Climate Action and Adaptation Plan

GHG Emissions Inventory, Forecast and Back-cast Technical Appendix

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Table of Contents

Tables

Figures

1 Introduction

This technical appendix to the City of Beverly Hills (City) Climate Action and Adaptation Plan (CAAP) provides background and details on the calculation of greenhouse gas (GHG) emissions in the 2015 and 2019 Community GHG Emissions Inventories, 2019 Municipal Operations GHG Emissions Inventory, GHG Emissions Forecast, and GHG Emissions Back-cast. The summary of these calculations provides a sound technical basis for the development of the CAAP and serve as component of the substantial evidence for the GHG reductions achieved by relevant California legislation and the GHG reduction measures included in the CAAP.

1.1 Legislative Context and Requirements

California considers GHG emissions and the impacts of climate change to be a serious threat to public health, the environment, economic well-being, and natural resources of the state, and has taken an aggressive stance to mitigate the impact on climate change through the adoption of legislation and policies, the most relevant of which are summarized below.

- **Executive Order (EO) S-3-05,** signed by the Governor in 2005, establishes statewide GHG emission reduction targets to achieve long-term climate stabilization as follows: by 2020, reduce GHG emissions to 1990 levels and by 2050, reduce GHG emissions to 80% below 1990 levels. The 2050 target was accelerated by the 2045 carbon neutral target in Executive Order B-55-18, as discussed below.[1]
- **Assembly Bill (AB) 32,** known as *the Global Warming Solutions Act of 2006,* requires that California's GHG emissions be reduced to 1990 levels by the year 2020 (approximately a 15% reduction from 2005 to 2008 levels). The AB 32 Climate Change Scoping Plan, 2008, identifies mandatory and voluntary measures to achieve the statewide 2020 emissions goal, and encourages local governments to reduce municipal and community GHG emissions proportionate with state goals.[2] This State achieved this goal in 2017, reducing GHG emissions below 1990 levels three years before the target.
- **Senate Bill (SB) 32,** signed by the Governor in 2016, establishes a statewide mid-term GHG reduction goal of 40% below 1990 levels by 2030. The California Air Resources Board (CARB) formally adopted an updated Climate Change Scoping Plan in December 2017 (2017 Scoping Plan), establishing the roadmap to achieve the 2030 goal and giving guidance to achieve substantial progress toward the 2050 state goal.
- **Executive Order (EO) B-55-18,** signed by the Governor in 2018, expanded upon EO S-3-05 by creating a statewide GHG goal of carbon neutrality by 2045. EO B-55-18 identifies CARB as the lead agency to develop a framework for implementation and progress tracking toward this goal.

[1] Executive Orders are binding only unto state agencies. Accordingly, Executive Order S-3-05 will guide state agencies' efforts to control and regulate GHG emissions but will have no direct binding effect on local government or private actions.

[2] Specifically, the AB 32 Scoping Plan states that CARB, "encourages local governments to adopt a reduction goal for municipal operations emissions and move toward establishing similar goals for community emissions that parallel the State commitment to reduce GHG emissions by approximately 15% from current levels by 2020" (p. 27). "Current" as it pertains to the AB 32 Scoping Plan is commonly understood as between 2005 and 2008.

2 GHG Emissions Inventories

California's 2017 Scoping Plan, released by CARB in November 2017, outlines California's strategy for achieving the state's 2030 GHG emission reduction goal.[3] Based on the 2017 Scoping Plan, there are nine economic GHG emission generating sectors, which include: agriculture, residential and commercial buildings, electric power, high global warming potential (GWP),[4] industrial, recycling and waste, transportation, natural working lands net sink,[5] and the Cap-and-Trade Program. The City of Beverly Hills does not have a significant agricultural sector which generates GHG emissions; therefore, this sector is excluded from the inventory and is not discussed further. Typically, CARB regulates the GHG emissions associated with industrial stationary combustion through the California Cap-and-Trade Program; however, according to CARB's annual summaries of reported GHG emissions for entities covered under Cap-and-Trade, there were no industrial facilities in the City regulated by CARB.[6,7] Lastly, a full carbon inventory of net sources and sinks of GHG emissions in Natural and Working Lands is not included in this inventory due to a lack of granular data at the City scale; however, the carbon sequestration value of trees in the City right-of-way will be calculated using the City's tree inventory.

The City of Beverly Hills 2015 and 2019 GHG emissions inventories provide separate assessments of GHG emissions generated by the community and by municipal operations for the City to exert stronger influence over GHG emission sources that are under their direct control. In this analysis, community-wide GHG emissions inventories (community inventories) are calculated for the years 2015 and 2019, while a municipal operations GHG emissions inventory (municipal inventory) is only calculated for the year 2019. There is significant overlap between GHG emission sources presented in the 2019 inventories; therefore, the municipal inventory is considered as a subset of the community inventory and the two inventories are not intended to be additive. The community inventory is intended to represent the total GHG emission emitted directly by and as a result of activities occurring within the City's physical boundaries, from which a GHG emissions forecast and GHG reduction targets will be calculated. The municipal inventory provides deeper insight to a subset of the community GHG emissions, which are under direct control of the City and a result of municipal operations.

2.1 2015 and 2019 Greenhouse Gas Emissions Inventories Overview

The 2015 community inventory serves as an assessment of previous GHG emission levels, with the 2019 community inventory allowing for an understanding of how GHG emissions have changed over time. The 2019 community inventory is used here for the baseline of a GHG emissions forecast to

[3] Per Senate Bill (SB) 32, the state is required to reduce GHG emissions by 40 percent below the 1990 levels by 2030.

[4] High GWPs are not included in this analysis because the City does not have operational control over high-GWP generating sources; high GWP generating emission sources include refrigeration systems in large food processing plants and chemical and petrochemical facilities, among others.

[5] Per the 2017 Scoping Plan, work is currently underway to estimate the range of potential sequestration benefits from natural and working land sectors.

[6] Please see https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm for more information on the Cap-and-Trade Program.

[7] California Air Resources Board. 2021. Mandatory GHG Reporting – Reported Emissions. https://ww2.arb.ca.gov/mrr-data. Accessed May 16, 2021.

estimate how GHG emissions may change in the future. A GHG emissions back-cast can be established using the 2015 community inventory by assessing how the State's GHG emissions levels have changed since 1990. The percent change between the 2015 and 1990 statewide GHG emission levels can be used to estimate Beverly Hills 1990 GHG emissions levels.

The 2015 and 2019 community inventories include all relevant emission sources occurring within Beverly Hills's geo-political control (i.e., sources of emissions within the City limits over which the City has significant influence or jurisdictional authority). A more in depth analysis of emissions resulting from facilities that the City owns and/or operates (e.g., City Hall) is presented in the 2019 municipal inventory. The municipal inventory is a subset of the community inventory, meaning that all municipal operations are included in the commercial, transportation, solid waste, or water categories of the community inventory. The municipal inventory is not added to the community analysis; rather, it is a portion of the total community GHG emissions. The municipal inventory allows the City to track its GHG emissions resulting from the City owned facilities and vehicles over which it is able to exert control with GHG reduction policies and ultimately lead by example.

2.2 Inventory Methodology Overview

The GHG inventories presented here are based on the Local Governments for Sustainability (ICLEI) principles adapted from the World Business Council for Sustainable Development and the World Resources Institute (WBCSD/WRI) GHG Protocol Initiative (March 2004), which includes the *United States Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol)[8] and the *Local Government Operations Protocol* (LGOP) developed by ICLEI. These protocols identify specific principles that serve to guide the measurement and reporting of GHG emissions which include relevance, completeness, consistency, transparency, and accuracy. Both the LGOP and Community Protocol state that local governments should assess emissions of all six internationally recognized GHGs. These gases are outlined in Table 1, which includes their sources and GWP.[9] This inventory was prepared in conformance with International Organization of Standardization (ISO) 14064-1 and therefore, incorporates the latest 100-year GWP values published in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).[10] The GWP refers to the ability of each gas to trap heat in the atmosphere. For example, one pound of methane has 28 times more heat capturing potential than one pound of carbon dioxide. This report focuses on the three GHGs most relevant to local government policymaking: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These gases comprise a large majority of GHG emissions at the community level. Other gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluorides are emitted primarily in private sector manufacturing and electricity transmission and are the subject of regulation at the state level and therefore, have been omitted from this inventory. GHG emissions are reported in metric tons of carbon dioxide equivalent (MT CO_2e) units, per standard practice. When dealing with an array of emissions, the gases are converted to their carbon dioxide equivalents for comparison purposes.

[8] ICLEI. July 2019. U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emission.

[9] According to the United States Environmental Protection Agency (USEPA), the GWP was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide (USEPA 2017; https://www.epa.gov/ghgemissions/understanding-global-warming-potentials. Accessed August 12, 2021)

[10] International Organization for Standardization (ISO) published ISO 14064-1 in 2006 (revised 2018) to provide an international standard for the quantification and reporting of GHG emissions.

Table 1 Summary of Greenhouse Gas Emission

Greenhouse Gas	Formula	Primary Source(s)	GWP (CO_2e)
Carbon Dioxide	CO_2	Fuel combustion	1
Methane	CH_4	Fuel combustion, anaerobic decomposition of organic waste (landfills, wastewater treatment plants), fuel handling	28
Nitrous Oxide	N_2O	Combustion and wastewater treatment	265
Hydrofluorocarbons	Various	Leaking refrigerants and fire suppressants	4-12,400
Perfluorocarbons	Various	Aluminum production, semiconductor manufacturing, HVAC equipment manufacturing	6,630-11,100
Sulfur Hexafluoride	SF_6	Transmission and distribution of power	23,500

Source: Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report AR5, Chapter 8 Anthropogenic and Natural Radiative Forcing. 2014. https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf. Accessed August 12, 2021.
GWP: Global Warming Potential

Community GHG Emissions Inventories Overview

Based on the requirements of the Community Protocol developed by ICLEI, a minimum set of five "Basic Emissions Generating Activities" or *sectors* must be included in all Community Protocol-compliant GHG emissions inventories. Specifically, local governments must include GHG emissions associated with the following sectors: use of electricity by the community, use of fuel in residential and commercial stationary combustion equipment, on-road passenger and freight motor vehicle travel, use of energy in potable water and wastewater treatment and distribution, and generation of solid waste by the community. The purpose of this requirement is to facilitate the process of assessing GHG emission sources and activities over which local governments commonly have influence, and to support shared learning and comparison on a common set of GHG emissions across communities. Therefore, this community inventory includes all applicable sectors, as well as the additional forest land and trees sector, to evaluate urban forest carbon sequestration value. As demonstrated in Table 1, all other economic sectors outlined above for the CARB 2017 Scoping Plan align with the Community Protocol GHG emission sectors.

Table 2 CARB and ICLEI Community Protocol Sector Connectivity Summary

CARB 2017 Scoping Plan Economic Sector	ICLEI Community Protocol Sector	Sector in Beverly Hills Community Inventory
Residential and commercial	Use of electricity by the community, use of fuel in residential and commercial stationary combustion equipment	Energy
Electric power		
Recycling and waste	Generation of solid waste by the community	Solid Waste
Transportation	On-road passenger and freight motor vehicle travel	Transportation
NA	Use of energy in potable water and wastewater treatment and distribution	Water and Wastewater
Natural and working lands	Forest Land and Trees	Carbon Sequestration

Notes: NA = Not applicable

Municipal GHG Emissions Inventory Overview

Likewise, the ICLEI LGOP is designed to provide a standardized set of guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government operations. According to the LGOP, to separately account for direct and indirect emissions, to improve transparency, and to provide utility for different types of climate policies and goals, municipal GHG emissions should be categorized by scope.[11] The scope of a GHG emission source is based on the degree of operational control the City has over the emission sources, and whether they occur within or outside of the jurisdictional boundaries.[12] In addition to scope, municipal emissions should also be categorized into the following local government sectors: buildings and other facilities, streetlights and traffic signals, water delivery facilities, port facilities, airport facilities, vehicle fleet, transit fleet, power generation facilities, solid waste facilities, and wastewater facilities.[13] The municipal GHG emission sectors included in this municipal inventory, and the associated scope of emission sources, are provided in Table 3.

Table 3 Reported Municipal GHG Emissions Sources and Scope

Sector in 2019 GHG Inventory	GHG Emissions Source	GHG Emissions Scope
Energy	Natural Gas (Buildings and other facilities)	Scope 1
	Electricity (Buildings and other facilities, streetlights and traffic signals, water delivery facilities and vehicle fleet)	Scope 2
Transportation	Municipal Vehicles Fleet	Scope 1
	Public Transit Fleet	Scope 1
	Employee Commute	Scope 3
Water and Wastewater	Water Consumption	Scope 3
Solid Waste	Municipal Waste Generation	Scope 3

[11] It is important to note that municipal emissions are a subset of the community emissions and are calculated separately to provide a source of information to develop GHG reduction measures targeted for City operations.

[12] Scope 1: Direct GHG emissions from sources within a local government's operations that it owns and/or controls.
Scope 2: Indirect GHG emissions associated with the consumption of electricity, steam, heating, or cooling that are purchased from a utility provider that also provides energy to other jurisdictions and/or is located outside City boundaries.
Scope 3: All other indirect GHG emissions not covered in Scope 2.

[13] The following local government sectors are not relevant to the City of Beverly Hills Municipal Operations GHG emissions inventory and are therefore excluded from the GHG inventories and not further discussed in this analysis.

- Port facilities: The City is not surrounded by any body of water that could support a port.
- Airport facilities: The City does not have an airport within the City borders, nor does it have operational control over an airport.
- Power generation facilities: The City purchases electricity from Southern California Edison and the Clean Power Alliance and does not have operational control over power generation facilities.
- Solid waste facilities: The City does not have a landfill within its borders, nor does it have operational control over a landfill.
- Wastewater facilities: The City's wastewater collection and processing is provided by the Los Angeles County Sanitation District. A small portion of the City's overall electricity consumption may be attributed to the collection of wastewater, which is included in the "buildings and other facilities" sector.

2.3 Inventory Calculation Methodology by Sector and Source

Energy Sector GHG Emissions Data and Methodology

GHG emissions included in the energy sector are generated through electricity and natural gas consumption. The City of Beverly Hills has two primary electricity providers, Southern California Edison (SCE) and Clean Power Alliance (CPA), with some electricity customers obtaining direct access electricity from third-party private providers. While electricity in the City is purchased from multiple sources, SCE continues to provide electricity transmission and customer billing for all electricity consumed in the City. The City joined CPA in 2017 and began receiving electricity from CPA in February 2019. As of 2019, electricity customers were provided four options for their electricity service:

1. Continue to purchase electricity from SCE.
2. Purchase electricity from CPA and receive 36% renewable energy (Lean Power Rate Product).
3. Purchase electricity from CPA and receive 50% renewable energy (Clean Power Rate Product).
4. Purchase electricity from CPA and receive 100% renewable energy (100% Green Power Rate Product).

Community Energy (Electricity & Natural Gas) GHG Emission Sources

COMMUNITY ELECTRICITY INVENTORY DATA

Community electricity consumption data was obtained from multiple sources, and some data processing was required to accurately attribute electricity consumption to the appropriate electricity provider. Data for the 2019 Community GHG Inventory was obtained from SCE and CPA in the form of kilowatt-hour (kWh) consumption. Total electricity consumption in the City for 2019 was obtained from SCE through the official energy data request program (EDRP), which includes electricity consumption SCE, CPA, and direct access customers.[14] The SCE data provided annual electricity consumption disaggregated by the residential, commercial, and industrial customer classes. California Public Utilities Commissions (CPUC) aggregation rules are intended to protect customer confidentiality by reducing the possibility of identifying customers through the release of consumption information.[15] Data provided by SCE passed both the 15/20 and 5/25 aggregation rules and is aggregated annually and assumed to be complete.[16] CPA provided electricity consumption by month for all CPA customers in each "Rate Product" for 2019.[17] The CPA data did not disaggregate consumption by customer class.

In obtaining data from SCE through the EDRP, a non-disclosure agreement was signed by Rincon and the City of Beverly Hills to limit the publication of energy consumption data to protect customer

[14] Data provided to the City by email from SCE on April 23, 2021.

[15] Residential, Commercial Consumption Data 15/20 Rule: Aggregated over a group consisting of 15 customers in a single customer class. No single customer accounts for more than 20 percent of the total energy consumption in an individual month.
Industrial Consumption Data 5/25 Rule: Aggregated over a group consisting of five customers in a single customer class. No single customer accounts for more than 25 percent of the total energy consumption in an individual month.

[16] Residential, Commercial Consumption Data 15/20 Rule: Aggregated over a group consisting of 15 customers in a single customer class. No single customer accounts for more than 20 percent of the total energy consumption in an individual month.
Industrial Consumption Data 5/25 Rule: Aggregated over a group consisting of five customers in a single customer class. No single customer accounts for more than 25 percent of the total energy consumption in an individual month.

[17] Data provided to the City by email from CPA on April 5, 2021.

privacy. Pursuant to the non-disclosure agreement, community electricity consumption activity data provided by SCE for the 2019 Community GHG Inventory cannot be disclosed to the public, and as such will not be included in the GHG inventory, or any public facing documents. Due to data retention policies by SCE, data was not available for the 2015 community inventory through the EDRP process. Electricity consumption data for the 2015 community inventory was obtained from the Los Angeles County Chief Sustainability Office, consisting of data that was included as part of the 2019 OurCounty Sustainability Plan for Los Angeles County.[18] This data consists of electricity consumption by customer class in megawatt-hours, which was converted to kWh for consistency with the 2019 Community Inventory data.

GHG emissions associated with electricity consumption are generated at varying rates depending on the electricity provider and CPA Rate Product, and as such, electricity consumption must be attributed appropriately by the varied rates of GHG emission generation. Specifically, electricity purchased from SCE generates GHG emissions at a specific rate, while each Rate Product for electricity purchased from CPA also generate GHG emission at specific rates depending on the amount of renewable and GHG-free electricity included in the electricity source mix. Since the SCE data obtained in 2019 encompasses all electricity consumption in the City, the total electricity purchased by customers from SCE and other direct access third-party providers was assumed to be the difference between the total electricity consumption provided by SCE and CPA. The total electricity provided to customers by direct access third-party providers was not available, and as such, this electricity consumption is assumed to be include in the SCE electricity consumption and is also assumed to generate GHG emissions at a rate similar to SCE electricity.

Due to a lack of reporting of electricity consumption by customer class for CPA data, electricity consumption by customer class in 2019 was estimated based on the percentage of total electricity consumption by residential, commercial, and industrial customers in 2015. It is possible that a smaller number of high-energy consuming commercial customers have opted-out of CPA and continue to purchase electricity from SCE, which would mean a larger proportion of CPA energy consumption is used by residential customers. However, due to customer privacy regulations it is not possible to obtain a detailed breakdown to support this assumption. This estimate of the breakout between consumption for non-residential and residential customers is primarily performed for the purposes of GHG emission forecast. The reporting of GHG emissions in the inventory summary does not breakout by customer class for 2019, as this data is not accurately known and is primarily an estimate for GHG emissions forecasting purposes.

GHG emissions associated with community electricity consumption are calculated using Community Protocol Method BE.2 *Emissions from Electricity Use*. Annual average electricity GHG emission factors used to calculate GHG emissions vary by year, electricity provider, and CPA Rate Product. The SCE electricity GHG emission factors were obtained from the 2017 and 2019 Edison International Sustainability Reports.[19,20] The CPA GHG emission factors for each Rate Product were obtained from the Climate Registry's public Utility-Specific Emission Factors for CPA, which is a third-party verified source.[21] CPA GHG emission factors were provided in form of pounds of CO_2 and

[18] Los Angeles County. 2019. LA County Building Electricity and Natural Gas by Sector by City (2015). https://data.lacounty.gov/Sustainability/LA-County-Building-Electricity-and-Natural-Gas-by-/ca5h-dxi4. Accessed May 16, 2021.

[19] Edison International. 2018. Edison International Sustainability Report 2017. https://www.edison.com/content/dam/eix/documents/sustainability/eix-2017-sustainability-report.pdf. pg. 10. Accessed May 16, 2021.

[20] Edison International. 2020. Edison International Sustainability Report 2019. https://www.edison.com/content/dam/eix/documents/sustainability/eix-2019-sustainability-report.pdf. pg. 12. Accessed May 16, 2021.

[21] The Climate Registry. 2021. CRIS Public Reports. Utility-Specific Emission Factors. https://www.theclimateregistry.org/our-members/cris-public-reports/. Accessed May 16, 2021

converted to MT CO_2 to provide an equivalent reporting metric.[22] Emissions from CH_4 and N_2O were then accounted for by adjusting the emission factors using average total output emission factors for the California grid (i.e., the CAMX eGRID Subregion) from the U.S. EPA Emissions & Generation Resource Integrated Database for 2019 (eGRID2019).[23]

As further detailed in the Community On-road Transportation Inventory Data below, final building electricity GHG emissions were adjusted to exclude the GHG emissions from electric vehicle charging since this is accounted for in the on-road transportation subsector. Specifically, on-road passenger electric vehicle GHG emissions were subtracted from residential electricity GHG emissions.

The (non-adjusted) community electricity consumption activity data, GHG emissions factors, and resulting adjusted and non-adjusted GHG emissions are provided for the year 2015 in Table 4, and for the year 2019 in Table 5.

Table 4 2015 Community Electricity Data and GHG Emissions

Data Type	Value	% of Total (Consumption)	Data Source
Electricity Consumption Activity Data – SCE and Direct Access			
Residential	200,714,500 kWh	35.30%	Los Angeles County. 2019. LA County Building Electricity and Natural Gas by Sector by City (2015). https://data.lacounty.gov/Sustainability/LA-County-Building-Electricity-and-Natural-Gas-by-/ca5h-dxi4. Accessed May 16, 2021.
Commercial	367,176,420 kWh	64.58%	
Industrial	673,731 kWh	0.12%	
Total	**568,564,651 kWh**	**100.00%**	
Electricity GHG Emissions Factor			
SCE Electricity GHG Emission Factor	0.0002345 MT CO_2e/kWh	NA	Edison International. 2018. Edison International Sustainability Report 2017. https://www.edison.com/content/dam/eix/documents/sustainability/eix-2017-sustainability-report.pdf. pg. 10. Accessed May 16, 2021
Electricity GHG Emissions			
Residential	47,068 MT CO_2e	35.30%	Calculated by multiplying the emissions factor and total activity data above.
Commercial	86,103 MT CO_2e	64.58%	
Industrial	158 MT CO_2e	0.12%	
Adjusted Electricity GHG Emissions			
Residential	46,945 MT CO_2e	35.24%	Calculated by subtracting GHG emissions from electricity consumption for electric vehicle charging from residential electricity GHG emissions.
Commercial	86,103 MT CO_2e	64.64%	
Industrial	158 MT CO_2e	0.12%	
Total	**133,206 MT CO_2e**	**100.00%**	

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour; SCE = Southern California Edison

Totals may not add due to rounding.

[22] 2,204.62 lbs = 1 MT

[23] USEPA. 2021. Emissions & Generation Resource Integrated Database (eGRID). eGRID Summary Tables 2019. https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed May 16, 2021.

Table 5 2019 Community Electricity Data and GHG Emissions

Data Type	SCE	CPA – 100% Green Power	CPA – Clean Power	CPA – Lean Power	Data Source
Electricity Consumption Activity Data[1]					
Residential	Redacted[2]	35,512 kWh	103,036,131 kWh	812,204 kWh	Data provided to the City by email from SCE on April 23, 2021. Data provided to the City by email from CPA on April 5, 2021.
Commercial	Redacted[2]	51,797 kWh	150,286,941 kWh	1,184,669 kWh	
Industrial	Redacted[2]	21,909 kWh	63,567,841 kWh	501,087 kWh	
Total	**Redacted[2]**	**109,217 kWh**	**316,890,912 kWh**	**2,497,960 kWh**	
Electricity GHG Emissions Factor					
Emission Factor[3]	0.0002400 MT CO_2e/kWh	0.0000000 MT CO_2e/kWh	0.0001639 MT CO_2e/kWh	0.0002708 MT CO_2e/kWh	The Climate Registry. 2021. CRIS Public Reports. Utility-Specific Emission Factors. https://www.theclimateregistry.org/our-members/cris-public-reports/. Accessed May 16, 2021 Edison International. 2020. Edison International Sustainability Report 2019. https://www.edison.com/content/dam/eix/documents/sustainability/eix-2019-sustainability-report.pdf. pg. 12. Accessed May 16, 2021.
Electricity GHG Emissions					
Residential	*Redacted[2]*	0 MT CO_2e	16,957 MT CO_2e	220 MT CO_2e	Calculated multiplying the emissions factor and total activity data above.
Commercial	*Redacted[2]*	0 MT CO_2e	24,734 MT CO_2e	322 MT CO_2e	
Industrial	*Redacted[2]*	0 MT CO_2e	10,462 MT CO_2e	136 MT CO_2e	
Total	**45,957 MT CO_2e**	**0 MT CO_2e**	**51,938 MT CO_2e**	**676 MT CO_2e**	
Adjusted Total Electricity GHG Emissions					
Total Residential		31,714			Calculated as summing the residential and nonresidential electricity GHG emissions across SCE and CPA and subtracting the GHG emissions associated with electric vehicle charging.
Total Nonresidential[3]		66,522			

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour; MWh = megawatt-hour; SCE = Southern California Edison; CPA = Clean Power Alliance.
Totals may not add due to rounding.
[1] Electricity consumption by customer class was determined by multiplying the total electricity consumption for each Rate Product by the percentage of total electricity consumption in Table 4. Only the total consumption for each Rate Product was provided by CPA, and customer class totals are estimated.
[2] Due to California Public Utilities Commissions customer data privacy regulations and the terms of the associated non-disclosure agreement, electricity consumption data obtained through the Energy Data Request Program cannot be publicly disclosed.
[2] Reported CPA emission factors from CRIS only accounted for CO2 emissions from electricity. The reported emission factors (i.e., 0 MT CO2/kWh for 100% Green Power, 0.000163 MT CO2/kWh for Clean Power, and 0.0002699 MT CO2/kWh for Lean Power) were adjusted to also account for CH_4 and N_2O emissions using total output emission factors (i.e., 0.033 lbs/MWh for CH_4 and 0.004 lbs/MWh for N_2O) from the eGRID2019 and applying the respective GWPs.
[3] Nonresidential includes commercial and industrial electricity consumption.

COMMUNITY ELECTRICITY TRANSMISSION AND DISTRIBUTION LOSSES INVENTORY DATA

When electricity is transported through transmission wires over long distances some of the energy is lost as heat, resulting in transmission losses. Additional energy is lost when electricity is delivered to lower voltage wires for distribution to end users, resulting in distribution losses. The Community Protocols recommend reporting of transmission and distribution (T&D) losses, as this emission source can be reduced through increased distributed energy generation (i.e., solar photovoltaic) by reducing the need for electricity that is transported over long distances.

T&D losses are calculated by applying a grid loss factor to the total electricity consumed in the City, as provided in Table 4 and Table 5, using Community Protocol Method BE.4.1. Total electricity consumption was adjusted to exclude electricity used to charge electric vehicles since these emissions are considered negligible. Specifically, on-road passenger electric vehicle miles traveled (EVMT) electricity was subtracted from the residential electricity activity data. The grid loss factor used to estimate T&D losses was obtained from eGRID 2019, for the WECC California regional grid.[24] GHG emissions from the T&D losses are calculated by multiplying the estimated losses by the appropriate GHG emission factor for eGRID 2019 and 2016.

The community electricity T&D losses activity data, GHG emissions factors, and resulting GHG emissions are provided for the years 2015 and 2019 in Table 6.

Table 6 2015 and 2019 Community Electricity T&D Losses Data and GHG Emissions

Data Type	2015	2019	Data Source
Electricity T&D Losses Activity Data			
Total Electricity Consumption	568,564,651 kWh	510,987,357 kWh	USEPA. 2016. Emissions & Generation Resource Integrated Database (eGRID). eGRID Summary Tables 2016. https://www.epa.gov/egrid/historical-egrid-data. Accessed February 14, 2023. USEPA. 2021. Emissions & Generation Resource Integrated Database (eGRID). eGRID Summary Tables 2019. https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed May 16, 2021.
Adjusted Total Electricity Consumption	568,040,551 kWh	509,244,275 kWh	
Grid Loss Factor	4.23%	5.1%	
Estimated T&D Losses	24,028,115 kWh	25,971,458 kWh	
Electricity GHG Emissions Factor			
eGRID Electricity GHG Emissions Factor[1]	0.0002345 MT CO_2e/kWh	0.000193 MT CO_2e/kWh	Edison International. 2018. Edison International Sustainability Report 2017. https://www.edison.com/content/dam/eix/documents/sustainability/eix-2017-sustainability-report.pdf. pg. 10. Accessed May 16, 2021 2019 electricity GHG emission factor is the weighted average for all providers, as provided in Table 5.
Electricity T&D Losses GHG Emissions			
Total GHG Emissions	5,635 MT CO_2e	5,010 MT CO_2e	Calculated by multiplying the above adjusted activity data, grid loss factor, and emissions factor.

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour; SCE = Southern California Edison; T&D = transmission and distribution losses.

Totals may not add due to rounding.

[1] 2015 T&D Losses use the GHG emission factor for from the 2016 version of eGRID, while the 2019 GHG emission factor uses the 2019 version of eGRID.

[24] USEPA. 2021. Emissions & Generation Resource Integrated Database (eGRID). eGRID Summary Tables 2019. https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf. Accessed May 16, 2021.

COMMUNITY NATURAL GAS INVENTORY DATA

Community natural gas use is based on residential, commercial, and industrial building energy use. Community natural gas consumption data for 2015 and 2019 was obtained from SCG through the EDRP, which was aggregated in the form of total annual therms.[25] Similar to electricity, the data was provided by customer category (i.e., commercial, industrial, and residential). California Public Utilities Commissions (CPUC) aggregation rules are intended to protect customer confidentiality by reducing the possibility of identifying customers through the release of consumption information.[26] Data provided by SCG passed both the 15/20 and 5/25 aggregation rules, is aggregated annually, and assumed to be complete.

Similar to the data provide by SCE through the EDRP, the data provided by SCG also included a non-disclosure agreement was signed by Rincon and the City of Beverly Hills to limit the publication of energy consumption data to protect customer privacy. Pursuant to the non-disclosure agreement, community natural gas consumption activity data provided by the SCG for the 2015 and 2019 community inventories cannot be disclosed to the public, and as such will not be included in the GHG inventory, or any public facing documents.

GHG emissions associated with community natural gas consumption are estimated using Community Protocol Method BE.1.1 Stationary Fuel Combustion based on default emission factors obtained from the United States Environmental Protection Agency (USEPA) Table 1 Emission Factors for Greenhouse Gas Inventories (0.005313 MT CO_2e/therm).[27]

The community natural gas activity data, GHG emissions factors and calculated GHG emissions are provided for the year 2015 and 2019 in Table 7.

Table 7 2015 and 2019 Community Natural Gas Data

Data Type	2015	2019	Data Source
Consumption Total	*Redacted*[1]	*Redacted*[1]	Data provided to the City by email from SCG on March 16, 2021.
Natural Gas Combustion GHG Emission Factor	0.005313 MT CO_2e/therm	0.005313 MT CO_2e/therm	USEPA. 2018. Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021.
GHG Emissions from NG Combustion	78,678 MT CO_2e	89,061 MT CO_2e	Calculated multiplying the emissions factor and total activity data above.

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; NG = natural gas

Totals may not add due to rounding.

[1] Due to California Public Utilities Commissions customer data privacy regulations and the terms of the associated non-disclosure agreement, natural gas consumption data obtained through the Energy Data Request Program cannot be publicly disclosed.

[25] Data provided to the City by email from SCG on March 16, 2021.

[26] Residential, Commercial Consumption Data 15/20 Rule: Aggregated over a group consisting of 15 customers in a single customer class. No single customer accounts for more than 20 percent of the total energy consumption in an individual month. Industrial Consumption Data 5/25 Rule: Aggregated over a group consisting of five customers in a single customer class. No single customer accounts for more than 25 percent of the total energy consumption in an individual month.

[27] USEPA. 2018. Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021.

Municipal Energy (Electricity & Natural Gas) GHG Emission Sources

MUNICIPAL ELECTRICITY INVENTORY DATA

The LGOP recommends reporting scope 2 electricity use emissions from the municipality in the following sub-sectors: 1) streetlights and traffic signals, 2) water delivery facilities, 3) port facilities, 4) airport facilities, 5) vehicle fleet, 6) transit fleet, 7) power generation facilities, 8) solid waste facilities, 9) wastewater facilities, and 10) all other municipality buildings/facilities. Reporting for the 2019 municipal inventory includes streetlights and traffic signals, water delivery facilities, wastewater facilities, and municipal buildings and facilities. The City operates four groundwater pumping wells, water treatment facilities, water delivery and conveyance pumps, and wastewater conveyance pumps. Due to the format of the electricity data provided, it was not possible to disaggregate these end uses completely. As such, the sub-sectors reported for municipal electricity consumption include:

- Streetlights and traffic signals,
- Groundwater pumping facilities,
- Water and wastewater delivery and conveyance, and
- Buildings and facilities.

Beverly Hills does not have port facilities, power generation facilities, solid waste facilities, or operational control over airport facilities, as discussed previously. Additionally, electricity consumption from transit fleet is not reported separately and is included under the buildings and other facilities sector.

In February of 2019, the City began purchasing electricity from CPA at the Clean Energy Rate Product level. With this, the City's municipal electricity accounts were served with electricity that was generated from 50% renewable sources from February to December. Electricity was still being purchased from SCE for the month of January 2019.

Municipal electricity consumption was obtained from SCE in the form of monthly consumption in kWh by service account for the year 2019.[28] Electricity consumption data was provided for each service account, for which consumption was categorized into the appropriate sub-sector by the SCE provided billing rate for the respective account.

GHG emissions associated with municipal electricity consumption were calculated using the recommended method outlined in LGOP Section 6.2 *Electricity Use*. The 2019 GHG emission factor for SCE was used to calculate GHG emissions for electricity consumption for the month of January, and the 2019 GHG emission factor for the CPA Clean Power Rate Product was used to calculate GHG emissions for energy consumption for the remainder of the year. The electricity consumption totals for municipal operations, GHG emission factors, and resulting GHG emissions are provided in Table 8.

[28] Data provided to the City by email from SCE on March 2, 2021.

Table 8 2019 Municipal Electricity Data and GHG Emissions

Data Type	January – SCE	February to December – CPA	Data Source
Electricity Consumption Activity Data[1]			
Streetlights and Traffic Signals	399,959 kWh	2,560,493 kWh	City of Beverly Hills Billing Summary. Data provided to the City by email from SCE on March 2, 2021.
Water Pumping Facilities	32,444 kWh	427,815 kWh	
Water and Wastewater Conveyance and Distribution	66,042 kWh	804,930 kWh	
Buildings and Facilities	988,252 kWh	12,775,292 kWh	
Total	**1,486,697 kWh**	**16,568,530 kWh**	
Electricity GHG Emission Factor			
GHG Emission Factor	0.0002400 MT CO_2e/kWh	0.0001630 MT CO_2e/kWh	See Table 5.
Electricity GHG Emissions			
Total	357 MT CO_2e	2,685 MT CO_2e	Calculated by multiplying the emissions factor and total activity data above.

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour

Totals may not add due to rounding.

MUNICIPAL NATURAL GAS INVENTORY DATA

The City of Beverly Hills is provided natural gas by SCG through the City's municipal natural gas accounts. Municipal natural gas consumption data was provided by SCG in the form of monthly consumption totals by service account in therms.[29] End-use applications of natural gas in buildings and facilities, such as furnaces, are considered a scope 1 emission source. The LGOP recommends reporting stationary combustion emissions from the municipality in the following sectors: 1) water delivery facilities, 2) power generation facilities, 3) solid waste facilities, 4) wastewater facilities, 5) port facilities, 6) airport facilities, and 7) all other municipality buildings/facilities. There are no ports or airports in the City, and the City does not manage solid waste, power generation, or wastewater facilities; and these sources are not included in the natural gas GHG emissions reporting. While the City does have water delivery facilities, natural gas consumption in the data provided is aggregated by municipal account address, and the City's water treatment facility is co-located with the City's Public Works facility. Therefore, all GHG emissions from natural gas consumption are reported under municipal buildings and facilities.

GHG emissions associated with municipal natural gas consumption were calculated using provided total annual consumption and the recommended method outlined in LGOP Section 6.1 *Stationary Combustion*. A default emission factor based on fuel type will be used and obtained from US EPA Emission Factors for Greenhouse Gas Inventories (0.005313 CO_2e/therm).[30] The energy consumption activity data, emissions factor, and calculated municipal GHG emissions from natural gas consumption are provided in Table 9.

[29] Data provided to the City by email from SCG on March 1, 2021.

[30] US EPA. 2018. Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021.

Table 9 2019 Municipal Natural Gas Data and Emissions

Data Type	Value	Data Source
Consumption Buildings and Facilities	54,960 therms	Data provided to the City by email from SCG on March 1, 2021.
Natural Gas Combustion GHG Emission Factor	0.005313 MT CO_2e/therm	USEPA. 2018. Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021.
Natural Gas Combustion GHG Emissions	292 MT CO_2e	Calculated multiplying the emissions factor and total activity data above.

Notes: MT CO_2e = metric tons of carbon dioxide equivalent

Totals may not add due to rounding.

Transportation Sector GHG Emissions Data and Methodology

Transportation GHG emissions are generated by the community and the municipal operations through on-road transportation, use of off-road equipment, and municipal employee commute. Community on-road transportation emissions result from passenger and commercial vehicle trips originating and/or ending in the City of Beverly Hills. Community off-road transportation GHG emissions result from use of various types of off-road equipment, including lawn and garden, commercial and light industrial, construction, and golf carts. GHG emissions from fuel consumed by the municipal fleet, including heavy-trucks, light-trucks, passenger vehicles, and off-road equipment are attributed to municipal operations. Lastly, GHG emissions from employee commute is assessed and attributed to municipal operations.

Community Transportation GHG Emission Sources

COMMUNITY ON-ROAD TRANSPORTATION INVENTORY DATA

On-road transportation-related data for 2015 and 2019 included estimated vehicle miles traveled (VMT) based on Southern California Association of Governments (SCAG) model Trip-Based Travel Demand Model v6.3 from the agency's 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). SCAG's Trip-Based Travel Demand Model analyzes transportation and socioeconomic data such as population, household, and employment, to forecast daily vehicle trips for each traffic analysis zone (TAZ). The model output was post-processed to obtain VMT data consistent with the Senate Bill 375 Regional targets Advisory Committee, which attributes vehicles trips to the City based on trip origin and destination, as follow:

- VMT for trips that originate and end within the City (Internal-Internal, or I-I) is attributed 100% to the City.
- VMT for trips that originate within the City and end outside of the City, or vice versa, (Internal-External, or I-X; and, External-Internal, or X-I) is attributed 50% to the City.
- VMT for pass-through trips that do not being or end in the City (External-External, or X-X) are excluded from City VMT calculations.

Calculations for VMT were completed by Fehr and Peers and provided in the form of a *VMT Analysis in Support of the Beverly Hills CAAP Memorandum*. VMT data was provided in the form of daily VMT, which can be converted to annual VMT using the SCAG average weekday to annual factor of 347 days per year.

GHG emissions due to passenger vehicle travel were calculated using the recommended Community Protocol Method TR.1.A. Because emissions data were not provided, Methods TR.1.B.2 and TR.1.B.3 will be used to convert provided VMT data into emissions data and regional emission factors from CARB's EMFAC2021 model version 1.0.1.[31] EMFAC2021 VMT-based emission rates are based on the vehicle class, model years, speed, and fuel type. A fleet-wide GHG emission factor was used to calculate the mix of vehicle class specific to the City of Beverly Hills determined via the Trip Based SCAG model. Emissions from freight and service trucks (i.e., medium and heavy-duty trucks) were calculated using Community Protocol Method TR.2.C, which is similar to assigning passenger emissions. The activity data, GHG emissions factors and results for community on-road transportation GHG emissions are provided in Table 10.

Table 10 Community On-road Transportation GHG Emissions

Emissions Source	2015	2019	Data Source
On-road Transportation Activity Data			
Passenger Vehicles	1,365,197 Annual VMT	1,378,554 Annual VMT	SCAG Trip-Based Travel Demand Model v6.3.
Commercial Vehicles	39,567 Annual VMT	42,141 Annual VMT	
Total	**1,404,764 Annual VMT**	**1,420,695 Annual VMT**	
GHG Emission Factors			
Passenger Vehicles	0.0003934 MT CO_2e/mile	0.0003662 MT CO_2e/mile	California Air Resources Board. 2021. EMFAC2021 v1.0.1. Online Database. Available: https://arb.ca.gov/emfac/emissions-inventory/91f3161426bf7bed46172f9b24d6b047afed2156.
Commercial Vehicles	0.0013523 MT CO_2e/mile	0.0012946 MT CO_2e/mile	
GHG Emissions			
Passenger Vehicles	186,360 MT CO_2e	175,182 MT CO_2e	Calculated multiplying VMT by the appropriate GHG emission factors.
Commercial Vehicles	18,567 MT CO_2e	18,930 MT CO_2e	
Total	**204,927 MT CO_2e**	**194,112 MT CO_2e**	

Notes: VMT = vehicle miles traveled; MT CO_2e = metric tons of carbon dioxide equivalent.

Totals may not add due to rounding.

In addition to accounting for the total VMT and GHG emissions from on-road vehicle travel, GHG emissions from electricity used for electric vehicle (EV) charging were also considered. While these GHG emissions are already captured under the electricity consumption in the community GHG emissions inventories, it is beneficial to estimate EV charging related GHG emissions and categorize them under the transportation sector. To avoid double counting, these EV charging related GHG emissions are subtracted from the final reported residential electricity consumption GHG emission totals.

The electricity consumption for EV charging was calculated using the outputs of EMFAC2021, where the estimated percent of total VMT that is driven by electric vehicles in Los Angeles County was applied to the VMT for Beverly Hills to get an estimated total VMT for electric vehicles. This VMT was then converted to an estimated electricity consumption based on the EMFAC2021 calculated kilowatt-hours per mile for EVs in Los Angeles County. For the year 2019, the resulting electricity consumption was divided into electricity delivered by CPA and SCE, based on the proportion of total

[31] California Air Resources Board. 2021. EMFAC2021 v1.0.1. Online Database. Available: https://arb.ca.gov/emfac/emissions-inventory/91f3161426bf7bed46172f9b24d6b047afed2156. Accessed November 15, 2021.

electricity supplied to the City by each, 62.5% and 37.5%, respectively In 2015, SCE was the only electricity provider, so all electricity associated with EV charging was supplied by SCE. This electricity consumption was converted to MT CO_2e by multiplying by the appropriate GHG emission factor for the respective electricity provider. The electricity consumption, GHG emission factors, and resulting GHG emissions included in Table 11.

Table 11 Community Electric Vehicle Data and GHG Emissions

Emissions Source	2015	2019	Data Source
Electric Vehicle Electricity Consumption			
Passenger Vehicles – SCE Attributed	523,740 kWh	653,209 kWh	California Air Resources Board. 2021. EMFAC2021 v1.0.1. Online Database. Available: https://arb.ca.gov/emfac/emissions-inventory/91f3161426bf7bed46172f9b24d6b047afed2156.
Passenger Vehicles CPA Attributed	N/A	1,089,873 kWh	
Total	**523,740 kWh**	**1,743,082 kWh**	
GHG Emission Factors			
SCE Electricity	0.0002345 MT CO_2e/kWh	0.0002400 MT CO_2e/kWh	See Table 4 and Table 5. The CPA electricity emission factor is the average of the rate product emission factors, weighted by the total residential electricity consumed at each rate product.
CPA Electricity	N/A	0.0001647 MT CO_2e/kWh	
GHG Emissions from Electric Vehicles			
Passenger Vehicles – SCE	123 MT CO_2e	157 MT CO_2e	Calculated multiplying energy consumption by the appropriate electricity GHG emission factors.
Passenger Vehicles ¬ CPA	N/A	179 MT CO_2e	
Total	**123 MT CO_2e**	**336 MT CO_2e**	

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; N/A = not applicable; SCE = Southern California Edison; CPA = Clean Power Alliance; kWh = kilowatt-hour

Totals may not add due to rounding.

COMMUNITY OFF-ROAD TRANSPORTATION INVENTORY DATA

GHG emissions for the 2015 and 2019 community GHG emissions inventories were calculated using off-road equipment fuel consumption data as modeled by CARB. Activity data was obtained from several CARB recommended off-road models. These included CARB's OFFROAD2017 model which breaks down regional fuel consumption by equipment class, the SORE2020 model for lawn and garden equipment and transportation refrigeration units, and RV2018 for recreational vehicle data.[32] These models were run for Los Angeles County for the inventory years to obtain fuel consumption for gasoline, diesel, and natural gas/liquefied petroleum gas and then apportioned to Beverly Hills by growth metrics for each of the included years, consistent with the 2019 GHG Emissions Inventory. Outputs from each of these models were used based on the relevant sector they pertained to. The equipment sectors drawn from each model are shown in Table 12.

[32] The off-road emissions models are available through the CARB Mobile Source Emissions Inventory division Modeling Tools, at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools.

Table 12 Off-road Model Activity Data Sources

OFFROAD2017 Model:	RV2018 Model:	SORE2020 Model
▪ Construction and Mining Equipment ▪ Light Commercial Equipment	▪ Recreational Vehicles	▪ Lawn and Garden Equipment ▪ Transport Refrigeration Units

The metrics used to attribute off-road activity and calculate resulting emissions to the City of Beverly Hills are included in Table 13 below. The fuel consumption data and apportionment metrics for the City of Beverly Hills used to calculate GHG emissions from community off-road activity are provided in Table 14. Finally, the GHG emissions calculated from using the activity data and attribution metrics are provided in Table 15.

Table 13 2015 and 2019 Off-Road Apportionment Metrics

Attribution Metric	2015	2019
Beverly Hills Demographics Data		
Population	34,627	34,767
Jobs	74,266	75,402
Service Population	108,893	110,169
Los Angeles County Demographics Data		
Population	10,036,092	10,333,079
Jobs	4,719,639	4,814,694
Service Population	14,755,731	15,147,773
Percent of County Totals in Beverly Hills		
Population	0.35%	0.34%
Jobs	1.57%	1.57%
Service Population	0.74%	0.73%

Date Source: SCAG. 2020. Connect SoCal: Demographics and Growth Forecast. Available:https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579. Accessed November 18, 2021.

Note about data source: The growth forecasts in the above source are only provided for specific years. A more detailed breakdown of the growth forecasts for interim years was provided by SCAG through email.

Table 14 2015 and 2019 Community Off-road Activity Data

Equipment Type	Apportionment Metric	Fuel Type	2015 (gallons)	2019 (gallons)
Construction and Mining	Jobs	Diesel	538,747	590,338
		Gasoline	44,242	43,619
Light Commercial	Jobs	Diesel	54,483	53,473
		Gasoline	230,258	224,348
		Natural Gas (LPG)	51,730	50,997
Transportation Refrigeration Units	Jobs	Diesel	539	567
		Gasoline	8,991	8,904
Recreational Vehicles	Population	Gasoline	1,614	1,613
Lawn and Garden	Service Population	Diesel	3,342	3,530
		Gasoline	175,489	188,061

Data Source: California Air Resources Board. 2021. OFFROAD2021 v1.0.1 Emissions Inventory . Available: https://arb.ca.gov/emfac/emissions-inventory/b3e3139ff7a2304c48acb2a0684ab41b38c5c26e. Accessed November 30, 2021.

Notes: LPG = liquefied petroleum gas

Table 15 2015 and 2019 Community Off-road GHG Emissions

Equipment Type	Fuel Type	2015 (MT CO_2e)	2019 (MT CO_2e)
Construction and Mining	Diesel	5,571	6,104
	Gasoline	401	396
Light Commercial	Diesel	563	553
	Gasoline	2,096	2,042
	Natural Gas (LPG)	300	296
Transportation Refrigeration Units	Diesel	6	6
	Gasoline	82	81
Recreational Vehicles	Gasoline	15	15
Lawn and Garden	Diesel	35	37
	Gasoline	1,599	1,714
Total Off-road GHG Emissions	**Diesel**	**6,174**	**6,700**
	Gasoline	**4,193**	**4,247**
	Natural Gas (LPG)	**300**	**296**
Total Off-road GHG Emissions (all fuels)		**10,667**	**11,242**

Notes: LPG = liquefied petroleum gas; MT CO_2e = metric tons of carbon dioxide equivalent
Totals may not add up due to rounding.

Municipal Transportation GHG Emission Sources

MUNICIPAL FLEET INVENTORY DATA

LGOP recommends reporting local government's vehicle fleet emission as two sectors: 1) transit fleet and 2) all other fleet vehicles (on-road and off-road equipment). The City of Beverly Hills operates and owns numerous pieces of on-road fleet vehicles and off-road equipment. LGOP also recommends reporting emissions from employee commute and employee business travel as a scope 3 emission sources.

The City of Beverly Hills provided fuel consumption totals for the year 2019 for renewable diesel and gasoline for the City's vehicle and equipment fleet.[33] The vehicle fleet also utilizes renewable natural gas, which is metered by SCG.[34] GHG Emissions will be calculated using LGOP Method 7.1.1.1, with fuel specific emission factors obtained from USEPA Emission Factors for Greenhouse Gas Inventories.[35] The table below, Table 16, contains data for the municipal fleet's fuel consumption, emissions factors used in calculations, and the calculated GHG emissions values.

[33] Data provided to the City by email on July 6, 2021.

[34] Data provided to the City by email from SCG on March 1, 2021.

[35] USEPA. 2018. Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021.

Table 16 2019 Municipal Fleet Fuel Consumption, Emissions Factors, and GHG Emissions

Year	Value	Data Source
Municipal Fleet Fuel Consumption		
Unleaded Gasoline	144,086 gal	Unleaded gasoline and biodiesel fuel consumption data provided by email from the City of Beverly Hills Fleet and Facilities Manager on July 9, 2021. Natural gas data provided to the City by email from SCG on March 1, 2021.
Bio-Diesel	38,493 gal	
Renewable Natural Gas	143,825 therm	
CO_2 Emissions Factors		
Unleaded Gasoline	8.78 kg CO_2/gal	USEPA – Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021
Bio-Diesel	0 kg CO_2/gal	
Renewable Natural Gas	0 kg CO_2/gal	
CH_4 Emissions Factors		
Unleaded Gasoline	0.38 g CH_4/gal	USEPA – Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021
Bio-Diesel	0.41 g CH_4/gal	
Renewable Natural Gas	0.1 g CH_4/gal	
N_2O Emissions Factors		
Unleaded Gasoline	0.08 g N_2O/gal	USEPA – Emission Factors for Greenhouse Gas Inventories. https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf. Accessed May 16, 2021
Bio-Diesel	0.08 g N_2O/gal	
Renewable Natural Gas	0.01 g N_2O/gal	
GHG Emissions		
Unleaded Gasoline	1,270 MT CO_2e	Calculated multiplying fuel consumption by the appropriate GHG emission factors and GWP, and then converting all units to metric tons.
Bio-Diesel	1.3 MT CO_2e	
Renewable Natural Gas	0.8 MT CO_2e	
Total GHG Emissions	**1,271 MT CO_2e**	

Notes: MT CO2e = metric tons of carbon dioxide equivalent. CO_2 = carbon dioxide, N_2O = nitrous oxide, CH_4 = methane; Gal = gallons

Totals may not add due to rounding.

Bio-Diesel and Renewable Natural Gas emissions account for only methane and nitrous oxide. The carbon dioxide emissions associated with renewable fuel combustion are considered as "biogenic" and are not counted towards emissions totals.

MUNICIPAL EMPLOYEE COMMUTE INVENTORY DATA

The municipal inventory also includes an estimate of GHG emissions from employee commute patterns, based on the results of the 2019 South Coast Air Quality Management District (SCAQMD) Rule 2022 Employee Commute Survey.[36] The City of Beverly Hills's employee commute survey was distributed to City employees in 2019, with approximately 550 responses, demonstrating the commute mode of approximately 95% of the City's employees. The results of the survey provided the number of weekly vehicle commute trips by City employees in a single-occupancy vehicle trip equivalent, which was 1,762.67 trips per week.[37] The commute distance for employees was obtained by employee commute survey results that included the home zip code of commuting employees, which was used to calculate the approximate distance that each employee travels to and from work each day. An average trip length of 13.75 miles was calculate for the zip code data, which when

[36] 2019 SCAQMD Rule 2022 Employee Commute Survey Results. Provided on January 26, 2021.

[37] The single-occupancy vehicle trip equivalent excludes public transit trips, active transportation trips, and zero-emission vehicle trips; and discounts carpool trips.

multiplied by the number of trips results in approximately 24,241 VMT per week.[38] This value can then be converted to annual VMT, assuming 48 work weeks per year, resulting in approximately 1,163,577 VMT per year associated with employee commute. GHG emissions will be calculated from employee commute VMT using the appropriate passenger vehicle emission factors from EMFAC2017 VMT-based emission rates. Employee commute is a scope 3 emission source.

The activity data used to calculate employee commute GHG emissions, and the resulting emissions values, are provided below in Table 17.

Table 17 2019 Employee Commute Data and GHG Emissions

Employee Commute	Value	Data Source
Average Weekly SOV Trips	1,762.67 trips	2019 SCAQMD Rule 2022 Employee Commute Survey Results. Provided on January 26, 2021.
Average Trip Length	13.75 miles	California Air Resources Board. 2021. EMFAC2021 v1.0.1. Online Database. Available: https://arb.ca.gov/emfac/emissions-inventory/91f3161426bf7bed46172f9b24d6b047afed2156.
Average Weekly VMT	24,241 VMT	
Work Weeks per Year[2]	48 weeks	
Annual VMT	1,163,577 VMT	
GHG Emission Factor	0.000339067 MT CO_2e/mile	
Total GHG Emissions	**699 MT CO_2e**	

Notes: VMT = vehicles miles traveled; SOV = single-occupancy vehicle; MT CO_2e = metric tons of carbon dioxide equivalent

Totals may not add due to rounding.

[1] The specific fuel type of vehicles was not available in the data provided. Therefore, the fuel type of vehicle was estimated based on their use.

[2] An estimate of 48 work weeks per year accounts for 2 weeks of holiday time and an additional 2 weeks of vacation time per year.

Water and Wastewater GHG Emissions Data and Methodology

GHG emissions associated with water consumption are related to the energy used for water conveyance, treatment, and distribution. Similarly, emissions associated with wastewater generation are related to the energy associated with the treatment and collection of wastewater, as well as fugitive emissions related to the treatment process. This section discusses the data sources and calculation methodology used to calculate GHG emissions from water and wastewater in the community and municipal GHG inventory.

Community Water Consumption GHG Emissions Sources

The City of Beverly Hills' water supply comes from the locally pumped groundwater and Metropolitan Water District (MWD). In 2015 and 2019, all water consumed in the City was obtained from MWD, as the Beverly Hills Water Treatment Plant was not in operation. Water consumption data to be used for calculating 2019 community GHG emissions was provided in the form of monthly

[38] An average trip length was calculated from the VMT analysis included in Attachment A. The 2019 value for VMT in Table 1 was divided by the 2019 value for total trips in Table 2.

water delivered to customers for 2019.[39] Data used to calculate GHG emissions for 2015 was obtained from the City's 2015 Urban Water Management Plan (UWMP).[40]

The amount of energy required for community water consumption will be determined following Community Protocol Method WW.14 and using specific energy intensity factors for MWD. The energy intensity of treated water delivered by MWD was obtained from the MWD 2020 UWMP.[41]

GHG emission were calculated by applying the appropriate GHG emission factors for electricity to the energy used in each aspect of the water supply cycle. The energy consumption included in the MWD water supply occurs outside of the City boundaries; therefore, the GHG emissions associated with energy consumed in the MWD treated water supply will be calculated using the appropriate eGRID GHG emission factors. Specifically, the WECC California grid emission factors obtained from eGRID 2016 and eGRID 2019 will be used for the 2015 and 2019 inventory years, respectively.

The water consumption totals, energy intensities of the water supply, and calculated community GHG emissions calculations are provided in Table 18.

Table 18 Community Water Consumption, Energy Intensity Data, and GHG Emissions

Data Type	2015	2019	Data Source
MWD Imported Water Consumption	3,399.28 MG	2,923.71 MG	City of Beverly Hills. 2016. 2015 Urban Water Management Plan. https://www.beverlyhills.org/cbhfiles/storage/files/115079846772769831/FinalCityofBeverlyHills2015UWMPReport.pdf. pp. 6-2. Accessed May 16, 2021. Master Water Delivered Data. Provided by email on February 17, 2021.
MWD Imported Water Energy Intensity	5,948 kWh/MG	5,948 kWh/MG	Metropolitan Water District. 2020. 2020 Urban Water Management Plan. page A.10.7. http://www.mwdh2o.com/PDFUWMP/2020%20Urban%20Water%20Management%20Plan%20-%20June%202021.pdf. Accessed June 13, 2021
MWD Imported Water GHG Emission Factor	0.0002404 MT CO_2e/kWh	0.0002065 MT CO_2e/kWh	USEPA. 2019. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/egrid/emissions-generation-resource-integrated-database-egrid. USEPA. 2017. Emissions & Generation Resource Integrated Database (eGRID). eGRID Summary Tables 2016. https://www.epa.gov/sites/production/files/2018-02/egrid2016_summarytables.xlsx.
Total Annual GHG Emissions	**4,396 MT CO_2e**	**3,452 MT CO_2e**	Calculated multiplying the above water consumption, energy intensity, and the GHG emissions factor.

Notes: MG = million gallons; kWh = kilowatt-hour; MT CO_2e = metric tons of carbon dioxide equivalent

Totals may not add due to rounding.

[39] Master Water Delivered Data. Provided by email on February 17, 2021.

[40] City of Beverly Hills. 2016. 2015 Urban Water Management Plan. https://www.beverlyhills.org/cbhfiles/storage/files/115079846772769831/FinalCityofBeverlyHills2015UWMPReport.pdf. pp. 6-2. Accessed May 16, 2021.

[41] Metropolitan Water District. 2020. 2020 Urban Water Management Plan. page A.10.7. http://www.mwdh2o.com/PDFUWMP/2020%20Urban%20Water%20Management%20Plan%20-%20June%202021.pdf. Accessed June 13, 2021

Community Wastewater Generation GHG Emissions Sources

The City collects sanitary wastewater flows within the City via a City sewer system that conveys the flows to trunk sewers operated and maintained by the Los Angeles Bureau of Sanitation. The trunk sewers convey the wastewater to the Hyperion Wastewater Reclamation Plant (HWRP) that is owned by the City of Los Angeles and operated by the Los Angeles Bureau of Sanitation.[42] Methodologies used to calculate GHG emissions are dependent on the processes occurring at the treatment facility.[43] Accordingly, the following assumptions were made based on information about the HWRP:

- Stationary combustion of digestor gas occurs at the HWRP.
- Anaerobic digestion of solids occurs at HWRP.
- HWRP does not have a nitrification or denitrification phase.
- Fossil-fuel-derived methanol is not used for biological nitrogen removal.
- Effluent is discharged into an ocean environment with minimal industrial inputs from Beverly Hills.
- The entire population of Beverly Hills is served by HWRP.
- Centralized treatment at HWRP is the primary form of wastewater treatment in Beverly Hills, and on-site septic treatment is used minimally or not at all.[44]

Based on the above assumptions, GHG emissions for process and fugitive emissions from wastewater treatment were calculated using Community Protocols Methods WW.1.(alt) WW.2.(alt), WW.8.(alt), and WW.12.(alt); with the primary data input being population served. Community Protocol Method WW.15 was used to determine the amount of energy used for wastewater conveyance and treatment, using the energy intensity factor reported for Los Angeles County Sanitation District of 1,577 kilowatt-hours per million gallons (kWh/MG).[45] The conveyance and treatment of wastewater occurs primarily outside of the City of Beverly Hills boundaries; therefore, GHG emissions from electricity used in wastewater conveyance and treatment use the appropriate eGRID emission factors for 2015 and 2018.

The wastewater generation totals, energy intensities, City specific factors used for community wastewater GHG emissions calculations, and calculated GHG emission totals are provided in Table 19.

[42] City of Beverly Hills. 2016. 2015 Urban Water Management Plan. https://www.beverlyhills.org/cbhfiles/storage/files/11507984672769831/FinalCityofBeverlyHills2015UWMPReport.pdf. pp. 6-2. Accessed May 16, 2021.

[43] Wastewater treatment technology specifications can vary widely between jurisdictions, as a result of process specifics, influent characteristics, and the age of infrastructure. As noted in the Community Protocols, the wastewater emissions calculation methodologies used here were designed as a generalized top-down approach for countries where detailed information was not available; they are a simplified approach that sacrifice accuracy. These methods have a range of accuracy for CH_4 emissions of +37% to -47% and +76% to -93% for N_2O, compared to direct source measurements. While there is significant uncertainty in the fugitive and process emissions associated with wastewater treatment, providing estimates of their emissions provides a general understanding of the magnitude of this emission source in comparison to others.

[44] City of Los Angeles. Hyperion Water Reclamation Plant. https://www.lacitysan.org/san/faces/home?_adf.ctrl-state=pu8etyzyn_5&_afrLoop=10096259410058748#!. Accessed May 16, 2021.

[45] California Public Utilities Commission (CPUC). 2010. Embedded Energy in Water Studies; Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles. http://www.cpuc.ca.gov/general.aspx?id=4388. Accessed May 16, 2021.

Table 19 Community Wastewater Generation Data and GHG Emissions

Data Type	2015	2019	Data Source
Wastewater Generation Population Served	39,567 persons	42,141 persons	California Department of Finance. E-5 Population and Housing Estimates. http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/. Accessed May 16, 2021.
Collection and Treatment Energy Intensity	1,577 kWh/MG	1,577 kWh/MG	California Public Utilities Commission (CPUC). 2010. Embedded Energy in Water Studies; Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles. Appendix B – Agency Profiles. http://www.cpuc.ca.gov/general.aspx?id=4388. Accessed May 16, 2021.
GHG Emissions Factor	0.0002404 MT CO_2e/kWh	0.0002065 MT CO_2e/kWh	USEPA. 2019. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/egrid/emissions-generation-resource-integrated-database-egrid. USEPA. 2017. Emissions & Generation Resource Integrated Database (eGRID). eGRID Summary Tables 2016. https://www.epa.gov/sites/production/files/2018-02/egrid2016_summarytables.xlsx.
Annual GHG Emissions Process and Fugitive GHG Emissions	604 MT CO_2e	607 MT CO_2e	Calculated using the above activity data and ICLEI WW.1. (alt) WW.2.(alt), WW.8.(alt), and WW.12.(alt) methodology.
Collection and Treatment GHG Emissions	690 MT CO_2e	430 MT CO_2e	
Total Wastewater Emissions	**1,295 MT CO_2e**	**1,037 MT CO_2e**	

Notes: MG = million gallons; kWh = kilowatt-hour; MT CO_2e = metric tons of carbon dioxide equivalent
Totals may not add due to rounding.

Municipal Water Consumption GHG Emissions Sources

As discussed previously, the City of Beverly Hills' water supply came exclusively from MWD in 2015 and 2019. Water consumption data was provided by MWD for all municipal accounts, which includes water used for fire operations.[46] Total indirect emissions from electricity use from water consumption at City facilities were calculated using Community Protocol Method WW.14 and using specific energy intensity factors for MWD. The energy consumption included in the MWD water supply occurs outside of the City boundaries; therefore, the GHG emissions associated with energy consumed in the MWD treated water supply will be calculated using the appropriate eGRID GHG emission factor.

Table 20 provides the total water consumption by municipal facilities, the average energy intensity of the water supply, the electricity GHG emission factor, and calculated GHG emission totals.

[46] Master Water Delivered Data. Provided by email on February 17, 2021.

Table 20 2019 Municipal Water Consumption, Energy Intensity, and GHG Emissions

Data Type	Value	Data Source
Municipal Water Consumption Total Municipal Consumption	42 MG	Master Water Delivered based on data reporting from the water utility service provider by email from City of Beverly Hills on February 17, 2021.
Energy Intensity MWD Imported Water	8 kWh/MG	Metropolitan Water District. 2020. 2020 Urban Water Management Plan. page A.10.7. http://www.mwdh2o.com/PDFUWMP/2020%20Urban%20Water%20Management%20Plan%20-%20June%202021.pdf. Accessed June 13, 2021
GHG Emissions Factor MWD Imported Water	02065 MT CO_2e/kWh	USEPA. 2019. Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/egrid/emissions-generation-resource-integrated-database-egrid.
Annual GHG Emissions	**MT CO_2e**	Calculated multiplying the above water consumption, energy intensity, and the GHG emissions factor.

Notes: MG = million gallons; kWh = kilowatt-hour; MT CO_2e = metric tons of carbon dioxide equivalent
Totals may not add due to rounding.

[1] Water consumption attributed to local groundwater will not be added to emissions totals due to risk of double counting with GHG emissions captured in municipal energy consumption.

Solid Waste Sector GHG Emissions Data and Methodology

GHG emissions from solid waste include methane generated by the decay of organic material, collection and transport of waste, fuel consumption in landfilling equipment, and combustion of waste in waste-to-energy facilities. Solid waste generated by the community is sent to multiple landfilling and processing facilities by Athens Services. Methane emissions from waste decay represent the "methane commitment" of disposed waste generated in the inventory year, even though these emissions will occur throughout the time-period over which the waste decays.

Community Solid Waste GHG Emissions Sources

Community waste disposal data was obtained through a Los Angeles County historical waste disposal tonnage report, which provides the total waste sent to landfill by the City of Beverly Hills in 2015 and 2019.[47] The Beverly Hills community generated 41,171 and 46,912 tons of waste sent to landfill in 2015 and 2019, respectively. The recommended GHG emissions calculation methodologies are Community Protocol Methods SW.4, SW.5, and SW.7 for emissions associated with methane emissions from waste sent to landfills, landfilling process emissions and waste sent to combustion facilities, respectively. The landfill gas (LFG) capture rate of a destination landfill contributes significantly to the methane emissions generated by waste disposal. While many of the destination landfills report having LFG capture, the availability of accurate data representing current LFG capture rates is limited; therefore, the Community Protocol recommended default LFG capture rate of 75% was used for emission calculations. GHG emissions generated by waste collection and transport are not included in this sector, as they are accounted from in community VMT in the on-road transportation sector.

The waste generation totals and calculated community solid waste GHG emissions are provided in Table 21.

[47] Los Angeles County Public Works. Historical Disposal Tonnage for All In-County Jurisdictions. Provided by email on May 20, 2021.

Table 21 Community Solid Waste Data and GHG Emissions

Data Type	2015	2019	Data Source
Community Waste Generation Waste Landfilled	41,171 tons	46,912 tons	Los Angeles County Public Works. Historical Disposal Tonnage for All In-County Jurisdictions. Provided by email on May 20, 2021.
Annual GHG Emissions (emissions from waste decomposition and process emissions)	**13,474 MT CO_2e**	**15,352 MT CO_2e**	Calculated using the above activity data and ICLEI Methods SW.4, SW.5, and SW.7.

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Totals may not add due to rounding.

Municipal Solid Waste GHG Emissions Sources

GHG emissions associated with generation of solid waste in City-operated facilities are a scope 3 emission source. Waste generation data specific to municipal facilities and operations was provided by the City in the form of total tonnage hauled from municipal facilities by the waste service provider, Athens, which showed a total municipal waste generation of 353.49 tons in 2019.[48] The LGOP does not provide a recommended calculation methodology for this emission source; therefore, Community Protocol Method SW.4 was used to calculate emissions associated with municipal waste generation. A characterization of the municipal waste stream was not available; therefore, it is conservatively assumed that the waste is similar to the average waste stream used for Community Protocol Method SW.4.

The waste generation totals and calculated municipal solid waste GHG emissions are provided in Table 22.

Table 22 Municipal Solid Waste Data and GHG Emissions

Data Type	Value	Data Source
Municipal Waste Generation Waste Landfilled	353.49 tons	Data provided by the City of Beverly Hills by email on May 11, 2021.
Annual GHG Emissions (emissions from waste decomposition)	**134 MT CO_2e**	Calculated using the above activity data and ICLEI Method SW.4.

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Totals may not add due to rounding.

Carbon Sequestration

As part of the 2019 Community GHG Inventory the carbon sequestration value of the trees in the City's right-of-way was calculated based on the tree inventory conducted to inform the in progress Urban Forest Management Plan. The tree inventory included a detailed assessment of each tree in the City's right-of-way, including the specie, height and diameter at breast height (DBH), which was last updated in January 2020.[49] This assessment includes all trees managed by the City. To calculate the associated carbon sequestration value, the average DBH of tree species in the City was entered into the i-Tree Planting Calculator version 2.1.2 to obtain an annual carbon sequestration value.[50] The i-Tree Planting Calculator estimates the long-term environmental benefits from a tree planting

[48] Data provided by the City of Beverly Hills by email on May 11, 2021.

[49] Tree inventory provided by the City of Beverly Hills on March 18, 2021.

[50] I-Tree Planting Calculator. https://planting.itreetools.org/. Accessed May 16, 2021.

project, with carbon dioxide sequestration values derived from species-based biomass equations based on tree characteristics.[51] This annual carbon sequestration value will reduce the City's overall community GHG emissions and highlight the value of preserving the urban forest. Table 23 below contains the data used for carbon sequestration analysis and the resulting GHG emissions.

Table 23 Carbon Sequestration Data, Assumptions, and GHG Emissions

Data Type	2019	Data Source
Species Identified	298 species	Tree inventory data in the Urban Forest Management Plan, provided by the City of Beverly Hills.
Total Tree Count (all species)	27,045 trees	
Tree Lifespan assumption	40 years	I-Tree Planting Calculator. https://planting.itreetools.org/. Accessed May 16, 2021.
Total Annual CO_2 Sequestered	**1,817 MT CO_2**	Calculated from I-Tree I-Tree Planting Calculator. https://planting.itreetools.org/. Accessed May 16, 2021.

Notes: MT CO_2 = metric tons of carbon dioxide
Totals may not add due to rounding.

2.4 2015 and 2019 Community GHG Inventory Results

The 2015 and 2019 community GHG inventories provide the total GHG emissions resulting from activities occurring within, or attributable to the community within the City of Beverly Hills. The results will be used to estimate future GHG emissions and set GHG reduction targets that align with state legislation. Community GHG emissions are reported by emission sector, consistent with the CARB 2017 Climate Change Scoping Plan and the ICLEI Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, which include energy, transportation, water, and solid waste.[52]

Due to California Public Utilities Commission data privacy rules, data acquired through the Southern California Gas Energy Data Request Program cannot be published or publicly disclosed. As such, natural gas data had been aggregated into one GHG emissions source. This natural gas GHG emissions source includes both residential and non-residential consumption. The disaggregated data will be used for the development of GHG reduction measures; however, this data must be aggregated into one source for public facing documents.

2015 Community GHG Emissions Inventory Results

In 2015, the City of Beverly Hills generated approximately 452,399 MT CO_2e. The results of the 2015 community GHG inventory update show the transportation and energy sector GHG emission sources generated nearly equivalent total GHG emissions, contributing 48% and 48%, respectively to the 2015 GHG emissions total. Solid waste and water sector emission sources contributed 3% and

[51] I-Tree Planting Calculator. References. https://planting.itreetools.org/references/. Accessed May 16, 2021.

[52] There are primary sectors from the 2017 Scoping Plan that are excluded from the 2019 Community inventory. Agriculture sector is excluded because there are not significant agricultural activities in Beverly Hills. Industrial emission sources are excluded because GHG emission from these emission sources are regulated by the state under the Mandatory GHG Reporting Program and the Cap-and-Trade Program. High-GWP sector emissions are also excluded due to a lack a reliable community-wide data set encompassing these emission sources.
California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf?utm_medium=email&utm_source=govdelivery. Accessed August 12, 2021.

1% of total 2015 GHG emissions, respectively. The results of the 2015 community GHG inventory are provided in Figure 1 as they relate to the GHG emission sector, and Table 24 as they pertain to GHG emission sector and the associated emission sources.

Figure 1 2015 Community GHG Emissions Inventory Results

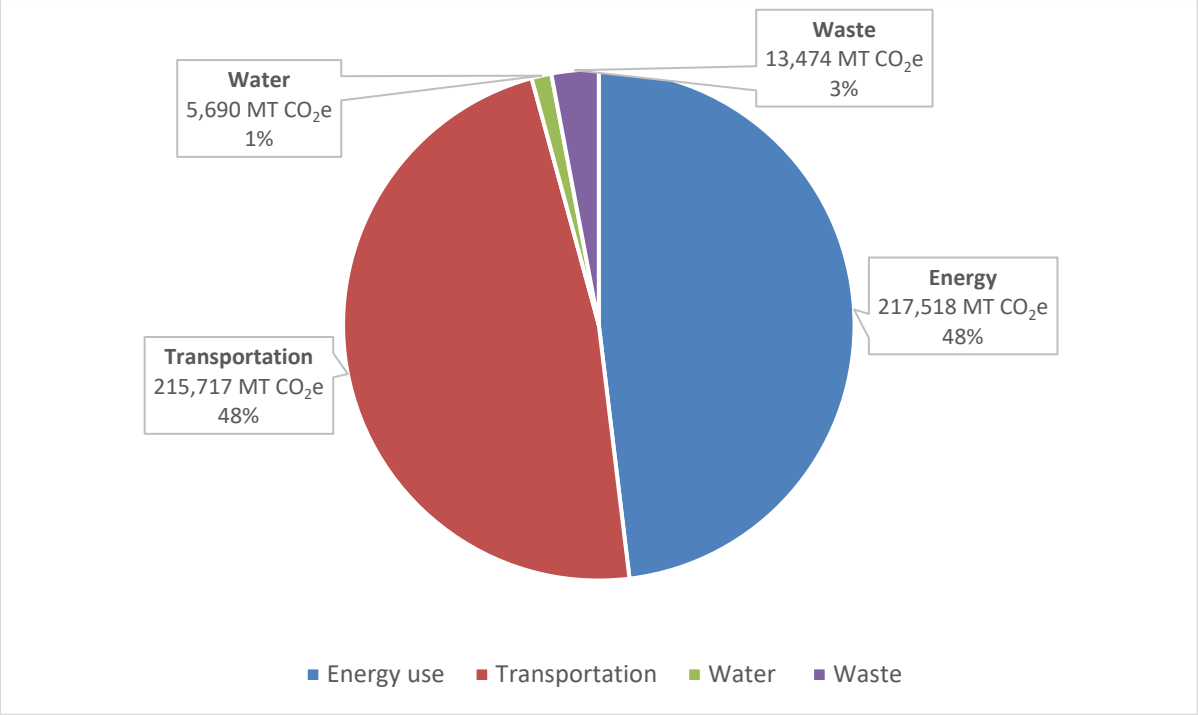


Table 24 Updated 2015 Community GHG Emissions Inventory Results

Sector/Emission Source	GHG Emissions (MT CO_2e)	Percentage of Total Emissions
Energy	**217,518**	**48%**
Non-Residential Electricity Consumption[1]	86,261	19%
Natural Gas	78,678	17%
Residential Electricity Consumption[2]	46,945	10%
Electricity Transmission and Distribution Losses[3]	5,635	1%
Transportation	**215,717**	**48%**
Passenger On-road Vehicles	186,360	41%
Electric Vehicle Charging	123	<1%
Commercial On-road Vehicles	18,567	4%
Off-road Equipment	10,667	2%
Solid Waste[4]	**13,474**	**3%**
Waste Sent to Landfill	13,021	3%
Landfilling Process Emissions	453	<1%
Water	**5,690**	**1%**
Imported Potable Water Supply	4,396	1%
Wastewater Treatment Process and Fugitive Emissions	604	<1%
Wastewater Collection and Treatment Energy	690	<1%
Cumulative Emissions	**452,399**	**100%**

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent

Totals may not add due to rounding.

[1] Non-residential electricity consumption GHG emission totals include commercial and industrial customer class electricity consumers.

[2] Residential electricity consumption GHG emission total has been adjusted to remove the used for electric vehicle charging, which is accounted for in the transportation sector.

[3] GHG emissions from the from transmission and distribution loss associated with the electricity consumption for electric vehicles charging have been excluded.

[4] GHG emissions generated by the collection and transport of waste generated within the City are captured in the Commercial On-road Vehicle source in the Transportation sector.

2019 Community GHG Emissions Inventory Results

In 2019, the City of Beverly Hills generated approximately 417,839 MT CO_2e, with an estimated annual sequestration of carbon of 1,817 MT CO_2, resulting in a net generation of 416,022 MT CO_2e. The City of Beverly Hills 2019 community GHG emissions were largely dominated by the transportation sector emission sources generating 49% of the City's total GHG emissions, with energy being the second largest source, generating 46% of the City's total GHG emissions. Solid waste and water sector emissions made a much smaller contribution to overall GHG emissions, at 4% and less than 1%, respectively. The results of the 2019 community inventory are provided in Figure 2 and Table 25.

Figure 2 2019 Community GHG Emissions Inventory Results

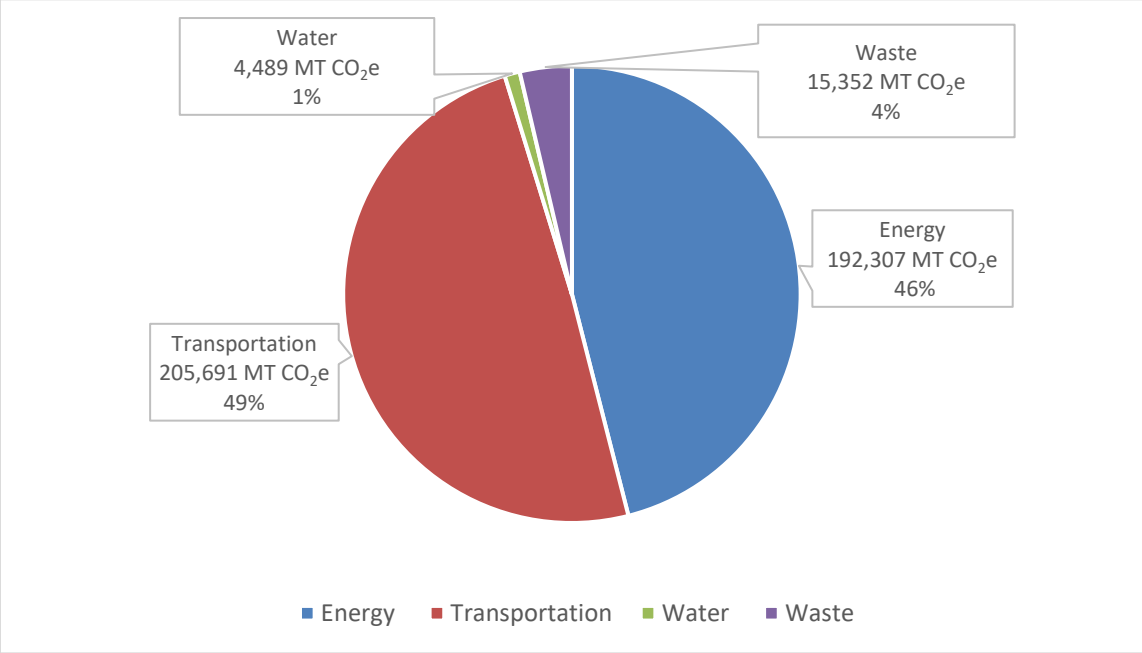


Table 25 2019 Community GHG Emissions Inventory Results

Sector/Emission Source	GHG Emissions (MT CO_2e)	Percentage of Total
Energy	**192,307**	**46%**
Electricity Consumption – CPA[1]	52,435	14%
Electricity Consumption – SCE[1]	45,801	13%
Natural Gas	89,061	24%
Electricity Transmission and Distribution Losses[2]	5,010	1%
Transportation	**205,691**	**49%**
Passenger On-road Vehicles	175,182	42%
Electric Vehicle Charging – CPA	179	<1%
Electric Vehicle Charging – SCE	157	<1%
Commercial On-road Vehicles	18,930	5%
Off-road Equipment	11,242	3%
Solid Waste[3]	**15,352**	**4%**
Waste Sent to Landfill	14,836	4%
Landfilling Process Emissions	516	<1%
Water	**4,489**	**1%**
Imported Potable Water Supply	3,452	1%
Wastewater Treatment Process and Fugitive Emissions	607	<1%
Wastewater Collection and Treatment Energy	430	<1%
Carbon Sequestration[4]	**(1,817)**	**-<1%**
Cumulative Emissions	**416,022**	**100%**

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent; CPA = Clean Power Alliance; SCE = Southern California Edison

Totals may not add due to rounding.

[1] Electricity consumption GHG emission total has been adjusted to remove the emissions from electric vehicle charging, which is accounted for in the transportation sector.

[2] GHG emissions from the from transmission and distribution loss associated with the electricity consumption for electric vehicles charging have been excluded.

[3] GHG emissions generated by the collection and transport of waste generated within the City are captured in the Commercial On-road Vehicle source in the Transportation sector.

[4] The carbon sequestration is calculated from the trees in the City's right-of-way.

2.5 GHG Emissions Reduction Progress Since 2015

Between the years 2015 and 2019, the City of Beverly Hills has reduced its GHG emissions by a total of 8%. The majority of these GHG emissions reduction occurred in the energy sector through a reduction in overall electricity consumption and increased availability of renewable electricity through participation in the Clean Power Alliance (CPA). The water sector also experienced a relatively significant 21% GHG emissions reduction through an overall reduction in water consumption city-wide. The transportation sector experienced a slight decrease in GHG emissions of five percent, through improved fuel efficiency standards, while the solid waste sector had a 14% increase in GHG emissions, attributable to an increase in waste generation in the City. Table 26 and Figure 3 provide an overview of the GHG emissions reduction in each community GHG emission source and sector between 2015 and 2019.

Table 26 GHG Emissions Reduction between 2015 and 2019

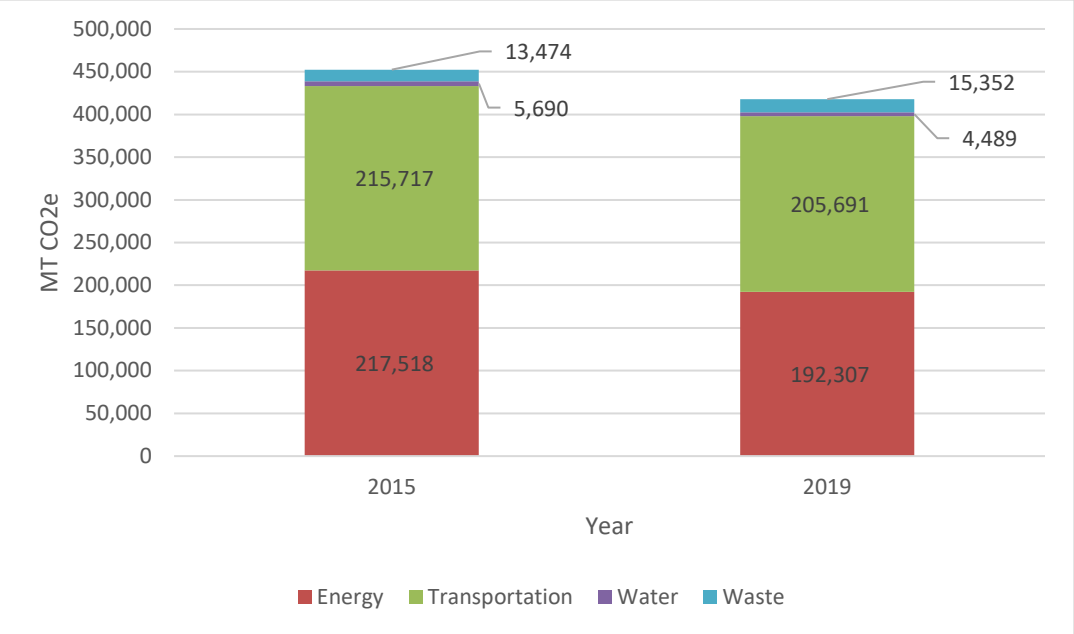
Sector/Emission Source	2015 GHG Emissions (MT CO_2e)	2019 GHG Emissions (MT CO_2e)	Change in GHG Emissions Since 2015 (MT CO_2e)	Percent Change in GHG Emissions Since 2015
Energy	**217,518**	**192,307**	**(25,207)**	**-12%**
Non-Residential Electricity Consumption	86,261	66,522	(19,736)	-23%
Natural Gas	78,678	89,061	10,382	13%
Residential Electricity Consumption	46,945	31,714	(15,229)	-32%
Electricity Transmission and Distribution Losses	5,635	5,010	(624)	-11%
Transportation	**215,717**	**205,691**	**(10,026)**	**-5%**
Passenger On-road Vehicles	186,360	175,182	(11,177)	-6%
Electric Vehicle Charging	123	336	213	174%
Commercial On-road Vehicles	18,567	18,930	363	2%
Off-road Equipment	10,667	11,242	575	5%
Solid Waste	**13,474**	**15,352**	**1,879**	**14%**
Waste Sent to Landfill	13,021	14,836	1,816	14%
Landfilling Process Emissions	453	516	63	14%
Water	**5,690**	**4,489**	**(1,201)**	**-21%**
Imported Potable Water Supply	4,396	3,452	(944)	-21%
Wastewater Treatment Process and Fugitive Emissions	604	607	2	<1%
Wastewater Collection and Treatment Energy	690	430	(260)	-38%
Cumulative Emissions	**452,399**	**417,839**	**(34,560)**	**-8%**

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent; Totals may not add due to rounding.

[1] Non-residential and residential electricity consumption GHG emission total has been adjusted to remove the emissions from electric vehicle charging, which is accounted for in the transportation sector.

[2] GHG emissions from the electricity consumption for electric vehicles charging have been excluded from the inventories.

Figure 3 GHG Emissions Reduction between 2015 and 2019



Energy sector emissions reduction can be directly attributed to increased energy-efficiency and participation in the CPA. Between 2015 and 2019, the Beverly Hills service population (total employment plus residents) increased by approximately 1%; however, in the same time period overall electricity consumption decrease by 10%. Compounding this is the joining of the CPA in 2019, which allows electricity customers in the City to purchase electricity from more renewable sources. This resulted in an overall impact of reducing electricity consumption associated GHG emissions by an effective 26%.

An overall increase in natural gas consumption in the community offset the GHG reduction gains achieved from electricity. Between the two inventory years, GHG emissions from natural gas consumption increased by 13%, which can be directly attributed to a respective increase in consumption. With population and employment growing by only 0.5% and 1.5%, respectively, but natural gas consumption growing by 14% and 11%, respectively in the same time period, the influence of this substantial increase in natural gas consumption may have resulted from increased heating needs. According to a heating degree day[53] data set published by the National Weather Service Climate Prediction Center, the months of January, February, and March in 2019 were substantially cooler than 2015, as measured at the Los Angeles International Airport.[54] The annual number of heating degree days in 2019 were 24% higher in 2019 than in 2015, indicating the potential for an increase in energy use for building heating. While this may be a factor in the increase of natural gas use, it is possible that other external factors contributed to the increase in consumption.

[53] A degree day compares the mean (the average of the high and low) outdoor temperatures recorded for a location to a standard temperature. The more extreme the outside temperature, the higher the number of degree days. A high number of degree days generally results in higher levels of energy use for space heating or cooling. A heating degree day refers to a temperature below the mean, and as such, a higher number of heating degree days is expected to result in a higher building heating energy demand.

[54] NOAA Center for Weather and Climate Prediction. Degree Day Statistics. States and Cities. Archive: 1997 – current. Available: https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/. Accessed August 25, 2021.

Transportation sector GHG emissions reduction can be primarily attributed to reduced vehicle emissions from increased fuel efficiency in the regional on-road vehicle fleet. Passenger vehicle GHG emissions saw a decrease in the City, which was primarily due to increased fuel efficiency and minimal growth in vehicle miles traveled (VMT). However, commercial on-road VMT increased by 7% in the City, offsetting any potential GHG reduction from improved efficiency. This increase in commercial VMT is likely attributable to economic growth in the City and region.

Waste sector GHG emissions increased by 14%, which is directly related to an increase in the amount of waste generated in Beverly Hills that is sent to landfills. The 14% increase in emissions between 2015 and 2019 is a direct result of a 14% increase in waste sent to landfill, which is likely attributable to economic growth and housing development in the City.

Water sector GHG emissions sources also saw significant reduction in total emissions between 2015 and 2019. GHG emissions from water supply are generated by the energy used to convey, treat, and distribute water, with imported water sources requiring a high energy intensity. Between 2015 and 2019, Beverly Hills reduced its reliance on imported water by 9% through its water conservation efforts. However, the primary driver for emissions reduction in this sector result from the decreased carbon intensity of electricity used to supply water to Beverly Hills. This sector may see decreased emissions when the City's water treatment plant is back online in 2022, which would result from the reduced amount of imported water from Metropolitan Water District of Southern California.

3 GHG Emissions Forecast

A baseline GHG inventory (i.e., the 2019 community inventory) sets a reference point for a single year; however, annual GHG emissions change over time due to external factors such as population and job growth. A GHG emissions forecast accounts for projected growth and presents an estimate of GHG emissions in a future year. Calculating the difference between the GHG emissions forecast and the reduction targets set by the City determines the gap to be closed through CAAP policies. This section quantifies an estimate of the future GHG emissions in Beverly Hills and the impact state regulations will have on GHG emissions in the forecasted years 2025, 2030, 2035, 2040, and 2045.

Several indicator growth rates were developed from demographic growth projections and the results of the 2019 community inventory and applied to the various GHG emission sectors to forecast future GHG emissions. These growth rates were developed from the SCAG 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), housing, population, and job projections. This forecast based solely on the 2019 GHG inventory and growth projections is considered the business-as-usual scenario (BAU), where it is assumed that no additional action will occur to reduce future GHG emissions. Once BAU forecasted GHG emissions are established, a legislative adjusted (adjusted) scenario of future GHG emissions is developed which considers the GHG reduction impact of state and federal legislation on the BAU forecasted GHG emissions. The applicable state and federal regulatory requirements, including vehicle emissions standards, Renewable Portfolio Standard, and Title 24 efficiencies, are then incorporated to accurately reflect expected reductions from adopted legislation and programs. The adjusted scenario forecast provides a more accurate picture of future GHG emissions growth and the responsibility of the City and community for GHG reductions to align with state GHG reduction goals.

3.1 Business-as-Usual GHG Emissions Forecast

A BAU GHG emissions forecast uses demographic projections and modeled on- and off-road transportation emissions to estimate future GHG emissions without the influence of approved GHG reduction legislation or policies. The BAU forecast is based on growth projected trends in housing, population, and employment over time, consistent with local and regional projections. The BAU forecast GHG emissions were estimated for the years 2025, 2030, 2035, 2040, and 2045. The BAU GHG emissions projections were calculated based on the guidance of the Association of Environmental Professionals 2012 whitepaper Forecasting Communitywide GHG Emissions and Setting Reduction Targets.[55] To develop a GHG emissions forecast, the appropriate “growth metrics” (e.g., population, housing, and employment projections) are multiplied by BAU “growth indicators”, which represent a baseline metric developed from the baseline 2019 community inventory. This allows for projections of activity data that can be converted into GHG emissions estimates using specific GHG emissions factors, which are assumed to be the same in the future as in the 2019 community inventory. The result is a BAU forecast in which GHG emissions change with time in relation to demographics, with the assumption that GHG emissions rates and activity data will continue in the future as they did in the year of the 2019 community inventory. This methodology is used for all GHG emissions sectors and sources included in the 2019 GHG emissions inventory. The

[55] Association of Environmental Professionals (AEP) Forecasting Community-Wide Greenhouse Gas Emissions and Setting Reduction Targets. May 2012. Accessed September 2021 online via: https://califaep.org/docs/Forecasting_and_Target_Setting.pdf

following provides an overview of the growth metrics, growth indicators, and GHG emissions factors used to project GHG emissions for the BAU forecast calculations.

Growth Metrics

GHG emissions are largely driven by consumption of fuel and energy, and generation of solid waste and wastewater by residents, households, and employees in a jurisdiction. As housing, population, and jobs increase over time, it is expected that GHG emissions levels will also grow. In a BAU forecast, this growth is assumed to be the primary metric for determining changes in future GHG emissions.

Growth metrics developed here use the most recent SCAG *Connect SoCal* 2020 - RTP/SCS demographic forecasts.[56] These are adjusted to account for the 6th Cycle Regional Housing Needs Assessment (RHNA) allocation of housing needs for the City of Beverly Hills between 2021 and 2030. As such, the number of households in Beverly Hills is expected to grow by 3,096 units between 2020 and 2030, with growth rates after 2030 consistent with SCAG 2020 RTP/SCS projected growth rates for Beverly Hills.[57] With this increase in housing units it is conservatively assumed that there would be a comparative growth in population. To account for this potential increase in population, the average household occupancy in the year 2020 of 2.32 persons per household was multiplied by the number of projected housing units to estimate future population. This adjustment in housing units and population allows for the GHG emissions forecast projection to be consistent with the City's recently adopted Housing Element. The Beverly Hills growth metrics for the BAU forecast and associated calculations are provided in Table 27.

Table 27 Growth Metrics for Beverly Hills BAU GHG Emissions Forecast

Growth Metric	2019	2020	2025	2030	2035	2040	2045
Housing Units from SCAG SoCal Connect[1]	14,944	14,979	15,138	15,296	15,447	15,562	15,676
Increase in Housing Units from RHNA Allocations[2]	0	0	1,390	2,779	2,806	2,827	2,848
Housing Units used for BAU Forecast[3]	14,944	14,979	16,527	18,075	18,253	18,389	18,524
Persons per Housing Unit	2.33	2.32	2.32	2.32	2.32	2.32	2.32
Population Used for BAU Forecast[4]	34,767	34,802	38,399	41,995	42,410	42,724	43,038
Employment[1]	75,402	75,686	76,641	77,596	78,561	79,919	81,277

[56] Southern California Association of Governments. May 2020. Connect SoCal. Demographics and Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579. Accessed November 10, 2021.

[57] SCAG. 2020. SCAG 6th Cycle Draft RHNA Allocation Based on Final RHNA Methodology & Final Connect SoCal. https://scag.ca.gov/sites/main/files/file-attachments/rhna-draft-allocations-090320-updated.pdf?1602188695. Accessed November 10, 2021.

Growth Metric	2019	2020	2025	2030	2035	2040	2045
Service Population	110,169	110,488	115,040	119,591	120,971	122,643	124,315

Notes: Service Population = Population + Employment; RHNA = regional housing needs assessment

[1] Data source: Southern California Association of Governments. May 2020. Connect SoCal. Demographics and Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579. Accessed November 10, 2021.

[2] The increase in housing units from RHNA allocations for 2030 was calculated by adding the required RHNA allocations for the City of Beverly Hills, 3,096 units, to the 2020 projected housing unit totals. After 2030, the number of housing units is assumed to continue to increase as at the same rate per year as determined in the SCAG 2020 SoCal Connect RTP/SCS projections, starting from the adjusted 2030 number of housing units accounting for RHNA allocations.

[3] The number of housing units used to forecast GHG emissions in the BAU forecast was determined by adding the additional required under RHNA allocations. This increase accounts for housing units already considered in the City's general plan, as well as the additional required units from RHNA allocations.

[4] The total persons per unit was determined for the years 2019 and 2020 by dividing the SCAG 2020 SoCal Connect RTP/SCS projected population by the projected number of households in Beverly Hills. After 2020, where an increase in the number of housing units is expected from RHNA allocations, an increased population beyond that accounted for in the SCAG 2020 SoCal Connect RTP/SCS is calculated by multiplying the persons per housing unit for the year 2020 by the total number of projected housing units. This methodology allows for a conservative estimate of the total population in Beverly Hills, accounting for the potential for increased population resulting from the increase in the number of housing units from the RHNA allocations.

Growth Indicators

Growth indicators allow for the forecasting of activity data for future years based on the activity data in the baseline 2019 community inventory and the associated growth metrics. The appropriate metric used for each growth indicator is developed based on the relevance of the GHG emissions source. For example, residential energy consumption would be expected to grow with the number of new households, commercial/industrial energy consumption would be expected to grow with the number of new jobs, and total solid waste generation would be expected to grow with both residents and employment (service population). The forecasting of activity data for transportation sector GHG emission sources use modeled activity data for VMT and fuel consumption, which are discussed further in the followings section. Table 28 provides the metrics that were associated with each GHG emissions sector to develop growth indicators and project GHG emissions from each GHG emissions source in the respective sectors.

Table 28 Growth Metrics and Associated GHG Emissions Sectors

GHG Emissions Sector	GHG Emission Source	Activity Data/Units	Associated Growth Metric	Growth Metric Data Source
Transportation	On-road Transportation	VMT	VMT	SCAG TDM model
	Off-road Transportation	Fuel Consumption (Gallons)	Fuel Consumption	CARB OFFROAD2021
Energy	Residential Electricity Consumption (CPA and SCE)	kWh	Households	See Table 27
	Residential Natural Gas Consumption	Therms	Households	See Table 24
	Non-residential Electricity Consumption (CPA and SCE)	kWh	Employment	SCAG Connect SoCal
	Non-residential Natural Gas Consumption	Therms	Employment	SCAG Connect SoCal
Imported Water	Electricity Imbedded in Water Supply	kWh	Service Population	See Table 24

GHG Emissions Sector	GHG Emission Source	Activity Data/Units	Associated Growth Metric	Growth Metric Data Source
Wastewater	Wastewater Process Emissions	Wastewater Generated (MG)	Service Population	See Table 24
	Electricity Imbedded in Wastewater Collection and Treatment	kWh	Service Population	See Table 24
Solid Waste	Solid Waste Generated	Tons	Service Population	See Table 24

Notes: SCE = Southern California Edison; CPA = Clean Power Alliance; kWh = kilowatt-hour; MG = million gallons; VMT = vehicle miles traveled; TDM = transportation demand management

The growth indicators for Beverly Hills are provided in Table 29 for each GHG emissions source, excluding on-road and off-road transportation which are discussed further in the following section. The electricity consumption under the energy sector has been disaggregated by the electricity provider (CPA of SCE).

Table 29 Growth Indicators for BAU GHG Emissions Forecast

GHG Emissions Source	Growth Indicator	Units
Energy		
Residential Electricity - SCE	4,122.65	kWh/Household
Residential Electricity - CPA	6,878.61	kWh/Household
Residential Natural Gas	742.87	Therms/Household
Non-residential Electricity - SCE	1,713.84	kWh/Employment
Non-residential Electricity - CPA	2,859.53	kWh/Employment
Non-residential Natural Gas	75.10	Therms/Employment
Water		
Imported Water	151.73	kWh/Service Population
Wastewater Collection and Treatment	18.92	kWh/Service Population
Wastewater Treatment and Discharge	0.01	MG/Service Population
Solid Waste		
Solid Waste Generated	0.28	Tons Landfilled/Service Population

Notes: NA = not applicable MT CO_2e = metric ton carbon dioxide equivalent; SCE = Southern California Edison; CPA = Clean Power Alliance; kWh = kilowatt-hour.

BAU Activity Data Forecast

The projection of activity data for the BAU forecast was obtained from multiplying the appropriate growth metrics and growth indicators for specific GHG emission sources, as well as from models for VMT and off-road fuel consumption for transportation sector GHG emission sources. The resulting activity data for each GHG emissions source is provided in Table 30, while the transportation sector activity data is provided below.

Table 30 Activity Data for BAU GHG Emissions Forecast

GHG Emissions Source	Units	2025	2030	2035	2040	2045
Energy						
Residential Electricity - SCE	kWh	68,135,115	74,516,985	75,250,817	75,811,498	76,368,057
Residential Electricity - CPA	kWh	113,682,815	124,330,906	125,555,299	126,490,790	127,419,403
Residential Natural Gas	Therms	12,277,377	13,427,336	13,559,567	13,660,597	13,760,884
Non-residential Electricity - SCE	kWh	131,350,556	132,987,275	134,641,133	136,968,530	139,295,927
Non-residential Electricity - CPA	kWh	219,157,200	221,888,050	224,647,496	228,530,737	232,413,978
Non-residential Natural Gas	Therms	5,755,977	5,827,700	5,900,175	6,002,165	6,104,155
Electricity T&D Losses[1]	kWh	27,148,610	28,239,884	28,564,832	28,957,879	29,350,366
Water						
Imported Water	kWh	17,454,904	18,145,422	18,354,808	18,608,499	18,862,190
Wastewater Collection and Treatment	kWh	1,380	1,435	1,451	1,472	1,492
Wastewater Treatment and Discharge	MG	2,176,707	2,262,818	2,288,929	2,320,566	2,352,202
Solid Waste						
Solid Waste Generated	Tons	31,817	33,076	33,457	33,920	34,382

Notes: SCE = Southern California Edison; CPA = Clean Power Alliance; kWh = kilowatt-hour; MG = million gallons; T&D = transmission and distribution

1. Electricity Transmission and Distribution Losses were calculated as 5.1% of the total electricity consumption in the City.

Transportation Activity Data Forecasts

Transportation sector activity data for the GHG emissions forecast was obtained from separately modeled activity data. The sources and activity data used for the BAU forecast are provided below.

ON-ROAD TRANSPORTATION ACTIVITY DATA FORECAST

Activity data for the forecast of passenger on-road transportation was modeled separately from the above growth metrics and growth indicators, using the SCAG Trip-Based Travel Demand Model v6.3 from the agency's 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). This data was developed using the same methodology as discussed in for the 2019 GHG Emissions Inventory. Trip data was also split by light motor vehicle (LMV) or heavy-duty trucks (HDT) to delineate between commercial and passenger on-road transit. Daily VMT data was annualized using

an annualization factor of 347 to take into account reduced weekend and holiday travel consistent with CARB methodologies.[58] The results are summarized in Table 31.

Table 31 BAU GHG Emissions Forecast Passenger On-Road Transportation Data

Data Type	2025	2030	2035	2040	2045
Passenger Vehicle Annual VMT	485,310,383	491,104,242	496,897,754	502,691,613	508,485,125
Commercial Vehicle Annual VMT	15,962,694	17,079,340	18,195,639	19,312,285	20,428,584

Notes: VMT = vehicle miles traveled

Data Source: SCAG Trip-Based Travel Demand Model v6.3.

In addition to the VMT data, the electricity consumption from EVs was also forecasted based on the 2019 GHG Emissions Inventory. To gain a reasonable estimate of the contribution of EVs to future transportation sector GHG emissions, the EV electricity consumption in the 2019 GHG Emissions Inventory was forecasted from the growth metric of households in the City and the growth indicator of kwh/household. This assumes that the majority of EV charging events occur at residences. Furthermore, it was necessary to estimate the amount of energy used for EV charging by the electricity provider, as SCE and CPA have different GHG emissions factors for electricity. Due to a lack of available data for understanding the total electricity used for EV charging for each electricity provider, it was estimated that the EV charging for CPA and SCE electricity was proportional to the total electricity provided to the City by each provider. As such, it was estimated that 62.5% of electricity used for EV charging was provided by CPA, and 37.5% of electricity used for EV charging was provided by SCE. The resulting electricity consumption is added to the transportation sector GHG emissions. The data used to estimate future EV electricity consumption in the City is provided in Table 32.

Table 32 BAU GHG Emissions Forecast Passenger On-Road EV Activity Data

Data Type	2025	2030	2035	2040	2045
Households (Growth Metric)	16,527	18,075	18,253	18,389	18,524
EV Charging – CPA (kWh/household)	72.93	72.93	72.93	72.93	72.93
EV Charging – SCE (kWh/household)	43.71	43.71	43.71	43.71	43.71
EV Charging – CPA (kWh)	1,205,322	1,318,219	1,331,200	1,341,119	1,350,964
EV Charging – SCE (kWh)	722,403	790,066	797,847	803,792	809,692

Notes: VMT = CPA = Clean Power Alliance; SCE = Southern California Edison; kWh = kilowatt-hour

Off-Road Activity Data

Activity data for the forecast of off-road GHG emissions was modeled separately from the above growth metrics and growth indicators, using several CARB recommended off-road models. These included CARB's OFFROAD2017 model which breaks down regional fuel consumption by equipment class, the SORE2020 model for lawn and garden equipment transportation refrigeration units, and RV2018 for recreational vehicle data. These models were run for Los Angeles County for the forecast years to obtain fuel consumption for gasoline, diesel, and natural gas/liquefied petroleum gas and

[58] Data Source: California Air Resources Board. 2020. Base Year Data. Available: https://www.arb.ca.gov/cc/sb375/data/baseyeardata/ghg-base-est-ambag062110.pdf. Accessed October 20, 2021.

then apportioned to Beverly Hills by growth metrics for each of the included years, consistent with the 2019 GHG Emissions Inventory. The equipment sectors drawn from each model are shown in Table 33.

Table 33 Off-road Model Activity Data Sources

OFFROAD2017 Model:	RV2018 Model:	SORE2020 Model
▪ Construction and Mining Equipment ▪ Light Commercial Equipment	▪ Recreational Vehicles	▪ Lawn and Garden Equipment ▪ Transport Refrigeration Units

The results of these models were summarized for all equipment sectors relevant to Los Angeles County. Beverly Hills was allocated a percentage of county fuel consumption for each sector relative to Beverly Hills' proportion of jobs or population in the county, as done in the 2019 community inventory, as shown in Table 13. The off-road fuel consumption results for the BAU forecast are summarized in Table 34.

Table 34 Beverly Hills BAU GHG Emissions Forecast Off-Road Fuel Consumption

Off-road Fuel Category	2019	2025	2030	2035	2040	2045
Diesel	647,908	728,585	744,844	775,677	811,180	845,300
Gasoline	466,546	480,758	486,225	486,419	488,760	490,177
Natural Gas	50,997	50,857	50,210	49,824	49,779	49,635

Notes: All values are of the unit gallons of fuel

Data Source: California Air Resources Board. 2017. OFFROAD2017 – ORION. Available: https://www.arb.ca.gov/orion/. Accessed July 20, 2021.

California Air Resources Board. 2020. Off-Road-Gasoline Equipment. Available: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road-0. Accessed October 7, 2021.

BAU GHG Emission Factors

The BAU GHG emissions forecast is representative of a scenario where community activities are generally similar to that of the baseline 2019 GHG emissions inventory. As such, BAU activity data growth is multiplied by the emissions factors used to calculate GHG emissions from the baseline GHG emissions inventory to generate an estimate of future GHG emissions without influence from GHG reduction policies at the State or local level. The BAU GHG emissions factors for the relevant GHG emissions sources and sectors are provided in Table 35, reported in MT CO_2e.

Table 35 BAU GHG Emissions Factors

GHG Emissions Source	GHG Emissions Factor	Units
Transportation		
Passenger On-Road Transportation	0.0003662155	MT CO_2e/VMT
Commercial On-Road Transportation	0.0012945549	MT CO_2e/VMT
Passenger EV - CPA	0.0001646797	MT CO_2e/kWh
Passenger EV - SCE	0.0002400000	MT CO_2e/kWh
Off Road – Diesel	0.0103402399	MT CO_2e/Gallons
Off Road – Gasoline	0.0091029590	MT CO_2e/Gallons
Off Road – Natural Gas (LPG)	0.0058009700	MT CO_2e/Gallons
Energy		
Residential Electricity - SCE	0.0002400000	MT CO_2e/kWh
Residential Electricity - CPA	0.0001646797	MT CO_2e/kWh
Residential Natural Gas	0.0053125123	MT CO_2e/Therm
Non-residential Electricity - SCE	0.0002400000	MT CO_2e/kWh
Non-residential Electricity - CPA	0.0001646797	MT CO_2e/kWh
Non-residential Natural Gas	0.0053125123	MT CO_2e/Therm
Electricity Transmission & Distribution Losses	0.0001929055	MT CO2e/kWh
Water		
Imported Water	0.0002065000	MT CO_2e/kWh
Wastewater Collection and Treatment	0.0002065000	MT CO_2e/kWh
Wastewater Treatment and Discharge	0.4589927805	MT CO_2e/MG Treated
Solid Waste		
Community Generated Solid Waste	0.5038561538	MT CO_2e/Tons Landfilled

Notes: NA = not applicable MT CO2e = metric ton carbon dioxide equivalent; CPA = Clean Power Alliance; SCE = Southern California Edison; kWh = kilowatt-hour; LPG = liquefied petroleum gas; EV = electric vehicle; MG = million gallons.

BAU GHG Emissions Forecast Results

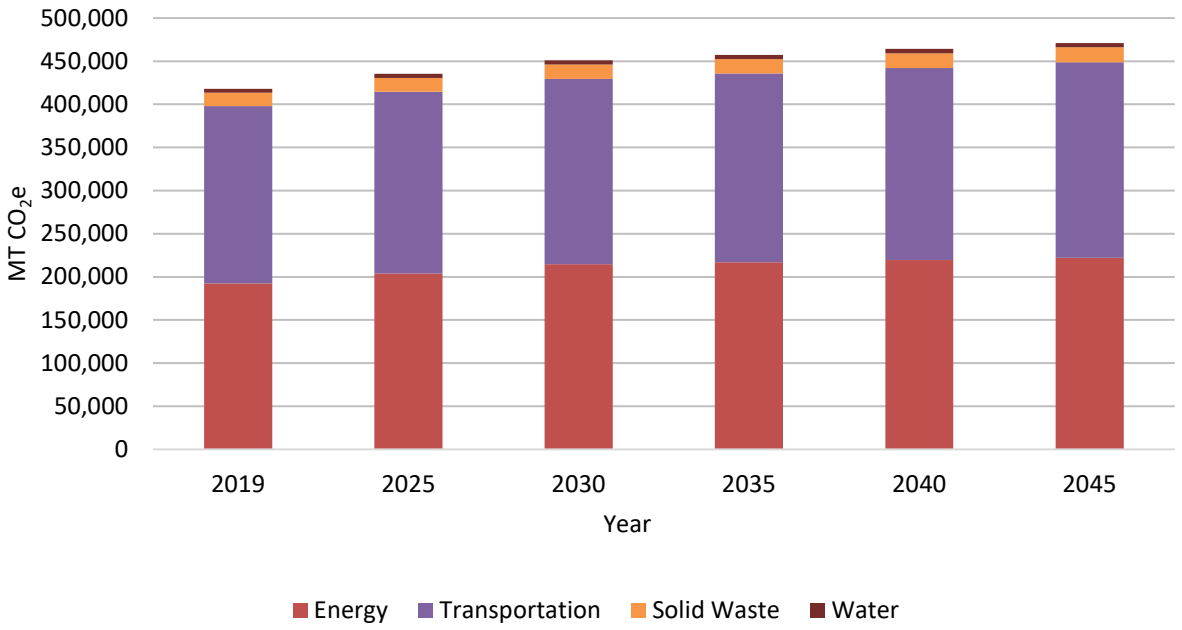
The following provides a summary of the results of the BAU GHG emissions forecast for each source in Beverly Hills, with the results reported in MT CO_2e. The BAU forecast projects an increase in GHG emissions above the baseline 2019 community inventory from all GHG emissions sources through 2045. An increase in housing stock commensurate with the RHNA allocations for 2020-2029 is included in the growth forecast for housing and population to ensure a conservative estimate of population and housing growth within the City. Table 36 and Figure 4 provide a summary of the Beverly Hills BAU GHG emissions forecast result for the years 2025, 2030, 2035, 2040, and 2045.

Table 36 BAU GHG Emissions Forecast Summary

GHG Emissions Source	2025	2030	2035	2040	2045
Transportation	**210,970**	**214,786**	**218,675**	**222,634**	**226,568**
Passenger On-Road Transportation	177,728	179,850	181,972	184,093	186,215
Commercial On-Road Transportation	20,665	22,110	23,555	25,001	26,446
Passenger EV - CPA	198	217	219	221	222
Passenger EV - SCE	173	190	191	193	194
Off Road – Diesel	7,534	7,702	8,021	8,388	8,741
Off Road – Gasoline	4,376	4,426	4,428	4,449	4,462
Off Road – Natural Gas (LPG)	295	291	289	289	288
Energy	**203,728**	**214,556**	**216,936**	**219,577**	**222,212**
Residential Electricity - SCE	16,352	17,884	18,060	18,195	18,328
Residential Electricity - CPA	18,721	20,475	20,676	20,830	20,983
Residential Natural Gas	65,224	71,333	72,035	72,572	73,105
Non-residential Electricity - SCE	31,524	31,917	32,314	32,872	33,431
Non-residential Electricity - CPA	36,091	36,540	36,995	37,634	38,274
Non-residential Natural Gas	30,579	30,960	31,345	31,887	32,428
Electricity Transmission & Distribution Losses	5,237	5,448	5,510	5,586	5,662
Water	**4,705**	**4,879**	**4,935**	**5,004**	**5,066**
Imported Water	3,604	3,747	3,790	3,843	3,895
Wastewater Collection and Treatment	467	473	479	486	486
Wastewater Treatment and Discharge	634	659	666	675	685
Solid Waste	**16,031**	**16,665**	**16,858**	**17,091**	**17,324**
Community Generated Solid Waste	16,031	16,665	16,858	17,091	17,324
Total	**435,434**	**450,886**	**457,404**	**464,305**	**471,169**

Notes: CPA = Clean Power Alliance; SCE = Southern California Edison; LPG = liquefied petroleum gas; EV = electric vehicle.
All values presented in metric tons of carbon dioxide equivalent (MT CO_2e).
Totals may not add due to rounding.

Figure 4 Beverly Hills BAU GHG Emissions Forecasts through 2045



3.2 Legislative Adjusted GHG Emissions Forecasts

The adjusted forecast accounts for GHG emissions reductions that can be reasonably expected from State legislation and regulations. While there are numerous pieces of legislation that are likely to achieve long-term GHG emissions reduction, there can be wide variations on how these are implemented within a specific jurisdiction. As such, only limited pieces of legislation are accounted for in this adjusted forecast to provide that GHG emissions reduction estimates remain conservative.

GHG Emissions Reduction Legislation Included in Adjusted Forecast

Several State regulations have been enacted that reduce Beverly Hills' future GHG emissions. The impact of these regulations was quantified and incorporated into the adjusted forecast to provide a more accurate depiction of future GHG emissions growth and the responsibility of GHG emissions reduction for Beverly Hills beyond established State and federal regulations. The following were applied to the adjusted forecast based on the unique sectors within Beverly Hills.

- 2019 Title 24 Building Energy Efficiency Standards
- Senate Bill 100 - California Renewables Portfolio Standard Program: emissions of greenhouse gases
- Safer Affordable and Fuel-Efficient (SAFE) Vehicle Rules and Actions
- Innovative Clean Transit (ICT) Regulation
- Advanced Clean Trucks (ACT) Regulation

GHG Emissions Reduction from Legislation Calculations

Transportation Legislation

The GHG emissions reduction from transportation legislation considered in the GHG emissions forecast accounts for the reduction in tailpipe GHG emissions from increased fleet fuel efficiency and the increased penetration of EVs. CARB's EMFAC2021 model accounts for the currently adopted legislation in future tailpipe emissions factors and increased EV adoption as influenced by market trends.[59] While the increased adopted EVs is not directly attributed to adopted legislation in the model, it is assumed that California's initiatives to increase EV adoption, including Executive Order N-79-20, will influence the purchase of private EVs through increased investment in EV charging infrastructure. As such, these increases in EV adoption beyond the growth in the BAU forecast are considered in the adjusted forecast.

The tailpipe GHG emissions reduction from transportation legislative reductions are calculated using the outputs of the EMFAC2021 model. The difference between future GHG emissions calculated using the baseline GHG emissions factors and future GHG emissions factors considering adopted legislation in EMFAC2021 is considered the legislative reductions. The GHG emissions factors, activity data, and resulting decrease in transportation tailpipe GHG emissions for each forecast year is provide in Table 37.

Table 37 Transportation Legislative Reductions Data and Resulting GHG Emissions

	2025	2030	2035	2040	2045
Vehicle Miles Traveled					
Passenger On-Road Transportation	485,310,383	491,104,242	496,897,754	502,691,613	508,485,125
Commercial On-Road Transportation	15,962,694	17,079,340	18,195,639	19,312,285	20,428,584
BAU GHG Emissions Factors (MT CO_2e/VMT)					
Passenger On-Road Transportation	0.00036622	0.00036622	0.00036622	0.00036622	0.00036622
Commercial On-Road Transportation	0.00129456	0.00129456	0.00129456	0.00129456	0.00129456
Adjusted Legislative Emissions Factors (MT CO_2e/VMT)					
Passenger On-Road Transportation	0.00032268	0.00029515	0.00027899	0.00027135	0.00026770
Commercial On-Road Transportation	0.00113724	0.00098905	0.00084005	0.00073663	0.00068907
BAU Transportation GHG Emissions (MT CO_2e)					
Passenger On-Road Transportation	177,728	179,850	181,972	184,093	186,215
Commercial On-Road Transportation	20,665	22,110	23,555	25,001	26,446
Adjusted Transportation GHG Emissions (MT CO_2e)					
Passenger On-Road Transportation	156,599	144,948	138,629	136,407	136,121
Commercial On-Road Transportation	18,153	16,892	15,285	14,226	14,077

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent. VMT = Vehicle Miles Traveled.
Totals may not add due to rounding.

The incorporation of increased EV penetration into the adjusted forecast, beyond that considered in the BAU forecast, serves to slightly reduce the GHG emissions reductions from legislation, influenced by the additional electricity consumption needed to fuel EVs. This electricity

[59] California Air Resources Board. 2021. EMFAC2021 Volume II Technical Document. Available: https://ww2.arb.ca.gov/sites/default/files/2021-03/emfac2021_volume_3_technical_document.pdf. Accessed November 30, 2021.

consumption was calculated using the outputs of EMFAC2021, where the estimated percent of total VMT that is driven by electric vehicles in Los Angeles County was applied to the VMT for Beverly Hills to get an estimated total VMT for electric vehicles. This VMT was then converted to an estimated electricity consumption based on the EMFAC2021 calculated kilowatt-hours per mile for EVs in Los Angeles County. The resulting electricity consumption was divided into electricity delivered by CPA and SCE, based on the proportion of total electricity supplied to the City by each, 62.5% and 37.5%, respectively This electricity consumption was converted to MT CO_2e by multiplying by the BAU electricity GHG emission factor for the respective electricity provider. The electricity consumption and resulting GHG emissions included in the transportation sector GHG emissions reductions are provided in Table 38. The GHG emissions from the electricity consumption included here are expected to be reduced through SB 100, which is discussed further below.

Table 38 Transportation Legislation Electric Vehicles Emissions Increase

Calculation Metric	2025	2030	2035	2040	2045
Electric Vehicle Electricity Consumption above BAU (kWh)					
Passenger Vehicles – Total	5,214,153	7,994,224	10,151,903	11,313,373	11,881,381
Passenger Vehicles – CPA Attributed	3,260,182	4,998,439	6,347,542	7,073,758	7,428,909
Passenger Vehicles SCE Attributed	1,953,971	2,995,785	3,804,361	4,239,615	4,452,472
Commercial Vehicles – Total	157,951	1,324,096	3,451,462	5,493,904	7,014,902
Commercial Vehicles – CPA Attributed	98,760	827,900	2,158,048	3,435,098	4,386,112
Commercial Vehicles SCE Attributed	59,191	496,197	1,293,413	2,058,806	2,628,790
Electricity GHG Emissions Factor (MT CO_2e/kwh)					
SCE Electricity	0.00024000	0.00024000	0.00024000	0.00024000	0.00024000
CPA Electricity	0.0001646797	0.0001646797	0.0001646797	0.0001646797	0.0001646797
Resulting GHG Emissions Increase from Electric Vehicles (MT CO_2e)					
Passenger Vehicles – CPA	537	823	1,045	1,165	1,223
Passenger Vehicles ¬ SCE	469	719	913	1,018	1,069
Commercial Vehicles – CPA	16	136	355	566	722
Commercial Vehicles ¬ SCE	14	119	310	494	631

Notes: MT CO_2e = Metric tons of carbon dioxide equivalent; kwh = kilowatt-hour; CPA = Clean Power Alliance; SCE = Southern California Edison; BAU = business-as-usual

Totals may not add due to rounding.

TITLE 24

The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated triennially to allow consideration and possible incorporation of new energy-efficient technologies and methods. Since the 2019 GHG inventory year, the 2019 Title 24 Energy Efficiency Standards have come into effect, creating significantly more efficient new building stock. For projects implemented after January 1, 2020, the California Energy Commission (CEC) estimates that the 2019 standards will reduce consumption by 54% for residential buildings and 30% for commercial buildings, relative to the 2016 standards. The CEC further estimates that 2022 and 2025 will result in efficiency increases of five percent for both

residential and non-residential uses. This diminishing return is largely due to the achievement of zero net energy in the 2019 code cycle and uncertainty in the 2019 California Energy Efficiency Action Plan for achieving non-residential energy efficiency savings. These percentage savings relate to space heating and cooling, lighting, and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses.

The calculations and GHG emissions forecast assume that all future growth in the residential and non-residential sectors results in energy increases in newly constructed buildings. Accordingly, Title 24 is expected to reduce energy consumption from the BAU forecast levels by a percentage of the additional energy use above the levels in 2019. The 2019, 2022, and 2025 Title 24 requirements would reduce the consumption below baseline by a total of 54% for non-residential growth and by 30% for residential growth in each forecast year. Furthermore, the reduction in overall electricity consumption is expected to reduce GHG emissions associated with electricity transmission and distribution losses. The GHG emissions reduction resulting from Title 24 are calculated from the reduction in energy consumption from the BAU residential energy consumption from future growth, multiplied by the BAU GHG emissions factors, as provided in Table 39. These emissions are further reduced by SB 100; however, the Title 24 GHG reductions are accounted for first to avoid double counting.

Table 39 Title 24 GHG Emissions Reduction Calculations

Calculation Metric	2025	2030	2035	2040	2045
BAU Activity Data					
Residential Electricity CPA (kwh)	113,682,815	124,330,906	125,555,299	126,490,790	127,419,403
Residential Electricity ¬ SCE (kwh)	68,135,115	74,516,985	75,250,817	75,811,498	76,368,057
Residential Natural Gas (therms)	12,277,377	13,427,336	13,559,567	13,660,597	13,760,884
Electricity T&D Losses (kwh)	27,148,610	28,239,884	28,564,832	28,957,879	29,350,366
Adjusted Activity Data					
Residential Electricity ¬ CPA (kwh)	107,911,729	112,916,332	113,491,796	113,931,477	114,367,925
Residential Electricity ¬ SCE (kwh)	64,676,249	67,675,728	68,020,629	68,284,149	68,545,732
Residential Natural Gas (therms)	12,195,060	13,264,522	13,387,496	13,481,454	13,574,721
Electricity T&D Losses (kwh)	26,677,882	27,308,837	27,580,854	27,933,460	28,285,802
Reduction in Activity Data from Title 24					
Residential Electricity ¬ CPA (kwh)	5,771,086	11,414,575	12,063,503	12,559,313	13,051,478
Residential Electricity ¬ SCE (kwh)	3,458,866	6,841,257	7,230,188	7,527,349	7,822,325
Residential Natural Gas (therms)	82,317	162,814	172,070	179,143	186,163
Electricity T&D Losses (kwh)	470,728	931,047	983,978	1,024,420	1,064,564

Calculation Metric	2025	2030	2035	2040	2045
BAU GHG Emission Factors					
Electricity ¬ CPA (MT CO_2e/kwh)	0.00024000	0.00024000	0.00024000	0.00024000	0.00024000
Electricity ¬ SCE (MT CO_2e/kwh)	0.0001646797	0.0001646797	0.0001646797	0.0001646797	0.0001646797
Natural Gas (MT CO_2e/therm)	0.00531251	0.00531251	0.00531251	0.00531251	0.00531251
Electricity T&D Losses (MT CO_2e/kwh)	0.0001929055	0.0001929055	0.0001929055	0.0001929055	0.0001929055
GHG Emissions Reduction from Title 24 (MT CO_2e)					
Residential Electricity ¬ CPA	950	1,880	1,987	2,068	2,149
Residential Electricity ¬ SCE	830	1,642	1,735	1,807	1,877
Residential Natural Gas	437	865	914	952	989
Electricity T&D Losses	91	180	190	198	206
Total Title 24 GHG Emissions Reduction	**2,309**	**4,566**	**4,826**	**5,024**	**5,221**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kwh = kilowatt-hour; CPA = Clean Power Alliance; SCE = Southern California Edison; BAU = business-as-usual; T&D = transmission and distribution

T may not add due to rounding.

SB 100

CPA and SCE currently provide electricity in Beverly Hills and are subject to SB 100 requirements. GHG emissions from electricity consumption are largely determined by the emissions factor associated with the supplied electricity. Legislative GHG emissions reductions from SB 100 are calculated as the difference between GHG emissions under the BAU forecast electricity and GHG emissions calculated using a SB 100-adjusted GHG emissions factor for a given forecast year. An adjusted GHG emission factors is calculated by scaling the baseline electricity GHG emissions factor with the RPS percentage for eligible renewable electricity required for compliance with SB 100. Both electricity providers for Beverly Hills had different electricity emissions factors due to different electricity generation sources in the electricity delivery mix. The RPS percentages and associated GHG emissions factors used to determine the Adjusted forecast electricity emissions are provided in Table 40. The table also includes a weighted average emission factor (between SCE and CPA) which was used for the GHG emissions associated with transmission and distribution losses and data regarding eGRID which was used for the GHG emissions associated with imported water and wastewater collection and treatment.

Table 40 Electricity Provider Forecasted RPS and Electricity GHG Emissions Factors

Calculation Factor	2019	2025	2030	2035	2040	2045
SCE Electricity						
Renewable Portfolio Standard Percentage[1]	35%	49%	60%	73%	87%	100%
Adjusted Electricity Emission Factor (MT CO_2e/kWh)	0.00024000	0.00018977	0.00014792	0.00009861	0.00004931	0.00000000
CPA Electricity[2]						
Renewable Portfolio Standard Percentage	47%	54%	60%	73%	87%	100%
Adjusted Electricity Emission Factor (MT CO_2e/kWh)	0.00016468	0.00016103	0.00014278	0.00012452	0.00008301	0.00004151
Weighted Electricity[3]						
Adjusted Electricity Emission Factor (MT CO2e/kWh)	0.00019291	0.00018749	0.00016039	0.00013329	0.00008886	0.00004443
eGRID Electricity						
Renewable Portfolio Standard Percentage[3]	32%	47%	60%	73%	87%	100%
Adjusted Electricity Emission Factor (MT CO_2e/kWh)	0.00020650	0.00015983	0.00012094	0.00008062	0.00004031	0.00000000

Notes: MT CO2e = metric tons of carbon dioxide equivalent; kwh = kilowatt-hour; CPA = Clean Power Alliance; SCE = Southern California Edison

1. Edison International. 2020. Sustainability Report 2019. Available: <https://www.edison.com/content/dam/eix/documents/sustainability/eix-2019-sustainability-report.pdf>. Accessed November 11, 2021.

2. The CPA electricity GHG emissions factor and RPS percentage are the average RPS for each of the three power options, weighted by the electricity consumption in Beverly Hills at each power level. Data Source: Clean Power Alliance. 2020. 2019 Power Content Label. Available: < https://www.energy.ca.gov/filebrowser/download/3221>. Accessed November 11, 2021.

3. The weighted electricity emission factor is calculated as the weighted average of the adjusted SCE and CPA adjusted emission factors based on the forecasted distribution of electricity between the two providers.

4. Data Source: USEPA. 2021. eGRID Summary Tables 2019. Available: < https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf>. Accessed November 11, 2021.

The resulting GHG emissions reduction that can be expected from SB 100 are provided Table 41. These GHG emissions reductions were calculated by multiplying the forecasted activity data by the above SB 100 adjusted GHG emission factors and then subtracting the resulting SB 100 GHG emissions from the unadjusted GHG emissions totals for each GHG emission source. In the cases of Title 24 adjusted electricity consumption and increases in EV adoption, where electricity activity data was adjusted by legislation, the legislative adjusted activity data was used to calculate GHG emission reductions to avoid double counting. Commercial electricity, imported water consumption, and wastewater treatment related electricity consumption use the BAU activity data for GHG emissions reduction calculations.

Table 41 SB 100 GHG Emissions Reductions

GHG Emissions Sector/Source	2025	2030	2035	2040	2045
Passenger On-road EV - CPA	98	254	627	1,036	1,446
Passenger On-road EV - SCE	134	349	651	962	1,263
Commercial On-road EV - CPA	2	33	176	423	722
Commercial On-road EV - SCE	3	46	183	393	631
Residential Electricity - SCE	3,248	6,232	9,617	13,021	16,451
Residential Electricity - CPA	2,364	4,535	9,268	14,033	18,834
Non-Residential Electricity - SCE	6,597	12,245	19,036	26,119	33,431
Non-Residential Electricity - CPA	4,801	8,911	18,346	28,149	38,274
Electricity T&D Losses	868	1,628	2,870	4,147	5,456
Imported Water	925	1,720	2,439	3,167	3,895
Wastewater Collection and Treatment	106	196	292	391	486
Total SB 100 GHG Emissions Reduction	**19,145**	**36,147**	**63,505**	**91,841**	**120,889**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; kwh = kilowatt-hour; CPA = Clean Power Alliance; SCE = Southern California Edison; BAU = business-as-usual; T&D = transmission and distribution

All values are presented in MT CO_2e.

Totals may not add due to rounding.

Adjusted GHG Emissions Forecast Results

State legislation is expected to result in GHG emissions reduction from the BAU forecast in the transportation, energy, and water sectors. Title 24 is expected to reduce GHG emissions from reduced electricity and natural gas consumption in new residential housing units. SB 100 is expected to further reduce GHG emissions in the energy sector through reduced GHG emissions associated with electricity generation, as well as in the water sector where electricity is embedded in the water supply and wastewater collection and treatment. The expected legislative reductions from transportation legislation, SB 100, and Title 24 are summarized in Table 42.

Table 42 Beverly Hills Adjusted GHG Forecast Emissions Reduction Summary (MT CO_2e)

GHG Emissions Source	2025	2030	2035	2040	2045
Transportation Legislation GHG Emissions Reduction					
Passenger On-road Transportation	21,129	34,902	43,343	47,687	50,095
Commercial On-road Transportation	2,511	5,218	8,270	10,775	12,369
Passenger On-road EV - CPA	(537)	(823)	(1,045)	(1,165)	(1,223)
Passenger On-road EV - SCE	(469)	(719)	(913)	(1,018)	(1,069)
Commercial On-road EV - CPA	(16)	(136)	(355)	(566)	(722)
Commercial On-road EV - SCE	(14)	(119)	(310)	(494)	(631)
Total Transportation GHG Emissions Reduction	**22,604**	**38,322**	**48,988**	**55,219**	**58,819**
Title 24 GHG Emissions Reduction					
Residential Electricity ¬ CPA	830	1,642	1,735	1,807	1,877
Residential Electricity ¬ SCE	950	1,880	1,987	2,068	2,149
Residential Natural Gas	437	865	914	952	989
Electricity T&D Losses	91	180	190	198	205
Total Title 24 GHG Emissions Reduction	**2,309**	**4,566**	**4,826**	**5,024**	**5,221**
SB 100 GHG Emissions Reduction					
Residential Electricity - CPA	3,248	6,232	9,617	13,021	16,451
Residential Electricity - SCE	2,364	4,535	9,268	14,033	18,834
Non-Residential Electricity - CPA	6,597	12,245	19,036	26,119	33,431
Non-Residential Electricity - SCE	4,801	8,911	18,346	28,149	38,274
Passenger On-road EV - CPA	98	254	627	1,036	1,446
Passenger On-road EV - SCE	134	349	651	962	1,263
Commercial On-road EV - CPA	2	33	176	423	722
Commercial On-road EV - SCE	3	46	183	393	631
Electricity T&D Losses	868	1,628	2,870	4,147	5,456
Imported Water	925	1,720	2,439	3,167	3,895
Wastewater Collection and Treatment	106	196	292	391	486
Total SB 100 GHG Emissions Reduction	**19,145**	**36,147**	**63,505**	**91,841**	**120,889**
Total Legislative GHG Emissions Reduction	**44,058**	**79,035**	**117,320**	**152,085**	**184,929**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent; CPA = Clean Power Alliance; SCE = Southern California Edison; T&D = transmission and distribution; EV = electric vehicle

All values are presented in MT CO_2e.

Totals may not add due to rounding.

Table 43 provides the resulting GHG emissions for each source after accounting for the legislative reductions above for milestone years from 2025 through 2045.

Table 43 Beverly Hills Adjusted GHG Emissions Forecast Detail (MT CO_2e)

GHG Emissions Source	2025	2030	2035	2040	2045
Transportation	**188,129**	**175,783**	**168,050**	**164,600**	**163,688**
Passenger On-road Transportation	156,599	144,948	138,629	136,407	136,121
Commercial On-road Transportation	18,153	16,892	15,285	14,226	14,077
Passenger On-road EV - CPA	638	787	637	349	-
Passenger On-road EV - SCE	508	560	454	249	-
Commercial On-road EV - CPA	14	103	179	143	-
Commercial On-road EV - SCE	11	73	128	102	-
Off Road – Diesel	7,534	7,702	8,021	8,388	8,741
Off Road – Gasoline	4,376	4,426	4,428	4,449	4,462
Off Road – Natural Gas (LPG)	295	291	289	289	288
Energy	**183,542**	**176,440**	**152,972**	**129,083**	**104,544**
Residential Electricity – CPA	12,274	10,011	6,708	3,367	-
Residential Electricity – SCE	15,407	14,061	9,421	4,729	-
Residential Natural Gas	64,786	70,468	71,121	71,620	72,116
Non-Residential Electricity - SCE	24,927	19,671	13,277	6,753	-
Non-Residential Electricity - CPA	31,290	27,630	18,649	9,486	-
Non-Residential Natural Gas	30,579	30,960	31,345	31,887	32,428
Electricity T&D Losses	4,279	3,640	2,451	1,241	-
Water	**3,675**	**2,963**	**2,205**	**1,446**	**685**
Imported Water	2,679	2,027	1,352	676	-
Wastewater Collection and Treatment	362	277	187	95	-
Wastewater Treatment and Discharge	634	659	666	675	685
Solid Waste	**16,031**	**16,665**	**16,858**	**17,091**	**17,324**
Community Generated Solid Waste	16,031	16,665	16,858	17,091	17,324
Community-wide Total	**391,377**	**371,851**	**340,085**	**312,220**	**286,241**

Notes: MT CO2e = metric tons of carbon dioxide equivalent; CPA = Clean Power Alliance; SCE = Southern California Edison; T&D = transmission and distribution; EV = electric vehicle; LPG = liquefied petroleum gas

All values are presented in MT CO2e.

Totals may not add due to rounding.

Figure 5 shows the GHG emissions trends in terms of MT CO_2e for the Adjusted forecast. Adjusted forecast emissions trend downward over time through 2045.

Figure 5 Beverly Hills Adjusted GHG Emissions Forecasts through 2045

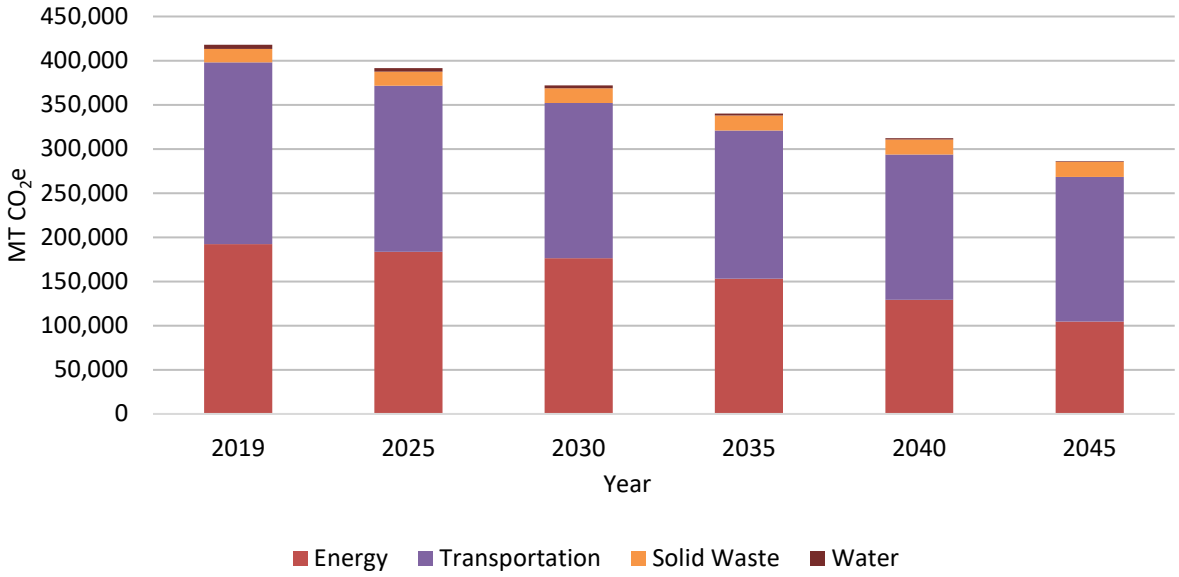
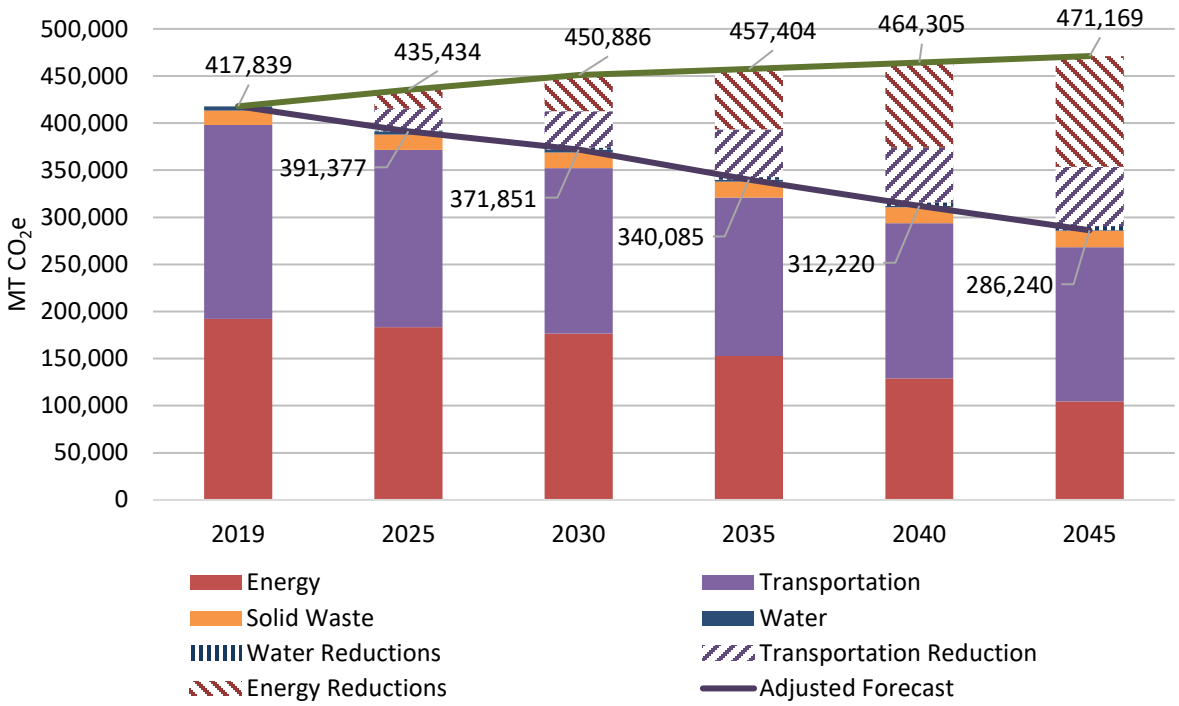


Figure 6 shows the GHG emissions trends in terms of MT CO_2e over the course of the BAU and Adjusted forecasts to illustrate the influence of State legislation on projected emissions.

Figure 6 Beverly Hills BAU and Adjusted GHG Emissions Forecasts through 2045



4 GHG Emissions Back-cast

State legislation related to GHG emissions reduction bases statewide GHG reduction goals on a 1990 baseline year, and it is recommended that community-level GHG reduction plans and CAAPs similarly align with these state goals. In order to set GHG reduction targets for the City of Beverly that meet or exceed the State's goals, it is practical to develop a comparison of the City's known GHG emissions to 1990 levels. In doing so, the City can clearly demonstrate alignment with the State's GHG reduction goals by developing local GHG reduction targets that match the state goals relative to the local 1990 GHG emission level. Many jurisdictions, including Beverly Hills, did not track data that can be used to develop a comprehensive GHG emissions inventory in the year 1990.

The earliest community-wide GHG emissions inventory developed for Beverly Hills is the year 2015, which will be used to make an estimate of 1990 emissions levels, or a GHG emissions "back-cast". OPR recommends estimating 1990 emissions level using calculations that can be supported by substantial evidence.[60] As such, a comparison of statewide GHG emission levels between 1990 and 2015, for economic sectors relevant to the City of Beverly Hills, will be used to estimate how GHG emissions in Beverly Hills have evolved since 1990. The economic sectors used for this comparison include:

- Residential Buildings,
- Commercial Buildings,
- Transportation,
- Electricity Generation (imports), and
- Electricity Generation (in state).[61]

These economic sectors represent the majority of GHG emissions in the City of Beverly Hills in 2015, with commercial and residential buildings, transportation, and electricity consumption making up 96% of the City's GHG emissions profile. Comparing the statewide GHG emissions for these sectors to those of Beverly Hills relies on the assumption that factors influencing the changes in GHG emissions in these sectors would also have influenced a similar change in GHG emissions in the City of Beverly Hills. These factors include but are not limited to increased population and jobs, increased VMT, improved energy efficiency, improved vehicle fuel efficiency, and increased renewable energy imports and generation.

The State's GHG Emissions Inventory provides statewide GHG emissions data for the year 1990, and for each year between 2000 and 2019. This data shows that statewide GHG emissions for the above economic sectors had increased after 1990, and then been reduced to near 1990 levels as of 2015.[62] Table 44 provides the statewide GHG emissions data for the years 1990, 2005, and 2015 for the relevant economic sectors, as well as the percent change in GHG emissions between 1990 and 2015.

[60] Governor's Office of Planning and Research. 2017. General Plan Guidelines. Chapter 8: Climate Change. Available: https://opr.ca.gov/docs/OPR_C8_final.pdf. Accessed November 30, 2020.

[61] The industrial and agricultural economic sectors reported in the California GHG Emissions Inventory are not included for this analysis, as the City of Beverly Hills does not contain agricultural lands or industrial entities regulated under the State's Cap-and-Trade or Mandatory GHG Reporting programs.

[62] California Air Resources Board. Current California GHG Emissions Inventory Data. Available: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed November 30, 2021.

Table 44 Statewide GHG Emissions Levels for Relevant Economic Sectors and Beverly Hills GHG Emissions Estimates

Economic Sector	1990 (MMT CO_2e)	2005 (MMT CO_2e)	2015 (MMT CO_2e)	Percent Change Between 1990 and 2015
Commercial Buildings	14.43672426	15.80115831	22.05280909	52.75%
Residential Buildings	29.74045803	30.2974353	27.90617132	-6.17%
Electricity Generation (Imports)	61.52142063	62.92798062	33.98145161	-44.76%
Electricity Generation (In State)	48.98575036	45.29658502	49.9756954	2.02%
Transportation	150.5937996	193.465005	170.9145044	13.49%
Total	**305.2781529**	**347.7881643**	**304.8306318**	**-0.15%**
Beverly Hills Community GHG Emissions Estimate Back-cast (MT CO_2e)	**453,063**	**516,152**	**452,399**	**-0.15%**

Notes: MMT CO_2e = million metric tons of carbon dioxide equivalent

Data Source: California Air Resources Board. Current California GHG Emissions Inventory Data. Available: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed November 30, 2021.

The trend in statewide GHG emissions between 1990 and 2015 can be used to estimate how the total GHG emissions in Beverly Hills may have changed during the same time period. As shown in the table above, GHG emissions have increased and decreased within the various economic sectors; however, the sum of statewide GHG emissions for the economic sectors relevant to Beverly Hills are nearly equivalent in 1990 as compared to 2015. As such, it reasonable to estimate that Beverly Hills' GHG emissions have changed similarly over time, and that 1990 and 2015 GHG emission levels may also be nearly equivalent.

With 2015 and 1990 total GHG emissions levels being nearly equivalent at the state level for relevant economic sectors, it is appropriate to use the total 2015 Community GHG Emissions Inventory levels as a comparison to a 1990 baseline level for the City of Beverly Hills. While this trend in GHG emissions is not appropriate to be applied to individual GHG emission sources within the City, increases and decrease of emissions for various sources over time result in a similar cumulative GHG emissions level. Based on this, GHG emissions targets for the City that are consistent with State legislations can use 2015 Community GHG Emissions Inventory levels as a comparative 1990 baseline, with the estimate of Beverly Hills 1990 community GHG emissions levels having been 453,063 MT CO_2e. For simplicity of tracking GHG emissions reductions over time, it is recommended that the City use data and emissions totals from the 2015 Community GHG Emissions Inventory as a baseline for the CAAP and future GHG reduction planning.