap

Another organization leading the way in environmental stewardship is the US Green Building Council. The USGBC Missouri Gateway Chapter's vision is, "To create and restore buildings and communities that will regenerate and sustain the health and vitality of all life within a generation."[3] This mission serves as a foundation to assist stakeholders in local business and industry, as well as municipal, county and state governments. They educate individuals about sustainable development, energy efficiency and emissions reduction. In 2013, The City of Brentwood worked in cooperation with the Missouri Gateway Chapter to complete a GHG inventory to progress the

Figure 4: USGBC Missouri Gateway Chapter

[1] FOCUS St. Louis, Environmental Sustainability Roadmap: A Toolkit for Local Governments (St. Louis, MO FOCUS, 2009) http://focus-stl.org/.
[2] For more information on OneSTL visit http://www.onestl.org/
[3] USGBC - Missouri Gateway Chapter (St. Louis, MO: USGBC St. Louis, 2012) http://www.usgbc-mogateway.org/

sustainability commitment of the municipality. This inventory was supported through the Regional Environmental Internship Program, which was inherited by USGBC-Missouri Gateway Chapter from FOCUS St. Louis in 2012.

The City of Warmth

The City of Brentwood is a premier residential community, known as the "City of Warmth" to residents because of its small town charm and friendly atmosphere. Brentwood is a full service community that provides fully staffed police and fire departments, city-owned and operated residential trash and curbside recycling services[4]. Established in the early 1800's, the City was previously known as Maddenville and was governed by a Board of Trustees. Brentwood received its current name and became incorporated in 1919. The City covers approximately 1.96 miles. Brentwood is a small city with a population of 8,035 as of the 2012 estimated Census.

The City is a fourth class city and is governed under the City Administrator form of government. The legislative body is comprised of the Mayor and an eight member Board of Aldermen. Two aldermen are elected from each of the City's four wards to serve four-year terms. Brentwood is an inner-ring suburb of St. Louis, located in St. Louis County, Missouri. The City is located within suburban St. Louis County with easy access to Highway 40 (I-64), the Inner belt (I-170), and I-44. The City is within 15 minutes of the Lambert–St. Louis International Airport and within 10 minutes of the downtown business and industrial heart of St. Louis. Moreover, it is just five minutes from the St. Louis County Government offices located in Clayton. This location helps to make the City a sought after place in which to live and to operate a business.

As of the Census of 2010, there were 4,136 households, and 1,832 families residing in the city. The population density was 4,109.7 inhabitants per square mile (1,586.8 /km2). There were 4,410 housing units at an average density of 2,250.0 per square mile (868.7 /km2). The racial makeup of the city was 87.5% White, 3.1% African American, 0.1% Native American, 6.8% Asian, 0.6% from other races, and 1.9% from two or more races. Hispanic or Latino of any race were 2.8% of the population[5].

Of the 4,136 households present in Brentwood, 20.8% had children under the age of 18 living with them, 33.6% were married couples living together, 8.0% had a female householder with no husband present, 2.8% had a male householder with no wife present, and 55.7% were non-families. 46.1% of all

[4] For more information about the City of Brentwood visit http://www.brentwoodmo.org/
[5] American FactFinder, United States Census Bureau. http://factfinder2.census.gov/

households were made up of individuals and 9.5% had someone living alone who was 65 years of age or older. The average household size was 1.94 and the average family size was 2.86. The median age in the city was 35 years. 18.4% of residents were under the age of 18; 7.9% were between the ages of 18 and 24; 37.4% were from 25 to 44; 24% were from 45 to 64; and 12.4% were 65 years of age or older. The gender makeup of the city was 46.1% male and 53.9% female. The City continues to benefit from its strong and diversified local economy. It also continues to see steady growth in sales tax revenue as a result of past and current development strategies. While the City cannot predict that the trend will continue, it plans to take advantage of continued future growth to build cash reserves to a level sufficient to support current service levels and plan for replacement of city equipment and infrastructure. Elected officials and city staff continue to work with federal, state and local officials to find ways to improve Brentwood through transportation projects, accessibility projects and flood prevention programs. The City is able to maintain current levels of service, make capital improvement investments in the City infrastructure, and replace equipment and vehicles that have come to an end of their useful life without making use of reserves. However, the City needs to continue to improve financial results to create a surplus of funds that will ensure city services remain uninterrupted during extreme financial times, such as those of the past few years.

Brentwood has a number of major initiatives on the horizon. In early 2013, Drury Development broke ground on an 8-story 210 room Drury Inn and Suites. This project will include a freestanding restaurant Bonefish, and will greatly enhance the SE corner of Brentwood Boulevard and Eager Road, including burying overhead utility lines. The hotel and restaurant are expected to be open in summer 2014. The City recently completed the construction of two sidewalk improvement projects, the Rose Avenue Improvement Project and the Brentwood Pedestrian & Transit Improvement Project. The Rose Avenue project consists of new sidewalks, lighting and ADA ramps to provide safe pedestrian access from Brentwood Boulevard into the Brentwood Promenade. The Brentwood Pedestrian & Transit Improvement Project consists of new sidewalks and ADA ramps from Memorial Park through Hanley Industrial Court, connecting to the Brentwood Metro Link Station. The combined total cost of these projects is estimated at $1,216,000 with 80% of the costs funded through a federal grant[6].

Design for road overlay, sidewalk and drainage improvements and new lighting for Litzsinger Road from Brentwood Boulevard to McKnight began in 2012 and is still underway, with preliminary design plans complete and construction scheduled for 2014. The total cost for this project is estimated at

[6] http://www.city-data.com/city/Brentwood-Missouri.html

$1,925,000. This project is also 80% funded by a federal grant. The City has multiple Flood Mitigation Projects underway. This is intended to support the City's efforts to reduce flooding within the Manchester Road commercial corridor. In late 2011, Brentwood acquired a portion of Executive Walk Apartments, located adjacent to Norm West Park, through donation. This property consists of 2.31 acres and is located in the floodplain. Demolition of the existing apartment buildings is expected to be completed by December 2013. MSD has committed $500,000 to reimburse the City for the cost of clearing this site, due to the project's anticipated flood mitigation benefit. Another important project, the City has engaged an engineering firm to develop a flood mitigation study for the Manchester Road corridor. The study will provide realistic next steps for reducing flooding in an important commercial area of Brentwood, as well as 3 supporting documentation for grant applications to implement the study's recommendations[7].

The following programs have been implemented by the City of Brentwood in an effort to create and maintain a more sustainable community and many have been funded, at least in part, by grants and rebate programs:

Recycling Becomes Me Campaign - The City of Brentwood offers curbside single-stream recycling free of charge for all residents. Curbside recycling carts and containers may be obtained from the Brentwood Public Works Department on a first come first serve basis. The City also offers at no cost, a 95 gallon recycling cart. These carts were purchased through a Saint Louis Jefferson Solid Waste Management District Grant.

Brentwood Parks & Recreation and REI Clean-up - The City, along with REI as a sponsor, works with residents one day each year to clean up the local creeks and parks. Residents meet at Memorial Park for orientation, and are sent on their way with trash bags in hand. The day is spent cleaning the local creeks and parks and instilling a sense of community.

Community Shred Day - The City of Brentwood in conjunction with Shred and Protect Document Services hosts a Community Shred Day for the residents of Brentwood. The focus of this event is to give Brentwood residents the opportunity to dispose of personal and confidential paperwork not suitable for regular trash pickup.

[7] Information contained in this section was taken from weekly City Administrator Reports and City of Brentwood Newsletters

RainScape Grant Program - The City is also participating in Deer Creek Watershed Alliance Rainscape Grant Program. The Deer Creek Watershed Alliance is a project of Missouri Botanical Garden; the RainScape Rebates program is funded by Metropolitan St. Louis Sewer District, Mabel Dorn Reeder Foundation, Missouri Department of Conservation, Great Rivers Greenway, participating municipalities, and US EPA Region 7 through the Department of Natural Resources (subgrant number G11-NPS-15), under Section 319 of the Clean Water Act. RainScape Rebates program is a voluntary program that financially assists those wishing to landscape their yards to improve stormwater management. There are a variety of rainscaping options to choose from, including planting a rain garden, installing a rain barrel, amending soil, and/or replacing lawn grass with trees, shrubs, and low maintenance ground cover. Landowners in participating municipalities, including residents, schools, churches, government entities, and businesses, are eligible to participate.

TRIM Grant - The City of Brentwood Received a TRIM Grant in the amount of $9,500.00 to assist in funding with a Citywide Street Tree Inventory. The Street Tree Inventory will list and assess every tree located in the City's public right-of-way. In depth description of each tree will be categorized as far as species, size, 3 location, condition, value, and recommendations for work priority. All of the inventories data that is collected will be stored in a Tree Keeper Software Program. The Tree Keeper Software helps assist staff in managing and prioritizing risk assessment and scheduling work orders. Trees that are planted, pruned, or removed will also be documented. The City of Brentwood looks forward to utilizing this tool to help manage the urban forest[8].

Climate Change

A close examination of human interactions with the environment reveals the true impact we as a species clearly have on our planet and its ecosystems. Humanity's ability to influence and alter its surroundings is unparalleled. Whether positively or negatively, humans have both the intellectual capability and physical means to manipulate and dramatically change the environment. The impacts and ramifications of these alterations are only beginning to become realized. Humans have begun to understand that actions taken to produce food, generate energy, and provide transportation can have consequences for future generations and can disrupt a natural balance necessary to sustain life. In the past decades, individuals have started to cooperate in an effort to change the way humanity approaches

[8] Information in this section came from The City of Brentwood Comprehensive Annual Financial Report that ended December 31, 2012

these crucial issues. People are uniting through a commonly held idea; the actions taken today, directly affect what will happen in the future. As this idea evolves, more and more people are becoming aware of the adverse effects human activity is having on our environment.

Climate scientists at a Stockholm conference of the UN's Intergovernmental Panel on Climate Change say a key report has been adopted. It concludes that global warming is man-made with at least 95 percent certainty[9]. Human influence on the climate system is clear. This is evident in most regions of the globe, a new assessment by the Intergovernmental Panel on Climate Change (IPCC) concludes. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. The evidence for this has grown, thanks to more and better observations, an improved understanding of the climate system response and improved climate models[10]. Although knowledge on the subject is increasing, many scientists have been aware of the effects of global warming for some time. Over twenty years ago, the scientific community took steps to address climate change. The Kyoto Protocol of 1990 standardized the major gases contributing to climate change[11]. According to ICLEI protocols, local governments should assess emissions of all six internationally-recognized greenhouse gases regulated under the Kyoto Protocol. These gases are as follows:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexafluoride (SF_6)

Understanding a GHG Inventory

As a result of increased awareness and concern for the impact greenhouse gases are having in regards to climate change, many local governments are looking to realize the scope of their contribution.

ICLEI protocols

This greenhouse gas inventory was conducted under the guidelines established through the International Council for Local Environmental Issues (ICLEI) Local Governments for Sustainability

[9] http://www.dw.de/scientists-finalize-climate-warming-report/a-17118305
[10] http://www.ipcc.ch/news_and_events/docs/ar5/press_release_ar5_wgi_en.pdf
[11] For more information about the Kyoto Protocol visit http://www.unfccc.int/kyoto_protocol/items/2830.php

protocols[12]. These protocols provide a standard for data collection and reporting and have been used in GHG inventories nationwide. Their use ensures that Brentwood's inventory will be nationally accepted and can be compared to other municipalities both locally and across the country. The ICLEI protocols define their purpose and assist local governments in the following ways[13]:

- Enabling local governments to develop emissions inventories following internationally recognized GHG accounting and reporting principles with attention to the unique context of local government operations
- Advancing the consistent, comparable and relevant quantification of emissions and appropriate, transparent, and policy-relevant reporting of emissions
- Enabling measurement towards climate goals
- Promoting understanding of the role of local government operations in combating climate change
- Helping to create harmonization between GHG inventories developed and reported to multiple programs

The ICLEI process of quantifying and reducing GHG emissions is outlined into five milestones.

1. Conduct an inventory and forecast of local greenhouse gas emissions

2. Establish a greenhouse gas emissions reduction target

3. Develop a climate action plan for achieving the emissions reduction target

4. Implement the climate action plan

5. Monitor and report on progress.

Figure 5: ICLEI Process

It was the intention of the Brentwood government to join ICLEI for many reasons. Primarily, the purpose of joining ICLEI was to conduct a municipal Greenhouse Gas Emissions Inventory. This motion was passed with unanimous support from the Board of Alderman through Resolution 996. As a result of this GHG Inventory, Brentwood also hopes to promote city functions relating to sustainability an educate staff and residents concerning sustainability practices and

[12] For more information visit ICEI Local Governments for Sustainability http://www.icleiusa.org/

[13] *Local Government Operations Protocol: For the quantification and reporting of greenhouse gas emissions inventories*, Version 1.1, May 2010

resources. Joining ICLEI was also done with the intention of collaborating with other agencies to further sustainability efforts and develop a Climate Action Plan to reduce GHG emissions community-wide. Upon completion of the report, the City plans on reviewing and continuing to update a Climate Action Plan with focus on GHG reduction.

Benefits to conducting a GHG inventory

A greenhouse gas inventory can provide many benefits to the local government and the community as a whole. It will provide a benchmark to compare future progress in terms of emission reduction within the municipality. This baseline allows stakeholders to establish a foundation for realistic and obtainable climate action planning. Inventory baselines also provide government officials as well as citizens with knowledge to identify budgetary and fiscal constraints within the community.

Reporting a community's greenhouse gas emissions creates transparency throughout local municipalities. Transparency in energy usage, fuel consumption and the emissions that are created as a byproduct, translates into transparency in spending. A detailed and transparent utilization of a municipality's resources is beneficial to the community as a whole. Voluntarily reporting GHG emissions, establishes the local government as an environmental leader. Completing a GHG inventory provides local governments with a pathway to recognize, publicize, and promote their environmental stewardship.

Accounting for emissions has helped many organizations gain valuable insight into the relationship between improving efficiency and reducing emissions. As a result, organizations and municipalities have redesigned business operations and processes, implemented technological innovations, improved products and ultimately saved money and resources. This inventory can also be used as an educational tool to employees, city management, and the public to further the understanding of greenhouse gases and their impact on the environment.

Inventory Methodology

Quantifying GHG Emissions

Establishing a Baseline

Baseline GHG inventories are utilized to benchmark the ongoing emissions of a community, forecast future emissions, and create a strategic plan for climate change mitigation efforts. This report serves as a baseline inventory for the city of Brentwood, Missouri establishing 2010 as the baseline year to create projections of future emissions. This year was chosen because it was the earliest year in which a greenhouse gas inventory could be comprehensively and accurately conducted.

Establishing Boundaries

Community Geographical Boundary

This report quantifies the greenhouse gases produced within the geographical boundaries of the City of Brentwood, Missouri into a community wide inventory. The inventory includes all available emission-related data and is analyzed by sector. The emissions created by the local government are included in the community wide inventory but are broken down and presented in a greater detail within the Local Government Operations (LGO) section of the report.

Figure 6: ICLEI Protocol Boundaries

Governmental Organizational Boundary

The Local Government Operations portion of this report quantifies the emissions produced as a direct result of the daily actions performed by the local government. This is relevant information because it highlights specific areas, under the government's control, that can be examined and targeted as opportunities for emissions reduction as well as financial savings on energy costs.

Types of GHG Emissions

Table 1: Global Warming Potential of Greenhouse Gases

THE GLOBAL WARMING POTENTIAL (GWP) OF GREENHOUSE GASES	
Greenhouse Gas	Global Warming Potential (GWP)
Carbon Dioxide (CO_2)e	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFCs)	43-11,700
Perflurocarbons (PFCs)	6,500-9,000
Sulfur Hexafluoride (SF_6)	23,900

The types of emissions that are quantified in this report are the six gases defined within the Kyoto Protocol. Although the volume of gas emitted may be smaller, some gases have a greater effect on the climate. The effect a specific gas has on the environment is known as its global warming potential (GWP). GWP is defined as the unit measurement of heat trapping effects of gas relative to carbon dioxide. In other words, one metric ton of methane (CH_4) traps 21 times more heat than one metric ton of CO_2. Table 1 includes the GWP of the six internationally identified greenhouse gases.

In order to create a standard for comparison, all gases are multiplied by their GWP and expressed in metric tons of carbon dioxide equivalent (mt CO_2e). This concept is illustrated by Figure 7 in a CO_2e flow chart. To better understand a metric ton of CO_2e, it is useful to have real world comparisons. For example 1 mt CO_2e is equivalent to the emissions of an average vehicle for 73 days or 112 gallons of gasoline. It is also equivalent to the emissions from the electricity use of an average home for 55 days. A mt CO_2e also represents the amount of carbon sequestered annually by 348 square feet of forest[14].

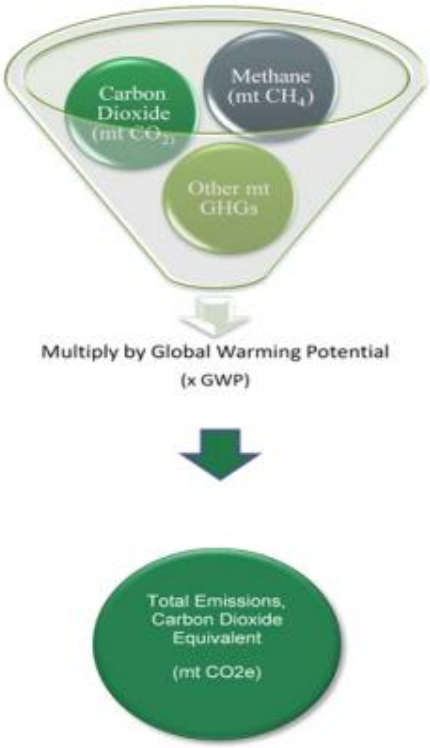

Figure 7: CO_2e Flow Chart

[14] http://www.epa.gov/cleanenergy/energy-resources/calculator.html Accessed November 8th, 2013

Quantification methods

There are two methods in quantifying GHG emissions. They are measurement based methodologies and calculation based methodologies. Measurement based methods are utilized by directly measuring greenhouse gas emissions from a source such as a flue from a power plant with technical measurement tools. Calculation based methods quantify emissions mathematically based on activity data and emission factor. Activity data refers to the measurement of greenhouse gas producing processing such as: fuel consumption by fuel type, annual electricity consumption, and annual vehicle miles traveled. The basic equation for calculation based methodology is as follows:

Activity Data x Emission Factor = Emissions

Calculations with Clean Air and Climate Protection (CACP)

In partnership with the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency (EPA), ICLEI developed the Clean Air and Climate Protection 2009 (CACP 2009) software to aid local governments in quantifying their GHG emissions. The software is designed to be compatible with ICLEI's Local Government Operations Protocol (LGOP) and is a tool to quantify emissions by calculation based methods. CACP was used to calculate total emissions in each sector for both the Community and Local Government Operations.

Evaluating by Sector

This report divides GHG emissions by sector. Within the community assessment, the energy use of the **Industrial**, **Commercial**, and **Residential** sectors are examined and quantified. The natural gas and electricity consumptions from each respective sector are combined and the resulting emissions are calculated. Other sectors that are analyzed as part of the community wide evaluation are **Transportation**, **Water Conveyance and Treatment**, and **Solid Waste**.

The Local Government Operations (LGO) assessment is also divided into sectors. The LGO sectors include: **Buildings**, **Lighting**, **Vehicle Fleet**, **Employee Commute**, and **Refrigerants**. Some sectors are divided even further and consumption is examined by specific facility or department. The detailed separation of this data is designed to assist the local government in focusing efforts of GHG emission reduction.

Evaluating by Scope

Additionally, analyzing the government's GHG emissions by scope can provide a beneficial perspective. This allows local governments to separately account direct and indirect emissions and plan for emission reducing policies accordingly. There are three different scopes that can be used to categorize GHG emissions.

Scope 1: All direct GHG emissions that occur within the geographical boundaries of the community (example: on site combustion of natural gas)
Scope 2: Indirect GHG emissions produced outside of the boundaries, but as a result of, activities within the community (example: purchased or acquired electricity)
Scope 3: All other indirect emissions not covered in Scope 2 (example: employee commute)

Figure 8 illustrates the sources of each scope[15]. Together, the three scopes provide a comprehensive framework for adopting and implementing reduction policies for GHG emissions.

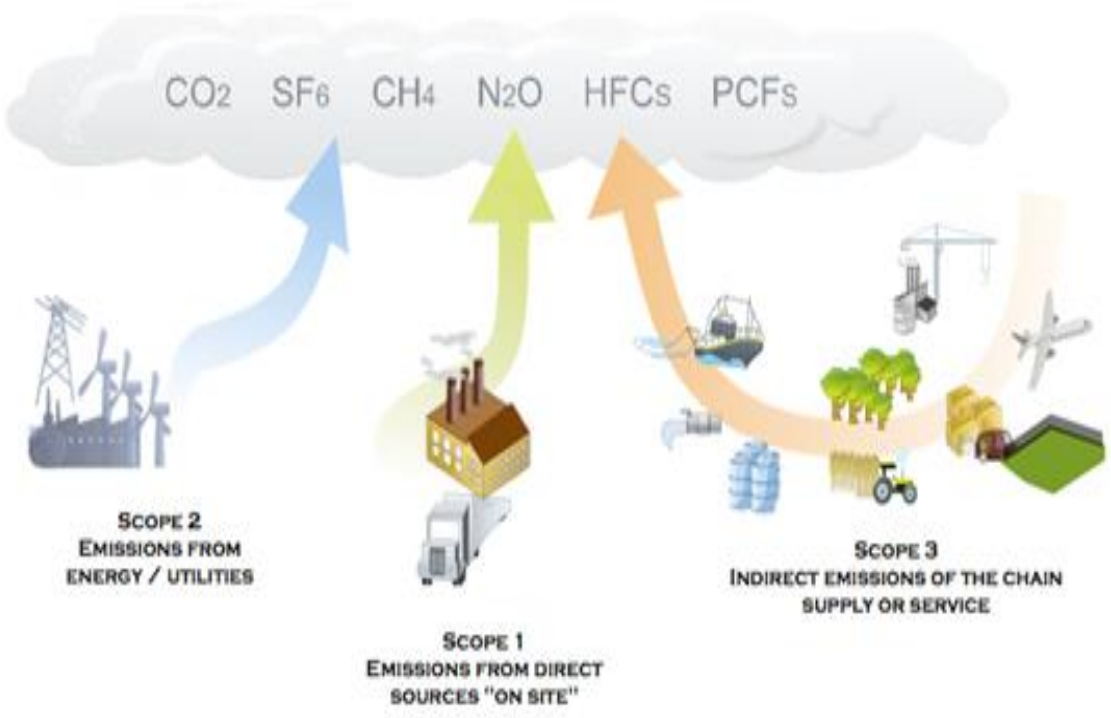

Figure 8: Greenhouse Gas Emissions Scope

[15] Greenhouse Gas Emissions Scope image was taken from www.intechopen.com

Community-Wide GHG Inventory

The City of Brentwood is committed to creating a community that is sustainable and environmentally conscious. In addition, the City is cognizant of its role regarding energy and environmental issues and wants to assist in the effort to inform and educate the Brentwood community on the wise use of natural resources, sustainable energy use, continued recycling efforts and other potential green environmental matters.

The City's daytime population is estimated at 22,000. Since the community only has just over 8,000 residents, this number represents a large amount of commuters. Furthermore, with the third highest common industry in the City of Brentwood being manufacturing, it is critical to be committed to this cause. Sustaining the growth of an economy is difficult without considering the environmental aspect.

When examining the GHG emissions of a community, it is important to know where the emissions are coming from. Understanding the contributing sectors and sources of emissions is a key step in formulating reduction strategies. Figure 9 displays a breakdown of the GHG emissions by sector. The Commercial Sector is the greatest contributor of emissions within the Brentwood community. Another large contributing sector is the Residential Sector. Emissions within this sector include the electricity and natural gas consumption utilized for energy in the homes of the citizens of Brentwood. The Transportation Sector accounts for 17% of total community emissions and is a result of the combustion of gasoline and diesel by vehicles traveling on the roadways of the city. Industries, though the smallest of the contributing sectors, are still responsible for over 14% of total GHG emissions.

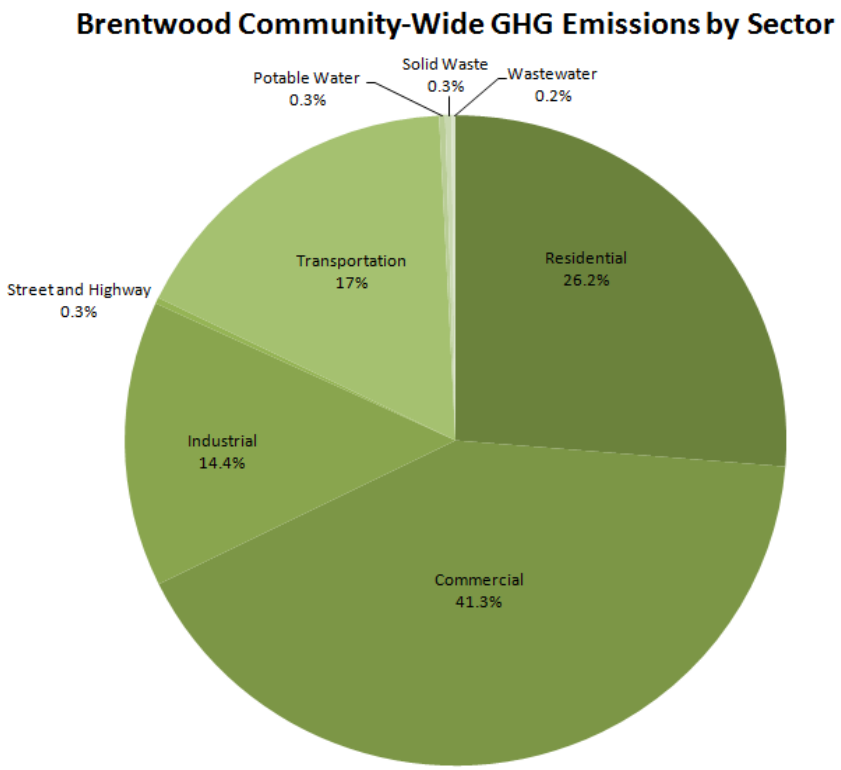

Figure 9: Community Emissions by Sector

Figure 10 illustrates the perscentage of community emissions by source. As the chart shows, emissions from the production and utilization of electricity account for the majority of metric tons CO_2e created. Since there is no electricity generating plant within the boundaries of Brentwood, all emissions from electricity are considered Scope 2 within this report. The 13.6% of gasoline and 3% of diesel represented in the chart are greenhouse gases that are emitted from vehicles within the boundaries of Brentwood community and are considered Scope 1. The natural gas consumption aslo represents Scope 1 emissions. Emissions related to the processing and distubution of water and disposing of solid waste are decribed in greater detail in their respective sections of this report. Table 2 provides a numerical representation of the breakdown of total Community-Wide emissions in metric tons CO_2e.

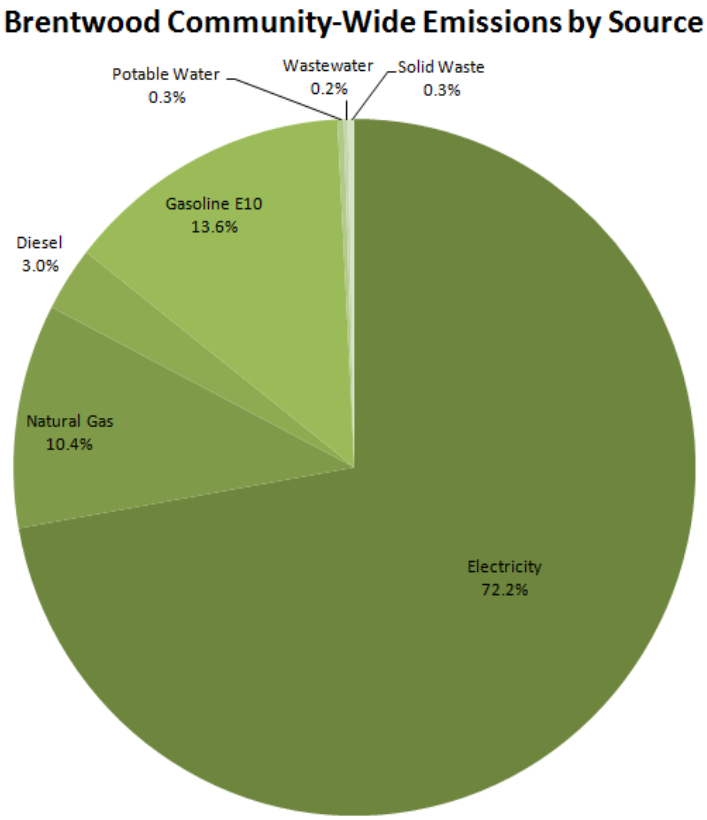

Figure 10: Community Emissions by Source

Table 2: Total Community Emissions in mt CO_2e

Emissions Category	Total Emissions (mt CO_2e)
Built Environment	
Electricity	162,415
Natural Gas	23,226
Transportation	
Total Emissions from Vehicles	37,444
Water	
Wastewater	384
Potable Water	765
Solid Waste	
Disposal of Community-Generated Solid Waste	644
Total Community Emissions	**224,878**

Built Environment

The built environment in any city is a major contributor to the emission of GHG gases. Buildings require electricity for lights and power. Buildings consume thousands of kilowatts of electricity to regulate their ambient temperature through heating and cooling systems. Many buildings also utilize natural gas for heating in the winter. The consumption and utilization of this energy result in the emissions of greenhouse gases.

Within a community this energy is used for different purposes. When conducting a GHG inventory, it is important to understand how the city's emissions are divided. This inventory divides Brentwood into four sectors. The Commercial sector is the largest contributor of GHG emissions followed by the Residential and Industrial sectors. The Street and Highway sector accounts for the electricity used in street lighting. Table 3 represents a breakdown of the energy consumption and resulting GHG emissions divided by sector.

Table 3: Community Electricity and Natural Gas

	Electricity Consumption (kWh)	Emissions from Electricity Consumption (mt CO_2e)	Natural Gas Consumption (Therms)	Emissions from Natural Gas (mt CO_2e)	Total Emissions (mt CO_2e)
Residential	58,729,920	47,655	2,201,171	11,701	59,356
Commercial	104,762,271	85,006	1,629,243	8,660	93,666
Industrial	35,846,581	29,087	539,885	2,865	31,952
Street and Highway	821,666	667	0	0	667
Totals	200,160,438	162,415	4,370,298	23,226	185,641

Figure 11 shows a comparison of each sector's emissions contribution. Their electricity and natural gas consumption are stacked to represent each source's contribution to the sector's total.

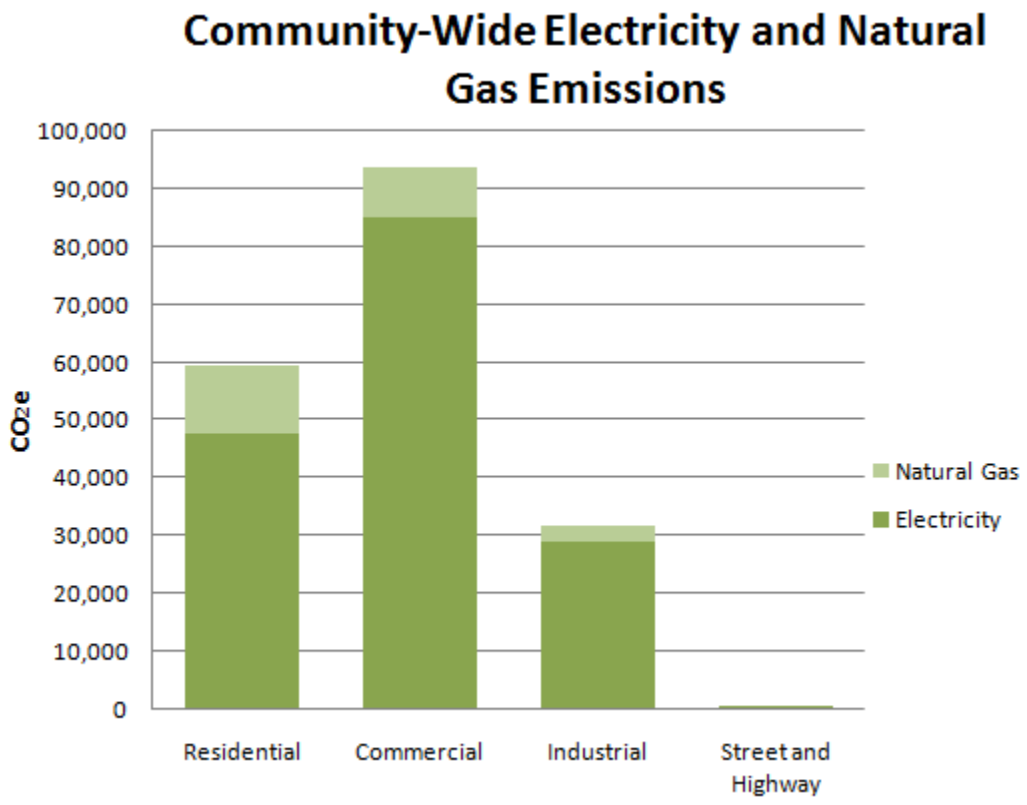

Figure 11: Community-Wide Electricity and Natural Gas Emissions

Transportation

A significant source of GHG emissions from nearly any community is a result of transportation. According to the EPA, "The largest sources of transportation-related greenhouse gas emissions include passenger cars and light-duty trucks, including sport utility vehicles, pickup trucks, and minivans. These sources account for over half of the emissions from the sector[16]. " In 2011, nation-wide emissions from the Transportation Sector accounted for about 28% of total greenhouse gas emissions. The overall contribution of GHG emissions from the Transportation Sector has increased by 18% since 1990[17]. The GHG emissions of the Brentwood community were estimated using Vehicle Miles Traveled (VMT). The data was provided by East-West Gateway Council of Governments. East-West Gateway is the

[16] http://www.epa.gov/climatechange/ghgemissions/sources/transportation.html, accessed November 19, 2013
[17] EPA Transportation Sector Emissions

metropolitan planning organization responsible for planning and adopting plans for the region's surface transportation system[18].

Figure 12: City of Brentwood Streets

According to East-West Gateway, motorists traveled 69,715,000 miles on the roads of Brentwood throughout the calendar year of 2010. This number was used to estimate fuel consumption by a standard vehicle-type breakdown to calculate GHG emissions for this period. In 2008, Missouri's Renewable Fuel Standard Act became effective and required all gasoline sold in the state must contain 10% ethanol[19]. This was taken into consideration for when calculating emissions for this sector. Emissions from ethanol are considered biogenic and are not included in emissions totals. A breakdown of fuel consumption can be found in Appendix B

[18] For more information on East-West Gateway Council of Governments, visit http://www.ewgateway.org/
[19] "Missouri Renewable Fuel Standard Act" Missouri Department of Agriculture http://mda.mo.gov/weights/fuel/renewablefuelstandard.php

Wastewater

The community of Brentwood does not have a wastewater treatment facility within its boundaries. All of the city's wastewater is treated by the St. Louis Metropolitan Sewer District at the Lemay Wastewater Treatment Plant. This facility services 2,354 residential, 488 non-residential, and 24 industrial connections within the boundaries of Brentwood. All wastewater is treated through this facility and septic tanks are not utilized.

GHG emissions were calculated based on the electricity and natural gas consumed by the treatment plant as a result of the city's contribution. In 2010, this contribution equated to 344,838 kWh of electricity and 19,516 therms of natural gas. This consumption resulted in 280 metric tons of CO_2e emitted as a byproduct of electricity and 104 mt of CO_2e emitted from the combustion of natural gas. In total, 384 mt of CO_2e were created from treating the wastewater of the Brentwood community.

Table 4: Energy used for Wastewater

Source	Total Energy Used	$mtCO_2e$
Electricity	344838 kWh	280
Natural Gas	19516 therms	104

Potable Water

The treatment and distribution of clean potable water is a vital and integral part of any community. This process does require energy and the emissions from the electricity used in the procurement of potable water are included in this report. Missouri American Water supplies potable water to the Brentwood community and their use of electricity is divided into treatment and distribution. In 2010, the community received 400,236,848 gallons of water from Missouri American Water Company. Table 5 shows the total amount of water used in each sector.

Table 5: Potable Water by Sector

Sector	1,000 gallons
Residential	228,419.80
Commercial	126,897.50
Industrial	42,060.80
Other Public Authorities	2,858.90

Treating the water to create a potable product resulted in the use of 832,493 kWh of electricity. The electricity needed to distribute the water to and across the city was calculated to be 110,065 kWh. The total GHG emissions related to this electricity consumption is 765 CO_2e.

Solid Waste

The way a community disposes of its solid waste can have a dramatic effect on its total greenhouse gas emissions. There is no landfill or other waste facility within the boundaries of Brentwood so all solid waste must be transported to an outside facility. Non-recycled solid waste is collected and transported to Fred Weber landfill in Maryland Heights. Because the emissions from the solid waste are generated outside of the city's boundaries, they are considered scope 2. The City of Brentwood handles its own waste so the emissions relating to fuel used in transfer are accounted for in the Vehicle Fleet Section under Local Government Operations below. Data was gathered from Fred Weber Disposal, Allied Waste, and Aspen Waste records. In the baseline year of 2010, Brentwood generated 2,673 tons of solid waste disposed of in a landfill. Emissions were calculated using a standard percentage breakdown of waste type, that breakdown can be found in Appendix B. The resulting GHG emissions were 644 mt of CO_2e.

The importance and benefits of recycling has become more apparent over time and is a crucial element in GHG emissions reduction. The City of Brentwood established a curbside recycling program in 1994 in an effort to divert waste from the landfill. The single stream recycling program collects: glass, aluminum, steel cans, plastics, paper, and cardboard[20]. The recycling is handled by Resource Management. In 2010, 608 tons of materials were diverted from the landfill. This waste diversion results in 0 additional calculated GHG emissions. As previously stated, the City also handles the recycling and emissions due to the transportation of waste are also accounted for in the Vehicle Fleet Section. The city collects yard waste; approximately 275 tons of yard waste was collected and processed by St. Louis Composting. Composting is environmentally responsible and beneficial to a community. The GHG emissions from this process are negligible and do to contribute to the city's overall total.

[20] For information on Brentwood's recycling program, visit https://www.brentwoodmo.org/DocumentCenter/View/5260

Local Government Operations Inventory

The Local Government Operations (LGO) section of this report breaks down and calculates the GHG emissions emitted as a result of day to day activities of the municipality's government. The government's emissions are a subset of Brentwood's total GHG emissions and are included in the total Community analysis. Greenhouse gases emitted as a result of Local Government Operations account for just under 2% of Brentwood's total. Figure 13 shows LGO emissions divided by percentage.

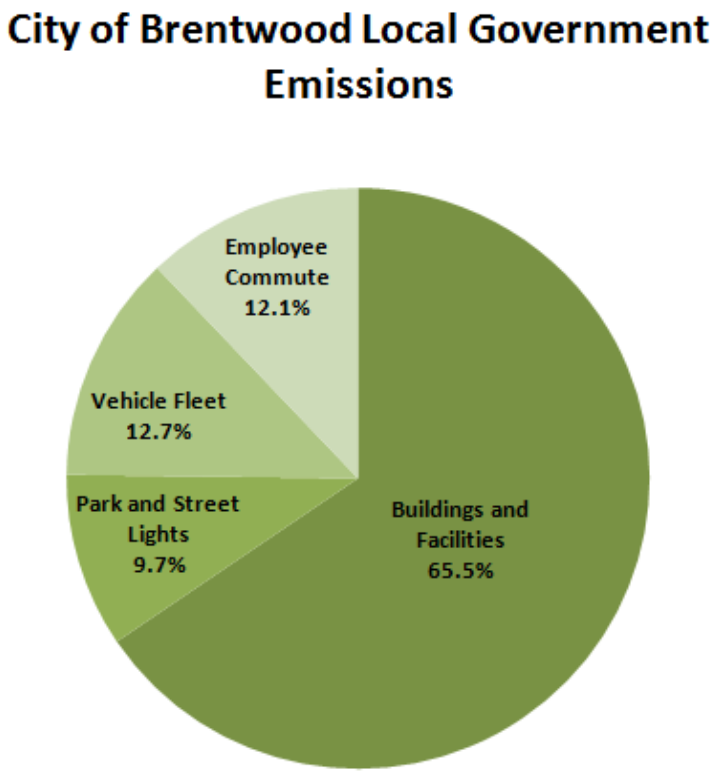

Figure 13: Local Government Operations (LGO) Emissions

Buildings and Facilities

The Buildings and Facilities section accounts for the largest amount of GHG emissions within the LGO. As previously stated, the emissions resulting from the utilization of electricity and natural gas within buildings are substantial. As described earlier in this report, the emissions caused by natural gas are classified as Scope 1 because the fuel is combusted on site, and thus the emissions are released, within the geographical boundaries of the community. Conversely, emissions caused by electricity are classified as Scope 2 because the combustion of the fuel takes place outside of the community's borders. As illustrated in Figure 13, the emissions caused by buildings and facilities operated by the local government, make up 65.5% of total LGO emissions. This section represents a large opportunity for emissions reduction.

To accurately implement changes that will result in a reduction of GHG emissions, it is important to understand the specific contribution of each building. The LGO Buildings and Facilities section is divided into the major facilities operated by the government. The buildings include: City Hall, Police Station, Fire

Station, Recreation Center, Public Works buildings, and a combination of other minor facilities. Total utility numbers from the Public Works buildings include the main office and the garage. The other minor facilities included in the total of the LGO emissions can be found in Appendix B. It is also important to note that in 2010, the Fire Station was under construction and records only reflect the last three months of the year. Monthly utility records from Ameren Missouri and Laclede Gas were utilized to calculate total consumption from each building. Table 6 illustrates the breakdown of each facility's energy consumption**.**

Table 6: Energy Use and Cost by Government Building

	Electricity (kWh)	Electricity Cost	Natural Gas (thems)	Natural Gas Cost
City Hall	235,837	$18,239	8,354	$7,478
Police Station	393,520	$24,098	0	$0
Fire Station*	37,520	$2,159	339	$562
Recreation Center	2,234,656	$137,339	0	$0
Public Works	72,307	$6,586	5,405	$5,437
Other	58,187	$4,981	4,114	$4,061
Total	**3,032,027**	**$193,403**	**18,211**	**$17,537**

As the table shows, the Recreation Center uses the largest amount of energy. When comparing buildings it is important to keep in mind the size and function of the building. The Recreation Center houses an indoor ice rink and requires more energy to function. This does however represent an opportunity for GHG reduction. Efficiency measures of all buildings should be examined to lower utility cost and ultimately reduce the dependency on fuels that emit greenhouse gases.

Table 7: Government Buildings by Emissions and Cost

Building	CO_2e mt	Total Utilities Cost
City Hall	236	$25,717
Police Station	319	$24,098
Fire Station*	32	$2,721
Recreation Center	1813	$137,339
Public Works	87	$12,023
Other	69	$9,042

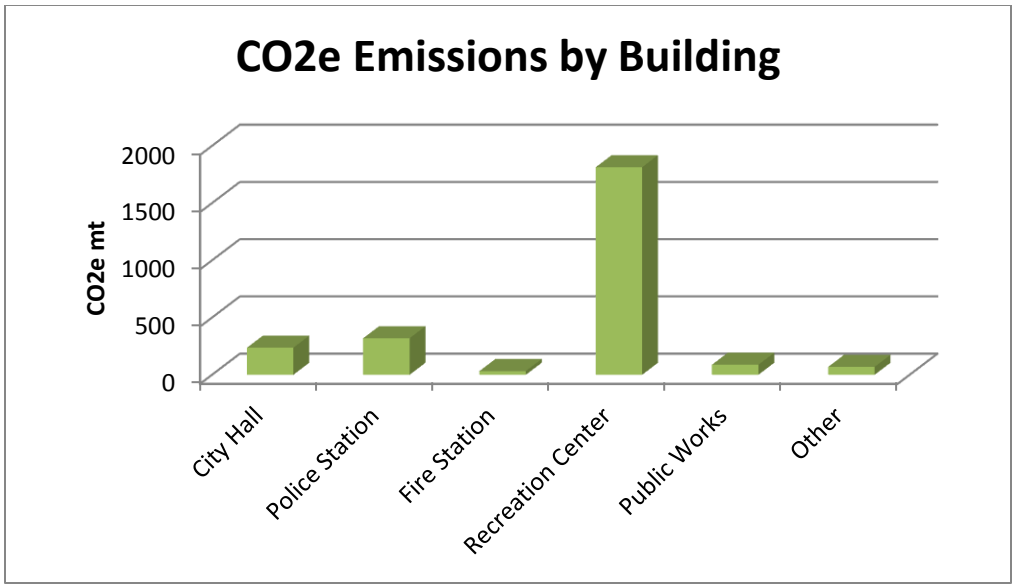

Figure 14: CO2e Emissions by Building

Table 7 and Figure 14 provide more perspective on the overall utility consumption and contribution to GHG emissions of each building. It should also be noted that all major buildings, with the exception of the Public Works Building, have diesel run backup generators. The emissions from these generators are not included in this analysis because generators were not used in 2010.

Lighting

Electricity used for outdoor lighting and parks account for roughly 10% of LGO emissions. The total amount of electricity consumption included within this sector was calculated from lights directly controlled by the government. This includes select traffic and signal lights, indoor and outdoor park lighting, and select streetlights. In total, 473,075 kWh of electricity were consumed for lighting. This resulted in 384 mt CO_2e and cost the city $61,342. Because these emissions are a product of electricity generated outside of the boundaries of the community, they are considered Scope 2. A detailed breakdown of the city lighting is provided in Appendix B.

Vehicle Fleet

As described in the Transportation section of this report, the combustion of fuels in vehicles, greatly contributes to GHG emissions. The local government can track their fuel consumption and establish responsible policies to help mitigate emissions. The City of Brentwood does currently keep records of

the fuel consumed by government related operations and they are divided by department. Table 8 shows the amount of fuel in gallons consumed by each department in 2010.

Table 8: Fuel Consumption of Vehicle Fleet

	Gasoline (gal)	Diesel (gal)	Propane (gal)
Planning	670	0	0
Police	19,970	0	0
Public Works	10,855	12,933	0
Recreation	7,442	0	1,375
Fire	827	3,616	0
Total	**39,764**	**16,549**	**1,375**

Table 9 shows the resulting cost of each fuel consumed divided by department.

Table 9: Fuel Cost of Vehicle Fleet

	Gasoline Cost	Diesel Cost	Propane Cost
Planning	$1,700.48	$0.00	$0.00
Police	$47,655.19	$0.00	$0.00
Public Works	$26,209.54	$35,267.23	$0.00
Recreation	$17,986.76	$0.00	$2,123.02
Fire	$2,064.53	$10,248.96	$0.00
Total	**$95,616.50**	**$45,516.19**	**$2,123.02**

Fuel data in this section accounts for fuel consumed by all vehicles used in the government fleet. These include police cruisers, ambulances, fire trucks, dump trucks, and personal transport vehicles among others. Propane is used by the ice resurfacing vehicle at the Recreation Center. The data was divided further into vehicle type so that GHG emissions could be accurately calculated. The detailed breakdown of each department's fuel consumption is included in Appendix B. As with the Community Transportation section, gasoline emissions were adjusted to account for a 10% ethanol blend. In total, the vehicle fleet of the City of Brentwood emitted 535 mt CO_2e in 2010. The city spent $143,256 on fuel. Fuel is necessary for daily government operations but this section does represent a potential for future GHG emission reduction.

Employee Commute

Another sector that is included within the LGO is the Employee Commute. This section represents the emissions released as a product of city employees driving back and forth to work. The emissions within this section are classified as Scope 3. For the greatest accuracy in estimating emissions associated with the employee commute, each full time employee's commute was analyzed. A list of the address of each full time employee was provided and the distance they drove from their home to the building they worked at in the city was calculated. The calculated mileage was then entered into a template that accounted for total days worked and estimated average time off for each employee. These calculations generated a total for Vehicle Miles Traveled (VMT). As shown in Table 10, the majority of employees commute within 0-15 miles of the city. The employee commute generated 478 mt CO_2e and contributed around 12% of total emissions of the LGO.

Table 10: Employee Commute Distance to Work

Miles from Work	Number of Employees
0-5	41
6-10	15
11-15	19
15-20	9
21-25	13
26-30	5
31-35	7
36-40	4
41-45	3
46-50	4
51-75	5

Refrigerants

Refrigerants can be a major source of GHG emissions within a community but were not included in this report. Fugitive emissions from refrigerants used for both vehicles and buildings are released into the atmosphere but are commonly not tracked. Furthermore R-22 or Freon is used in many cooling systems but, according to ICLEI protocols, should not be included in GHG inventories. The use of R-22 is being phased out and alternatives should be found for cooling.

As previously mentioned in this report, the Recreation Center does operate an indoor ice rink and requires a considerable amount of refrigerant trough out the year. In 2010, the City used R-22 to initially create and maintain the ice in rink. Six 125lb canisters were used at the beginning of the year and another four to eight canisters were used throughout the year. In the future, the City should be aware of the type of refrigerants used and be conscious of their environmental impact. Additionally they should track the amount used in both the government buildings and vehicle fleet.

Conclusions

The emissions included within this report create a baseline of the City of Brentwood's total contribution. This report can be utilized in the creation of a Climate Action Plan that will highlight beneficial programs and policies developed to reduce the emissions of both the community and local government. It is also recommended that this inventory be used in the future as a source of comparison. Progress and success of emissions reducing policies can be measured utilizing this inventory as a standard.

The major source of GHG emissions is the result of the combustion of coal used in electricity producing power plants. This represents a great opportunity for the city to become active leaders in the utilization of alternative fuel sources. Technology is continuing to advance and alternative fuel sources are becoming more practical. Many companies within the St. Louis area are helping to advance solar power and other alternative fuel sources in a cost effective way. As Brentwood progresses as an environmentally conscious community, this opportunity should not be overlooked.

The overall energy efficiency of individual buildings is an area in which the local government can focus on in regards to emissions reducing strategies. The field of building science has made considerable advancements in the last decade allowing contractors and energy efficiency professionals to reduce the demand on buildings and thus, lower utility bills. Another useful tool that can be used to track the efficiency of buildings is the EPA's ENERGY STAR Portfolio Manager[21]. This tool allows facility managers to track and measure the energy and water consumption of specific buildings. This is important and useful when establishing a baseline for each building and planning for future energy reduction measures.

Data from this report shows that the Recreation Center consumes the largest amount of energy annually. This is not surprising based on the size of the building and the functions and activities it provides. It does however represent an opportunity for energy savings and a reduction of LGO greenhouse gas emissions. At the time of this report, plans have been discussed to renovate the building. These plans should be developed with energy efficiency practices in mind. It would be beneficial to the City to adopt a policy concerning energy efficiency in any new renovation or construction project.

[21] For more information on the Energy Star Portfolio visit http://www.energystar.gov/

Another opportunity for greenhouse gas emissions reduction is with the City's vehicle fleet. Cities large and small depend on the functionality of their vehicle fleet and reducing the amount of fuel consumed to complete necessary tasks is often difficult. It is possible however to keep fuel emissions in mind as the city progresses. Policies could be implemented so that fuel efficiency is a consideration in the purchasing of new vehicles to the fleet. The purchasing of bio fuels to run the vehicle fleet would also be a large step in reducing the emissions of City vehicles. Adopting environmentally conscious policies can also set the City of Brentwood apart from other communities and allow it to become a model of positive change.

Municipal comparisons

As previously stated, many other municipalities in the St. Louis area have conducted greenhouse gas emissions reports in the past. It can be beneficial to a local government to compare their emissions to other communities' emissions to provide perspective. This section compares Brentwood's emissions to those of Wildwood[22], Maplewood[23], Creve Coeur[24], Richmond Heights[25], and Clayton[26]. Table 11 shows a comparison of each city's total GHG emissions in relation to population and size.

Table 11: Municipality Greenhouse Gas Emissions

Municipality	Inventory Year	Population in Inventory Year	City Area (sq. miles)	Total Community Emissions (mt CO_2e)	Emissions per square mile (mt CO_2e)	Emissions per capita (mt CO_2e)
Brentwood	2010	8,035	1.96	224,878	114,734	28
City of Wildwood	2010	35,517	68	284,268	4,180	8
Maplewood	2010	8,044	1.56	105,045	67,337	13
Creve Coeur	2005	16,920	10.1	794,963	78,709	47
Richmond Heights	2008	8,600	2.3	243,621	105,922	28
Clayton	2006	15,935	2.5	472,466	188,986	30

[22] Schweiss (formerly Ofner), Johanna, *The City of Wildwood, Missouri 2010 Greenhouse Gas Emissions Inventory* (St. Louis MO: City of Wildwood, 2013)
[23] LaBrier, Amanda, *Community and Local Government Operations Greenhouse Gas Emissions Inventory 2010, 2011, & 2012* (St. Louis MO: Maplewood, 2013)
[24] Kellum, Spencer, *City of Creve Coeur, Missouri Baseline Greenhouse Gas Emissions Inventory for 2005* (St. Louis MO: City of Creve Coeur, 2008)
[25] Robinson, Teresa, *2008 Community-Wide & Local Government Operations Greenhouse Gas Inventory* (St. Louis MO: City of Richmond Heights, 2010)
[26] City of Clayton MO, *Greenhouse Gas Emissions Inventory Report* (St. Louis MO: City of Clayton)

Table 12 and Figure 15 illustrate the breakdown of each community's overall emissions by sector[27].

Table 12: Municipality Greenhouse Gas Emissions by Sector

Municipality	Inventory Year	Residential (mt CO_2e)	Commercial (mt CO_2e)	Industrial (mt CO_2e)	Transportation (mt CO_2e)	Solid Waste (mt CO_2e)	Water and Wastewater (mt CO_2e)
Brentwood	2010	59,356	93,666	31,952	37,444	644	1,149
City of Wildwood	2010	166,814	29,945	67	82,739	2,897	1,692
Maplewood	2010	32,899	31,016	13,751	22,011	368	89*
Creve Coeur	2005	132,320	366,012	54,299	268,089	2,686	1,558
Richmond Heights	2008	44,855	74,688	127	123,150	801	Not Included
Clayton	2006	87,500	323,529	Not Included	46,064	4,124	Not Included

*Potable water was not included in the Maplewood report, the total is a result of emissions from wastewater only.

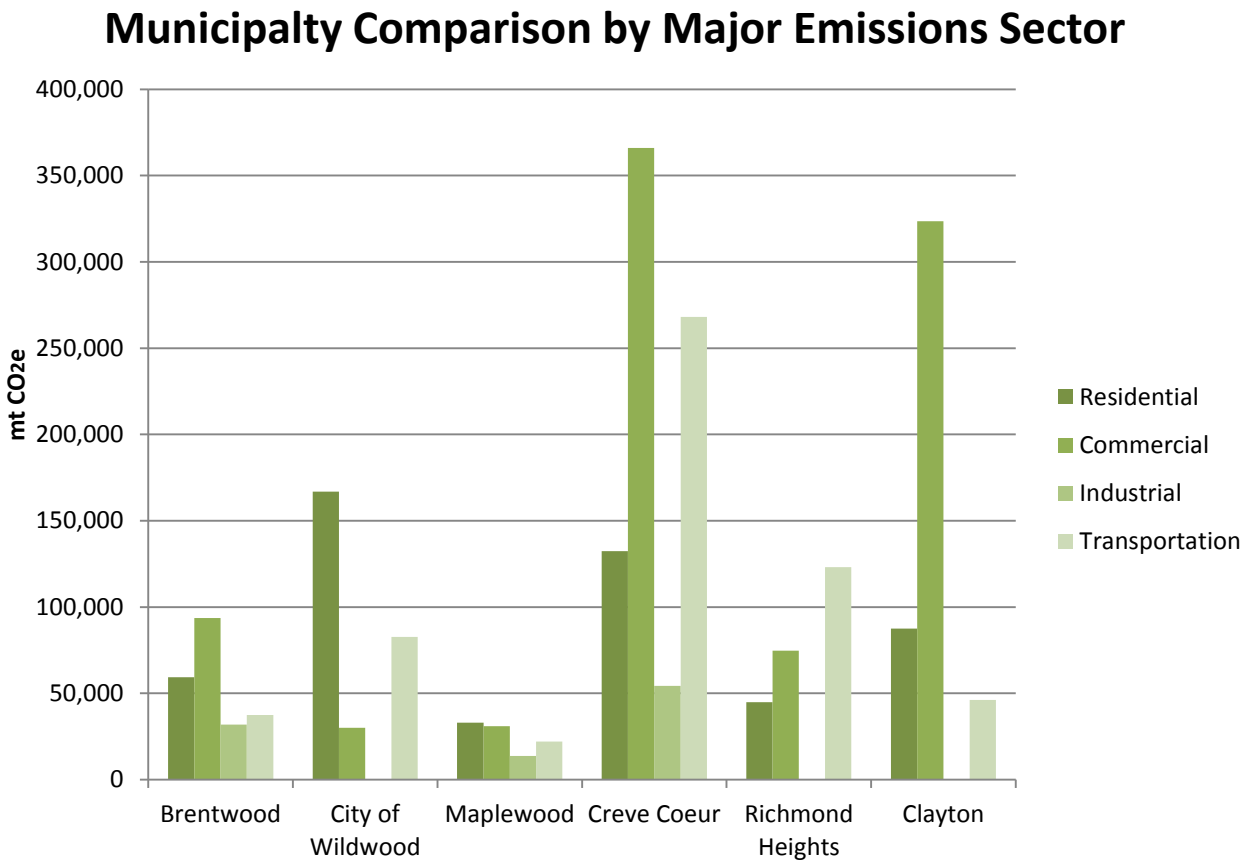

Figure 15: Municipality Comparison by Major Emissions Sector

[27] Information in the Municipality Comparison section was shared and used with permission by Johanna Schweiss (formerly Ofner)

Appendix A: List of Abbreviations and Acronyms

ADA	Americans with Disabilities Act
CACP 2009	Clean Air and Climate Protection 2009
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
EPA	Environmental Protection Agency
gal	gallons
GHG	Greenhouse Gas
GWP	global warming potential
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
ICLEI	International Council for Local Environmental Initiatives
kWh	kilowatt hour
lb	pound
LGO	Local Government Operations
mt	metric ton
MSD	Metropolitan Sewer District
N_2O	Nitrous oxide
NACAA	National Association of Clean Air Agencies
PFCs	Perfluorocarbons
R-22	Freon
REIP	Regional Environmental Internship Program
SE	southeast
REI	Recreation Equipment Inc.
SF_6	Sulfur hexafluoride
TRIM	Tree Resource Improvement Maintenance
UN	United Nations
USGBC	United States Green Building Council
VMT	Vehicle Miles Traveled

Appendix B: Community-Wide and LGO Inventory Details

Community-Wide Details

Transportation

Table 13: Community E10 Consumption

Gasoline Light Trucks	1,453,260 gallons
Gasoline Passenger Cars	1,950,052 gallons
Ethanol	422,847 gallons
Total CO2e	30,678 mt

Table 14: Community Diesel Consumption

Diesel Heavy Trucks	3,764,610 gallons
Diesel Light Trucks	906,295 gallons
Diesel Passenger Cars	209,145 gallons
Total CO2e	6,766 mt

Solid Waste

Table 15: Percentage Breakdown of Solid Waste by Type

Paper Products	40%
Food Waste	15%
Plant Debris	2%
Wood/Textiles	6%
All Other Waste	37%

Local Government Operations Details

Buildings and Facilities

Minor facilities include the Post Office, Historical Society building, Straussner Berm, and 800 Hanley Industrial Court. These buildings were included inventory because the City pays the utilities bills at these locations and they are utilized for the local government's operations.

Lighting

These tables represent the data used in calculating the electricity used for street lighting for the City. Consumption was calculated in watts and converted to kilowatt hours[28].

[28] More information on how lighting consumption was calculated can be find at http://www.ameren.com/sites/AUE/Rates/Documents/UECSheet58Rate5MCoOwnedLtg.pdf

Table 16: Breakdown of Street Lighting by Lamp

Type of lamp	# of lamps	watts	hours	watts in 2010
9500 HPS Post Top	12	120	4000	5760000
9500 HPS Open Btm	36	120	4000	17280000
9500 HPS Enclosed	333	120	4000	159840000
6800 MV Open Btm	4	207	4000	3312000
6800 MV Enclosed	27	207	4000	22356000
54000 MV Enclosed	1	1080	4000	4320000
54000 MV Enclosed	2	1080	4000	8640000
25500 HPS Enclosed	99	307	4000	121572000
Total				343080000

Table 17: Lighting Hours of Operation by Month

Month	Hours used each month
January	408
February	347
March	346
April	301
May	279
June	255
July	272
August	298
September	322
October	368
November	387
December	417
Total	4000

Vehicle Fleet

The following tables represent the cost and fuel consumption of each department in 2010.

Table 18: Planning Department Fuel Use by Month

Month	Passenger Car Gasoline (gal)	Cost ($)
Jan	38.35	86.04
Feb	63.89	160.40
Mar	31.55	76.86
Apr	80.05	205.87
May	59.15	166.28
Jun	53.02	127.76
Jul	69.69	173.85
Aug	62.76	145.23
Sep	68.97	181.49
Oct	56.69	139.58
Nov	46.85	126.23
Dec	39.23	110.89
Total	**670.2**	**1,700.48**

Table 19: Police Department Fuel Use by Month

Month	Light Truck Gasoline (gal)	Cost ($)	Passenger Car Gasoline (gal)	Cost ($)
Jan	269.95	618.39	1617.47	3,706.96
Feb	185.83	440.94	1411.65	3,364.93
Mar	197.87	448.31	1262.58	2,905.14
Apr	324.87	807.61	1399.40	3,494.30
May	252.37	654.77	1347.54	3,544.01
Jun	258.97	667.83	1297.25	3,330.22
Jul	345.65	826.68	1417.61	3,395.75
Aug	307.40	723.93	1424.49	3,430.18
Sep	270.87	658.84	1608.64	2,933.29
Oct	292.22	705.73	1376.59	3,345.17
Nov	240.39	584.16	1290.29	3,178.84
Dec	243.63	596.32	1326.62	3,292.89
Total	**3190.02**	**7,733.51**	**16780.13**	**39,921.68**

Table 20: Public Works Department Gasoline Use in Vehicles by Month

Month	Light Truck Gasoline (gal)	Cost ($)	Passenger Car Gasoline (gal)	Cost ($)	Heavy Truck Gasoline (gal)	Cost ($)
Jan	316.47	725.83	32.37	72.86	590.02	1,347.79
Feb	183.10	430.60	32.30	79.96	692.80	1,634.65
Mar	141.09	325.02	48.87	112.17	997.39	2,214.52
Apr	289.38	715.70	53.86	137.35	328.48	781.61
May	304.20	688.54	33.37	84.69	301.15	772.20
Jun	366.19	947.82	51.38	131.58	405.41	1,039.64
Jul	379.80	927.65	74.20	175.65	396.91	917.66
Aug	336.77	833.46	35.39	87.52	445.82	1,067.79
Sep	346.74	848.38	48.84	116.57	325.81	781.36
Oct	374.22	920.49	38.37	93.78	371.14	893.86
Nov	304.37	772.09	37.58	93.99	518.86	1,263.52
Dec	322.29	813.91	33.88	86.76	379.31	927.22
Total	**3,664.62**	**8,949.49**	**520.41**	**1,272.88**	**5,753.1**	**13,641.82**

Table 21: Public Works Department Off Road Gasoline and Diesel Use by Month

Month	Off Road Gasoline (gal)	Cost ($)	Diesel (gal)	Cost ($)
Jan	77.34	174.83	1014.1	2,682.65
Feb	105.21	244.57	523.6	1,317.82
Mar	64.58	146.51	1170.2	3,066.26
Apr	66.41	164.09	1539.6	4,286.48
May	83.85	234.93	817.2	2,268.51
Jun	81.23	192.13	885	2,324.58
Jul	75.49	205.25	1242	3,279.06
Aug	67.52	186.73	1329.3	3,556.09
Sep	68.65	185.61	956.1	2,538.07
Oct	59.28	179.92	1253.4	3,522.72
Nov	53.23	137.63	1103.3	3,172.02
Dec	113.64	293.15	1098.7	3,252.97
Total	**916.43**	**2,345.35**	**12932.5**	**35,267.23**

Table 22: Recreation Department Fuel Use by Month

Month	Light Truck Gasoline (gal)	Cost ($)	Propane Containers	Cost ($)
Jan	677.80	1,529.04	18	224.76
Feb	482.28	1,127.84	16	218.33
Mar	603.41	1,356.84	14	188.17
Apr	724.41	1,744.93	18	215.64
May	622.06	1,616.37	10	118.24
Jun	620.49	1,583.74	3	32.43
Jul	731.28	1,754.07	16	172.19
Aug	732.40	1,753.37	14	145.45
Sep	683.47	1,664.93	17	191.30
Oct	651.45	1,590.85	15	178.46
Nov	488.49	1,208.46	15	194.27
Dec	424.94	1,056.32	18	243.78
Total	**7442.48**	**17,986.76**	**174**	**2,123.02**

Table 23: Fire Department Fuel Use by Month

Month	Light Truck Gasoline (gal)	Cost ($)	Diesel (gal)	Cost ($)
Jan	64.06	176.97	319.33	864.59
Feb	72.45	173.03	352.86	976.14
Mar	70.45	165.10	222.43	602.57
Apr	111.83	277.00	250.65	697.39
May	65.24	169.97	322.17	957.32
Jun	58.07	150.91	353.90	1,031.08
Jul	60.33	146.88	311.60	865.93
Aug	58.30	141.97	391.57	1,088.18
Sep	78.45	192.29	262.13	747.54
Oct	55.70	134.48	299.50	857.62
Nov	65.48	163.64	298.30	871.63
Dec	66.37	172.29	231.91	688.97
Total	**826.73**	**2,064.53**	**3,616.35**	**10,248.96**