Greenhouse Gas Inventory Maintenance Standard Operating Procedure

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INVENTORY PROCESS AND PROTOCOL

This document accompanies the following Microsoft Excel Inventory Management System (IMS) documents used to calculate the City's community-wide and municipal greenhouse gas (GHG) inventory, following the **Global Protocol for Community-Scale Greenhouse Gas Inventories** and The Greenhouse Gas Protocol: A Corporate Reporting Standard, respectively, for reporting to the Carbon Disclosure Project (CDP):

- KCMO Community IMS - 2019_CDP Submission.xlsm
- KCMO Operations IMS – 2019.xlsm

During this inventory update, data were collected for calendar years 2018-2020. Since 2020 data showed considerable impact from COVID-19 travel restrictions and stay-at-home orders, 2019 data were used to track progress from the 2017 inventory. Ongoing maintenance of the GHG inventories is important for tracking progress and reporting results to stakeholders and should be completed every 2-3 years and in emissions reduction goal years (2025,2030, and 2040). This document provides a standard operating procedure for ongoing GHG inventory updates.

DATA COLLECTION & MANAGEMENT

This section details the process for data collection to facilitate inventory updates to track progress toward the City's emissions goals.

DATA REQUESTS

The tables in Appendix A list the required data, units, format, and contact for each emission source. Data requests should be sent at least 2-months before the inventory submission deadline. See Appendix B for email templates from the 2019 inventory update. Generally, CDP reporting deadlines are at the end of June, so data requests should be sent by the beginning of May. Note that some data sources, especially public data, may not be available by this time for the previous year. For this reason, some communities choose to submit their inventory for the year prior. For example, the inventory submitted to the CDP in June 2021 will be the calendar year 2019 inventory. When requesting data, it is best practice to provide a table showing the format in which the data should be provided and establish a deadline for the person to provide the data. Two to four weeks is a standard amount of time to give for the deadline. Larger utilities may require more time to fulfill a data request, while fleet managers may be able to fulfill requests much sooner. Over time the contact person for specific data may change. It is important to track these changes and update the information in Appendix A, and in the IMS.

DATA MANAGEMENT

Once data is received it should be saved in a folder dedicated specifically for data that will be used for the inventory. Some data, such as large utility files, will require further analysis to determine total monthly or annual energy or water use. Pivot tables are a useful Excel tool when doing analysis on large utility data files. If a data file requires further analysis, it is good practice to save a copy of the raw data file in addition to a copy of the analyzed file. All data should be labeled with emissions source and inventory year.

DATA INPUT

All original data are input into the Inventory Management System (IMS) on the community activity inputs tab (or Operations Inputs tab if using the operations IMS tool). Emissions factors should also be updated on the emissions factor inputs tab as applicable, along with the updated data source and any notes. Emissions factors are taken from The Climate Registry for the appropriate year unless otherwise noted. The tool uses these emissions factors for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) to calculate total emissions in metric tons of CO_2 equivalent ($MTCO_2e$). These data are used to calculate emission by source. These calculations can be found on a separate tab for each source and are organized by energy, transportation, and other emissions categories s. Lists of assumptions, data sources, and notes for converting all raw data to $MTCO_2e$ for each emission source are also included in the IMS. More details on data collection and processing are detailed below.

EMISSIONS SOURCES GROUPING

Emissions come from various sources, such as the use of electricity, burning natural gas, or driving a car that uses gasoline. The emissions sources included in the community and municipal GHG inventories are grouped in various ways for reporting purposes.

The most used groups are shown below.

1. By Scope: This shows where the emissions originated and is broken into three categories.
    a. Scope 1: Direct emissions occurring from burning of fossil fuels or the release of greenhouse gases within city limits (if using the community IMS), or on municipal building property (if using operations IMS). (e.g., natural gas, internal combustion engine vehicles)
    b. Scope 2: These are emissions resulting from grid delivered energy used within city boundaries. For KCMO community inventory this includes only electricity.
    c. Scope 3: These are direct emissions occurring outside city limits, but as a result of activities of people living within the city boundary. For example, an airline flight taken by a city resident.
2. By source: this shows the fuel type causing the emissions shown and can be helpful when identifying strategies to eliminate emissions. For KCMO the sources included are:
    a. Natural Gas, including fugitive emissions from distribution lines
    b. Fuel Oil #2
    c. Electricity
    d. Gasoline

e. Diesel
f. CNG
g. Jet Fuel A
h. AV Gas
i. Landfill Gas
j. Process emissions from wastewater treatment

3. **By sector**: This shows what types of facilities are responsible for these emissions and can be helpful when identifying targets for outreach. Sectors included in KCMO:
    a. Residential buildings (electricity and natural gas use)
    b. Commercial buildings (electricity and natural gas use)
    c. Industrial buildings (electricity and natural gas use)
    d. Transportation (on-road and transit)
    e. Waste (solid waste and wastewater)

EMISSIONS SOURCES

Individual emission sources are what feed into the groupings above. The emissions sources included in the community and municipal GHG inventories are listed below, along with an explanation of what is included in each category, basic calculation methodology, and any relevant assumptions.

Stationary Energy

Stationary energy includes energy use from buildings, consisting mainly of electricity and natural gas use. For government operations this also includes chilled water and steam provided by a central plant. In the community inventory, the energy used by the central plant to create steam and chilled water are included in the inventory, so the steam and hot water use are not counted (to avoid double counting the emissions).

Electricity

GHG emissions from electricity use are indirect (Scope 2), occurring at the source of electricity generation, but are attributed to the consumer of the electricity. These emissions primarily come from combusting coal, natural gas, and oil to generate electricity.

For this inventory, electricity use data were identified for both government operations and the entire Kansas City community. Data were not normalized for weather, as weather does not typically have a significant impact on electricity consumption. Emissions from electricity consumption were calculated using factors for CO_2, CH_4, and N_2O provided by Evergy.

Government Operations

Data (kWh) were provided by Evergy, by meter number. These meter numbers were then aggregated by accounting codes to develop energy use by department breakdowns.

Community-wide

Data were provided by Evergy, by sector based on rate codes. Between 2017 and 2018, Evergy updated their data system to allow electricity use data to be pulled by the City rather than estimated based on zip codes. Due to this change, the data provided better matches the city limits than the

previous methodology. The estimated impact of these methodology changes is a net increase in electricity emissions of about 3.0%, which is below the threshold that requires recalculation of baseline of 5%.

There are two electricity generation facilities within Kansas City limits, the Hawthorn facility and the South Harper Peaking Facility. Both facilities are considered large emitters and are required to report emissions to the EPA. Though both facilities cause direct Scope 1 emissions in the community, the emissions from these facilities is reported separately from the Community inventory in the CDP reporting since their emissions is accounted for in the electricity use data.

Natural Gas

Natural Gas use falls under Scope 1 emissions, which are direct emissions occurring at the site when the gas is combusted for uses such as heating buildings, providing hot water, and providing heating for industrial processes.

For this inventory, natural gas use data were identified for both City operations and the Kansas City community. Data were not normalized for weather. Emissions from combusting natural gas were calculated using factors for CO_2, CH_4, and N_2O from The Climate Registry (TCR), based on the sector consuming the gas (residential, commercial, or industrial).

Government Operations

Data is provided by Spire and is reported as CCF. The data were provided by meter number and accounting codes were then used to allocate energy use by department.

Community-wide

Data is provided by Spire and is reported as CCF or MCF per year for Residential, Commercial, and Industrial sectors. Spire upgraded their data systems to allow the energy use reported to match the city limits more closely. The impact of the change in data collection methodology is estimated to be approximately a 0.5% increase in natural gas use.

Steam & Chilled Water – Municipal Only

Steam data is provided by ESP Facility Services in the General Services department and is formatted as MMBTU by department.

Chilled water is also provided by ESP Facility Services in the General Services Department and is reported per department as ton-hours.

Transportation

Transportation emissions are reported for all three scopes as shown below:

1. **Scope 1:** This includes all direct combustion from transportation occurring within city limits. For Kansas City this is made up of on-road transportation and public transit.
2. **Scope 2:** These emissions account for electricity use for any electric vehicles in use in the city. This electricity use from charging these vehicles will be included in the use data provided for stationary energy and is difficult to break out. Most EV charging occurs at home and will be wrapped into the

residential electricity data. Since the number of EVs in the city is small and the data needed to break out this use are not readily available, electricity use from EV charging is included in the electricity data where the vehicle is charged and is not broken out under transportation.

3. **Scope 3:** This includes any fuel use from transportation driven by KCMO residents but extending beyond city limits. For KCMO, only airline emissions are included in Scope 3 emissions. Vehicle emissions are the other large source of Scope 3 transportation emissions, but quantifying these emissions is difficult due to lack of data.

On-road Transportation

GHG emissions from on-road transportation are direct (Scope 1), occurring at the tailpipe of a vehicle as the result of fossil fuel combustion in the vehicle's engine. On-road transportation includes personal and commercial vehicle travel within city limits.

Community-wide

For 2019 data, total on-road miles was obtained from Google Environmental Insights Explorer. For more information on the methodology used to collect this data, visit their website https://insights.sustainability.google/methodology. This data was used, along with national statistics on typical vehicle miles traveled (VMT) breakout and fuel efficiency by vehicle type, as well as gasoline and diesel emissions factors from TCR to calculate on-road emissions. Note that the number of EVs are currently de minimis in the community, but this assumption should be checked on the next inventory update. Total electricity use from EVs is tracked to ensure that the amount of electricity used by on-road vehicles is de minimis. If this value approaches 1% of total electricity use, then the emissions should be broken out and reported separately.

Government Operations: Fleet

GHG emissions from on-road transportation are direct (Scope 1), occurring at the tailpipe of a vehicle as the result of fossil fuel combustion in the vehicle's engine. City fleet vehicles included all vehicles owned and operated by the City.

Fuel data for fleet vehicles was provided by department, by fuel type. Emissions from fossil fuel combustion in employee vehicles was calculated using a factor for CO_2 from TCR. CH_4, and N_2O emissions are not estimated, as they are calculated based on milage rather than fuel consumption and that data is not readily available. The emissions contribution from these two gases is typically de minimis for on-road vehicles.

Government Operations: Employee Commuting

GHG emissions from personal vehicles used for commuting to work are indirect (Scope 3), as the City does not own and operate the vehicles.

An online survey was conducted to determine how City employees commute to work, as well as how many days a week they commute and the distance of the commute. Responses were used to determine an average commute length and frequency for each transit mode. These averages were applied to the total count of City employees, to calculate annual gasoline and diesel fuel use. Emissions from fossil fuel combustion in employee vehicles were calculated using a factor for CO_2,

CH_4, and N_2O from TCR. CO_2 emissions are estimated based on vehicle fuel efficiency and miles traveled, while CH_4, and N_2O emissions are based on estimated VMT.

Public Transit: Community Only

GHG emissions from on-road public transit vehicles are direct (Scope 1), occurring at the tailpipe of a vehicle as the result of fossil fuel combustion in the vehicle's engine. Public transit includes Kansas City Area Transportation Authority (KCATA) vehicle revenue miles traveled within city limits.

Fuel use, including gallons of gasoline, diesel fuel, and CNG (in gasoline gallon equivalent (GGE) used, were pulled from the KCATA annual report submitted to the Federal Transit Administration (FTA). KCATA provided revenue VMT within KCMO - to allow bus fuel use to be scaled, to only include use within city limits. Emissions from fossil fuel combustion in vehicles were calculated using factors for CO_2 CH_4 and N_2O from TCR. Emissions from CH_4 and N_2O were concluded to be de minimis so were not included.

Airline Travel

Airline traffic at Kansas City International Airport (KCI) and Charles B. Wheeler Downtown Airport were included in the community inventory as an indirect (Scope 3) emissions source. Both airports are located within city limits; emissions for their ground activities, including buildings and ground equipment, were accounted for in other source categories.

Kansas City International Airport (KCI)

Fuel use data from commercial flights are generally considered confidential and not available, so emissions from flights at KCI were calculated based on passenger data and typical emissions per passenger-mile - from national flight statistics. Data were acquired from flykci.com showing annual counts of passengers enplaned and deplaned at the airport. Methodologies for calculating airport emissions agree that each airport should account for the emissions of departing aircraft only and thereby clearly define the split of emissions between origin and destination airports.

Since KCI serves a region larger than only KCMO, enplanements were apportioned to KCMO based on an estimated number of passengers originating in KCMO as compared to other parts of the greater region. This was estimated by using the number of annual KCI parking passes purchased by city residents. National flight statistics from the U. S. Department of Transportation Bureau of Transportation Statistics (BTS) were used to calculate average fuel use per passenger mile for domestic flights. This fuel efficiency was used to estimate the total fuel use for flights departing from KCI that are attributed to KCMO residents. Emissions from fossil fuel combustion for departing flights were calculated using factors for CO_2, CH_4, and N_2O from TCR.

Charles B. Wheeler Downtown Airport

Annual fuel use was provided by the airport fuel provider for both AV Gas and Jet Fuel A. These data were used to calculate emissions using factors for CO_2, CH_4, and N_2O from TCR. Since this is a small municipal airport, it was assumed that all fuel use was attributable to activities from KCMO residents. Note that these data have not been available in previous years and increase the City GHG inventory by 0.5%, which is well below the 5% threshold for recalculation.

Large Emitters

Large emitters are defined as facilities that emit more than 50,000 MT CO2e per year in direct (Scope 1) emissions. These facilities are required to report their annual emissions to the EPA; the data can be found through the EPA's Facility Level Information on Greenhouse gases Tool (FLIGHT).

In 2019, KCMO had the following seven large emitters listed in FLIGHT for Kansas City:

1. Bayer Crop Science (listed as Bayer Cropscience)
2. Ford Motor Company - Ford Kansas City Assembly Plant
3. Hawthorn
4. Ingredion Inc.
5. Spire Missouri West (aka - Missouri Gas Energy)
6. South Harper Peaking Facility
7. Vicinity Energy (aka Veolia Energy) Kansas City

Only fuels or emissions that were not covered elsewhere were included here, such as fuel oil #2, coal, and fugitive emissions natural gas distribution system. Emissions from electricity generation are listed in the CDP reporting but are not added to the community emissions because these emissions are accounted for in the electricity use emissions.

Solid Waste

GHG emissions from solid waste disposed at landfills result from decomposing organic materials and waste management processes. Solid waste emissions are indirect (Scope 3) because the actively used landfills are outside city boundaries.

Government Operations:

Solid waste emissions are not included as no data were available.

Community-wide

The KCMO Parks & Recreation/Forestry Department provided residential waste data in tons. These data were categorized by trash, recycling, leaves and brush, white goods, and tires.

For residential solid waste, only the trash category was used to calculate emissions. Commercial municipal solid waste (MSW) was estimated based on the national average of MSW per capita and factoring out residential waste. The emissions factor for MSW was estimated using EPA's Solid Waste Management and Greenhouse Gases, Edition 3. It is assumed that all landfills used for KCMO solid waste have landfill gas capture and flaring systems and that landfill gas is not used to generate electricity.

Wastewater Treatment – Community Only

GHG emissions from wastewater treatment are direct and can produce CH_4 and N_2O, depending on the treatment process used. These are Scope 1 emissions as they are released at the treatment plant, which is within city boundaries.

There are six wastewater treatment facilities within KCMO that treat wastewater from both within and outside of the city. Process emissions and fugitive emissions from effluent discharge calculations assumed aerobic and

nitrification/denitrification processes. Emissions were calculated based on the population served, using ICLEI's Local Government Operations Protocol.

GLOBAL WARMING POTENTIAL (GWP) UPDATES

The Intergovernmental Panel on Climate Change (IPCC) assesses GWP factors for GHGs. GWP Factors help to convey the effect different GHGs will have on the environment over the next 100 years, with carbon dioxide (CO_2) being the reference point. For example, methane (CH_4) has a GWP of 28 which means it has 28 times the heat-trapping capacity of CO_2. The three GHGs examined in this inventory are CO_2, CH_4 and N_2O; they are subject to updating by IPCC and should be updated on the Conversion Factors tab as appropriate. The GWP used in this report are listed in Table 1. No changes in GWP occurred between the 2017 inventory and this update. When the GWP values are updated, the updated values can be added to the Conversion Factors tab.

Table 1: GWP of common GHG - from the IPCC from the 5th Assessment Report

Common Name	GWP
Carbon dioxide	1
Methane	28
Nitrous oxide	265
HFC-134	1,000
HFC-134a	1,300
R-404A	3,260
R-410A	1,725
SF6	23,900

STATISTICS

The following community statistics are collected to help put the GHG emissions into context and help identify driving factors behind emissions trends.

POPULATION

Population data were used for benchmarking purposes.

Government Operations

Note that for operations, population refers to employee count. The Human Resources Department typically provides the number of employees per department.

Community-wide

City population was taken from U.S. Census estimates.

BUILDING SQUARE FOOTAGE

Building square footage data were used historically for benchmarking purposes. However, discrepancies were discovered in 2019 reported data and are currently unresolved. Investigation into the previous, current, and correct methodology is ongoing.

Government Operations

A building list and square footage was exported from Portal.

Community-wide

The KCMO Sustainability Coordinator provided 2013 data on number of buildings and square footage for residential, commercial, industrial, and other – municipal/institutional buildings.

GEOGRAPHIC AREA – COMMUNITY ONLY

Geographic area data were used for benchmarking purposes. Geographic area for Kansas City was taken from the U.S. Census Bureau.

REPORTING METHODOLOGY

The City reports the community and municipal GHG emission to the CDP and provides a community update to track progress to goals. The sources included in each report are slightly different, as shown below.

CARBON DISCLOSURE PROJECT

The City reports all emissions sources required for Basic reporting (shown in light blue in Table 2) as well as two other significant sources of emissions: Scope 3 airline emissions and industrial process emissions.

Table 2: Guide to emissions sources included in CDP reporting.

Source	Scope 1	Scope 2	Scope 3
Stationary Energy			
Residential Buildings	X	X	NE
Commercial and Institutional Buildings and Facilities	X	X	NE
Manufacturing Industries and Construction	X	X	NE
Energy Industries	IE - Vicinity only uses natural gas which will be included in industrial natural gas use	NO	NE
Energy Generation supplied to grid	NO		
Agriculture, forestry, and fishing activities	NO	NO	NE
Non-Specified Sources	NO	NO	NE
Fugitive Emissions from coal-related activities	NO		NE

Source	Scope 1	Scope 2	Scope 3
Fugitive emissions from oil and natural gas systems	X		NE
Transportation			
On-Road	X	IE - in electricity use where the vehicle is charged	NE
Railways	NO	X	NE
Waterborne Navigation	NO	IE - Included in commercial electricity use at the port	NE
Aviation (should disaggregate international flights)	IE - the small amount of fuel used for flights taking off and landing in KCMO will be included in the Scope 3 emissions data	IE - included in commercial energy use at the airport	X
Off-Road	NO	IE - Included in electricity use where the vehicle is charged	NE
Waste			
Solid Waste Disposal	NO		X
Disposal of solid waste generated outside boundary	NO		
Biological Treatment of Waste (e.g., composting)	NO		NO
Biological Treatment of waste generated outside of boundary	NO		
Incineration and Open Burning	NO		NO
Incineration of waste generated outside of boundary	NO		
Wastewater Treatment and Discharge	X		NO
Wastewater generated outside of boundary	NO		
Products & Processes			
Industrial Processes	X		NE
Product Use	NO		NE
Land Use & Agriculture			
Livestock	NE		NE
Land	NE		NE
Aggregate Sources & Non-CO2 Emissions on Land	NE		NE
Other			
Other Scope 3			NE
Required for Territorial but not BASIC/BASIC +	GPC BASIC	GPC BASIC+	GPC Other Scope 3 – Not Required

Source	Scope 1	Scope 2	Scope 3
	Legend		
	X	Source Included	
	NO	Not Occurring	
	IE	Included Elsewhere	
	NE	Not Estimated	

COMMUNITY UPDATE INVENTORY

Since KCMO started calculating and reporting their GHG emissions long before the CDP reporting protocol was developed, there are some differences between the sources included. To accurately track the emissions trends as compared to the 2005 inventory as required by Resolution No. 200005, the community update inventory excludes airline emissions and industrial process emissions. A comparison of the 2019 inventory for under both protocols is shown in Table 3.

Table 3: Community update inventory as compared to the inventory reported to CDP.

	Community Update inventory	CDP Reported inventory
Total Emissions	8.6 million MT CO2e	8.9 million MT CO2e
Emissions Sources Included	1. Residential Energy a. Natural Gas b. Electricity 2. Commercial Energy a. Natural Gas b. Electricity 3. Industrial Energy a. Natural Gas b. Electricity 4. Transportation a. On-road b. Transit 5. Waste a. Solid Waste b. Wastewater	1. All community update inventory sources 2. Scope 3 airline emissions 3. Industrial process emissions