City of Mission

GHG Emissions Inventory

GREENHOUSE GASES EMISSIONS INVENTORY REPORT
B&V Project Number 141151

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1.0 Executive Summary

The United States (US) Mayors Climate Protection Agreement (MCPA) was initiated on February 16, 2005 to advance the goals of the Kyoto Protocol through leadership and action. By November 2, 2007, there were more than 710 signatories to the Agreement. The November 2, 2007 signing of the MCPA was the largest one-day signing in the history of the agreement. The City of Mission (City) was among the first cities in Kansas, along with Topeka and Lawrence to sign the agreement. Currently 11 cities in Kansas have signed the Agreement. In furtherance of commitments made in signing this Agreement, the City is also a member of the Cities for Climate Protection (CCP) campaign. The CCP campaign is the International Council for Local Environmental Initiatives' (ICLEI) flagship campaign that is designed to educate and empower local governments to take action on climate change. The CCP is a performance-oriented campaign that offers a framework for local governments to reduce greenhouse gas emissions and improve livability within their communities. The framework includes the following five steps:

- Conduct a baseline emissions inventory and forecast.
- Adopt an emissions reduction target for the forecast year.
- Develop a Local Action Plan.
- Implement policies and measures.
- Monitor and verify results.

This report presents the first steps taken by the City to conduct a baseline emissions inventory of the greenhouse gas (GHG) emissions within its community and government operations, respectively. Based on the availability of reliable data obtained in conducting this GHG emissions inventory, calendar year 2005 was selected as the baseline year for the City. It is intended that the 2005 baseline GHG emissions inventory and the subsequent forecast will provide a benchmark against which the City can measure progress towards achieving its CCP goals.

The 2005 baseline emissions inventory was estimated using the Clean Air and Climate Protection (CACP) Software package that was developed for ICLEI by Torrie Smith Associates. This software estimates emissions derived from energy consumption and waste generation within a community. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions of three different GHGs - specifically carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) - are aggregated and converted according to their global warming potential in the internationally accepted units of carbon dioxide equivalents, or CO_2e. The 2005 baseline CO_2e emissions were determined to be 421,844 tons for the City's community

and 5,362 tons for the City's government operations. Figure 1-1 and Figure 1-2 summarize the baseline year emissions for the Community and Government sectors, respectively.

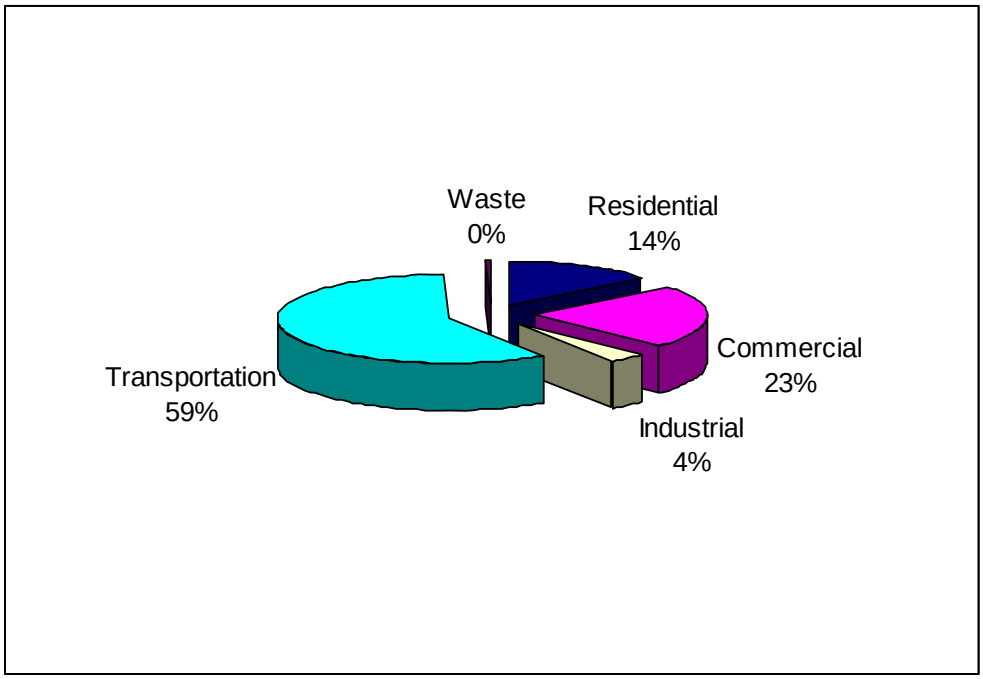

Figure 1-1. 2005 Community CO_2e Emissions by Sector.

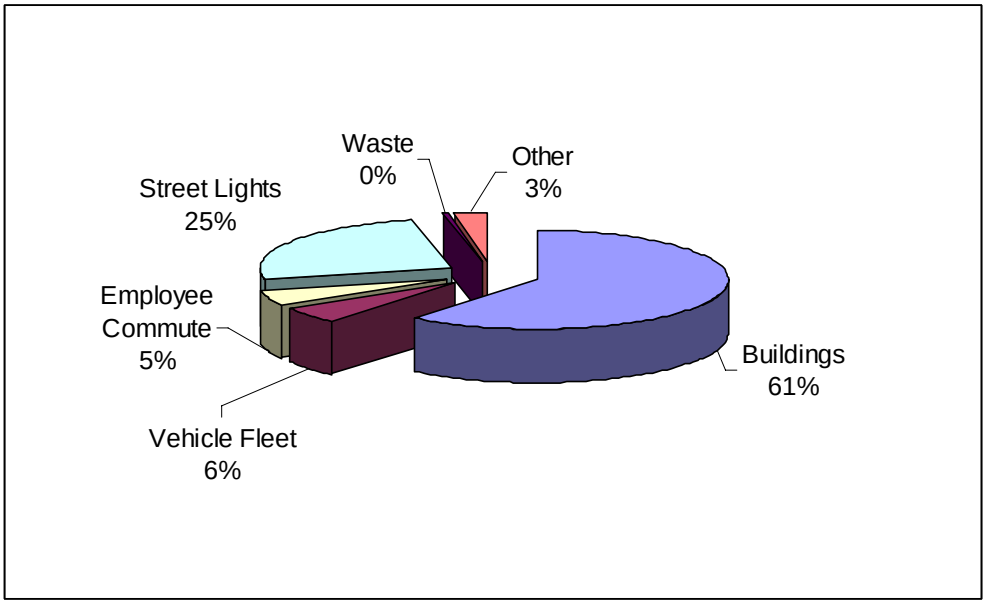

Figure 1-2. 2005 Government CO_2e Emissions by Sector.

2.0 GHG Inventory Methodology

The CACP software provided by ICLEI was used to quantify the 2005 baseline year GHG emissions. The software allows the user to:

- Create an inventory of greenhouse gas and criteria air pollutant emissions for a base year
- Forecast emissions growth to create an inventory of predicted emissions for a future year
- Evaluate measures to reduce emissions of these pollutants, and
- Prepare emissions reduction action plans.

The CACP software is designed to basically utilize input data on energy use and energy use reductions and convert it to emissions using specific emission factors (such as the USEPA's AP-42 emission factors, etc.,) that relate the emissions of a particular pollutant (e.g., carbon dioxide) to the quantity of the fuel used. The software also incorporates several default factors and coefficients that can be used in lieu of actual coefficients/factors. For electricity, the emission factors are based on end-use energy consumption, (emissions per kilowatt hour (kWh) consumed). The greenhouse gases carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4) are aggregated and reported as carbon dioxide equivalents (CO_2e). The software also has the capability to estimate criteria air pollutants: nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), volatile organic compounds (VOCs) and coarse particulate matter (PM_{10}). Criteria air pollutants are not addressed in this report, as these are not typically included in GHG inventories. The software has four primary modules:

- Community Analysis Module
- Government Analysis Module
- Community Measures Module
- Government Measures Module

The Analysis Modules are used for emission inventory purposes and the Measures Modules for quantifying the reduction in greenhouse gas and criteria air pollutant emissions from existing and proposed measures. Since the initial scope of the report is to estimate the baseline year GHG emissions inventory, only the Analysis Modules were utilized. The measures modules will be utilized subsequently to develop a forecast for GHG emissions reductions.

2.1 Analysis Modules

The Analysis modules estimate emission inventories based on a chosen a baseline year, energy use and waste data, by sector, as individual records in the inventory database. The appropriate analysis module, either Community or Government, needs be used to quantify emissions from the community as a whole (Community) or from government-controlled internal operations (Government). The Government Analysis module helps the user complete an inventory and forecast of greenhouse gas and criteria air pollutant emissions from operations/facilities such as fuel use, electricity use, and waste production resulting from government-owned and operated buildings, vehicles, street lighting, water pumping, and sewage treatment operations.

The Community Analysis module is designed to help complete an inventory and forecast of the greenhouse gas and criteria air pollutant emissions from fuel use, electricity use, and waste production from the entire community within a jurisdictional boundary of a governmental organization. It is important to note here that the software considers the Government Inventory as a subset of the Community Inventory. In other words, adding the total emissions from both community and government inventories will result in double counting the government emissions.

2.1.1 Initial Steps to Using CACP Software to Inventory GHG Emissions

In order to optimally use the Analysis modules in the CACP software, some key considerations and decisions were made with regards to collection and input of emissions data. Black & Veatch worked with the City to

1. Define the scope or boundaries of GHG emissions to be inventoried, and
2. Establish the base year from which to measure and track progress over time.

The following is intended to provide brief background explanation of these concepts, and to specifically outline the basis of the GHG inventory process.

Defining the Scope of GHG Emissions for Accounting

As the first step, Black & Veatch categorized the GHG sources within the City's established organizational and operational boundaries. GHG emissions were inventoried based on municipal operations (Government), and/or activities occurring within the city limits[1] (Community). Figure 2-1 shows the boundaries of the City.

[1] According to the City of Mission's official website description, the City of Mission is located in northeastern Johnson County, Kansas - a suburban area of the Kansas City metropolitan area. The City lies adjacent to a major transportation corridor, Interstate 35, and is quite accessible to the entire metropolitan area. Mission has a population of slightly under 10,000, and covers an area of 2.75 miles - about 95% of which is developed.

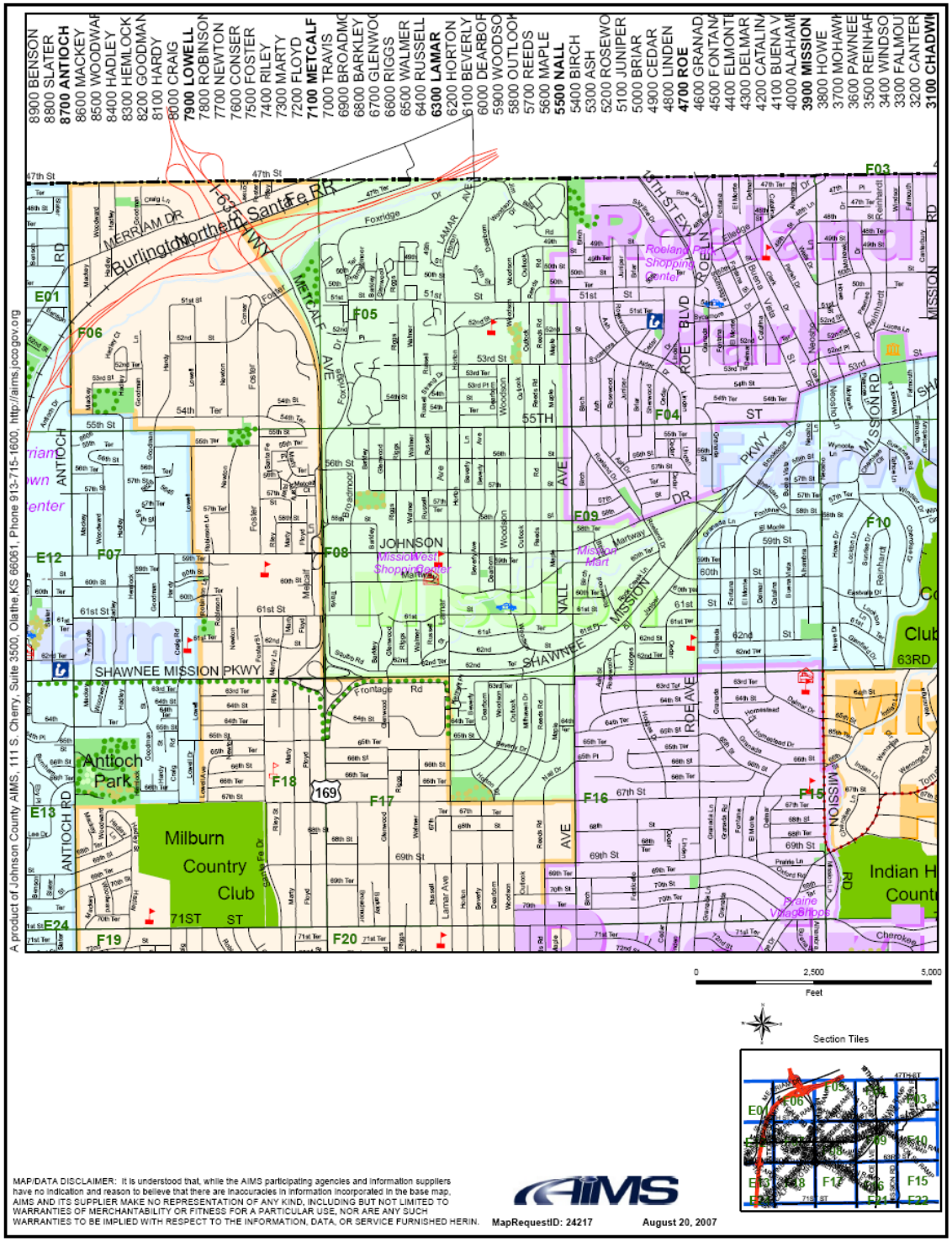

Figure 2-1. City of Mission Boundaries.

Source: City of Mission, KS

Organizational Boundaries

In setting organizational boundaries, the City is required to select an approach for consolidating GHG emissions and then consistently apply the selected approach to define those operations that constitute the City for the purpose of accounting (and ultimately reporting) GHG emissions. As mentioned earlier, the CACP software is designed to account for two basic boundaries – government and community.

Community – The community module is intended to estimate all emissions originating from sources located and activities occurring within a defined jurisdictional boundary (i.e. city limits). Sources can refer to stationary structures and businesses located within the community, and can be subdivided by either sectors (residential, business, industrial, etc.) as well as physical location (neighborhoods). Activities can include emissions from more transient sources such as transportation (traffic) and services (waste collection) occurring within the city limits. It should be noted that the community approach would by definition include municipal sources and activities occurring within the established jurisdictional boundaries. The city limits of Mission, established the organizational boundary for the Community Analysis module.

Government - Because municipal operations may vary in their legal and organizational structures - they may include wholly owned operations, joint ventures with other municipalities, or other shared services - for the purposes of financial accounting, they are treated according to established rules that depend on the structure of a city organization and the relationships among the parties involved.

Two distinct approaches were considered to consolidate GHG emissions: the equity share and the control approaches. If a city wholly owns all its operations, its organizational boundary will be the same whichever approach is used. However, for more cooperative joint venture operations, the organizational boundary and the resulting emissions may differ depending on the approach used.

- **Equity share approach** - Under this approach, a municipality accounts for GHG emissions from operations according to its share of equity in the operation. The equity share reflects economic interest, which is the extent of rights a city has to the risks and rewards flowing from an operation. Typically, the share of economic risks and rewards in an operation is aligned with the percentage ownership of that operation, and equity share will normally be the same as the ownership percentage.
- **Control approach** - Under this approach, a municipality accounts for 100 percent of the GHG emissions from operations over which it has control. It does not account for GHG emissions from operations in which it owns an

interest but has no control. Control can be defined in either financial or operational terms. When using the control approach to consolidate GHG emissions, the entity must choose between either the operational control or financial control criteria.

Based on discussions with the City, it was determined that the City wholly owns all its operations. The inputs to the Government Analysis module were determined accordingly.

Operational Sectors

Based on the requirements of the CACP software and the organizational boundaries identified above, 2005 year GHG emissions were categorized according to the operational sectors shown in Table 2-1 below.

Table 2-1. CACP Software Boundaries and Sectors.

Government	Community
Buildings	Residential
Vehicle Fleet	Commercial
Employee Commute	Industrial
Street Lights	Transportation
Waste	Waste
Other – Employee Travel and Off-Road Equipment	

Although the CACP software estimates GHG emissions across the community and government sectors, the format of its data output is not consistent with currently recognized protocols for reporting GHG emissions and reductions in state registries being developed around the country. Therefore, as an additional step, Black & Veatch categorized the emission data according to more widely recognized methodology that is more compatible with standardized registry schemes and that will avoid double counting of these emissions with other non-City sources and entities. This essentially involved characterizing emissions associated with City government and/or community operations as being direct, indirect or other emissions, and then categorizing these GHG emissions in accordance with following three operational "scopes" for possible future accounting and reporting purposes:

- **Scope 1 Direct GHG Emissions -** these include releases and exhaust of GHGs directly to the atmosphere occurring from sources that are owned or

controlled by the City (Government) or sources located within the city limits (Community). This would include emissions from combustion of fossil fuels in boilers, furnaces, vehicles, etc. owned or controlled by the City (Government) or located within the city limits (Community). The key data for estimating these emissions is fuel type and consumption.

- **Scope 2 Indirect GHG Emissions** – this accounts for GHG emissions from the generation of purchased electricity consumed by the City (Government) or residents, commercial and industrial entities located within the city limits (Community). Purchased electricity is defined as electricity that is purchased and consumed or otherwise delivered into the organizational boundary of the City.
- **Scope 3 Other Emissions** – this is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the City, but occur from sources not owned or controlled by the City or its inhabitants. Some examples of scope 3 activities are extraction, production and transportation of purchased materials or fuels; employee travel; disposal of waste; etc.

Categorizing, documenting and tracking emissions according to these three scopes will enable the City to organize its data in a manner that that is readily adaptable to voluntary and mandatory state and regional reporting schemes being established across the country – such as the Midwest Greenhouse Gas Accord that the State of Kansas signed on November 15th, and the reporting protocol of the multi-state Climate Registry of which Kansas became a founding member in May 2007.

2.1.2 Community Analysis - Data Collection, Assumptions & Input

The CACP Community Analysis module is broken down into six sectors: Residential, Commercial, Industrial, Transportation, Waste, and Other. A summary of the data inputs, assumptions and calculations for each of these sectors in the CACP Community Analysis module, are described below. The type and source of data that was collected, as well as source of the emissions factor or coefficient used in calculating emissions for each sector are summarized in Table 2-2 below.

Residential Commercial and Industrial Sectors utilize an aggregation of fuel and electricity consumption data and generic emission factors to determine emission levels from energy used. The input data needed must be obtained from local fuel and electricity providers in the form of total sales by different customer classes. All other information needed for computing emissions is based on generic factors/coefficients

contained in the software. Region specific or provider specific emission factors/coefficients can also be used instead of the default values.

Table 2-2. Community Analysis Module (2005).

Sector	Data Input	Emission Factor or Coefficient Source/Assumption	Usage/Activity Data Source
Residential, Commercial and Industrial	Fuel consumption by type (thousand cubic feet of natural gas)	GKCCC	Kansas Gas
	Electricity consumption (kWh)	KCPL Specific/GKCCC	KCPL
Transportation	Vehicle types & mix (Full, mid or compact size cars; heavy or light trucks; vans, motorcycles; % of each)	Default	Default
	Fuel type (gasoline, diesel)	Default	Default
	Fuel use (gallons or vehicle miles)	NA	NA
	Fuel efficiency (by vehicle type)	Default	Default
	Vehicle miles traveled	VMT Calculator	NA
	AADTs, Road type (side streets, arterials, highways)	VMT Calculator	KDOT Traffic Studies
	Road length (miles)	NA	Black & Veatch
Waste	Amount of waste generated (tons)	Johnson County, US Census	Johnson County
	Type of disposal (landfill, incineration, compost)	Landfill Default	Deffenbaugh
	Landfill (name, location, date opened, tons of waste in place, closing date)	NA	Deffenbaugh
	Waste composition & mix (paper, food, plant, wood, textiles; % of each)	Johnson County Specific	Johnson County
	Haulage and tipping costs	NA	Deffenbaugh
Other	Sources of HFCs, PFCs or SF_6 emissions	NA	NA

Note: Appendix A lists the points of contact that provided input data.

Kansas City Power and Light (KCPL) is the local electricity provider and provided the electricity usage data for KCPL's residential, commercial and industrial

clients within the City limits. Kansas Gas is the local natural gas provider and provided data for residential, commercial and transport[2] clients within the City limits. A KCPL specific CO_2 emission factor listed in the Greater Kansas City Chamber of Commerce (GKCCC) Carbon Footprint Calculator was used to quantify CO_2 emissions from electricity consumption. The natural gas combustion emission factor recommended by GKCCC Carbon Footprint Calculator was used.

Transportation Sector sub-module estimates emissions based on the major mode of transportation, fuel use, vehicle breakdown (or vehicle mix) and vehicle miles traveled within the jurisdictional boundary. The CACP user's guide recommends that the emissions be based on vehicle miles traveled rather than fuel use estimates since the VMT method provides a realistic estimate when compared to fuel usage within a jurisdictional boundary. **The VMT approach was followed for this report**.

The software provides a tool called "The Transportation Assistant", which requires information on the total annual vehicle miles traveled (VMT) in the community by fuel and vehicle type (a default fuel/vehicle split is included). It also requires an estimate of the fuel efficiency for each vehicle type (default values for fuel economy are included). If VMT is unavailable, there is a VMT Calculator that can help estimate annual VMT based on Average Annual Daily Traffic (AADT) counts by road type and total length of each of those road types within the jurisdictional boundaries.

The transportation sector emissions were based on AADT data obtained from the Kansas Department of Transportation (KDOT). KDOT provided yearly limited access highway AADT values for the years 2001-2007, raw[3] traffic counts for few selective local roads dated April 2001 and raw traffic counts for arterial roads for the year 2007. It was assumed that since the population of Mission, KS varied by only 180 people in the seven (2001-2007) year span, local road traffic would be constant over this period. Since raw traffic count data for arterial roads was only available for the year 2007 the 2005 baseline year data was estimated based on a ratio of AADTs for the limited access highways for the 2007 and 2005 calendar years respectively. Road Lengths were provided by Black & Veatch Geographic Information Systems (GIS) services.

Waste Sector sub-module calculates GHG emissions from decomposition of waste under a variety of disposal scenarios including land filling, open dumping, controlled incineration, open burning, and composting. Only greenhouse gas emissions

[2] Natural gas use defined as "Transport" by Kansas Gas are customers who use a marketer to buy their gas. Although ot all "Transport" customers are "industrial" since according to Kansas Gas, they also include schools and other businesses. It was therefore conservatively assumed that "Transport" falls under the Industrial sub-category.

[3] Raw counts are not AADTs as they have not been corrected for axle or seasonal corrections of the vehicles passing the point or segment on the day the count was taken. However, KDOT recommends that in the absence of AADT information, raw traffic counts are the closest approximations that can be used.

are calculated. All the waste from the City is collected and disposed off in a managed landfill owned and operated by Deffenbaugh Industries (Deffenbaugh). The following input data is required for managed landfills.

- Amount of waste generated
- Type of disposal
- Name of the landfill and dates of opening and closure of the landfill.
- Methane recovery factor for the landfill
- Waste composition (default data available in the software)
- Haulage and tipping costs

The CACP user's guide mentions that the software allows for two methods for calculating GHG emissions in the waste sector – the "Methane Commitment" method and the "Waste-In-Place" method. The Methane Commitment method quantifies the net lifetime greenhouse gas emissions from waste disposed of in the active year. In other words, although each site/practice will emit gases over time, the Methane Commitment method attributes all future emissions to the year in which the waste was produced. The Waste-In-Place Method on the other hand calculates methane emissions occurring in the active year as the result of the accumulated waste already interred in the landfills. The software recommends and utilizes the Methane Commitment Method as a default. The Methane Commitment Method was used for this analysis.

The waste share (i.e., waste mix composition ratios) was based on Johnson County Solid Waste Analysis - Final Report dated September 15, 2007. It was assumed that the waste share in the above referenced report was applicable for the 2005 baseline year. The amount of waste disposed to the managed landfill operated by Deffenbaugh was based on population of the City of Mission in 2005 and data from Johnson County Solid Waste Management Plan (2007 edition), which lists a residential disposal factor of 2.67 pounds per person per day; and a commercial disposal factor of 2.06 pounds per person per day. It was assumed that these disposal factors were applicable for the 2005 baseline year. Based on information provided by Deffenbaugh for Johnson County Landfill, a methane recovery factor[4] of 75 percent was applied. CACP model default factors for methane generation and sequestration were used. Johnson County Landfill is

[4] According to Deffenbaugh, 25 percent of landfill gas (LFG) escapes fugitively and 75 percent of LFG is collected and processed. Enpower operates a gas processing facility on site which treats the LFG by removing the majority of the non-methane components, including CO_2, water, and other volatile & non-volatile organic compounds to obtain pipeline quality gas. The gas is then sold into the natural gas market. The gas processing facility uses the Selexol process to treat the gas. Enpower is currently processing approximately 4,000 standard cubic feet per minute (SCFM) of LFG through the processing plant.

located outside the boundary of the City of Mission, and thus the GHG emissions from the landfill would qualify as Scope 3 emissions.

Other Sector sub-module can be used to enter the absolute amount of greenhouse gases or criteria air pollutants emitted from activities that are not included in any specific sector. Emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) or sulfur hexafluoride (SF_6) can be entered. This sector does not compute emissions based on emission factors, but rather lists the input data (absolute emissions). This sub-module was not used since a reasonable estimate of HFCs, PFCs and SF_6 cannot be made at this time.

2.1.2 Government Analysis - Data Collection, Assumptions & Input

The CACP Government Analysis accounts for emissions from facilities, operations, programs and vehicles owned or operated directly by the City based on calculations of fuel use, electricity use, and waste production inputs. Emissions are categorized into one of seven sectors: Buildings, Vehicle Fleet, Employee Commute, Streetlights, Water/Sewage, Waste and Other. The data inputs for these sectors are similar to the data input needs outlined for the community analysis module. A summary of the data inputs, assumptions and calculations for each of the Government Analysis sectors are described below, and the type and source of data that was collected, as well as source of the emissions factor or coefficient used in calculating emissions for each sector are summarized in Table 2-3 below.

It should be noted that the Government analysis module is a subset of the Community Analysis Module – meaning that when the Community module is used, emissions from government sources will be included, but not vice versa.

Buildings Sector utilizes an aggregation of fuel and electricity consumption data and generic emission factors to determine emission levels from energy used. The input data needed must be obtained from either the city departments or local fuel and electricity providers. All other information needed for computing emissions is based on generic factors/coefficients contained in the software. Region specific or provider specific emission factors/coefficients can also be used instead of the default values. The City provided electricity and natural gas consumption data for various City owned buildings. The emission factors used in the Community Analysis module were used.

Vehicle Fleet and Employee Commute Sectors estimate emissions based on the major mode of transportation, fuel use and vehicle breakdown (or vehicle mix) within the jurisdictional boundary. 2007 year vehicle fleet data was provided by the City's Public Works Department and the Police Department. Fuel consumption data for the vehicle fleet operated by the Public Works Department was based on fuel efficiencies from vehicle manufacturer data and average annual distance traveled for each vehicle. The

Police Department provided fuel usage data for their fleet for the year 2007. Since fleet records for previous years were not readily available, it was conservatively assumed that the current fleet data will be applicable for the 2005 baseline year.

Table 2-3. Government Analysis Module (2005).

Sector	Data Input	Emission Factor or Coefficient Source/Assumptions	Usage/Activity Data Source
Buildings	Fuel consumption by type (thousand cubic feet of natural gas)	GKCCC	City
	Electricity consumption (kWh)	KCPL Specific	City
Vehicle Fleet and Employee Commute	Vehicle types & mix (Full, mid or compact size cars; heavy or light trucks; vans, motorcycles; % of each)	Default	City
	Fuel type (gasoline, diesel)	Default	City
	Fuel use (gallons or vehicle miles)	NA	City
	Fuel efficiency (by vehicle type)	Default	Default
	Vehicle miles traveled	NA	NA
	AADTs, Road type (side streets, arterials, highways)	NA	NA
Waste	Amount of waste generated (tons)	Johnson County, Employee Count	Johnson County, City
	Type of disposal (landfill, incineration, compost)	Landfill Default	Deffenbaugh
	Landfill (name, location, date opened, tons of waste in place, closing date)	NA	Deffenbaugh
	Waste composition & mix (paper, food, plant, wood, textiles; % of each)	Johnson County Specific	Johnson County
	Haulage and tipping costs	NA	Deffenbaugh
Other	Sources of HFCs, PFCs or SF_6 emissions	NA	NA
	Off-Road Equipment	USEPA	City
	Air Miles and Car Miles	GKCCC	City

Note: Appendix A lists the points of contact that provided input data.

GHG emissions from the employee commute sector were based on employee survey responses and conservatively assuming all autos as mid-size. 61 responses were received. An average fuel consumed/employee was then determined. This factor was used to compute total fuel usage based on the employee count (full time equivalents) for the calendar year 2005.

Street and Traffic Light Sector sub-module calculates GHG emissions based on electricity usage. The City provided and inventory of street light bulbs and wattage along with electricity consumption information for Christmas lights, specific lights and signals and traffic lights. Other general street lights were assumed to operate an average of 10-hours per day.

Waste Sector sub-module calculates GHG emissions from decomposition of waste under a variety of disposal scenarios including land filling, open dumping, controlled incineration, open burning, and composting. Only greenhouse gas emissions are calculated. All the waste from the City's government operations is collected and disposed off in a managed landfill owned and operated by Deffenbaugh.

The waste share (i.e., waste mix composition ratios) was based on Johnson County Solid Waste Analysis - Final Report dated September 15, 2007. It was assumed that the waste split in the above referenced report was applicable for the 2005 baseline year. The amount of waste disposed (from the City's government operations) to the managed landfill operated by Deffenbaugh was based on employee count for the City of Mission in 2005 and waste disposal factor of 0.9 tons per employee per year recommended by the GKCCC Carbon Footprint Calculator. Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75 percent was applied. The Johnson County Landfill is located outside the boundary of the City of Mission, and thus the GHG emissions from the landfill would qualify as Scope 3 emissions.

Other Sector sub-module can be used to enter the absolute amount of greenhouse gases or criteria air pollutants emitted from activities that are not included in any specific sector. In addition to CO_2, CH_4 and N_2O, emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) or sulfur hexafluoride (SF_6) can be entered in this sub-module. This sector does not compute emissions based on emission factors, but rather lists the input data (absolute emissions). This sub-module was not used to estimate HFCs, PFCs and SF_6 since the information on activities that produce emissions of these gasses was not available.

This sector was however used to indicate the GHG emissions from employee travel (airline and employee travel by car) and off-road equipment (such as back hoes and lawn mowers) operated by the City. GHG emissions from employee travel were based

on employee travel miles for the 2005 baseline year and emission factors recommended by the GKCCC Carbon Footprint Calculator for airline travel (medium haul assumed) and car travel. Emission factors for off-road equipment were based on horsepower rating of each equipment, United States Environmental Protection Agency (USEPA) CO_2 emission factor and average annual hourly usage rate. Since, off-road equipment data was available for the end of the year 2007, the average annual hourly usage rate was conservatively based on the age of the equipment as of the end of 2007 and the total hours operated.

3.0 Inventory Results

This section presents a summary of the 2005 baseline year GHG emissions inventory.

3.1 Community Inventory

The community inventory provides an estimate of all of the greenhouse gas emissions produced within the City both by residents in their homes and by local businesses and the City government as they carry out their operations. As described in the previous section, five key sectors are included in the community inventory: residential, commercial, industrial, transportation, and solid waste.

In 2005, the City emitted approximately 421,844 tons of CO_2e emissions from the residential, commercial, industrial, transportation and waste sectors. Table 3-1 provides a summary of the CO_2e emissions produced by each of the sectors. Figure 3-1 provides an illustration of the contribution to emissions from each sector. The transportation sector was the largest contributor to total emissions, responsible for 59.3 percent of the greenhouse gas emissions produced within the city. This is followed by the commercial sector (23.5 percent) and the residential sector (14 percent). The solid waste sector (-0.5 percent) is reported as a negative emissions number because of the sequestration and 75 percent methane recovery rate applied to the Deffenbaugh managed landfill in the CACP software.

Table 3-1. 2005 Community CO_2e Emissions by Sector.

Sectors	CO_2e (tons)	% CO_2e	Energy (MBtu)
Residential	59,081	14.0	445,691
Commercial	99,127	23.5	498,696
Industrial	15,646	3.7	166,203
Transportation	249,999	59.3	2,914,080
Waste	-2,009	-0.5	NA
Total	421,844		4,024,670

Source: CACP Software Detailed Output Report.

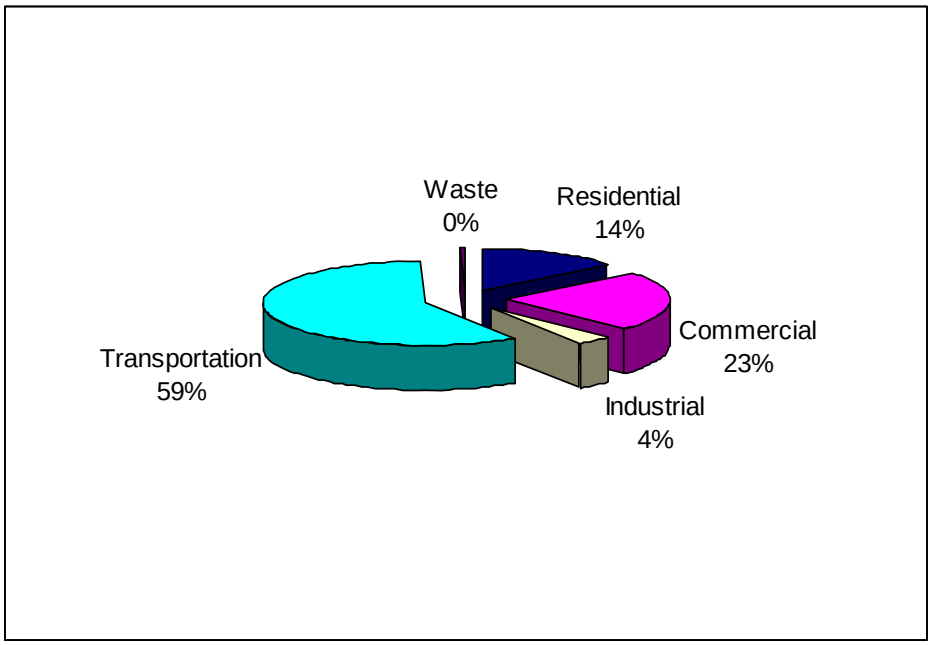

Figure 3-1. 2005 Community CO_2e Emissions by Sector.

Figure 3-2 shows the time series summary of the individual sectors and total GHG emissions for the years 2005 though 2007 for the Community Analysis Module.

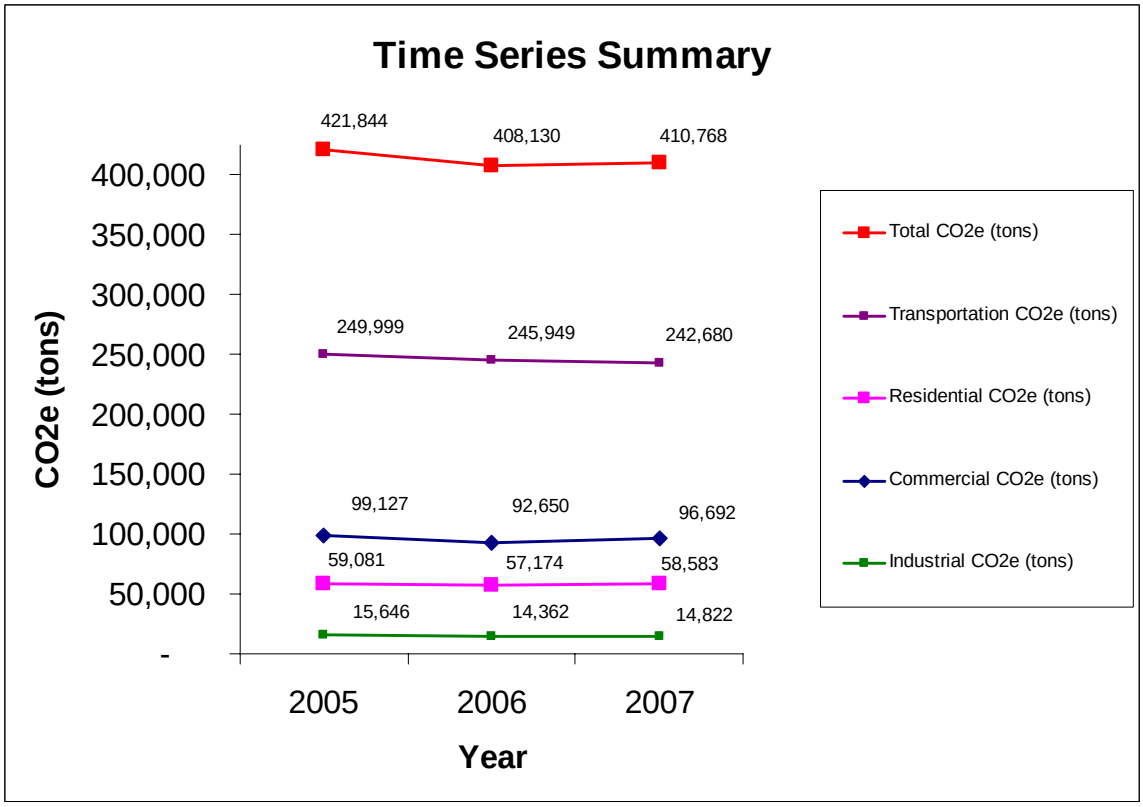

Figure 3-2. 2005-2007 Community CO_2e Emissions Trend Line.

3.1.1 Residential Sector

In 2005, the City's population was 9,746 with approximately 5,330 housing units. Within the residential sector, energy is consumed for such end-uses as space and water heating and cooling, appliances and lighting. According to the 2000 Census, 76 percent of households use natural gas for heating and 23 percent of households use electricity. Less than one percent uses other sources such as liquefied petroleum gas (LPG) and fuel oil. These other sources were assumed to be insignificant and not considered further. The residential sector emitted approximately 59,081 tons of CO_2e emissions and was responsible for 14 percent of all emissions within the City. On average, each household produced 11.1 tons of CO_2e emissions. Table 3-2 summarizes the emissions from the residential sector. For reporting purposes, emissions attributable to natural gas usage would be categorized as Scope 1 emissions, while emissions attributed to electricity consumption would be categorized as Scope 2 emissions.

Table 3-2. 2005 Residential CO_2e Emissions.

Residential - Energy Source	CO_2e Tons	CO_2e %	Energy (MBtu)
Electricity	42,391	71.7	161,113
Natural Gas	16,690	28.3	284,579
Total	59,081		445,692

Source: CACP Software Detailed Output Report

3.1.2 Commercial and Industrial Sectors

In 2005, the commercial sector released approximately 99,127 tons of CO_2e emissions and was responsible for 23.5 percent of the City's total CO_2e emissions. In 2005, the industrial sector released approximately 15,646 tons of CO_2e emissions and was responsible for 3.7 percent of the City's total CO_2e emissions. Table 3-3 and Table 3-4 summarize the emissions from the Commercial and Industrial sectors, respectively.

Table 3-3. 2005 Commercial CO_2e Emissions.

Commercial - Energy Source	CO_2e Tons	CO_2e %	Energy (MBtu)
Electricity	89,924	90.7	341,766
Natural Gas	9,203	9.3	156,931
Total	99,127		498,697

Source: CACP Software Detailed Output Report

Table 3-4. 2005 Industrial CO_2e Emissions.			
Industrial - Energy Source	**CO_2e Tons**	**CO_2e %**	**Energy (MBtu)**
Electricity	7,591	48.5	28,851
Natural Gas	8,055	51.5	137,352
Total	15,646		166,203
Source: CACP Software Detailed Output Report			

For reporting purposes, emissions attributable to natural gas usage would be categorized as Scope 1 emissions, while emissions attributed to electricity consumption would be categorized as Scope 2 emissions.

3.1.3 Transportation Sector

The transportation sector is responsible for about 59.3 percent of the City's greenhouse gas emissions. In 2005, motor vehicles driven within the City's boundaries emitted approximately 249,999 tons of CO_2e emissions. Figure 3-3 shows that approximately 72 percent (or 180,578 CO_2e tons) of total CO_2e emissions from the transportation sector in the community is contributed by limited access highway (i.e., I-35, Shawnee Mission Parkway and 69 Highway). The CO_2e emissions correlate directly to the vehicle miles traveled (VMT) for each year. Figure 3-4 shows the VMTs for years 2005 through 2007. Reduction in VMTs will contribute directly to reduction in GHG emissions from the transportation sector. Emissions attributable to the transportation sector (other than those attributable to City fleet vehicles) would qualify as Scope 3 emissions, which are not always reported.

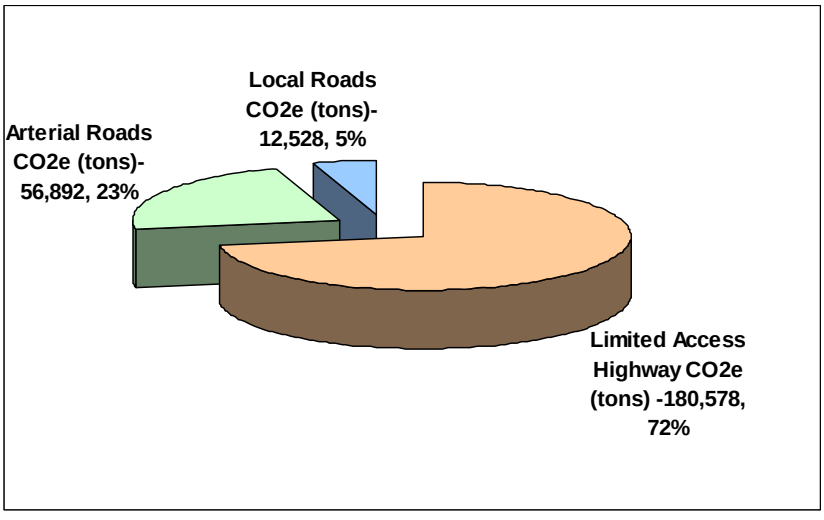

Figure 3-3. Transportation CO_2e Split for 2005.

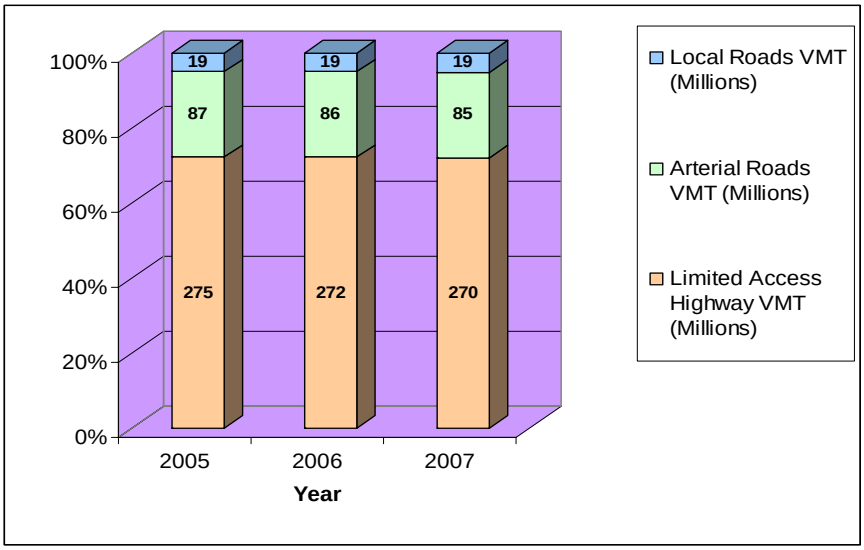

Figure 3-4. VMT Split 2005-2007

Since the limited access highways contribute a large percentage of transportation sector emissions, and the City has no control on these Scope 3 emissions when compared to VMTs from local and arterial roads, if the City chooses to not report the Scope 3 emissions from limited access highways, then the overall CO_2e emissions from the transportation sector in the community will be significantly reduced.

3.1.4 Solid Waste Sector

In 2005, 8,422 tons of municipal solid waste was disposed by the community to the Johnson County Landfill. The solid waste sector produced negative 2,009 tons of CO_2e emissions, meaning this sector actually served as an emissions *sink* and not an emissions *source*. The GHG emissions generated from waste are dependent on the type of waste being disposed of and the configuration of the landfill where waste is disposed. Two processes generally occur in a typical landfill. First, the waste does not completely decompose; causing some of the carbon that would have been released as CO_2 to actually be sequestered in the landfill. Second, because of the anaerobic conditions (lack of oxygen) in the landfill, the decomposing matter is released as methane, a greenhouse gas 21 times more potent than CO_2. If methane is not captured or burned, landfills are sources of GHG emissions. And in these cases, waste disposal can be a significant part of a community's climate pollution profile. However, the methane released can be captured to produce energy or it can be burned, which converts it back to the less potent CO_2.

The City's waste is sent to the Johnson County Landfill, a managed landfill with a methane recovery factor of 75 percent. This means that what does decompose in the

landfill is released as methane gas, 75 percent of which is captured (or "recovered") at the landfill. The net result is that a little bit more carbon equivalent is sequestered in the landfill than is emitted to the atmosphere (default methane generation and sequestration factors were assumed), and consequently serves as a GHG emissions sink. As discussed earlier, the Johnson County landfill is located outside the boundaries of the City, and thus GHG emissions under this sector would qualify as Scope 3 emissions.

3.2 Government Operations Inventory

The government analysis module quantifies emissions from buildings, vehicle fleets, employee commute, streetlights and traffic signals, wastewater facilities, and waste produced by municipal operations. There are no wastewater treatment facilities owned and operated by the City within its jurisdiction. The government module is reported in more detail than the community module because local governments have direct control over their own operations and it is therefore the area in which they are most likely to be able to directly affect major emissions reductions, and can act as a leader within their own community. This analysis will determine where the greatest opportunities for improvement lie.

The City emitted approximately 5,362 tons of CO_2e emissions in 2005. This accounts for approximately 1.3 percent of the emissions produced by the community as a whole, a figure that is typical for local governments. Table 3-5 provides a summary of energy use and greenhouse gas emissions by city operations. Figure 3-5 provides an illustration of the contribution to emissions from each sector.

Table 3-5. 2005 Government CO_2e Emissions by Sector.

Sectors	CO_2e (tons)	$\%CO_2e$	Energy (MBtu)
Buildings	3,304	61.6	20,217
Vehicle Fleet	307	5.7	3,592
Employee Commute	258	4.8	3,014
Street Lights	1,361	25.4	5,172
Waste	-20	-0.4	NA
Other	151	2.9	NA
Total	5,362		31,995

Source: CACP Software Detailed Output Report.

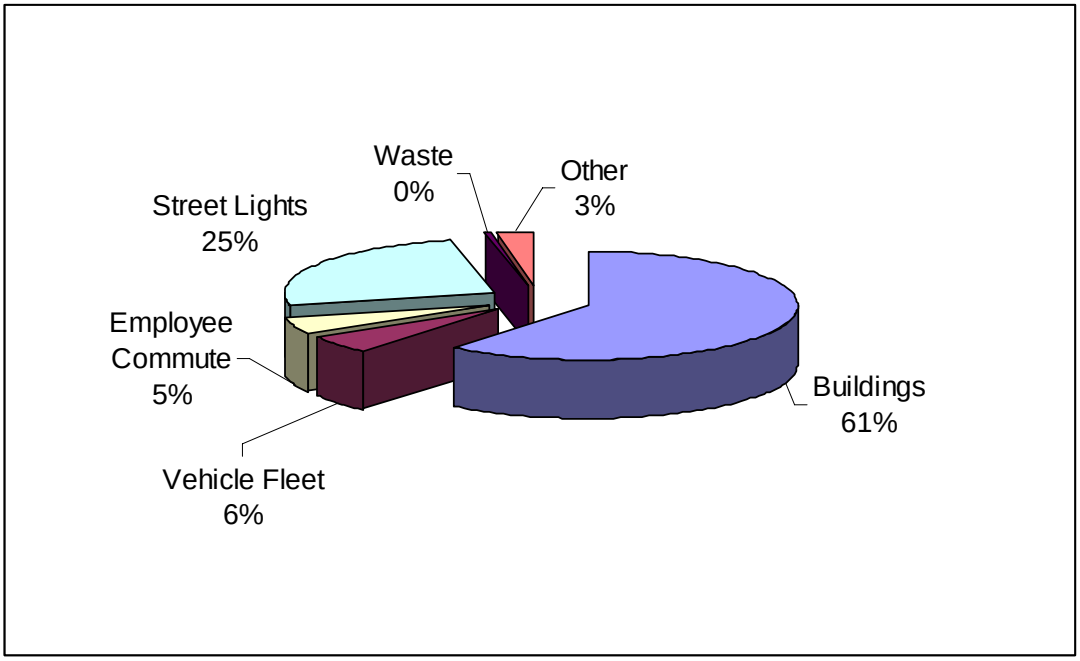

Figure 3-5. 2005 Government CO_2e Emissions by Sector.

As seen above, buildings (including parks) owned by the City have the largest contribution to overall GHG emissions from government operations. Energy consumption by street lights is the next highest at 25 percent of overall GHG emissions. Figure 3-6 shows the energy consumption of each building for the 2005 baseline year.

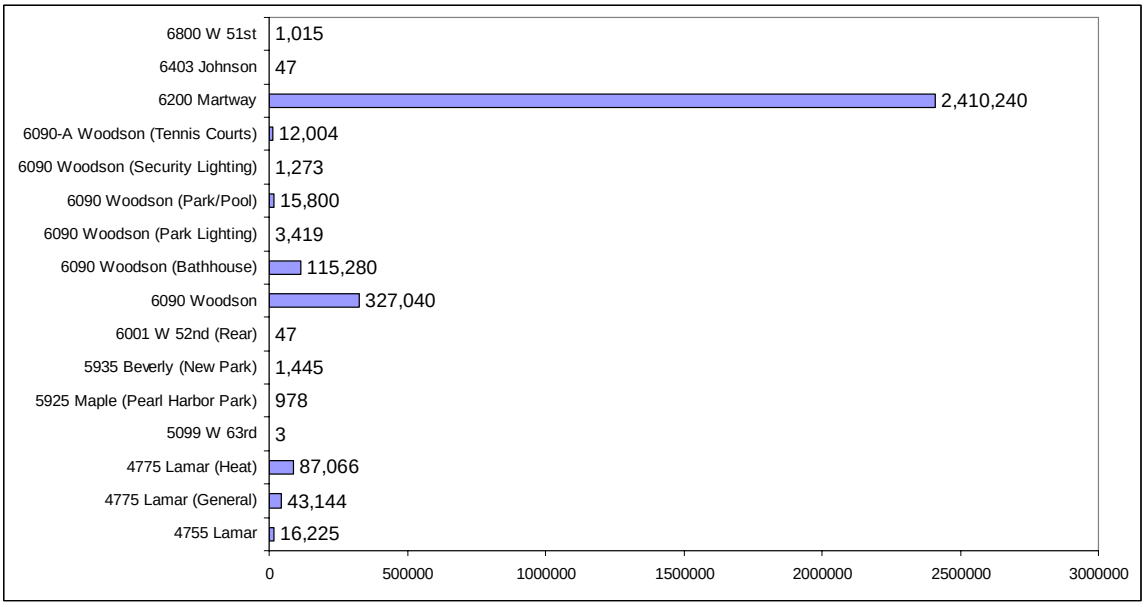

Figure 3-6. Buildings/Parks Electricity Consumption (kW-hr) in 2005

As seen above, the Community Center on 6200 Martway is the highest consumer of electricity followed by the City Hall and its associated facilities located at 6090 Woodson. The Community Center is also the highest consumer of natural gas.

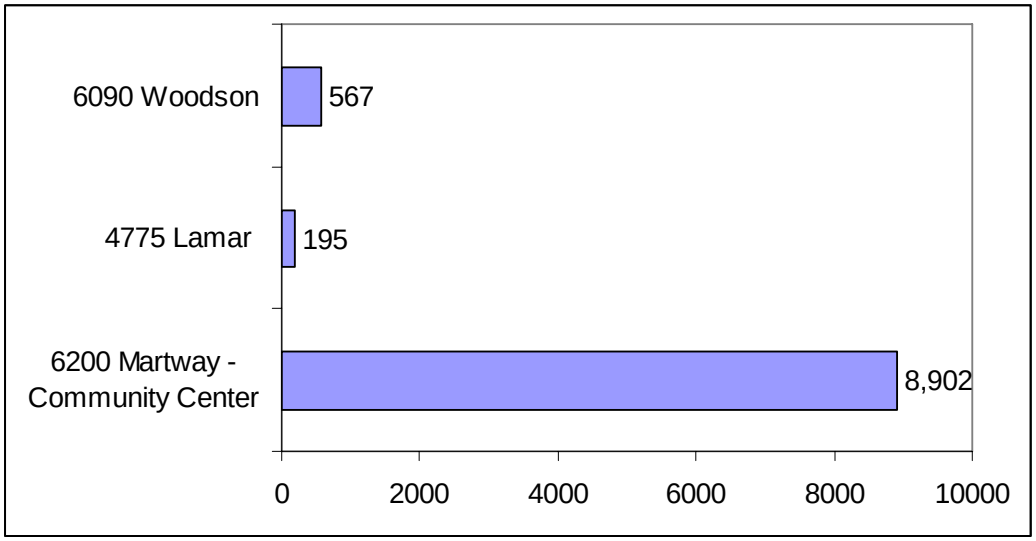

Figure 3-7. Natural Gas Consumption (1,000 CF) in 2005.

Figure 3-8 shows the electricity consumption trend (2005-2007) for the two largest consumers of electricity under the Government inventory. These two buildings are the Community Center and the City Hall, which includes park/pool, bathhouse, tennis courts, security lighting and park lighting). Figure 3-9 shows the time series summary of the individual sectors and total GHG emissions for the years 2005 though 2007.

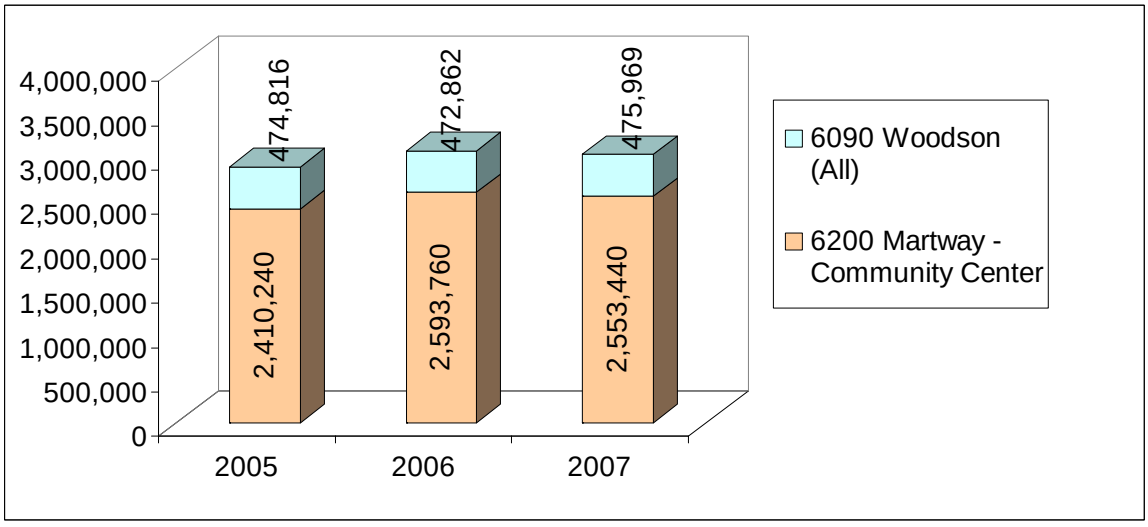

Figure 3-8. Electricity Consumption Trends 2005-2007 (kW-hr).

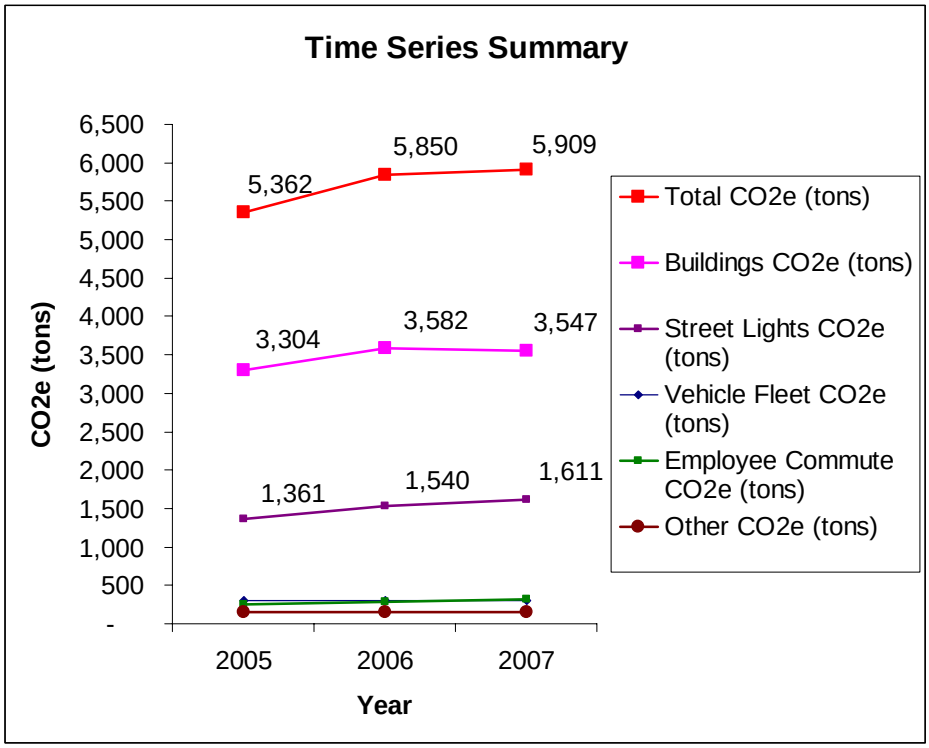

Figure 3-9. 2005-2007 Government CO_2e Emissions Trend Line.

Appendix A. GHG Inventory Contacts

Table A-1. GHG Inventory Sources and Contacts

Company	Contact Name	Phone Number	Email
KCPL	Janet Harrison	816-556-2561	Janet.Harrison@kcpl.com
Kansas Gas Service	Lisa Bunce	913-599-8912	lbunce@kgas.com
Deffenbaugh	Jay Martin	913-667-8762	jmartin@deffenbaughinc.com
KDOT	Leif Holliday	785-296-2906	leifh@ksdot.org
City of Mission	Josh Rauch	913-676-8368	jrauch@missionks.org
Johnson County, KS	Julie Coon	913-715-6900	julie.coon@jocogov.org

Appendix B. 2005-2007 CACP Inventory Summary Output

Mission

Community Greenhouse Gas Emissions
Time Series Report

Year	2005	2006	2007
Residential			
eCO2 (tons)	59,080.8	57,174.4	58,583.4
Energy (MMBtu)	445,691.5	417,778.5	433,106.6
Commercial			
eCO2 (tons)	99,127.2	92,650.1	96,691.7
Energy (MMBtu)	498,696.3	457,261.4	473,937.5
Industrial			
eCO2 (tons)	15,646.4	14,362.3	14,822.3
Energy (MMBtu)	166,203.3	164,170.6	164,165.5
Transportation			
eCO2 (tons)	249,998.7	245,949.4	242,679.5
Energy (MMBtu)	2,914,079.7	2,868,486.0	2,831,554.1
Waste			
eCO2 (tons)	-2,009.5	-2,006.4	-2,008.7
Total			
eCO2 (tons)	421,843.7	408,129.8	410,768.2
Energy (MMBtu)	4,024,670.8	3,907,696.6	3,902,763.7

Community Greenhouse Gas Emissions in 2005
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Mission, Kansas			
Residential			
City of Mission-All Residences			
Electricity	42,391	10.0	161,113
Natural Gas	16,690	4.0	284,579
Subtotal City of Mission-All Residences	59,081	14.0	445,691

The electricity Emission Factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Subtotal Residential	59,081	14.0	445,691
Commercial			
City of Mission-All Commercial			
Electricity	89,924	21.3	341,766
Natural Gas	9,203	2.2	156,931
Subtotal City of Mission-All Commercial	99,127	23.5	498,696

The electricity emission factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Subtotal Commercial	99,127	23.5	498,696
Industrial			
Untitled			
Electricity	7,591	1.8	28,851
Natural Gas	8,055	1.9	137,352
Subtotal Untitled	15,646	3.7	166,203

The electricity emission factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Natural gas use defined as "Transport" by Kansas Gas assumed to be industrial. These are customers who use a marketer to buy their gas. Although not all "Transport" customers are industrial since, according to Kansas Gas, they also include schools and other businesses, it was conservatively assumed that "Transport" falls under Industrial sub-category.

Subtotal Industrial	15,646	3.7	166,203

Community Greenhouse Gas Emissions in 2005
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Transportation			
Community Transportation-VMT Approach			
Gasoline	206,752	49.0	2,415,817
Diesel	43,247	10.3	498,262
Subtotal Community Transportation-VMT Approach	249,999	59.3	2,914,080

KDOT provided figures including yearly Limited Access Highway traffic flow for the years 2001-2007, local road counts for the City of Mission dated
April 2001 and documentation for Arterial Roads in the City of Mission from the year 2007.

It was assumed that since the population of Mission, KS varied by only 180 people in the seven year span, local road traffic would be constant over this period.

Traffic count data for Arterial Roads was only available for the year 2007. In order to develop data for years previous, the Limited Access Highway data was
examined. Based on a ratio of the previous/current years, figures were calculated for the years before 2007.

Road Lengths were provided by Black & Veatch GIS services.

Subtotal Transportation	249,999	59.3	2,914,080
Waste			
City of Mission-Community			*Disposal Method - Managed Landfill*
Paper Products	-1,370	-0.3	
Food Waste	296	0.1	
Plant Debris	-643	-0.2	
Wood/Textiles	-292	-0.1	
Subtotal City of Mission-Community	-2,009	-0.5	

Waste Share based on Johnson County Solid Waste Analysis - Final Report dated Sep 15, 2007. Assumes that the waste split is similar for all years.

Amount of waste generated is based on population of the City of Mission in 2005 and data from Johnson County Solid Waste Management Plan, which lists a residential disposal factor of 2.67 pounds per person per day; and a commercial disposal factor of 2.06 pounds per person per day.

Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75% was applied. Most of the MSW gets landfilled in the Johnson County Landfill, which is located outside the boundary of the City of Mission.

Subtotal Waste	-2,009	-0.5	
Subtotal Mission, Kansas	421,844	100.0	4,024,671
Total	421,844	100.0	4,024,671

Community Greenhouse Gas Emissions in 2006
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Mission, Kansas			
Residential			
City of Mission-All Residences			
Electricity	42,052	10.3	159,923
Natural Gas	15,122	3.7	257,855
Subtotal City of Mission-All Residences	57,174	14.0	417,778

The electricity Emission Factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Subtotal Residential	57,174	14.0	417,778
Commercial			
City of Mission-All Commercial			
Electricity	84,731	20.8	322,230
Natural Gas	7,919	1.9	135,031
Subtotal City of Mission-All Commercial	92,650	22.7	457,261

The electricity emission factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Subtotal Commercial	92,650	22.7	457,261
Industrial			
Untitled			
Electricity	6,093	1.5	23,172
Natural Gas	8,269	2.0	140,998
Subtotal Untitled	14,362	3.5	164,171

The electricity emission factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Natural gas use defined as "Transport" by Kansas Gas assumed to be industrial. These are customers who use a marketer to buy their gas. Although not all "Transport" customers are industrial since, according to Kansas Gas, they also include schools and other businesses, it was conservatively assumed that "Transport" falls under Industrial sub-category.

Subtotal Industrial	14,362	3.5	164,171

Community Greenhouse Gas Emissions in 2006
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	
Transportation				
Community Transportation-VMT Approach				
Gasoline	203,142	49.8	2,375,286	
Diesel	42,808	10.5	493,200	
Subtotal Community Transportation-VMT Approach	49	60.3	2,868,486	

KDOT provided figures including yearly Limited Access Highway traffic flow for the years 2001-2007, local road counts for the City of Mission dated
April 2001 and documentation for Arterial Roads in the City of Mission from the year 2007.

It was assumed that since the population of Mission, KS varied by only 180 people in the seven year span, local road traffic would be constant over this period.

Traffic count data for Arterial Roads was only available for the year 2007. In order to develop data for years previous, the Limited Access Highway data was
examined. Based on a ratio of the previous/current years, figures were calculated for the years before 2007.

Road Lengths were provided by Black & Veatch GIS services.

Subtotal Transportation	245,949	60.3	2,868,486	
Waste				
City of Mission-Community				*Disposal Method - Managed Landfill*
Paper Products	-1,368	-0.3		
Food Waste	296	0.1		
Plant Debris	-642	-0.2		
Wood/Textiles	-292	-0.1		
Subtotal City of Mission-Community	-2,006	-0.5		

Waste Share based on Johnson County Solid Waste Analysis - Final Report dated Sep 15, 2007. Assumes that the waste split is similar for all years.

Amount of waste generated is based on population of the City of Mission in 2006 and data from Johnson County Solid Waste Management Plan, which lists a residential disposal factor of 2.67 pounds per person per day; and a commercial disposal factor of 2.06 pounds per person per day.

Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75% was applied. Most of the MSW gets landfilled in the Johnson County Landfill, which is located outside the boundary of the City of Mission.

Subtotal Waste	-2,006	-0.5		
Subtotal Mission, Kansas	408,130	100.0	3,907,697	
Total	408,130	100.0	3,907,697	

Community Greenhouse Gas Emissions in 2007
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Mission, Kansas			
Residential			
City of Mission-All Residences			
Electricity	42,711	10.4	162,462
Natural Gas	15,872	3.9	270,645
Subtotal City of Mission-All Residences	58,583	14.3	433,107

The electricity Emission Factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Subtotal Residential	58,583	14.3	433,107
Commercial			
City of Mission-All Commercial			
Electricity	88,679	21.6	337,313
Natural Gas	8,013	2.0	136,624
Subtotal City of Mission-All Commercial	96,692	23.5	473,938

The electricity emission factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Subtotal Commercial	96,692	23.5	473,938
Industrial			
Untitled			
Electricity	6,686	1.6	25,432
Natural Gas	8,136	2.0	138,734
Subtotal Untitled	14,822	3.6	164,165

The electricity emission factor based on KCPL specific factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

The natural gas emission factor based on emission factor listed in the Greater Kansas City Chamber of Commerce Footprint Calculator.

Natural gas use defined as "Transport" by Kansas Gas assumed to be industrial. These are customers who use a marketer to buy their gas. Although not all "Transport" customers are industrial since, according to Kansas Gas, they also include schools and other businesses, it was conservatively assumed that "Transport" falls under Industrial sub-category.

Subtotal Industrial	14,822	3.6	164,165

Community Greenhouse Gas Emissions in 2007
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)
Transportation			
Community Transportation-VMT Approach			
Gasoline	200,250	48.8	2,342,712
Diesel	42,430	10.3	488,842
Subtotal Community Transportation-VMT Approach	242,679	59.1	2,831,554

KDOT provided figures including yearly Limited Access Highway traffic flow for the years 2001-2007, local road counts for the City of Mission dated
April 2001 and documentation for Arterial Roads in the City of Mission from the year 2007.

It was assumed that since the population of Mission, KS varied by only 180 people in the seven year span, local road traffic would be constant over this period.

Traffic count data for Arterial Roads was only available for the year 2007. In order to develop data for years previous, the Limited Access Highway data was
examined. Based on a ratio of the previous/current years, figures were calculated for the years before 2007.

Road Lengths were provided by Black & Veatch GIS services.

Subtotal Transportation	242,679	59.1	2,831,554
Waste			
City of Mission-Community			*Disposal Method - Managed Landfill*
Paper Products	-1,369	-0.3	
Food Waste	296	0.1	
Plant Debris	-643	-0.2	
Wood/Textiles	-292	-0.1	
Subtotal City of Mission-Community	-2,009	-0.5	

Waste Share based on Johnson County Solid Waste Analysis - Final Report dated Sep 15, 2007. Assumes that the waste split is similar for all years.

Amount of waste generated is based on population of the City of Mission in 2007 and data from Johnson County Solid Waste Management Plan, which lists a residential disposal factor of 2.67 pounds per person per day; and a commercial disposal factor of 2.06 pounds per person per day.

Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75% was applied. Most of the MSW gets landfilled in the Johnson County Landfill, which is located outside the boundary of the City of Mission.

Subtotal Waste	-2,009	-0.5	
Subtotal Mission, Kansas	410,768	100.0	3,902,764
Total	410,768	100.0	3,902,764

Mission

Government Greenhouse Gas Emissions
Time Series Report

Year	2005	2006	2007
Buildings			
eCO2 (tons)	3,303.6	3,581.8	3,546.9
Energy (MMBtu)	20,217.0	22,802.9	23,716.7
Vehicle Fleet			
eCO2 (tons)	306.6	306.4	306.3
Energy (MMBtu)	3,592.0	3,592.0	3,592.0
Employee Commute			
eCO2 (tons)	257.6	293.8	315.6
Energy (MMBtu)	3,014.5	3,439.6	3,696.9
Streetlights			
eCO2 (tons)	1,360.7	1,539.7	1,610.6
Energy (MMBtu)	5,171.6	5,855.4	6,126.4
Waste			
eCO2 (tons)	-20.2	-23.0	-24.7
Other			
eCO2 (tons)	153.5	150.8	154.3
Total			
eCO2 (tons)	5,361.9	5,849.5	5,909.0
Energy (MMBtu)	31,995.0	35,690.0	37,132.0

Government Greenhouse Gas Emissions in 2005
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Mission, Kansas				
Buildings				
4755 Lamar				
Electricity	15	0.3	55	0
Natural Gas	12	0.2	199	0
Subtotal 4755 Lamar	26	0.5	254	0
4775 Lamar (General)				
Electricity	39	0.7	147	0
Subtotal 4775 Lamar (General)	39	0.7	147	0
4775 Lamar (Heat)				
Electricity	78	1.5	297	0
Subtotal 4775 Lamar (Heat)	78	1.5	297	0
5099 W 63rd Street				
Electricity	0	0.0	0	0
Subtotal 5099 W 63rd Street	0	0.0	0	0
5925 Maple (Pearl Harbor Park)				
Electricity	1	0.0	3	0
Subtotal 5925 Maple (Pearl Harbor Park)	1	0.0	3	0
5935 Beverly (New Park)				
Electricity	1	0.0	5	0
Subtotal 5935 Beverly (New Park)	1	0.0	5	0
6001 W 52nd (Rear)				
Electricity	0	0.0	0	0
Subtotal 6001 W 52nd (Rear)	0	0.0	0	0
6090 Woodson				
Electricity	294	5.5	1,116	0
Natural Gas	34	0.6	579	0
Subtotal 6090 Woodson	328	6.1	1,695	0
6090 Woodson (Bathhouse)				
Electricity	104	1.9	393	0
Subtotal 6090 Woodson (Bathhouse)	104	1.9	393	0

Government Greenhouse Gas Emissions in 2005
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
6090 Woodson (Park Lighting)				
Electricity	3	0.1	12	0
Subtotal 6090 Woodson (Park Lighting)	3	0.1	12	0
6090 Woodson (Park/Pool)				
Electricity	14	0.3	54	0
Subtotal 6090 Woodson (Park/Pool)	14	0.3	54	0
6090 Woodson (Security Lighting)				
Electricity	1	0.0	4	0
Subtotal 6090 Woodson (Security Lighting)	1	0.0	4	0
6090-A Woodson (Tennis Courts)				
Electricity	11	0.2	41	0
Subtotal 6090-A Woodson (Tennis Courts)	11	0.2	41	0
6200 Martway				
Electricity	2,164	40.4	8,226	0
Natural Gas	533	9.9	9,081	0
Subtotal 6200 Martway	2,697	50.3	17,307	0
6403 Johnson				
Electricity	0	0.0	0	0
Subtotal 6403 Johnson	0	0.0	0	0
6800 W 51st Street				
Electricity	1	0.0	3	0
Subtotal 6800 W 51st Street	1	0.0	3	0
Subtotal Buildings	3,304	61.6	20,217	0
Vehicle Fleet				
Trucks and Fleet				
Gasoline	264	4.9	3,096	0
Diesel	43	0.8	495	0
Subtotal Trucks and Fleet	307	5.7	3,592	0
Subtotal Vehicle Fleet	307	5.7	3,592	0

Government Greenhouse Gas Emissions in 2005
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Employee Commute				
City of Mission Employee Commute				
Gasoline	258	4.8	3,014	
Subtotal City of Mission Employee Commute	258	4.8	3,014	

Based on Employee survey responses and conservatively assuming all autos as mid-size. 61 responses were received. An average fuel consumed/employee was determined. This factor was used to compute total fuel usage based on the employee count (full time equivalents) for the calendar year.

Subtotal Employee Commute	258	4.8	3,014	
Streetlights				
Christmas Lights				
Electricity	3	0.1	11	0
Subtotal Christmas Lights	3	0.1	11	0
Specific Lights and Signals				
Electricity	187	3.5	709	0
Subtotal Specific Lights and Signals	187	3.5	709	0
Street Lights - General				
Electricity	933	17.4	3,546	0
Subtotal Street Lights - General	933	17.4	3,546	0

Energy consumption based on bulb power rating (lumens and watts), number of each kind of bulb, and assuming each bulb is turned on for 10 hours per day.

Traffic Lights				
Electricity	238	4.4	905	0
Subtotal Traffic Lights	238	4.4	905	0
Subtotal Streetlights	1,361	25.4	5,172	0
Waste				
Untitled			*Disposal Method - Managed Landfill*	
Paper Products	-14	-0.3	18	
Food Waste	3	0.1	7	
Plant Debris	-6	-0.1	5	
Wood/Textiles	-3	-0.1	2	
All Other Waste	0	0.0	12	
Subtotal Untitled	-20	-0.4	44	

Waste Share based on Johnson County Solid Waste Analysis - Final Report dated Sep 15, 2007. Assumes that the waste split is similar for all years.

Amount of waste generated is based on employee count for the City of Mission in 2005 and waste disposal factor of 0.9 tons per employee per year.

Government Greenhouse Gas Emissions in 2005
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
This factor was obtained from teh KC Chamber of Commerce Carbon Footprint Calculator.				
Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75% was applied. Most of the MSW gets landfilled in the Johnson County Landfill, which is located outside the boundary of the City of Mission.				
Subtotal Waste	-20	-0.4		44
Other				
Air Miles				
Carbon Dioxide	21	0.4		
Subtotal Air Miles	21	0.4		
Travel Miles for Air Travel (medium haul) and Car Travel. Emission factors based on KC Chamber of Commerce's CO2 estimation tool.				
Car Miles				
Carbon Dioxide	5	0.1		
Subtotal Car Miles	5	0.1		
Travel Miles for Air Travel (medium haul) and Car Travel. Emission factors based on KC Chamber of Commerce's CO2 estimation tool.				
Mowers, Back Hoes, etc				
Carbon Dioxide	128	2.4		
Subtotal Mowers, Back Hoes, etc	128	2.4		
Subtotal Other	154	2.9		
Subtotal Mission, Kansas	5,362	100.0	31,995	44
Total	5,362	100.0	31,995	44

Government Greenhouse Gas Emissions in 2006
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Mission, Kansas				
Buildings				
4755 Lamar				
Electricity	13	0.2	51	0
Natural Gas	12	0.2	210	0
Subtotal 4755 Lamar	26	0.4	261	0
4775 Lamar (General)				
Electricity	37	0.6	141	0
Subtotal 4775 Lamar (General)	37	0.6	141	0
4775 Lamar (Heat)				
Electricity	83	1.4	317	0
Subtotal 4775 Lamar (Heat)	83	1.4	317	0
5099 W 63rd Street				
Electricity	0	0.0	0	0
Subtotal 5099 W 63rd Street	0	0.0	0	0
5633 Johnson				
Natural Gas	2	0.0	43	0
Subtotal 5633 Johnson	2	0.0	43	0
5925 Maple (Pearl Harbor Park)				
Electricity	1	0.0	3	0
Subtotal 5925 Maple (Pearl Harbor Park)	1	0.0	3	0
5935 Beverly (New Park)				
Electricity	1	0.0	5	0
Subtotal 5935 Beverly (New Park)	1	0.0	5	0
6001 W 52nd (Rear)				
Electricity	0	0.0	0	0
Subtotal 6001 W 52nd (Rear)	0	0.0	0	0
6090 Woodson				
Electricity	290	5.0	1,103	0
Natural Gas	31	0.5	527	0
Subtotal 6090 Woodson	321	5.5	1,629	0

Government Greenhouse Gas Emissions in 2006
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
6090 Woodson (Bathhouse)				
Electricity	106	1.8	403	0
Subtotal 6090 Woodson (Bathhouse)	106	1.8	403	0
6090 Woodson (Park Lighting)				
Electricity	3	0.1	12	0
Subtotal 6090 Woodson (Park Lighting)	3	0.1	12	0
6090 Woodson (Park/Pool)				
Electricity	15	0.3	57	0
Subtotal 6090 Woodson (Park/Pool)	15	0.3	57	0
6090 Woodson (Security Lighting)				
Electricity	2	0.0	8	0
Subtotal 6090 Woodson (Security Lighting)	2	0.0	8	0
6090-A Woodson (Tennis Courts)				
Electricity	8	0.1	31	0
Subtotal 6090-A Woodson (Tennis Courts)	8	0.1	31	0
6200 Martway				
Electricity	2,328	39.8	8,852	0
Natural Gas	647	11.1	11,038	0
Subtotal 6200 Martway	2,975	50.9	19,890	0
6403 Johnson				
Electricity	0	0.0	0	0
Subtotal 6403 Johnson	0	0.0	0	0
6800 W 51st Street				
Electricity	1	0.0	3	0
Subtotal 6800 W 51st Street	1	0.0	3	0
Subtotal Buildings	3,582	61.2	22,803	0
Vehicle Fleet				
Trucks and Fleet				
Gasoline	263	4.5	3,096	0
Diesel	43	0.7	495	0
Subtotal Trucks and Fleet	306	5.2	3,592	0

Assumed same for 2005-2007

Government Greenhouse Gas Emissions in 2006
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Subtotal Vehicle Fleet	306	5.2	3,592	0
Employee Commute				
City of Mission Employee Commute				
Gasoline	294	5.0	3,440	
Subtotal City of Mission Employee Commute	294	5.0	3,440	

Based on Employee survey responses and conservatively assuming all autos as "mid-size". 61 responses were received. An average fuel consumed/employee was determined. This factor was used to compute total fuel usage based on the employee count (full time equivalents) for the calendar year.

Subtotal Employee Commute	294	5.0	3,440	
Streetlights				
Christmas Lights				
Electricity	9	0.1	32	0
Subtotal Christmas Lights	9	0.1	32	0
Specific Lights and Signals				
Electricity	180	3.1	683	0
Subtotal Specific Lights and Signals	180	3.1	683	0
Street Lights - General				
Electricity	924	15.8	3,515	0
Subtotal Street Lights - General	924	15.8	3,515	0

Energy consumption based on bulb power rating (lumens and watts), number of each kind of bulb, and assuming each bulb is turned on for 10 hours per day.

Traffic Lights				
Electricity	427	7.3	1,625	0
Subtotal Traffic Lights	427	7.3	1,625	0
Subtotal Streetlights	1,540	26.3	5,855	0
Waste				
City of Mission-Waste			*Disposal Method - Managed Landfill*	
Paper Products	-16	-0.3	18	
Food Waste	3	0.1	7	
Plant Debris	-7	-0.1	5	
Wood/Textiles	-3	-0.1	2	
All Other Waste	0	0.0	12	
Subtotal City of Mission-Waste	-23	-0.4	44	

Waste Share based on Johnson County Solid Waste Analysis - Final Report dated Sep 15, 2007. Assumes that the waste split is similar for all years.

Government Greenhouse Gas Emissions in 2006
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Amount of waste generated is based on employee count for the City of Mission in 2005 and waste disposal factor of 0.9 tons per employee per year. This factor was obtained from teh KC Chamber of Commerce Carbon Footprint Calculator.				
Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75% was applied. Most of the MSW gets landfilled in the Johnson County Landfill, which is located outside the boundary of the City of Mission.				
Subtotal Waste	-23	-0.4		44
Other				
Airline Miles				
Carbon Dioxide	19	0.3		
Subtotal Airline Miles	19	0.3		
Travel Miles for Air Travel (medium haul) and Car Travel. Emission factors based on KC Chamber of Commerce's CO2 estimation tool.				
Car Miles				
Carbon Dioxide	4	0.1		
Subtotal Car Miles	4	0.1		
Travel Miles for Air Travel (medium haul) and Car Travel. Emission factors based on KC Chamber of Commerce's CO2 estimation tool.				
Mowers, Back Hoes etc				
Carbon Dioxide	128	2.2		
Subtotal Mowers, Back Hoes etc	128	2.2		
Emissions from Mowers, back hoes, etc were based on EPA's non-road emission factors.				
Subtotal Other	151	2.6		
Subtotal Mission, Kansas	5,850	100.0	35,690	44
Total	5,850	100.0	35,690	44

Government Greenhouse Gas Emissions in 2007
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Mission, Kansas				
Buildings				
4755 Lamar				
Electricity	2	0.0	9	0
Subtotal 4755 Lamar	2	0.0	9	0
Building was closed in March 2007				
4775 Lamar (General)				
Electricity	8	0.1	30	0
Subtotal 4775 Lamar (General)	8	0.1	30	0
4775 Lamar (Heat)				
Electricity	44	0.7	166	0
Natural Gas	32	0.5	554	0
Subtotal 4775 Lamar (Heat)	76	1.3	720	0
5099 W 63rd Street				
Electricity	0	0.0	0	0
Subtotal 5099 W 63rd Street	0	0.0	0	0
5633 Johnson				
Natural Gas	13	0.2	221	0
Subtotal 5633 Johnson	13	0.2	221	0
5908 Outlook				
Natural Gas	37	0.6	632	0
Subtotal 5908 Outlook	37	0.6	632	0
5925 Maple (Pearl Harbor Park)				
Electricity	0	0.0	2	0
Subtotal 5925 Maple (Pearl Harbor Park)	0	0.0	2	0
5935 Beverly (New Park)				
Electricity	2	0.0	6	0
Subtotal 5935 Beverly (New Park)	2	0.0	6	0
6001 W 52nd (Rear)				
Electricity	0	0.0	0	0
Subtotal 6001 W 52nd (Rear)	0	0.0	0	0

Government Greenhouse Gas Emissions in 2007
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
6090 Woodson				
Electricity	291	4.9	1,105	0
Natural Gas	51	0.9	862	0
Subtotal 6090 Woodson	341	5.8	1,967	0
6090 Woodson (Bathhouse)				
Electricity	110	1.9	417	0
Subtotal 6090 Woodson (Bathhouse)	110	1.9	417	0
6090 Woodson (Park Lighting)				
Electricity	3	0.1	13	0
Subtotal 6090 Woodson (Park Lighting)	3	0.1	13	0
6090 Woodson (Park/Pool)				
Electricity	12	0.2	47	0
Subtotal 6090 Woodson (Park/Pool)	12	0.2	47	0
6090 Woodson (Security Lighting)				
Electricity	2	0.0	7	0
Subtotal 6090 Woodson (Security Lighting)	2	0.0	7	0
6090-A Woodson (Tennis Courts)				
Electricity	9	0.2	36	0
Subtotal 6090-A Woodson (Tennis Courts)	9	0.2	36	0
6200 Martway				
Electricity	2,291	38.8	8,715	0
Natural Gas	639	10.8	10,893	0
Subtotal 6200 Martway	2,930	49.6	19,608	0
6403 Johnson				
Electricity	0	0.0	0	0
Subtotal 6403 Johnson	0	0.0	0	0
6800 W 51st Street				
Electricity	1	0.0	4	0
Subtotal 6800 W 51st Street	1	0.0	4	0
Subtotal Buildings	3,547	60.0	23,717	0

Government Greenhouse Gas Emissions in 2007
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Vehicle Fleet				
Trucks and Fleet				
Gasoline	263	4.5	3,096	0
Diesel	43	0.7	495	0
Subtotal Trucks and Fleet	306	5.2	3,592	0
Subtotal Vehicle Fleet	306	5.2	3,592	0
Employee Commute				
City of Mission Employee Commute				
Gasoline	316	5.3	3,697	
Subtotal City of Mission Employee Commute	316	5.3	3,697	
Based on Employee survey responses and conservatively assuming all autos as mid-size. 61 responses were received. An average fuel consumed/employee was determined. This factor was used to compute total fuel usage based on the employee count (full time equivalents) for the calendar year.				
Subtotal Employee Commute	316	5.3	3,697	
Streetlights				
Christmas Temporary Lights				
Electricity	83	1.4	316	0
Subtotal Christmas Temporary Lights	83	1.4	316	0
Specific Lights and Signals				
Electricity	176	3.0	671	0
Subtotal Specific Lights and Signals	176	3.0	671	0
Street Lights - General				
Electricity	920	15.6	3,498	0
Subtotal Street Lights - General	920	15.6	3,498	0
Energy consumption based on bulb power rating (lumens and watts), number of each kind of bulb, and assuming each bulb is turned on for 10 hours per day.				
Traffic Lights				
Electricity	432	7.3	1,642	0
Subtotal Traffic Lights	432	7.3	1,642	0
Subtotal Streetlights	1,611	27.3	6,126	0

Government Greenhouse Gas Emissions in 2007
Detailed Report

	Equiv CO_2 (tons)	Equiv CO_2 (%)	Energy (MMBtu)	Cost ($)
Waste				
City of Mission - Solid Waste			*Disposal Method - Managed Landfill*	
Paper Products	-17	-0.3		18
Food Waste	4	0.1		7
Plant Debris	-8	-0.1		5
Wood/Textiles	-4	-0.1		2
All Other Waste	0	0.0		12
Subtotal City of Mission - Solid Waste	-25	-0.4		44

Waste Share based on Johnson County Solid Waste Analysis - Final Report dated Sep 15, 2007. Assumes that the waste split is similar for all years.

Amount of waste generated is based on employee count for the City of Mission in 2007 and waste disposal factor of 0.9 tons per employee per year. This factor was obtained from teh KC Chamber of Commerce Carbon Footprint Calculator.

Based on information from Deffenbaugh for Johnson County Landfill, a methane recovery factor of 75% was applied. Most of the MSW gets landfilled in the Johnson County Landfill, which is located outside the boundary of the City of Mission.

Subtotal Waste	-25	-0.4		44
Other				
Airline Miles				
Carbon Dioxide	17	0.3		
Subtotal Airline Miles	17	0.3		

Travel Miles for Air Travel (medium haul) and Car Travel. Emission factors based on KC Chamber of Commerce's CO2 estimation tool.

Car Miles				
Carbon Dioxide	9	0.2		
Subtotal Car Miles	9	0.2		

Travel Miles for Air Travel (medium haul) and Car Travel. Emission factors based on KC Chamber of Commerce's CO2 estimation tool.

Mowers, Back Hoes, etc				
Carbon Dioxide	128	2.2		
Subtotal Mowers, Back Hoes, etc	128	2.2		

Emissions from Mowers, back hoes, etc were based on EPA's non-road emission factors.

Subtotal Other	154	2.6		
Subtotal Mission, Kansas	5,909	100.0	37,132	44
Total	5,909	100.0	37,132	44