2019 COMMUNITY GREENHOUSE GAS INVENTORY REPORT

April 2021

Introduction

This document presents the City of Culver City's (City's) greenhouse gas (GHG) emissions inventory for community-wide activities (referred to as the "community GHG inventory" or "inventory" in this report). The purpose of this community GHG inventory is to show source types, distribution, and amount of GHG emissions from using electricity and natural gas, transportation, solid waste, off-road equipment, industrial sources, water supply, and wastewater treatment within Culver City (city) by residents, businesses, and local government operations. This inventory will help policymakers apply cost-effective GHG reduction strategies in policy areas over which they have significant influence.

Culver City, covering about five square miles, is in western Los Angeles County and is mostly surrounded by the city of Los Angeles; has an elevation of about 95 feet above sea level; experiences average temperatures that range from a low of 55.2 °F (12.9 °C) to a high of 71.8 °F (22.1 °C); and receives an average of 13.3 inches of rain per year (NOAA, 2004).

Methodology and Data Collection

The community GHG inventory includes emissions for the calendar year 2019 from electricity, natural gas, transportation, solid waste, off-road equipment, industrial sources, water supply, and wastewater treatment activities occurring within the City's jurisdictional boundaries. Those boundaries include both the area within the city limits and the sphere of influence.[1] The report factors in emissions from energy used by buildings, traffic signals, streetlights, water conveyance (both within the jurisdictional boundary and upstream of the city), and wastewater treatment. Unlike the 2017 Community Energy GHG Inventory Report, which only reviewed GHG emissions from energy sources, the 2019 community GHG inventory considers emissions from every sector. The community GHG inventory analysis also considers 2019 socioeconomic data from Fehr & Peers and the city's growth.

The emission sources and activities included in this community GHG inventory are based on the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol). Local Governments for Sustainability (ICLEI) created the U.S. Community Protocol, which sets guidelines and methods that help local governments quantify and report GHG emissions from community-wide activities.[2] The community GHG inventory reviews emissions from sources that local government can influence. This generally includes activities within the City's jurisdictional boundary where the local government has jurisdictional influence and community activities outside City limits, e.g., automobile use by residents.

This document summarizes the following information for each emissions sector:

- **Data Acquisition and Sources:** Activity data sources used to generate emissions
- **Emission Calculation Methods:** Methods and models used to calculate emissions
- **Emissions Summary:** Inventory of GHG emissions by sector
- **Activity Data and Calculations:** Sector activity data and calculations used to develop the inventory (see **Error! Reference source not found.**)

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[1] Mobile and bus emissions associated with the sphere of influence are reflected in the on-road vehicular transportation calculations. All other calculations reflect sources within the city limits.
[2] Local Governments for Sustainability (ICLEI) was formerly the International Council for Local Environmental Initiatives.

Data Acquisition

On-Road Vehicular Transportation

Fehr & Peers provided on-road transportation data in the form of vehicle-miles traveled (VMT) by vehicle class and speed, and VMT for passenger vehicles and heavy-duty trucks for speeds ranging from five to 85 miles per hour (mph) in five-mph increments. The City's Transportation Department provided transit bus data including monthly natural gas use for 2019 in therms.[3] In 2019, the City's transit bus fleet was powered entirely by renewable natural gas.

Electricity

Clean Power Alliance (CPA)

In March 2019, CPA became the city's main electricity provider. CPA buys clean power and Southern California Edison delivers it to Culver City businesses and residents and maintains the system infrastructure. CPA began servicing some residential and commercial customers in Culver City in March 2019. CPA customers are automatically enrolled in the City's chosen default tier of Green Power (100 percent renewable energy) and have the options of "opting mid" to Clean Power (50% renewable energy), or "opting down" to Lean Power (36% renewable energy). CPA provided annual electricity use data for 2019, including total kilowatt-hours (kWh) for residential, traffic signals and street lights, small general service, medium general service, and large general service/industrial use. CPA also provided GHG emission factors and the percent breakdown of customers for each of their rate tiers.

Southern California Edison (SCE)

Before March 2019, SCE was the city's main electricity provider. Culver City customers can opt out of CPA and buy their power from SCE at either their default 35.1% renewable energy tier or their 50% or 100% renewable energy rate options (SCE, 2019). SCE provided annual and monthly electricity use data (in kWh) for 2019 for commercial, residential, and industrial/other uses. The SCE electricity data did not break out electricity use by rate option. Therefore, all emissions calculations assume SCE-provided power uses their default rate option of 35.1% renewable energy.

Los Angeles Department of Water and Power (LADWP)

LADWP supplies electricity to a few Culver City residents and businesses located mostly near the city's western boundaries. LADWP provided 2017 electricity use data by service address, consumption, land use, and other detailed categories. The 2017 data was scaled according to the city's growth between 2017 and 2019 to estimate 2019 electricity use.

Natural Gas

Southern California Gas (SoCalGas) is the sole provider of natural gas for building energy in Culver City. SoCalGas provided 2017 natural gas usage data, including annual natural gas consumption for commercial, single-family residential, multi-family residential, and industrial uses. The 2017 data was scaled according to the city's growth between 2017 and 2019 to estimate 2019 natural gas use.

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[3] A unit of heat energy equal to 100,000 British thermal units (Btu).

Solid Waste

Total tons of solid waste by waste type for residential and commercial uses was obtained from CalRecycle's Jurisdiction Disposal and Alternative Daily Cover database. Waste characterization data was obtained from CalRecycle's Solid Waste Characterization database.

Off-Road Equipment

The California Air Resources Board (CARB) OFFROAD2017 model was used to estimate fuel use for off-road vehicles and equipment at the county-level. The following vehicle classes were included in the inventory: construction and mining, industrial, agricultural, light commercial, and portable equipment. Although CARB does not breakdown the data at the city-level, this report extrapolates that information using employment data. City employment data by sector was provided by Fehr & Peers and compared to County employment data by sector. City-level fuel use was determined by its corresponding employment sector's fuel use in the County.

Industrial Sources

Except for the Inglewood Oil Field, there are no other large source industrial sources in the city that are required to report greenhouse gas emissions under the State's Cap-and-Trade program and the California Air Resources Board's (CARB) Mandatory Reporting Rule. For that reason, industrial sources for this inventory are limited to include fugitive gas emissions associated with operational oil wells. Emissions from the oil wells and associated calculations were scaled from 2017 to 2019 and reflect the decrease from 36 to 30 active production or injection wells in the city (City, 2017). There are no other large source industrial sources in the city that are required to report under the State's Cap-and-Trade program and the California Air Resources Board's (CARB) Mandatory Reporting Rule.

Water Supply

Golden State Water (GSW)
GSW is the main water provider for the community. GSW provided 2017 data, including monthly water use (in hundred cubic feet) by service address and land use (commercial, residential, public authority, industrial, fire protection, and irrigation). To estimate 2019 water use, 2017 data was scaled to the city's growth between 2017 and 2019.

Los Angeles Department of Water and Power (LADWP)
LADWP supplies water to a small portion of Culver City residents and businesses located mostly near the city's western boundaries. LADWP provided 2017 data, including water use organized by service address, consumption, land use, and other categories. To estimate 2019 water use, 2017 data was scaled to the city's growth between 2017 and 2019.

Wastewater Treatment

The City provided daily and annual flow rates for the city. A process engineer at the Hyperion Wastewater Treatment Plant (WWTP) provided daily and annual flow rates, digester gas volumes, and natural gas volumes. Hyperion WWTP treats a sizable portion of Los Angeles County's wastewater, including wastewater generated by residents and businesses in Culver City. The data received represents annual averages that were applied to both the 2017 and 2019 emissions calculations.

Emission Calculation Methods

Growth Factors

Growth factors were used to scale the 2017 Community Energy GHG Inventory emissions to 2019 and were based on the city's expected growth between 2019 and 2045. Fehr & Peers provided 2019 and 2045 socioeconomic data to calculate an annual growth rate for the city's population, employment, and service population (population plus employment). **Table 1** summarizes the sectors that were scaled, and which socioeconomic indicators were used to scale them. Sectors that were calculated directly for 2019, i.e., not scaled using growth factors, include on-road vehicular transportation, CPA-provided electricity, wastewater treatment, solid waste, off-road equipment, and industrial sources.

Table 1: How Growth Rates Were Applied by Sector in Culver City

Sectors	Utilities	Use Types	Socioeconomic Indicators	AAGR*
Electricity	LADWP	Residential	Population	0.13%
		Commercial/Industrial	Employment	0.25%
Natural Gas	SoCalGas	Residential	Population	0.13%
		Commercial/Industrial	Employment	0.25%
Water Supply	GSW	Residential, Irrigation	Population	0.13%
		Commercial, Industrial, Public Authority, Fire Protection	Employment	0.25%
	LADWP	Residential	Population	0.13%
		Commercial/Industrial	Employment	0.25%
*AAGR = Annual Average Growth Rate				
Source: Fehr & Peers, 2020.				

On-Road Vehicular Transportation

CARB's 2017 Emission Factor model (EMFAC2017) was run in emission rate mode to obtain 2017 run (RUNEX, expressed in grams(g)/mile), idle (IDLEX, expressed in g/minute), and start (STREX, expressed in g/trip) emission factors for all fuel and vehicle types in Los Angeles County. To compare the three emission rate modes, IDLEX and STREX emission factors were converted to grams per mile (g/mile) using population, VMT, and trip data from the same EMFAC2017 output. Emission rates for all processes (RUNEX, IDLEX, and STREX) were added for each GHG, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Emission factors, weighted by percentage of VMT per fuel type, were calculated for each vehicle type, and derived for each vehicle category (passenger vehicles and heavy-duty trucks) based on the percentage

of VMT per vehicle type and speed (five to 85 mph in five-mph increments).[4] The derived emission factors were then applied to the VMT by vehicle category and speed, accounting for total emissions for passenger vehicles and trucks.

Electricity

Emission factors for CPA, SCE, and LADWP, presented in **Table 2**, were applied to the total kilowatt-hour (kWh) consumption values within the city to calculate GHG emissions for electricity.

As shown under the Data Acquisition section of this report, CPA has three sets of emission factors corresponding to lean, clean, and green power rate tier options. **Table 3** includes the rate tier structure break down for CPA residential and commercial customers in Culver City as of March 2020. CPA electricity use was allotted by percentage of customers by rate tier and then emissions were calculated using the appropriate emission factors. In the case of green power, the emission factor is zero because electricity is sourced from 100 percent renewable (i.e., carbon-free) energy sources.

For LADWP, electricity emission factors are expressed in pounds (lbs) per megawatt-hour (MWh) for carbon dioxide (CO_2) and lbs per gigawatt-hour (GWh) for methane (CH_4) and nitrous oxide (N_2O). The SCE and LADWP emission factors are expressed in carbon dioxide equivalents (CO_2e), an aggregated metric that considers the global warming potential (GWP) of all three gases.

As SCE supplies the infrastructure and distribution system to deliver power to both its customers and CPA's customers, their meters track how much electricity all customers in the city use. SCE customers within the city include those who opted out of CPA's service and Direct Access (DA) customers. DA is an option that allows customers to elect to purchase electricity and other services from an Electric Service Provider (ESP), instead of SCE or the CPA. An ESP is the entity that contracts directly with the customer to provide electric service and executes Power Purchase Agreements with producers to provide an adequate supply of electricity to meet their needs. The total electricity use provided by SCE was calculated by subtracting the total electricity use CPA provides from the city's total electricity use.

Table 2: Electricity Emission Factors Used for Culver City's 2017 GHG Inventory

Utility	Electricity Emission Factors			
	CO_2e (lbs/MWh)	CO_2 (lbs/MWh)	CH_4 (lbs/GWh)	N_2O (lbs/GWh)
CPA – Lean Power (36% Renewables) [1]	-	10.59	0.033	0.004
CPA – Clean Power (50% Renewables) [1]	-	9.81	0.033	0.004
CPA – Green Power (100% Renewables)[1]	-	0	0	0
SCE[2]	467.38	-	-	-
LADWP[3]	648.36	-	-	-

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[4] This was done to remain consistent with how Fehr & Peers categorizes VMT, as discussed under the Data Acquisition section of the report.

Table 3: CPA Rate Tier Breakdown by Customer Type

Customer Type	Opt Out	Lean Power	Clean Power	Green Power	Total
Residential	4.1%	3.8%	1.3%	90.8%	100%
Commercial	5.0%	1.7%	0.7%	92.6%	100%
Source: CPA, 2020					

Natural Gas

Natural gas use emissions were calculated based on the total therms used by land use (commercial, single-family residential, multi-family residential, and industrial) and the standard emission factors from the United States Environmental Protection Agency (USEPA) for CO_2, CH_4, and N_2O expressed in kilograms per million British thermal units (kg/MMBtu), as shown in **Table 4**.

Table 4: Natural Gas Emission Factors Used for the 2019 Inventory

Fuel Type	Natural Gas Emission Factors		
	CO_2 (kg/MMBtu)	CH_4 (kg/MMBtu)	N_2O (kg/MMBtu)
Natural Gas	53.02	0.005	0.0001
Source: USEPA, 2014			

Solid Waste

The solid waste sector releases N_2O and CO_2 emissions when transporting and processing waste and methane (CH_4) when organic materials in the landfill decompose through the anaerobic process. To calculate emissions generated from organic waste, CalRecycle data was used to estimate each organic waste category's tonnage per land use type (commercial and residential). The default oxidation rate, landfill gas collection rate, and material-specific metric tons of CH_4 (MT CH_4/wet short ton waste) emission factors from the U.S. Community Protocol were then used to calculate emissions from each category of organic waste. Process emissions and transportation emissions were assumed to be captured in the off-road equipment and on-road transportation portions of this inventory, respectively.

Off-Road Equipment

The city's fuel consumption values were determined based on the city's percentage of county-wide fuel consumption from the OFFROAD2017 model for diesel, gasoline, and natural gas based on sector-specific employment data. For example, the city had 1.8 percent of total countywide construction jobs in 2017, so 1.8 percent of total countywide fuel use for construction equipment was assigned to the City. Employment sectors

included in the apportionment include agriculture, construction, manufacturing, wholesale, retail, transportation, and fire safety and suppression.

After calculating city-specific fuel use values, heavy-duty vehicle GHG emission factors were applied to diesel, gasoline, and natural gas-powered equipment for each off-road equipment sector (The Climate Registry, 2020). Natural gas was first converted from diesel gallons equivalent (DGE) to standard cubic feet (scf) using a factor of 139.3 scf per DGE (Alternative Fuels Data Center, 2013). **Table 5** shows the emission factors used for each off-road equipment type.

Table 5: Off-Road Equipment Emission Factors by Equipment Type

Equipment Type	Fuel Type	Emission	Emission Factor	Unit
Agricultural Equipment	Gasoline	CO_2	8.78	kg/gal
		CH_4	7.556	g/gal
		N_2O	0.215	
	Diesel	CO_2	10.21	kg/gal
		CH_4	0.287	g/gal
		N_2O	0.485	
	Natural Gas	CO_2	4.5	kg/gal
		CH_4	0.00103	g/scf
		N_2O	0.0001	
Construction/Mining Equipment	Gasoline	CO_2	8.78	kg/gal
		CH_4	5.683	g/gal
		N_2O	0.195	
	Diesel	CO_2	10.21	kg/gal
		CH_4	0.227	g/gal
		N_2O	0.472	
	Natural Gas	CO_2	4.5	kg/scf
		CH_4	0.00103	g/scf
		N_2O	0.0001	
Industrial/Commercial Equipment	Gasoline	CO_2	8.78	kg/gal
		CH_4	5.58	g/gal
		N_2O	0.198	
	Diesel	CO_2	10.21	kg/gal
		CH_4	0.249	g/gal
		N_2O	0.469	
	Natural Gas	CO_2	4.5	kg/scf
		CH_4	0.00103	g/scf
		N_2O	0.0001	

Equipment Type	Fuel Type	Emission	Emission Factor	Unit
Portable Equipment	Gasoline	CO_2	8.78	kg/gal
		CH_4	5.901	g/gal
		N_2O	0.184	g/gal
	Diesel	CO_2	10.21	kg/gal
		CH_4	0.335	g/gal
		N_2O	0.466	g/gal
	Natural Gas	CO_2	4.5	kg/scf
		CH_4	0.00103	g/scf
		N_2O	0.0001	g/scf
Source: The Climate Registry, 2020				

Industrial Sources

As stated earlier, industrial source emissions include fugitive gas emissions associated with oil wells and production and no other large source industrial sources in the city are required to report per State regulation. These source emissions do not include indirect emissions from electricity accounted for in electricity emissions or associated worker travel to and from the site that is accounted for under on-road vehicular transportation. The emissions were scaled from 2017 to 2019 accounting for a decrease from 36 to 30 active production and injection wells (City, 2017).

Water Supply

Emissions associated with water supply are based on the city's water use from GSW and LADWP by land use type (in hundred cubic feet, converted to acre-feet). The acre-feet of water was multiplied by an electricity intensity factor of 1,938 kWh/acre-foot for conveyance, treatment, and distribution (MWDSC, 2015). The resulting electricity use was then multiplied by SCE's CO_2e emission factor or LADWP's GHG emission factors, depending on which utility the water is sourced from, to calculate the emissions associated with water supply by land use type. GSW purchases electricity from SCE. Therefore, the emissions associated with the treatment, conveyance, and delivery of its water is based on the SCE electricity emission factor, which assumes SCE's default rate option is applied.

Wastewater Treatment

Wastewater treatment emissions were calculated by first estimating the Hyperion WWTP's (Wastewater Treatment Plant) total natural gas and digester gas emissions. Methods from the U.S. Community Protocol for WWTP emissions were used to convert total digester gas in cubic feet per day to British thermal units (BTUs) per day. To calculate an annual amount, the resulting BTUs were then by multiplied by 365 days and converted to CO_2e using the emission factors from **Table 6**. The natural gas consumption by the Hyperion WWTP was also converted to BTUs, annualized, and multiplied by the natural gas emission factors listed in **Table 2**, above.

Table 6: Digester Gas Emission Factors

Fuel Type	Digester Gas Emission Factors		
	CO_2 (kg/MMBtu)	CH_4 (kg/MMBtu)	N_2O (kg/MMBtu)
Digester Gas	-	0.0032	0.00063
Source: ICLEI, 2013			

Once emissions associated with Hyperion WWTP energy consumption were calculated, these emissions were apportioned to Culver City based on the proportion of the city's annual flow rate compared to Hyperion WWTP's total annual flow rate. The city's annual flow is about 1.6 percent of Hyperion's total annual flow.

Emissions Inventory

Summary

The community GHG emissions sources include electricity, natural gas, transportation, solid waste, off-road equipment, industrial sources, water supply, and wastewater treatment. **Table 7** presents the total emissions by source in metric tons of CO_2e ($MTCO_2e$). **Figure 1** shows the percent breakdown of the inventory by source.

Table 7: Total Culver City Community GHG Emissions by Source in 2019

Source	Total Emissions	
	$MTCO_2e$	%
On-Road Transportation	164,246	56.3
Natural Gas	59,678	20.4
Electricity	33,740	11.6
Solid Waste	16,529	5.7
Off-Road Equipment	14,469	5.0
Water Supply	2,497	0.9
Industrial Sources	383	0.1
Wastewater Treatment	380	0.1
Total	291,922	100.0
Note: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. Refer to Attachment A, A.1-1, for detailed calculations.		
Sources: CPA, 2020; SCE, 2020; SoCalGas, 2017; GSW, 2017; City, 2017		

Figure 1: Percent of Culver City Community GHG Emissions by Source in 2019

Water Supply 0.9%
Industrial Sources 0.1%
Wastewater Treatment 0.1%
Off-Road Equipment 5.0%
Solid Waste 5.7%
Electricity 11.6%
On-Road Transportation 56.3%
Natural Gas 20.4%
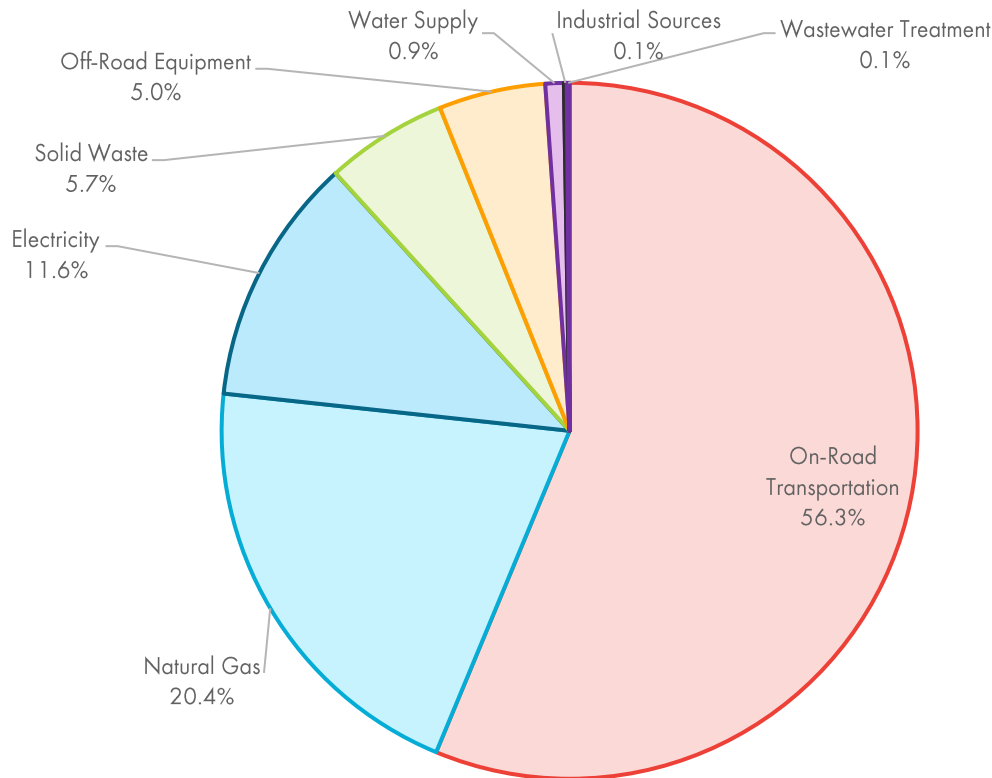
Sources: CPA, 2020; SCE, 2020; SoCalGas, 2017; GSW, 2017; City, 2017

As the results in **Table 7** and **Figure 1** show, the main source of community emissions is on-road transportation, representing 56.3 percent of total emissions, followed by natural gas at 20.4 percent and electricity at 11.6 percent of the total emissions. Building energy (electricity and natural gas) makes up a combined 32.0 percent of total emissions. Emissions from electricity are lower than many other communities because the city primarily uses CPA's 100 percent renewable, carbon-free energy.

On-Road Transportation

As described in the methodology above, on-road transportation emissions were calculated using VMT provided by Fehr & Peers for passenger vehicles and trucks. The inventory includes VMT associated with internal-internal trips (trips starting and ending in Culver City) and 50 percent of internal-external trips (trips with one leg that either starts or ends outside of Culver City). On-road transportation is the single largest contributor to emissions in the city, accounting for 56.3 percent of total emissions. **Table 8** shows the emissions breakdown by vehicle type and Error! Reference source not found. shows the percent of emissions by vehicle type.

Table 8: Culver City Community On-Road Transportation GHG Emissions by Vehicle Type in 2019

Vehicle Type	On-Road Transportation Emissions	
	MTCO$_2$e	%
Passenger Vehicles	131,914	80.3
Heavy-Duty Trucks	27,170	16.5
Buses-(Renewable Natural Gas)	5,162	3.1
Total	164,246	100.0

Note: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. Refer to Attachment A, Table A.1-9, for detailed calculations.

Sources: Fehr & Peers, 2020

Figure 2: Percent of Culver City Community On-Road Transportation GHG Emissions by Vehicle Type in 2019
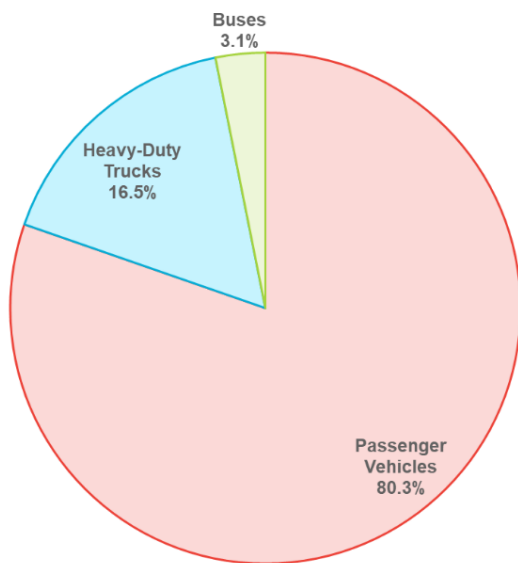
Sources: Fehr & Peers, 2020

As shown in Error! Reference source not found., passenger vehicles make up the majority of on-road transportation emissions in the city, followed by heavy-duty trucks, and then municipally-operated buses. Note that municipal buses use renewable natural gas and the bus fleet emissions were calculated using natural gas totals provided by the City rather than calculating based on VMT.

Building Energy

Electricity

Emissions from the electricity used by buildings was calculated for all of Culver City's residential, commercial, and industrial / other land uses and makes up 11.6 percent of total emissions. **Table 9** shows the total emissions for each land use type. **Figure 3** shows the percentage breakdown by land use type.

Table 9: Culver City Community Electricity GHG Emissions from Building Energy by Land Use in 2019

Land Use	Building Electricity Emissions	
	MTC0$_2$e	%
Commercial	24,410	72.3%
Industrial/Other	5,008	14.8
Residential	4,321	12.8
Total	**33,740**	**100**

Notes: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. "Industrial/Other" category includes sources not included in Commercial or Residential. For SCE electricity use, this value was calculated by subtracting the total non-residential electricity use from the total commercial electricity use. CPA and LADWP both supplied industrial/other rate categories. Refer to Attachment A, Tables A.1-2 through A.1-7, for detailed calculations.

Sources: CPA, 2020; SCE, 2019; LADWP, 2019

Figure 3: Percent of Culver City Community Electricity GHG Emissions from Building Energy by Land Use in 2019
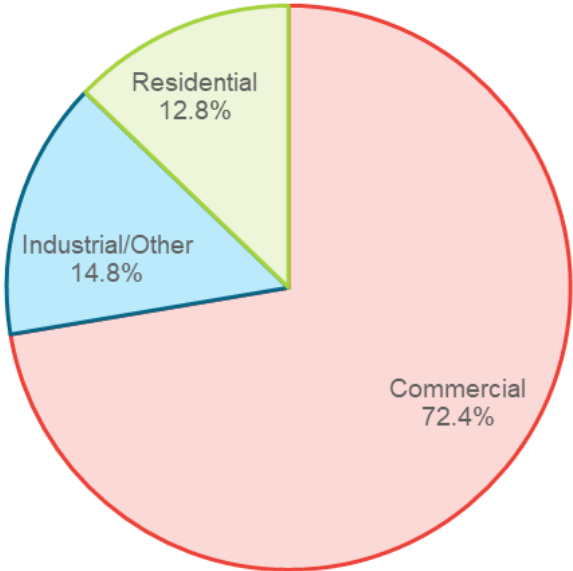
Sources: CPA, 2020; SCE, 2019; LADWP, 2019

As shown in **Table 9** and **Figure 3**, most electricity-related emissions are associated with commercial buildings, which account for 72.4 percent of total electricity-related emissions in the city. As shown in **Figure 4**, most building electricity emissions are associated with SCE customers, as compared to CPA and LADWP customers. While CPA supplies most of the electricity to the city, as shown in **Figure 5**, their renewable energy rate tier emission factors are significantly lower than SCE and LADWP, resulting in much lower emissions. In summary, CPA supplies 57.5 percent of the electricity to the city but only accounts for 0.1 percent of its total electricity emissions.

Figure 4: Percent of Building Electricity Emissions by Utility
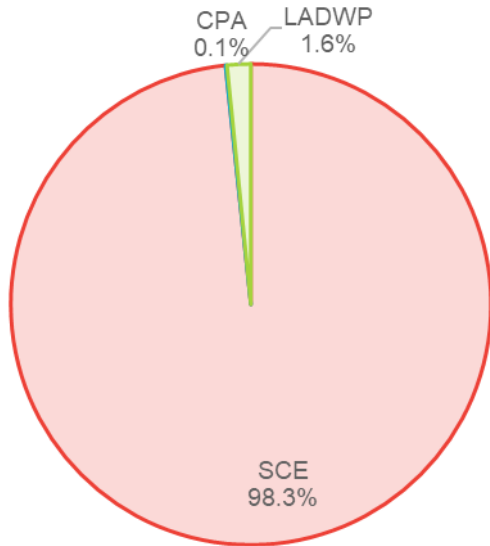
Sources: CPA, 2020; SCE, 2019; LADWP, 2019

Figure 5: Percent of Building Electricity Use by Utility
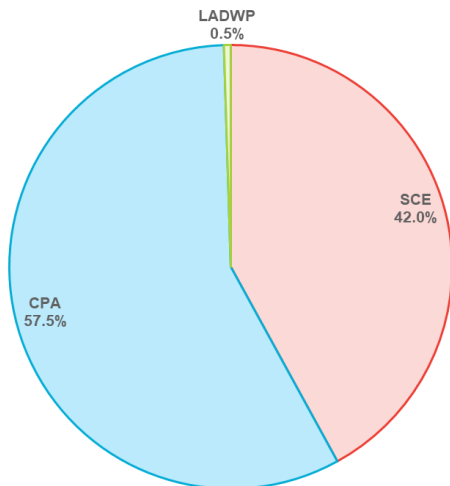
Sources: CPA, 2020; SCE, 2019; LADWP, 2019

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[5] SCE includes Direct Access customers who purchase electricity directly from a third-party electric service provider.

Natural Gas

Natural gas is typically used for heating, cooling, and cooking in residences and nonresidential buildings and makes up 20.4 percent of total emissions. The city's emissions from natural gas use are presented in **Table 10** and **Figure 6,** showing the percent breakdown of natural gas emissions by land use type.

Table 10: Culver City Community Natural Gas GHG Emissions from Building Energy by Land Use in 2019

Land Use	Building Natural Gas Emission	
	$MTCO_2e$	%
Commercial	30,930	51.8
Single-Family Residential	14,136	23.7
Multi-Family Residential	14,004	23.5
Industrial	608	1.0
Total	59,678	100

Note: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. Refer to Attachment A, Table A.1-8, for detailed calculations.

Source: SoCalGas, 2017

Figure 6: Percent of Culver City Community Natural Gas GHG Emissions from Building Energy by Land Use in 2019
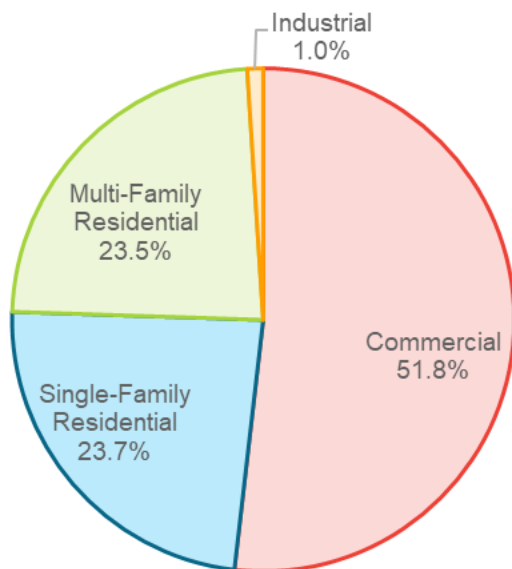
Source: SoCalGas, 2017

Commercial natural gas use makes up about 51.8 percent of the city's natural gas emissions (excluding indirect natural gas associated with wastewater treatment). Single-family and multi-family residential natural gas use is 47.2 percent of total natural gas emissions.

Solid Waste

Solid waste related emissions occur from the natural decay of organics breaking down at waste disposal facilities. Solid waste was calculated for both commercial and residential waste streams. Solid waste is 5.7 percent of total community GHG emissions. **Table 11** and **Figure 7** show the community emissions from solid waste and the percent breakdown of solid waste emissions by land use type, respectively.

Table 11: Culver City Community Solid Waste GHG Emissions in 2019

Source	Solid Waste GHG Emissions	
	MTC0$_2$e	%
Commercial	14,027	84.9
Residential	2,501	15.1
Total	16,528	100

Note: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. Refer to Attachment A, Tables A.1-10 through A.1-15, for detailed calculations.

Source: CalRecycle, 2019

Figure 7: Percent of Culver City Community Solid Waste GHG Emissions in 2019
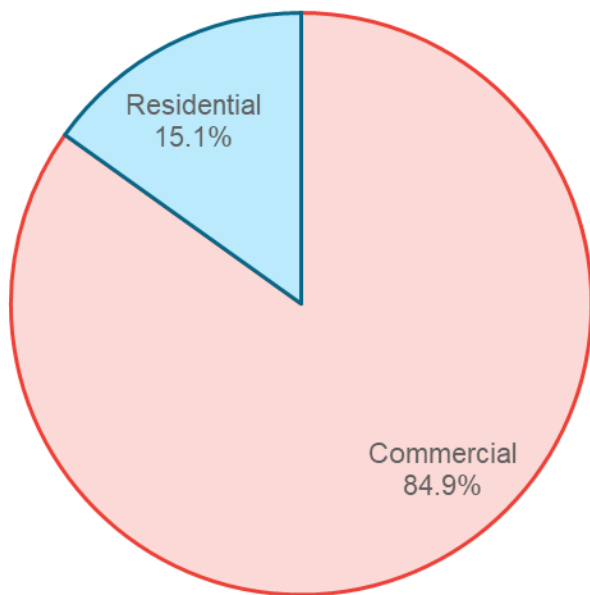
Source: CalRecycle, 2019

Off-Road Equipment

Off-road equipment includes mobile equipment used for construction, industrial processes, agriculture, commercial warehousing, and portable equipment, e.g., lawnmowers and leaf-blowers. Off-road equipment is typically diesel-powered but can also be gasoline- or natural gas-powered. Off-road equipment accounted for 5 percent of total community GHG emissions. **Table 12** and **Figure 8** show the community emissions from off-road equipment and the percent breakdown of emissions by fuel type.

Table 12: Culver City Community Off-Road Equipment GHG Emissions by Fuel Type in 2019

Source	Off-Road Equipment GHG Emissions	
	MTCO$_2$e	%
Diesel	9,869	68.2%
Gasoline	2,582	17.8%
Natural Gas	2,018	13.9%
Total	**14,469**	**100%**

Note: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. Refer to Attachment A, Tables A.1-16 through A.1-19, for detailed calculations.

Source: CARB OFFROAD2017 Model, 2019

Figure 8: Percent of Culver City Community Off-Road Equipment GHG Emissions by Fuel Type in 2019
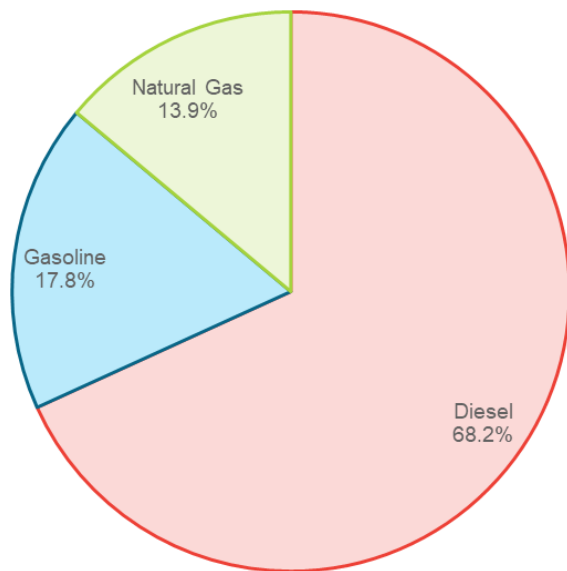
Source: CARB OFFROAD2017 Model, 2019

Water Supply

Water supplied to the community requires electricity for treatment, conveyance, and delivery, which results in emissions attributable to the City. Water supply is 0.9 percent of total community GHG emissions. **Table 13** and **Figure 9** show the City's emissions from water supply and the percent breakdown by land use type, respectively.

Table 13: Culver City Community Water Supply GHG Emissions by Land Use in 2019

Source	Water Supply GHG Emissions	
	MTC0$_2$e	%
Commercial	1,377	55.1
Residential	778	31.2
Public Authority	136	5.5
Industrial	77	3.1
Fire Protection	58	2.3
Irrigation	54	2.2
Other	12	0.5
Institutional	4	0.2
Educational	0.4	0.02
Total	**2,496**	**100**

Note: Totals may not add up exactly due to rounding in the calculations and significant figures presented in table. Refer to Attachment A, Tables A.1-20 through A.1-23, for detailed calculations.

Sources: GSW, 2017; LADWP, 2017

Figure 9: Percent of Culver City Community Water Supply GHG Emissions by Land Use in 2019
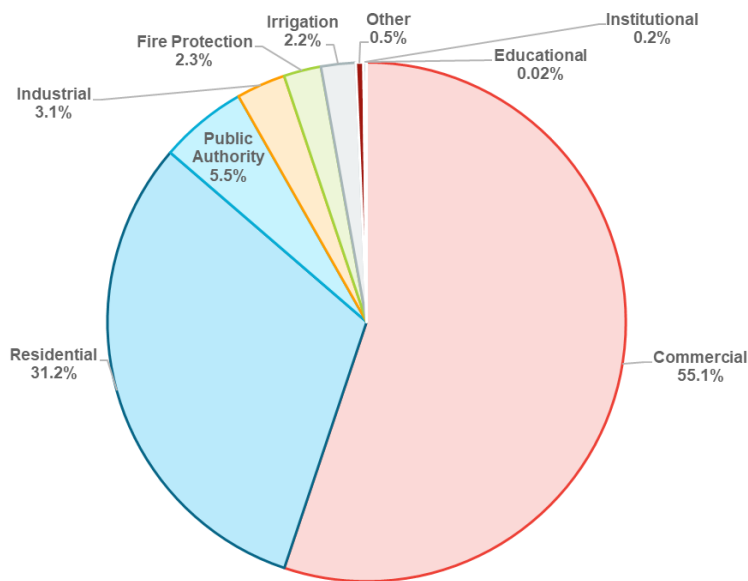
Sources: GSW, 2017; LADWP, 2017

Industrial Sources

Industrial sources for the city include emissions from fugitive gases resulting from oil wells and production.[6] Emissions from industrial sources are 0.1 percent of total community GHG emissions. **Table 14** shows the emissions contributing to oil well operations.

Table 14: Culver City Community GHG Emissions from Industrial Sources in 2019

Source	Total Emissions (MTCO$_2$e)
Industrial Source Emissions	383

Source: City, 2017. Refer to Attachment A, Table A.1-24, for detailed calculations.

Wastewater Treatment

Indirect emissions result from the energy used to treat wastewater generated within the city by residents and businesses. This treatment occurs at the regional Hyperion WWTP located in Playa Del Rey (Los Angeles). Energy-related emissions from wastewater treatment include digester gas and natural gas combustion. The Hyperion WWTP is mainly powered by combusting recycled digester gas in the treatment process and supplemented by combusting natural gas.

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[6] Industrial emissions are derived from the Inglewood Oil Field Specific Plan Air Quality and GHG Technical Report. It does not include indirect emissions from electricity which are included as part of electricity emissions or worker trips which are included as part of on-road vehicular transportation emissions. The emissions were then scaled from 2017 to 2019 accounting for a decrease from 36 to 30 production wells.

Table 15 shows the total community emissions resulting from combusting digester and natural gas at the Hyperion WWTP. Wastewater treatment makes up the smallest source of total energy-related community emissions at 0.1 percent of the total. **Figure 10** shows Culver City's estimated percent share of Hyperion WWTP's total annual energy-related emissions.

Table 15: Culver City Community GHG Emissions from Wastewater Treatment in 2019

Source	Emissions (MTCO$_2$e)		
	Digester Gas	Natural Gas	Total
Culver City Wastewater Treatment	6	374	380
Refer to Attachment A, Tables A.1-25 through A.1-28, for detailed calculations.			
Source: Hyperion WWTP, 2019			

Figure 10: Culver City Share of Hyperion Wastewater Treatment Emissions
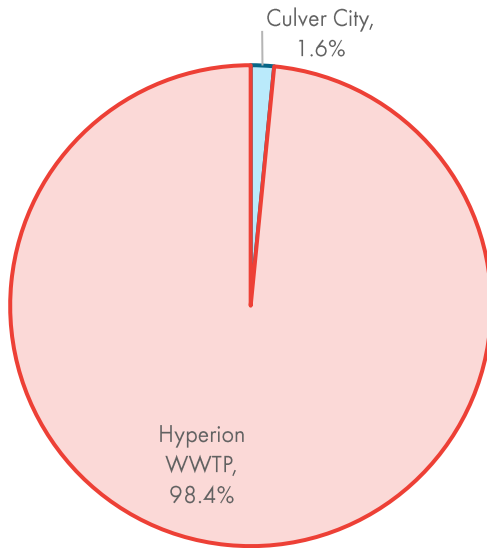
Source: Hyperion WWTP, 2019

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Attachment A: Activity Data and Calculations

A-1 Emissions Summaries

City of Culver City Community GHG Inventory - Summary

Table A.1-1: Total Community Emissions

Sector	By Sector (MTCO2e) Total	Percent of Total Emissions
On-Road Transportation	164,246	56.3%
Natural Gas	59,678	20.4%
Electricity	33,740	11.6%
Solid Waste	16,529	5.7%
Off-Road Equipment	14,469	5.0%
Water Supply	2,497	0.9%
Industrial Sources	383	0.1%
Wastewater Treatment	380	0.1%
Total	**291,922**	**100.0%**

City of Culver City Community GHG Inventory - Electricity

Table A.1-2: Total Community Electricity Emissions

Total Electricity - Summary	
Land Use	Total Emissions (MTCO2e)
Commercial	24,410
Industrial/Other	5,008
Residential	4,321
Total	**33,740**

Table A.1-3: Electricity Emissions - Clean Power Alliance

		Clean Power Alliance												
Land Use	Sum of 2019 kWh	Rate Tier Breakdown				Usage by Rate Tier (kWh)				Emissions by Rate Tier (MTCO2e)				
		Opt Out (SCE)	Lean Power	Clean Power	Green Power	Opt Out (SCE)	Lean Power	Clean Power	Green Power	Opt Out (SCE)	Lean Power	Clean Power	Green Power	Total
Domestic	55,501,540	4.1%	3.8%	1.3%	90.8%	2,270,013	2,103,508	715,970	50,412,049	481	10	3	0	**495**
Traffic and Street/Area Lighting	1,199,117	0%	0%	0%	100%	0	0	0	1,199,117	0	0	0	0	**0**
Small General Service	30,589,929	5.0%	1.7%	0.7%	92.5%	1,541,732	520,029	223,306	28,304,861	327	3	1	0	**330**
Medium General Service/Pumping	87,296,797	5.0%	1.7%	0.7%	92.5%	4,399,759	1,484,046	637,267	80,775,726	933	7	3	0	**943**
Large General Service/Industrial	50,302,110	5.0%	1.7%	0.7%	92.5%	2,535,226	855,136	367,205	46,544,542	537	4	2	0	**543**
Total	**224,889,493**					**10,746,730**	**4,962,719**	**1,943,748**	**207,236,296**	**2,278**	**24**	**9**	**0**	**2,311**

Source: Clean Power Alliance (CPA), 2019. Electricity Use Data

Table A.1-4: Electricity Emissions - Southern California Edison

		SCE - Summary			
Land Use	**Annual Electricity Use (kWh)**	**Emissions (MT)**			
		CO2	**CH4**	**N2O**	**CO2e**
Industrial/Other	19,096,271	4,048	0.000	0.000	4,048
Commercial	108,674,247	23,039	0.000	0.000	23,039
Residential	17,924,925	3,800	0.000	0.000	3,800
Total	**145,695,443**	**30,887**	**0.000**	**0.000**	**30,887**

Source: Southern California Edison (SCE), 2019. Electricity Use Data.

Notes: SCE electricity usage is calculated as the difference between total reported SCE kWh and CPA kWh per rate category

Table A.1-5: Electricity Emissions - LADWP Summary

		LADWP - Summary			
Land Use	**Annual Electricity Use (kWh)**	**Emissions (MT)**			
		CO2	**CH4**	**N2O**	**CO2e**
Industrial/Other	1,417,320	417	0.000	0.000	417
Commercial	332,499	98	0.000	0.000	98
Residential	90,953	27	0.000	0.000	27
Total	**1,840,771**	**541**	**0.000**	**0.000**	**541**

Source: Los Angeles Department of Water and Power (LADWP), 2017. Electricity Use Data.

Table A.1-6: Electricity Emissions - LADWP Detailed

		LADWP - Detailed			
Land Use	**Annual Electricity Use (kWh)**	**Emissions (MT)**			
		CO2	**CH4**	**N2O**	**Total Emissions (MTCO2e)**
Parking Lot/Patron or Employe	1,410,955	415	0.000	0.000	415
Store and Office Combination	165,959	49	0.000	0.000	49
Neighborhood Shopping	106,209	31	0.000	0.000	31
Multi-family Residential	90,953	27	0.000	0.000	27
Office Building	60,330	18	0.000	0.000	18
Church	6,366	2	0.000	0.000	2
Total	**1,840,771**	**541**	**0.000**	**0.000**	**541**

Source: Los Angeles Department of Water and Power (LADWP), 2017. Electricity Use Data.

Table A.1-7: Electricity Emissions by Utility

Utility	Emissions (MTCO2e)	Electricity Use (kWh)
SCE	33,166	156,442,173
CPA	33	214,142,763
LADWP	541	1,840,771
Total	**33,740**	**372,425,707**

City of Culver City Community GHG Inventory - Natural Gas

Table A.1-8: Total Community Natural Gas Use and Emissions

Land Use	Annual Therms	Emissions (MT)			
		CO2	CH4	N2O	CO2e
Commercial	5,816,600	30,840	2.91	0.06	30,930
Single-Family Residential	2,658,450	14,095	1.33	0.03	14,136
Multi-Family Residential	2,633,519	13,963	1.32	0.03	14,004
Industrial	114,390	606	0.06	0.00	608
Total Therms	**11,222,959**	**59,504**	**5.61**	**0.11**	**59,678**

Source: Southern California Gas (SoCalGas), 2017. Natural Gas Usage Data.

City of Culver City Community GHG Inventory - Transportation
Table A.1-9: Mobile Source Emissions by Vehicle Type

Speed (MPH)	Passenger	Truck	Total
5	876	541	1,417
10	1,747	672	2,419
15	2,621	597	3,217
20	8,497	1,513	10,010
25	21,098	3,217	24,315
30	28,823	4,458	33,281
35	19,690	3,589	23,279
40	13,970	2,948	16,918
45	11,396	2,931	14,326
50	6,193	1,278	7,471
55	6,187	1,547	7,734
60	5,046	1,508	6,554
65	3,343	1,737	5,080
70	658	153	811
75	977	242	1,219
80	793	241	1,034
85	0	0	0
Total	**131,914**	**27,170**	**159,084**

Sources:

1. Fehr & Peers, 2020. VMT and VMT by speed bin for the trips generated from Culver City.

2. Carb, EMFAC2017. https://arb.ca.gov/emfac/emissions-inventory

Note: Assumes VMT from F&P was provided as 50%. Assumes VMT from F&P was daily - used 365 to scale to annual.

City of Culver City Community GHG Inventory - Solid Waste

Table A.1-10: Culver City Solid Waste Tonnage

Jurisdiction	Total Waste (Wet Short Tons)	Commercial	Commercial Tonnage	Residential	Residential Tonnage	LFG?
Culver City	50,073	83%	41,775	17%	8,299	Yes

Source: CalReycycle, 2019.Local Government Disposal Reporting. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/

Table A.1-11: Emissions from Community Generated Waste (MTCO$_2$e) - Total

Jurisdiction	Total Tonnage	Mixed Solid Waste	Newspaper	Office Paper	Corrugated Containers	Magazines/Third-Class Mail	Food Scraps	Grass	Leaves	Branches	Dimensional Lumber	Total
Culver City	50,073	1,957	328	5,203	1,027	1,448	4,959	395	186	77	948	**16,529**

Source: CalReycycle, 2019.Local Government Disposal Reporting. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/

Emissions from Community Generated Organic Waste (MTCO$_2$e) - **Commercial**

Jurisdiction	Commercial Tonnage	Mixed Solid Waste	Newspaper	Office Paper	Corrugated Containers	Magazines/Third-Class Mail	Food Scraps	Grass	Leaves	Branches	Dimensional Lumber	Total
Culver City	41,775	1,482	266	4,628	896	1,256	4,191	305	131	34	838	**14,027**

Source: CalReycycle, 2019.Local Government Disposal Reporting. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/

Table A.1-13: Emissions from Community Generated Organic Waste (MTCO$_2$e) - Residential

Jurisdiction	Residential Tonnage	Mixed Solid Waste	Newspaper	Office Paper	Corrugated Containers	Magazines/Third-Class Mail	Food Scraps	Grass	Leaves	Branches	Dimensional Lumber	Total
Culver City	8,299	475	62	575	132	192	768	91	54	42	110	**2,501**

Source: CalReycycle, 2019.Local Government Disposal Reporting. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/

Table A.1-14: Solid Waste Emissions by Waste Type

Waste Stream	Emissions (MTCO2e)
Office Paper	5,203
Food Scraps	4,959
Mixed Solid Waste	1,957
Magazines/Third-Class Mail	1,448
Corrugated Containers	1,027
Dimensional Lumber	948
Grass	395
Newspaper	328
Leaves	186
Branches	77
Total	**16,529**

Sources:

1. CalReycycle, 2019.Local Government Disposal Reporting. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/

2. ICLEI, US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Appendix E: Solid Waste Emission Activities and Sources. http://icleiusa.org/publications/us-community-protocol/ . July 2013.

Table A.1-15: Solid Waste Emissions by Land Use

Solid Waste Source	Emissions (MTCO2e)
Commercial	14,027
Residential	2,501
Total	**16,529**

City of Culver City Community GHG Inventory - Offroad

Table A.1-16: OFFROAD Fuel Use Totals for Los Angeles County by Category

	Total Gallons Fuel - From Pivot Table		
Row Labels	Diesel	Gasoline	Nat Gas
Agricultural	753,578	0	0
Construction and Mining	36,926,774	0	0
Industrial	6,354,981	0	0
OFFROAD - Agricultural	185,270	172,598	0
OFFROAD - Construction and Mining	768,467	2,785,249	0
OFFROAD - Industrial	210,696	23,150,789	49,573,344
OFFROAD - Light Commercial	3,414,451	14,325,465	3,256,318
Portable Equipment	21,646,515	0	0

Source: California Air Resources Board OFFROAD2017 Model, 2019. https://www.arb.ca.gov/orion/

Table A.1-17: OFFROAD Fuel Use Totals for Los Angeles County by Category - Aggregated

Summary Categories	Diesel	Gasoline	Nat Gas
Construction	37,695,241	2,785,249	0
Industrial	6,565,677	23,150,789	49,573,344
Agriculture	938,849	172,598	0
Commercial	3,414,451	14,325,465	3,256,318
Portable Equipment	21,646,515	0	0

Source: California Air Resources Board OFFROAD2017 Model, 2019. https://www.arb.ca.gov/orion/

Table A.1-18: Offroad Fuel Use by Employment Type (gallons)

Fuel Type	Construction	Industrial	Agriculture	Commercial	Portable Equipment	Total
Diesel	683,922	31,738	1,637	29,751	188,015	**935,063**
Gasoline	50,534	111,911	301	124,822	0	**287,568**
Natural Gas	0	239,637	0	28,373	0	**268,011**

Source: California Air Resources Board OFFROAD2017 Model, 2019. https://www.arb.ca.gov/orion/

Table A.1-19: Offroad Emissions by Employment Type (MTCO2e)

Fuel Type	Construction	Industrial	Agriculture	Commercial	Portable Equipment	Total
Diesel	7,083	329	17	493	1,947	**9,869**
Gasoline	454	1,005	3	1,121	0	**2,582**
Natural Gas	0	1,804	0	214	0	**2,018**
Total	**7,537**	**3,138**	**20**	**1,827**	**1,947**	**14,469**

Source: California Air Resources Board OFFROAD2017 Model, 2019. https://www.arb.ca.gov/orion/

City of Culver City Community GHG Inventory - Water Supply

Table A.1-20: Total Community Emissions from Water Supply and Conveyance

Total Emissions Summary	
Source	**Total Emissions (MTCO2e)**
Commercial	1,377
Residential	778
Public Authority	136
Industrial	77
Fire Protection	58
Irrigation	54
Other	12
Institutional	4
Educational	0.4
Total	**2,497**

Table A.1-21: Community Emissions from Water Supply and Conveyance - GSW

Golden State Water		
Source	**Energy from Water Supply kWh**	**Emissions (MTCO2e)**
Commercial	5,884,965	1,248
Residential	3,137,867	665
Public Authority	642,008	136
Industrial	361,809	77
Fire Protection	274,224	58
Irrigation	254,200	54
Total	**10,555,073**	**2,238**

Source: Golden State Water (GSW), 2017. Monthly Water Use Data.

Table A.1-22: Community Emissions from Water Supply and Conveyance - LADWP Summary

LADWP - Summary					
Source	Energy from Water Supply	Emissions (MT)			
	kWh	CO2	CH4	N2O	CO2e
Commercial	439,535	129	0.00	0.00	129
Residential	384,369	113	0.00	0.00	113
Other	40,600	12	0.00	0.00	12
Institutional	14,925	4	0.00	0.00	4
Educational	1,529	0	0.00	0.00	0
Total	**880,959**	**259**	**0**	**0**	**259**

Source: Los Angeles Department of Water and Power (LADWP), 2017. Electricity Use Data.

Table A.1-23: Community Emissions from Water Supply and Conveyance - LADWP Detailed

LADWP - Detailed					
Source	Energy from Water Supply	Emissions (MT)			
	kWh	CO2	CH4	N2O	CO2e
Single Family Residential	183,499	54	0.000	0.000	54
Multi-family Residential	168,013	49	0.000	0.000	49
Department Store	152,831	45	0.000	0.000	45
Parking Lot/Patron or Employee	38,950	11	0.000	0.000	11
Store	33,178	10	0.000	0.000	10
Regional Shopping	31,836	9	0.000	0.000	9
Store and Residential Combo	28,076	8	0.000	0.000	8
Home for Aged and Others	28,053	8	0.000	0.000	8
Service Shop/Paint/Laundry	26,073	8	0.000	0.000	8
Office Building	23,184	7	0.000	0.000	7
Service Station/Full Service	22,182	7	0.000	0.000	7
Restaurant/Lounge/Tavern	21,333	6	0.000	0.000	6
Motel/Under 50 Rooms	17,894	5	0.000	0.000	5
Professional Building	17,769	5	0.000	0.000	5
Commercial	15,162	4	0.000	0.000	4
Fast Food Drive-up	13,794	4	0.000	0.000	4
Hospital	12,046	4	0.000	0.000	4
Store and Office Combination	12,024	4	0.000	0.000	4
Neighborhood Shopping	9,435	3	0.000	0.000	3
Fast Food-Walkup	5,303	2	0.000	0.000	2
Mobile Home Park	4,804	1	0.000	0.000	1
Auto Service/Body and Fender	3,783	1	0.000	0.000	1
Supermarket	3,058	1	0.000	0.000	1
Church	2,504	1	0.000	0.000	1
Utility/Pump Plant/State Prop	1,650	0	0.000	0.000	0
Private School	1,529	0	0.000	0.000	0
Light Manufacturing/Printing	961	0	0.000	0.000	0
Bank/Savings and Loan	483	0	0.000	0.000	0
Warehouse/Distributor	478	0	0.000	0.000	0
Lodge Hall/Fraternal Organiza	376	0	0.000	0.000	0
Auto Service/No Gas	259	0	0.000	0.000	0
Medical/Dental Building	224	0	0.000	0.000	0
Office Building/Residential	215	0	0.000	0.000	0
Total	**880,959**	**259**	**0.000**	**0.000**	**259**

Source: Los Angeles Department of Water and Power (LADWP), 2017. Electricity Use Data.

City of Culver City Community GHG Inventory - Industrial Sources

Table A.1-24: Industrial Source Emissions

Source	2017 Emissions (MTCO2e)	2019 Emissions (MTCO2e)	Percent of Total Emissions
	Total	Total	
Fugitive Gas Emissions	460	383	100.0%
Total	**460**	**383**	**100.0%**

Year	Number of Active Wells
2017	36
2019	30

Source: City of Culver City (City), 2017. Prepared by Yorke Engineering. Inglewood Oil Field Specific Plan Air Quality and GHG Technical Report, 2017.

Industrial emissions are a result of Inglewood Oil Field operations and annual emissions are derived from the Inglewood Oil Field Specific Plan Air Quality and GHG Technical Report. It does not include indirect emissions from electricity which are included as part of electricity emissions or workers which are included as on-road transportation emissions. The emissions were then scaled from 2017 to 2019 accounting for a decrease from 36 to 30 production wells.

City of Culver City Community GHG Inventory - Wastewater Treatment

Table A.1-25: Total Community Emissions from Wastewater Treatment

Culver City - Wastewater Emissions					
Daily Flow (mgal)	Annual Flow (mgal)	% of Hyperion Flow	Emissions (MTCO$_2$e)		
			Digester Gas	Natural Gas	Total
4.1	1,484	1.56%	6	374	**380**

Source: City of Culver City (City), 2020d. Wastewater Volumes. Email correspondence with Joe Susca and Mate Gaspar. October 20, 2020.

Table A.1-26: Hyperion Annual Flow and Capacity

Hyperion WWTP - Total Electricity			
Daily Flow (mgal)	Annual Flow (mgal)	Total Capacity (MW)	Total Operational Hours
260	94,900	20	8,760

Source: Hyperion WWTP, 2019. Email correspondence with Hi Sang Kim, Process Engineer. September 18, 2019.

Table A.1-27: Hyperion Digester Gas Emissions

Hyperion WWTP - Digester Gas Emissions					
GHG	ft^3 per day	Btu per ft^3	kg per MMBTU	Days per year	MTCO$_2$e
CH$_4$	6,500,000	620	0.0032	365	118
N$_2$O	6,500,000	620	0.0006	365	276
Total	**-**	**-**	**-**	**-**	**394**

Note: Emissions estimated using information from Hi Sang Kim and methodology from ICLEI's Community Protocol Appendix F WW.1.b and WW.2

Table A.1-28: Hyperion Natural Gas Emissions

Hyperion WWTP - Natural Gas Emissions					
Natural Gas Use (therms)	Natural Gas Use (MMBtu)	Emissions from Natural Gas (MT)			
		CO$_2$	CH$_4$	N$_2$O	CO$_2$e
4,500,000	450,000	23,859	2.25	0.05	**23,929**

Source: Hyperion WWTP, 2019. Email correspondence with Hi Sang Kim, Process Engineer. September 18, 2019.

A-2 Activity Data and Emission Factors

SCE Electricity Data

Table A.2-1: Total Reported Electricity Use by Culver City (SCE and CPA)

City	Rate of Category	Total Usage (KWH) by Rate Category
		2019
CULVER CITY, CITY OF	Agricultural	*
CULVER CITY, CITY OF	Commercial	227,760,090
CULVER CITY, CITY OF	Industrial	*
CULVER CITY, CITY OF	Residential	73,426,465
CULVER CITY, CITY OF	**Total**	**301,186,555**
CULVER CITY, CITY OF	**CPA Total**	**224,889,493**
CULVER CITY, CITY OF	**Remaining SCE Total**	**76,297,062**

Source: Southern California Edison (SCE), 2019. Electricity Use Data.

Note: Total reported electricity is used to track City-wide electricity use for SCE and CPA. The total electricity use provided by CPA was then subtracted from the SCE-reported total to determine the remaining amount of electricity use attributed to SCE

Table A.2-2: Total SCE Electricity Use

Rate of Category	Total Usage (KWH) by Rate Category
	2019
Agricultural	*
Commercial	57,696,551.92
Industrial/Other	69,398,381
Residential	18,600,510
Total SCE	**145,695,443**

Source: Southern California Edison (SCE), 2019. Electricity Use Data.

Note: Remaining SCE total commercial and residential electricity use was split according to the percentage of commercial and residential use in Table A.2-1. Industrial electricity was calculated by subtracting the commercial total in Table A.2-1 from the non-residential total in Table A.2-3.

SCE Electricity Data

PARAMETERS:

Request ID 'SCE8712242221'

Requestor 'City of Culver City'

Billing Period Between '2019-1-01' AND '2019-12-31'

Boundaries: City of Culver City

Table A.2-3: Residential and Non-Residential Electricity Use

City	Rate of Category	Total Usage (KWH) by Rate Category
		2019
CULVER CITY, CITY OF	Non-Residential (Commercial, Industrial and Agricultural)	297,158,471
CULVER CITY, CITY OF	Residential	73,426,465

Source: Southern California Edison (SCE), 2019. Electricity Use Data.

Summary of LADWP Raw Data

Table A.2-4: LADWP Residential Electricity Use

County Use	(Multiple Items)					
Residential						
Sum of LADWP Consumption	**Column Labels**				**2019**	
Row Labels	**Electricity (kWh)**	**Water (hcf)**	**Acre-feet**	**kWh**	**kWh - Water**	**kWh - Elec**
Mobile Home Park		1,077	2.5	4,792	4,804	-
Multi-family Residential	90,722	37,668	86.5	167,587	168,013	90,953
Single Family Residential		41,140	94.4	183,034	183,499	-
Vacant Land		0	0.0	0	-	-
Grand Total	**90,722**	**79,885**	**183.4**	**355,412**	**356,315**	**90,953**

Source: LADWP, 2017. Electricity Use Data

Table A.2-5: LADWP Commercial Electricity Use

County Use	(Multiple Items)					
Commercial						
Sum of LADWP Consumption	**Column Labels**				**2019**	
Row Labels	**Electricity (kWh)**	**Water (hcf)**	**Acre-feet**	**kWh**	**kWh - Water**	**kWh - Elec**
Auto Service/Body and Fender		846	1.9	3,764	3,783	0
Auto Service/No Gas		58	0.1	258	259	0
Bank/Savings and Loan		108	0.2	480	483	0
Church	6,334	560	1.3	2,491	2,504	6,366
Club/Lodge Hall/Fraternal Organization		84	0.2	374	376	0
Department Store		34,180	78.5	152,068	152,831	0
Fast Food Drive-up		3,085	7.1	13,725	13,794	0
Fast Food-Walkup		1,186	2.7	5,277	5,303	0
Home for Aged and Others		6,274	14.4	27,913	28,053	0
Hospital		2,694	6.2	11,986	12,046	0
Light Manufacturing/Printing		215	0.5	957	961	0
Medical/Dental Building		50	0.1	222	224	0
Motel/Under 50 Rooms		4,002	9.2	17,805	17,894	0
Neighborhood Shopping	105,679	2,110	4.8	9,387	9,435	106,209
Office Building	60,029	5,185	11.9	23,068	23,184	60,330
Office Building/Residential		48	0.1	214	215	0
Parking Lot/Patron or Employee	1,403,912	8,711	20.0	38,756	38,950	1,410,955
Private School		342	0.8	1,522	1,529	0
Professional Building		3,974	9.1	17,681	17,769	0
Regional Shopping		7,120	16.3	31,677	31,836	0
Restaurant/Lounge/Tavern		4,771	11.0	21,226	21,333	0
Service Shop/Paint/Laundry		5,831	13.4	25,942	26,073	0
Service Station/Full Service		4,961	11.4	22,072	22,182	0
Store		7,420	17.0	33,012	33,178	0
Store and Office Combination	165,131	2,689	6.2	11,963	12,024	165,959
Store and Residential Combo		6,279	14.4	27,936	28,076	0
Supermarket		684	1.6	3,043	3,058	0
Utility/Pump Plant/State Prop		369	0.8	1,642	1,650	0
Warehouse/Distributor		107	0.2	476	478	0
Commercial		3,391	7.8	15,087	15,162	0
Grand Total	**1,741,085**	**117,334**	**269.4**	**522,025**	**524,643**	**1,749,819**

Source: LADWP, 2017. Electricity Use Data

Note: 2017 electricity use was scaled to 2019 using population growth for residential and employment growth for commercial

Summary of Golden State Water Raw Data
Table A.2-6: GSW Water Use by Sector

Land Use	Water Use (hcf)	Acre-feet	kWh	2019 kWh
FIRE PROTECTION	61,329	141	272,856	274,224
IRRIGATION	56,991	131	253,556	254,200
PUBLIC AUTHORITY - METERED	143,582	330	638,803	642,008
WATER COMMERCIAL	1,316,145	3,021	5,855,591	5,884,965
WATER INDUSTRIAL	80,917	186	360,004	361,809
WATER RESIDENTIAL	703,502	1,615	3,129,912	3,137,867
Grand Total	**2,362,466**	**5,423**	**10,510,721**	**10,555,073**

Source: Golden State Water, 2017. Water Use Data

Note: 2017 water use data was scaled to 2019 using population and employment growth factors

City of Culver City Community GHG Inventory - VMT

Table A.2-7: VMT by Speed Bin

2019

Speed (MPH)	Internal-Internal VMT			Internal-External VMT		
	Passenger	Truck	Total	Passenger	Truck	Total
5	2,190	0	2,190	1,112,155	142,350	1,254,505
10	1,825	0	1,825	2,725,455	222,650	2,948,105
15	90,520	2,555	93,075	4,892,825	297,475	5,190,300
20	1,040,615	28,105	1,068,720	18,314,240	907,755	19,221,995
25	2,437,835	54,750	2,492,585	53,540,025	2,313,735	55,853,760
30	3,434,650	67,890	3,502,540	82,520,660	3,545,975	86,066,635
35	2,596,975	51,465	2,648,440	60,699,500	2,964,895	63,664,395
40	828,185	25,550	853,735	45,427,170	2,618,875	48,046,045
45	129,940	3,285	133,225	37,435,130	2,691,145	40,126,275
50	143,080	2,190	145,270	19,729,710	1,217,275	20,946,985
55	15,695	0	15,695	19,148,265	1,421,675	20,569,940
60	0	0	0	15,188,015	1,384,080	16,572,095
65	30,660	365	31,025	9,764,115	1,571,690	11,335,805
70	14,965	365	15,330	1,893,620	141,985	2,035,605
75	10,585	0	10,585	2,824,370	225,205	3,049,575
80	0	0	0	2,301,325	223,745	2,525,070
85	0	0	0	0	0	0
	10,777,720	236,520	11,014,240	377,516,580	21,890,510	399,407,090

Source: Fehr & Peers, 2020. VMT and VMT by speed bin for the trips generated by Culver City.

Note: Internal-external assumed to be reported as 50% by F&P.

City of Culver City Community GHG Inventory - Transportation Emission Factors

EMFAC 2007 Categories	F&P VMT Categories
HHDT	Truck
LDA	Passenger
LDT1	Passenger
LDT2	Passenger
LHDT1	Truck
LHDT2	Truck
MCY	Passenger
MDV	Passenger
MH	Truck
MHDT	Truck
OBUS	Bus
SBUS	Bus
UBUS	Bus

F&P VMT Categories	EMFAC 2007 Categories
Passenger Cars	LDA, LDT1, LDT2, MDV, MCY
Light/Medium/Heavy Trucks	LHDT1, LHDT2, MH, MHDT, HHDT
Buses	OBUS, SBUS, UBUS

Table A.2-8: Emission Factors by Vehicle Type and Speed

F&P Category	Speed	ID	2019 Emission Factors (g/mile)			
			CO2	CH4	N2O	CO2e
Truck	5	Truck5	3,610	1.35E+00	5.20E-01	3,798
Truck	10	Truck10	2,878	9.48E-01	3.96E-01	3,019
Truck	15	Truck15	1,915	1.66E-01	2.32E-01	1,988
Truck	20	Truck20	1,559	5.59E-02	1.89E-01	1,617
Truck	25	Truck25	1,311	3.80E-02	1.56E-01	1,358
Truck	30	Truck30	1,189	2.89E-02	1.47E-01	1,233
Truck	35	Truck35	1,145	4.51E-02	1.47E-01	1,190
Truck	40	Truck40	1,073	3.02E-02	1.36E-01	1,115
Truck	45	Truck45	1,048	2.36E-02	1.32E-01	1,088
Truck	50	Truck50	1,010	1.47E-02	1.25E-01	1,048
Truck	55	Truck55	1,048	1.08E-02	1.34E-01	1,088
Truck	60	Truck60	1,048	1.01E-02	1.38E-01	1,089
Truck	65	Truck65	1,064	1.10E-02	1.38E-01	1,105
Truck	70	Truck70	1,038	1.23E-02	1.28E-01	1,076
Truck	75	Truck75	1,038	1.23E-02	1.28E-01	1,076
Truck	80	Truck80	1,038	1.23E-02	1.28E-01	1,076
Truck	85	Truck85	1,038	1.23E-02	1.28E-01	1,076
Passenger	5	Passenger5	779	5.16E-02	1.92E-02	786
Passenger	10	Passenger10	635	3.66E-02	1.70E-02	641
Passenger	15	Passenger15	521	2.78E-02	1.54E-02	526
Passenger	20	Passenger20	434	2.26E-02	1.42E-02	439
Passenger	25	Passenger25	372	1.93E-02	1.32E-02	377
Passenger	30	Passenger30	331	1.73E-02	1.26E-02	335
Passenger	35	Passenger35	307	1.59E-02	1.21E-02	311
Passenger	40	Passenger40	298	1.51E-02	1.17E-02	302
Passenger	45	Passenger45	300	1.47E-02	1.15E-02	303
Passenger	50	Passenger50	308	1.45E-02	1.15E-02	312
Passenger	55	Passenger55	319	1.46E-02	1.17E-02	323
Passenger	60	Passenger60	328	1.49E-02	1.21E-02	332
Passenger	65	Passenger65	337	1.56E-02	1.26E-02	341
Passenger	70	Passenger70	340	1.61E-02	1.29E-02	345
Passenger	75	Passenger75	340	1.61E-02	1.29E-02	345
Passenger	80	Passenger80	340	1.61E-02	1.29E-02	345
Passenger	85	Passenger85	340	1.61E-02	1.29E-02	345

Source: CARB, EMFAC2017. https://arb.ca.gov/emfac/emissions-inventory

City of Culver City Community GHG Inventory - Solid Waste Emission Factors

Table A.2-9: Waste Categorization and Emission Factor

Material Type	ICLEI Category	Emission Factor
Branches and Stumps	Branches	0.062
Carpet	Mixed Solid Waste	0.060
Clean Dimensional Lumber	Dimensional Lumber	0.062
Clean Engineered Wood	Dimensional Lumber	0.062
Clean Pallets & Crates	Dimensional Lumber	0.062
Food	Food Scraps	0.078
Leaves and Grass	Grass	0.038
Magazines and Catalogs	Magazines/Third-Class Mail	0.049
Manures	Mixed Solid Waste	0.060
Mixed Residue	Mixed Solid Waste	0.060
Newspaper	Newspaper	0.043
Other Miscellaneous Paper - Compostable	Newspaper	0.043
Other Miscellaneous Paper - Other	Office Paper	0.203
Other Office Paper	Office Paper	0.203
Paper Bags	Magazines/Third-Class Mail	0.049
Phone Books and Directories	Magazines/Third-Class Mail	0.049
Prunings and Trimmings	Leaves	0.030
Remainder / Composite Organic	Mixed Solid Waste	0.060
Remainder / Composite Paper - Compostable	Magazines/Third-Class Mail	0.049
Remainder / Composite Paper - Other	Office Paper	0.203
Textiles	Mixed Solid Waste	0.060
Uncoated Corrugated Cardboard	Corrugated Containers	0.120
White Ledger Paper	Office Paper	0.203

Source: ICLEI, US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Appendix E: Solid Waste Emission Activities and Sources. http://icleiusa.org/publications/us-community-protocol/ . July 2013.

Table A.2-10: CH$_4$ Yield for Solid Waste Components

Waste Component	Emissions Factor, EF$_i$ (mt CH$_4$/wet short ton waste)	Source
Mixed Solid Waste	0.060	U.S. EPA AP-42
Newspaper	0.043	WARM
Office Paper	0.203	WARM
Corrugated Containers	0.120	WARM
Magazines/Third-Class Mail	0.049	WARM
Food Scraps	0.078	WARM
Grass	0.038	WARM
Leaves	0.030	WARM
Branches	0.062	WARM
Dimensional Lumber	0.062	WARM

Sources:

1. WARM—Exhibit 6 of http://epa.gov/epawaste/conserve/tools/warm/pdfs/Landfilling.pdf, February 2012.

2. U.S. EPA AP-42 – U.S. EPA Emission Factor Database, Chapter 2.4 Municipal Solid Waste Landfills (1998)

Offroad Employment Sectors

Categories for emissions apportionment

Table A.2-11: County-Wide Employment Data by Sector

Year	AGRICULTURE EMPLOYMENT	CONSTRUCTION EMPLOYMENT	MANUFACTURING EMPLOYMENT	WHOLSESALE EMPLOYMENT	RETAIL EMPLOYMENT	TRANSPORTATION EMPLOYMENT	FIRE EMPLOYMENT	Total
2019	6,310	176,262	337,746	227,429	435,697	252,368	232,331	1,668,143

Source: Fehr & Peers, 2020. Email correspondence with Jinghua Xu. September 17, 2020.

Table A.2-12: Culver City Employment by Sector
Employment Data

CITY [a]	AGRICULTURE EMPLOYMENT	CONSTRUCTION EMPLOYMENT	MANUFACTURING EMPLOYMENT	WHOLSESALE EMPLOYMENT	RETAIL EMPLOYMENT	TRANSPORTATION EMPLOYMENT	FIRE EMPLOYMENT	Total
Culver City	11	3,198	1,544	1,226	5,569	1,182	1,759	14,489
% of County	0.2%	1.8%	0.5%	0.5%	1.3%	0.5%	0.8%	0.9%

Source: Fehr & Peers, 2020. Email correspondence with Jinghua Xu. September 17, 2020.

Annual Wastewater Discharge Report
Flow Year 2018-2019
City of Culver City

I. City of Culver City

Table A.2-13: Measured Data Summary

Station	Flow (mgd)	BOD (ppd)	SS (ppd)
Braddock Pump	1.3287	2,468	1,153
Mesmer Pump	0.7874	1,641	817
Green Valley Circle	0.2688	349	160
Overland Pump	0.1112	176	79
Flow Measured (NO quality measured)*			
Duquesne	0.2657	386	289
Culver	0.2289	332	249
Inglewood	0.1611	234	175
Jasmine Pump	0.2113	307	230
Del Rey	0.0819	119	89
Fox Hills Pump	0.0988	143	108
Jackson	0.1043	151	113
McConnell	0.0977	142	106
Syd Park	0.1012	147	110
Ranch	0.0511	74	56
Slauson	0.0295	43	32
Measured Subtotal	**3.9277**	**6712**	**3766**

Source: City of Culver City (City), 2020d Wastewater Volumes. Email correspondence with Joe Susca and Mate Gaspar. October 20, 2020.

Table A.2-14: Estimated Data Summary

Tributary Area	Flow (mgd)	BOD (ppd)	SS (ppd)
Perry Dr & Fairfax	0.0024	4	3
Adams & Fairfax	0.0527	76	57
Jefferson n\o Duquesne	0.0023	3	3
Sony	0.0333	48	36
Lotz Lane	0.0066	10	7
Transport & Leahy	0.0046	7	5
Hughes Ave	0.0022	3.16	2.37
Green Valley Circle	0.0176	25.58	19.17
Lenawee*	0.0249	36.13	27.08
Blackwelder	0.0061	8.88	6.65
Estimated Subtotal**	**0.1374**	**222**	**166**

* factor of 42% applied

** factor of 90% applied

Source: City of Culver City (City), 2020d Wastewater Volumes. Email correspondence with Joe Susca and Mate Gaspar. October 20, 2020.

City of Culver City Community GHG Inventory - Growth Factors

Table A.2-15: Culver City Socioeconomic Data - 2019 and 2045

Model	SCAG 2020 RTP/ Culver City Model	SCAG 2020 RTP	Average Annual Growth Rate (SCAG)	Average Annual Growth Rate (CC Model)	Number of Years
Year	2045	2019			26
Service Population	105,587	100,343	0.20%	0.17%	
Pop	41,546	40,218	0.13%	0.01%	
HH	18,017	17,088	0.21%	0.14%	
Emp	64,041	60,125	0.25%	0.29%	
Ag	11	17	-1.36%	-1.03%	
Const	3,198	3,006	0.25%	0.25%	
Manu	1,544	2,111	-1.03%	-0.99%	
Whole	1,226	1,312	-0.25%	-0.25%	
Ret	5,569	5,949	-0.25%	-0.25%	
Trans	1,182	1,158	0.08%	0.08%	
Infor	15,668	15,684	0.00%	0.00%	
FIRE	1,759	1,628	0.31%	0.32%	
Prof	13,523	12,777	0.22%	0.22%	
Educ	10,117	7,644	1.24%	1.53%	
ArtEnt	7,035	6,246	0.49%	0.50%	
OthSer	2,010	1,653	0.83%	0.76%	
PubAdm	1,199	940	1.06%	2.07%	

mail correspondence with Jinghua Xu. September 17, 2020.

City of Culver City Community Energy GHG Inventory - Constants / Factors

Table A.2-16: Electricity Emission Factors by Utility

Utility	Emission Factors (lbs/MWh)		
	CO2	CH4	N2O
2019			
Clean Power Alliance - Lean[1]	10.59	0.033	0.00400
Clean Power Alliance - Clean	9.81	0.033	0.00400
Clean Power Alliance - Green	0	0	0
SCE [2]	467.38	0.000	0.00000
LADWP [3]	648.36	0.000	0.00000
CAMX [4]	496.54	0.033	0.00400

Sources:

1. CPA Efs only available for CO2. https://www.theclimateregistry.org/our-members/cris-public-reports/. CH4 and N2O Efs default to CAMX

2. Edison International, 2018. ESG/Sustainability Template - Section 2: Quantitative Information.
https://www.edison.com/content/dam/eix/documents/sustainability/2019-eix-esg-pilot-quantitative-section-sce.xlsx This

3. LADWP Emission Factors calculated using 2019 total electricity usage and total emissions estimations from CEC's Staff
Report Review of LADWP's 2017 Power IRP. https://www.energy.ca.gov/filebrowser/download/1901

4.USEPA EGRID Data Explorer, 2018. https://www.epa.gov/egrid/data-explorer

Table A.2-17: GHG Global Warming Potentials

GHG	GWP [1]
CO2	1
CH4	25
N2O	298

1. IPCCC AR4, 2007. https://www.ipcc.ch/reports/

Table A.2-18: Natural Gas GHG Emission Factors

GHG	Natural Gas EF (kg/MMbtu) [1]
CO2	53.02
CH4	0.005
N2O	0.0001

1. USEPA, 2014. Emission Factors for Greenhouse Gas Inventories.
https://www.epa.gov/sites/production/files/2015-
07/documents/emission-factors_2014.pdf

Table A.2-20: General Conversions

Conversions			
1	**lb**	2205	**MT**
1	**kWh**	0.001	**MWh**
1	**therm**	0.1	**MMBtu**
1	**Btu**	0.000001	**MMBtu**
1	**kg**	0.001	**MT**
100	**cubic feet**	0.002	**acre-feet**
1	**kWh**	3412	**Btu**

Table A.2-19: Water Supply, Gasoline, and Diesel Emission Factors

Water Supply Electricity Intensity Factor (kWh/acre-foot) [1]	Gasoline Emission Factor (MTCO2e per gallon) [2]	Diesel Emission Factor (MTCO2e per gallon) [2]
1,938	0.00878	0.01021

1. Metropolitan Water District of Southern California, 2015. Urban Water Management Plan.
http://www.mwdh2o.com/PDF_About_Your_Water/2.4.2_Regional_Urban_Water_Management_Pl
an.pdf

2. USEPA, 2014. Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf