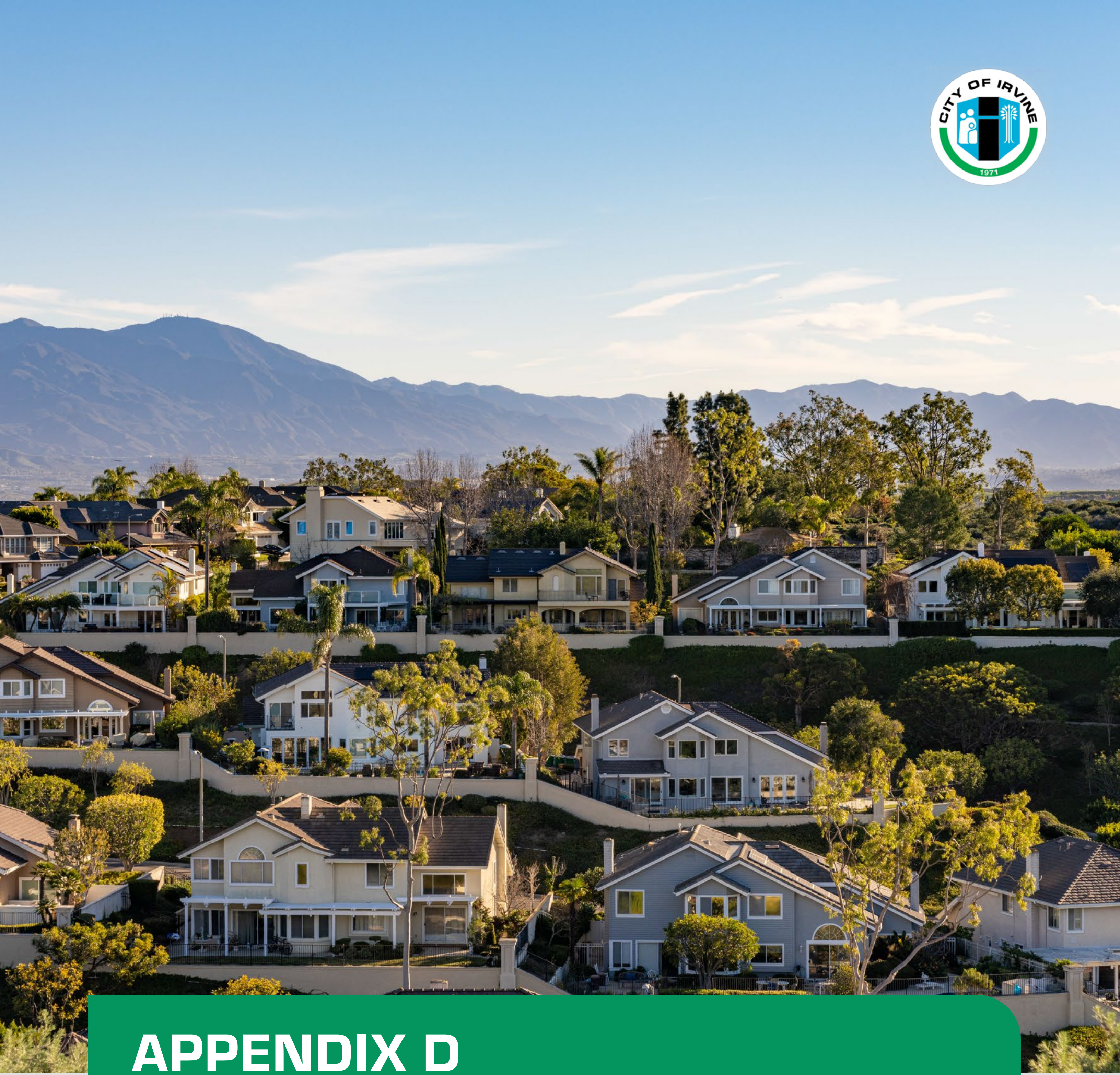

APPENDIX D

Greenhouse Gas Emissions Forecast.

IRVINE
CLIMATE ACTION
AND ADAPTATION PLAN

Memo

1230 Columbia St, Suite 440
San Diego, CA 92101
619.219.8000

Date: October 11, 2024

To: City of Irvine – CAAP Project Team

From: Poonam Boparai, Fred Hochberg, Hannah Kornfeld, and Andrew Martin

Subject: Greenhouse Gas Emissions Forecasts Report for the City of Irvine Climate Action and Adaptation Plan

---

INTRODUCTION

The City of Irvine (City) is developing a Climate Action and Adaptation Plan (CAAP) to reduce greenhouse gas (GHG) emissions and prepare the city for the impacts of climate change. This technical memorandum provides the results of these forecasts, and describes the methods, assumptions, emissions factors, and data sources used to prepare them. The GHG emissions forecasts provide a foundation for the City's climate action planning process, including establishing City-specific targets for reducing emissions levels, calculating additional reductions in emissions levels needed to meet the City's targets (also referred to as the emissions "gap"), and formulating and quantifying measures the City can take to meet its targets and close the gap.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of two parts:

- **Section 1: Summary of Inventory Results** presents an overview of the City's 2019 GHG emissions inventories for community-wide activities and municipal operations.

- **Section 2: Greenhouse Gas Emissions Forecasts** summarizes the forecasted GHG emissions under "business-as-usual" (BAU) and legislative-adjusted BAU scenarios for the years 2030 and 2040. The first scenario, called the BAU scenario, does not account for GHG emissions reductions resulting from laws and regulations adopted by local, regional, State, or federal agencies; it illustrates how much emissions would increase due to population and economic growth if no actions to reduce emissions were taken. The second scenario, a legislative-adjusted BAU scenario, shows emissions reductions from laws and regulations enacted by regional, State, and federal agencies; it does not reflect City actions to reduce GHG emissions. Further reductions in GHG emissions from City actions will be evaluated as a next step in the process of preparing the CAAP.

1 SUMMARY OF INVENTORY RESULTS

1.1 2019 COMMUNITY-WIDE INVENTORY

According to the *Greenhouse Gas Emissions Inventory Report for the City of Irvine Climate Action and Adaptation Plan* (2019 Inventory Report), the community generated approximately 2,247,593 metric tons of carbon dioxide equivalent ($MTCO_2e$) in 2019. Figure 1 and Table 1 present 2019 community-wide emissions by sector.

The largest emissions-generating sectors include on-road transportation and nonresidential and residential building energy. The 2019 emissions level serves as the baseline to forecast emissions and set reduction targets in the CAAP. GHG emissions from stationary sources regulated by State and federal agencies (e.g., sources covered by the Cap-and-Trade program) and outside the City's jurisdiction and influence (e.g., University of California, Irvine [UC Irvine], County-operated landfill) are discussed in the 2019 Inventory Report but not reflected in the community-wide emissions total for 2019.

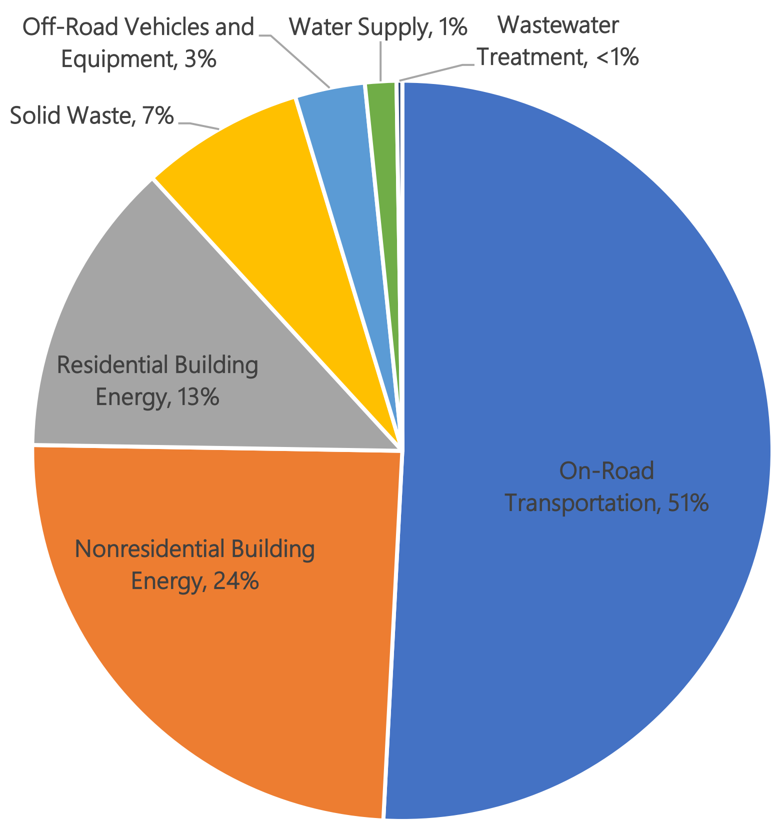

Figure 1 2019 Community-wide GHG Emissions Inventory in the City of Irvine

Note: Totals are rounded to the nearest percent.

Table 1 2019 Community-wide GHG Emissions Inventory in the City of Irvine

Sector	GHG Emissions ($MTCO_2e$)	Percent of Total
On-Road Transportation	1,140,206	51
Nonresidential Building Energy	550,138	24
Residential Building Energy	291,405	13
Solid Waste	160,626	7
Off-Road Vehicles and Equipment	68,756	3
Water Supply	30,798	1
Wastewater Treatment	5,665	<1
Total	**2,247,593**	**100**

Notes: Totals may not sum exactly due to independent rounding to the nearest percent. GHG = greenhouse gases; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

1.2 2019 MUNICIPAL OPERATIONS INVENTORY RESULTS

Based on the modeling conducted, the City's municipal operations generated approximately 18,566 $MTCO_2e$ in 2019. The employee commute and buildings and facilities sectors generated approximately 81 percent of total emissions. The 2019 inventory serves as the municipal operations GHG emissions baseline for the CAAP to forecast emissions and set emissions reductions targets. Table 2 and Figure 2 present the results of the City's 2019 municipal operations GHG emissions inventory by sector, and a description of each emissions sector, including key sources of emissions, is provided in further detail in *Greenhouse Gas Emissions Inventory Report for the City of Irvine Climate Action and Adaptation Plan*.

Table 2 2019 City of Irvine Municipal Operations GHG Emissions Inventory

Sector	GHG Emissions ($MTCO_2e$)	Percent of Total
Buildings and Facilities	12,003	65
Employee Commute	3,032	16
Wastewater Treatment	1,144	6
Vehicle Fleet	1,127	6
Streetlights and Traffic Signals	1,097	6
Solid Waste	159	1
Water Supply	4	<1
Total	**18,566**	**100**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gases; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

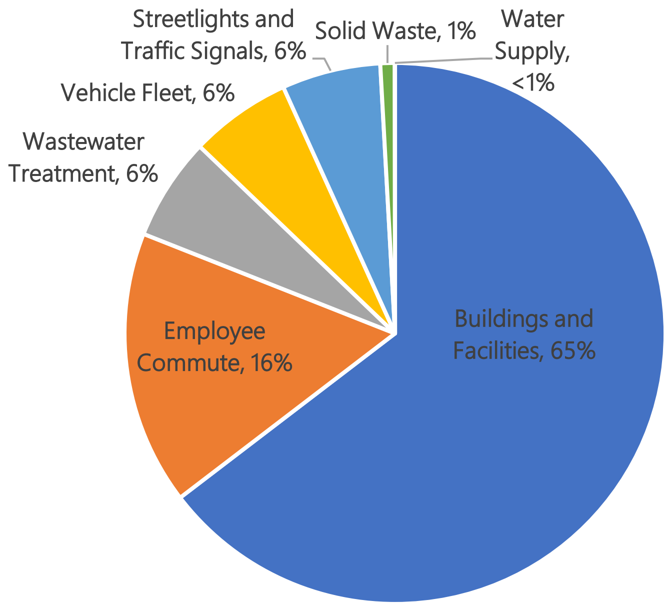

Figure 2 2019 City of Irvine Municipal Operations GHG Emissions Inventory

2 GREENHOUSE GAS EMISSIONS FORECASTS

2.1 COMMUNITY FORECAST RESULTS

The BAU GHG emissions forecasts provide an assessment of how emissions generated by community activities will change over time without further local, State, or federal action. In addition to accounting for the city's growth under a BAU scenario, an adjusted BAU forecast was prepared, which includes adopted legislative and regulatory actions at the State and federal levels that would affect emissions without any local action (referred to hereafter as 'legislative-adjusted BAU'). These include regulatory requirements to increase vehicle fuel efficiency and increase renewable energy sources in grid electricity portfolios. It is important to note that the legislative-adjusted BAU emissions forecasts only include emissions reductions associated with implementation of adopted federal and State legislation and regulations and do not include goals established by executive orders or targets established by federal or State agencies. These forecasts provide the City with the information needed to focus efforts on emissions sectors and sources that have the greatest opportunities for GHG emissions reductions.

The legislative-adjusted BAU GHG emissions forecasts for 2030 and 2040 are aligned with the reduction targets for statewide emissions levels established in State law, including the 2030 target set forth in Senate Bill (SB) 32 and the 2045 target set forth in Assembly Bill (AB) 1279:

- SB 32 (2016):
    - reduce statewide GHG emissions to 40% below 1990 levels by 2030.
- AB 1279 (2022):
    - achieve net zero GHG emissions statewide as soon as possible, but no later than 2045, and maintain net negative emissions thereafter; and
    - ensure that by 2045, statewide anthropogenic greenhouse gas emissions are reduced to at least 85% below the 1990 levels.

Both the BAU and legislative-adjusted BAU emissions forecasts were based on population and employment from the City's land use database and the California State University, Fullerton, Center for Demographic Research Orange County Projections. Population and employment are expected to increase by 17 and 23 percent, respectively, from 2019 to 2040. These growth factors were used to forecast emissions for most sectors. Additional information regarding the growth factors used for each sector is included in the following sections. Annual vehicle miles traveled (VMT) projections were developed using the origin-destination method using data from the Irvine Transportation Analysis Model (ITAM) Traffic Model 2021. Annual VMT by 2040 is projected to increase by 2.6 percent from 2019. VMT projections were used to scale emissions from the on-road transportation sector. Table 3 shows growth in population, employment, and annual VMT from 2019 to 2040.

Table 3 City of Irvine Community Demographic and Vehicle Miles Traveled Forecasts

Forecast Factor	2019	2030	2040
Population	291,124	317,246	340,993
Employment	250,954	280,541	307,438
Annual VMT	2,910,428,375	2,950,103,309	2,986,171,431

Notes: VMT = vehicle miles traveled.

Source: City of Irvine 2021; California State University, Fullerton 2018.

Table 4 shows baseline emissions in 2019 and BAU emissions forecasts for 2030 and 2040.

Table 4 Table 4. City of Irvine Community GHG Emissions Inventory and BAU Forecasts ($MTCO_2e$)

Sector	2019	2030	2040
On-Road Transportation	1,140,206	1,155,749	1,169,879
Nonresidential Building Energy	550,138	614,999	673,962
Residential Building Energy	291,405	317,552	341,322
Solid Waste	160,626	175,038	188,141
Off-Road Vehicles and Equipment	68,756	76,077	87,531
Water Supply	30,798	43,202	46,436
Wastewater Treatment	5,665	6,159	6,620
Total	**2,247,593**	**2,388,776**	**2,513,892**
Percent Change from 2019 Levels	—	6%	12%

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

Legislative-adjusted BAU emissions forecasts were prepared using the same demographic and VMT data that were used for the BAU forecasts, while accounting for regional, State, and federal laws and regulations that would affect local emissions. These forecasts provide the City with an understanding of future community emissions to inform the identification of emissions reduction measures developed to meet GHG targets. A summary of the legislative reductions applied is provided in Table 5.

Table 5 Table 5. Legislative Reductions Summary

Source	Legislative Reduction	Description	Sectors Applied
Regional	Orange County Power Authority (OCPA)	OCPA offers multiple electricity portfolios to its customers, each with its own percentage of renewable power. Customers that "opt out" of OCPA return to electric service with Southern California Edison. In the forecast years (i.e. all future years after 2019), it was assumed that approximately 62 percent of City of Irvine customers will take service on OCPA's 100% Renewable Choice Plan (100 percent renewable), 15 percent on the Smart Choice Plan (69 percent renewable), and 1 percent on the Basic Choice Plan (38 percent renewable). In total, this represents 77 percent of City of Irvine customers being served by OCPA (totals do not sum exactly due to independent rounding). The remaining 23 percent of customers are served by Southern California Edison (based on data provided by Lawrence, pers.comm., 2023 and City of Irvine 2023: 2).	Building Energy
State	California's Building Energy Efficiency Standards (2022 Title 24, Part 6)	Effective January 1, 2023, new residential and nonresidential buildings in California are required to comply with energy efficiency standards established by the California Energy Commission (CEC). The standards establish building performance requirements that encourage energy efficient approaches to building decarbonization, including energy efficiency improvements in the building envelope, electric heat pumps, photovoltaic arrays, and battery storage systems.	Building Energy
State	IRP (Integrated Resource Planning)	California Public Utilities Commission proceeding requiring California energy utilities to submit electric procurement plans to meet the State's GHG emissions reduction goals. Each utility's plan must reduce their GHG emissions below their share of total statewide electric sector emissions (38 million metric tons [MMT] of CO_2e by 2030 and 30 MMT by 2035 [CPUC 2022: 8]).[1]	Building Energy
State	SB 100	Updates the Renewable Portfolio Standard (RPS) to require procurement of 60 percent renewable energy by 2030. Additionally, all retail electricity sold in California must come from renewable or zero-carbon resources by 2045.	Building Energy
State	SB 1020 (Clean Energy, Jobs, and Affordability Act of 2022)	For retail electricity sales to California end-use customers, this bill requires that eligible renewable energy resources and zero-carbon resources comprise 90 percent by December 31, 2035, 95 percent by December 31, 2040, and 100 percent by December 31, 2045.	Building Energy
State	Pavley Clean Car Standards and Advanced Clean Car Standards I and II	Requires all new passenger cars, trucks and sport utility vehicles sold in California to meet increasingly stringent requirements regarding zero emissions technologies and emissions standards.	On-Road Vehicles
State	Truck and Bus Regulation	Requires diesel trucks and buses that operate in California to be upgraded to reduce GHG emissions.	On-Road Vehicles
Federal	Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles	Establishes fuel efficiency standards for medium- and heavy-duty engines and vehicles.	On-Road Vehicles

[1] IRP also requires that utilities submit a second, lower-carbon resource plan to meet statewide carbon goals. This second plan uses targets of 30 and 25 MMT in 2030 and 2035, respectively. However, this memorandum assumes the statewide emissions targets of 38 MMT in 2030 and 30 MMT in 2035 plan, as stated in Table 5, as a more conservative estimate of future electric sector emissions reductions.

Source	Legislative Reduction	Description	Sectors Applied
Federal	EPA Off-Road Compression-Ignition Engine Standards	Establishes standards for phasing of EPA diesel engine tiers for off-road compression-ignition equipment.	Off-Road Vehicles and Equipment

Notes: CEC = California Energy Commission; CO_2e = carbon dioxide equivalent; EPA = U.S. Environmental Protection Agency; GHG = greenhouse gas; OCPA = Orange County Power Authority; SB = Senate Bill.

Source: Prepared by Ascent in 2024.

The city's legislative-adjusted BAU emissions would decrease by approximately 55 percent between 2019 and 2040, as shown below in Table 6 and Figure 3. Figure 3 also shows the emissions trend that would occur without anticipated legislative reductions, accounting only for population, employment, and VMT changes (i.e., BAU emissions). Without the legislative reductions, emissions would be approximately 148 percent higher in 2040 compared to 2040 emissions levels in the legislative-adjusted BAU forecast. Emissions forecasts for each sector are discussed in detail in the following sections.

Table 6 Table 6. City of Irvine Community GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Sector	2019	2030	2040
On-Road Transportation	1,140,206	793,628	334,698
Nonresidential Building Energy	550,138	247,934	200,979
Residential Building Energy	291,405	203,559	193,301
Solid Waste	160,626	175,038	188,141
Off-Road Vehicles and Equipment	68,756	76,077	87,531
Water Supply	30,798	9,973	1,831
Wastewater Treatment	5,665	6,173	6,620
Total	**2,247,593**	**1,512,383**	**1,013,100**
Percent Change from 2019 Levels	—	-33%	-55%

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

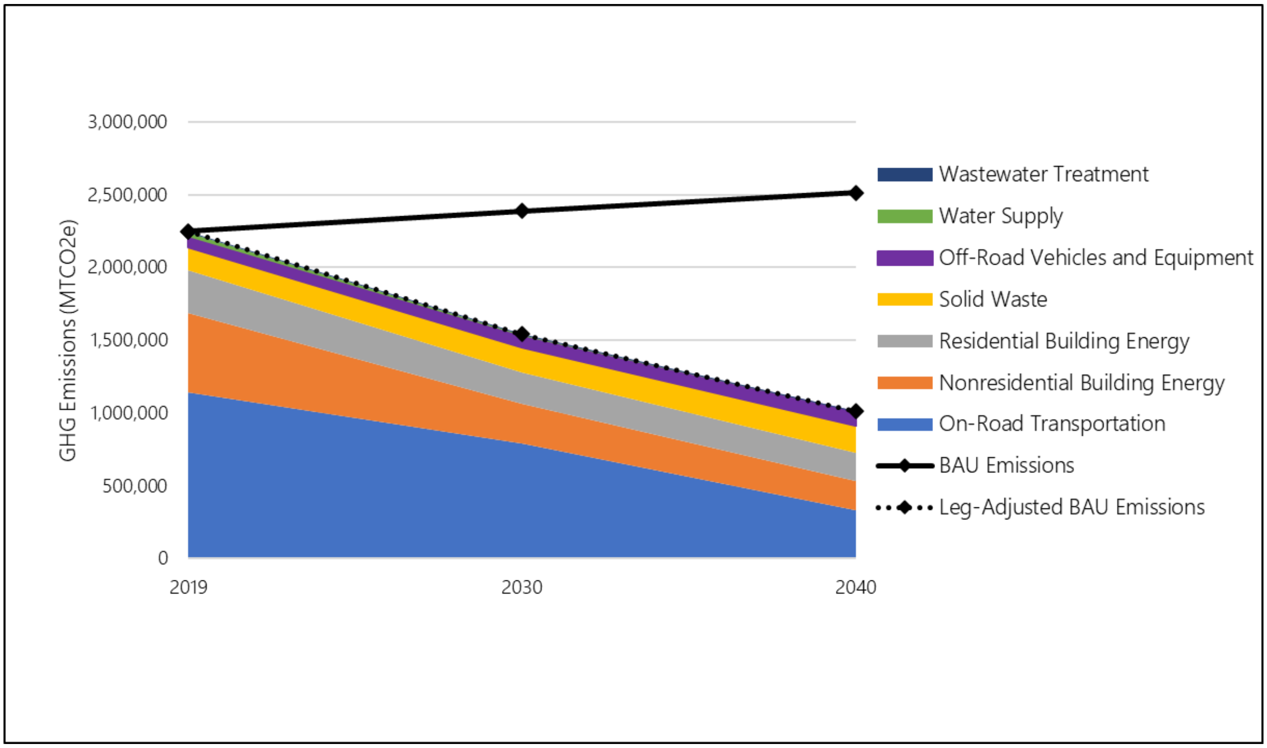

Figure 3 City of Irvine Community GHG Emissions Inventory and Forecasts

Notes: BAU = Business As Usual; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.2 COMMUNITY FORECAST METHODS BY SECTOR

2.2.1 Building Energy

BUILDING ENERGY ASSUMPTIONS

Building energy emissions in the city result directly from onsite combustion of natural gas and indirectly from electricity consumption. The combustion of fossil fuels (i.e., diesel, liquid propane gas [LPG], and natural gas) in backup generators also contributes to the city's building energy emissions. Southern California Edison (SCE) is an electricity provider and Southern California Gas Company (SoCalGas) is the natural gas provider in the city. Orange County Power Authority (OCPA) is a community choice aggregation agency established to source clean and renewable electricity in Orange County including the City of Irvine.

Electricity Emissions Factors

Emissions factors for electricity vary depending on the utility (SCE or OCPA), the carbon content of the different portfolios that each utility offers its customers, and year. To calculate City's overall electric emissions factor for a given year, a weighted average of OCPA emissions and SCE emissions was taken, accounting for participation rates and portfolio offerings across those two utilities (see Table 5 of this memorandum). This weighted average emissions factor was then applied to all electric usage. Table 7 below shows how this calculation was performed.

Table 7 Calculation of Weighted Emissions Electric Emissions Factor

Year	Participation rates by utility and power portfolio					$MTCO_2e$ / MWh by utility and power portfolio				
	SCE	OCPA Basic Choice Plan	OCPA Smart Choice Plan	OCPA 100% Renewable Choice Plan	Total	SCE	OCPA Basic Choice Plan	OCPA Smart Choice Plan	OCPA 100% Renewable Choice Plan	Weighted Average
2019	100%	0%	0%	0%	100%	0.208	NA	NA	NA	0.208
2030	23%	1%	15%	62%	100%	0.141	0.244	0.094	0	0.048
2040	23%	1%	15%	62%	100%	0.021	0.021	0.021	0.000	0.008

Notes: Total may not sum exactly due to independent rounding. NA = Not Applicable; OCPA = Orange County Power Authority; $MTCO_2e$ = metric tons of carbon dioxide equivalent; MWh = megawatt-hour; SCE = Southern California Edison.

Source: Data modeled by Ascent in 2024.

SCE's emissions factor for 2019 was derived from its Power Content Label, which shows 16.1 percent natural gas and 32.6 percent from unspecified sources of power (unspecified power is electricity that has been purchased through open market transactions and is not traceable to a specific generation source: SCE 2019). In total, this implies that SCE's portfolio is 48.7 percent carbon-emitting power (note: "carbon-emitting power" is used hereafter as a shorthand to refer to the sum of power generated by natural gas-fired generators and unspecified power). This 48.7 percent was then multiplied by California Air Resources Board (CARB) emissions factor for Mandatory Reporting of Greenhouse Gases (MRR) of 0.428 $MTCO_2e$/MWh, which reflects the emissions from unspecified power, and additionally is similar to the emission factor from an average single-cycle natural gas power plant (CARB 2018: 16).

Emissions factors for 2030 were derived from SCE and OCPA's IRP electricity resource plans as described in Table 5. In the case of SCE, its Integrated Resource Plan shows 67 percent GHG-free power in 2030 (SCE 2022). This corresponds to 33 percent emitting power from natural gas or unspecified power and thus 0.141 $MTCO_2e$/MWh based on the CARB emissions factor of 0.428 $MTCO_2e$/MWh shown above. In the case of OCPA, separate emissions factors for each portfolio (Basic Choice Plan, Smart Choice Plan, and 100% Renewable Choice Plan) were calculated. A percentage of carbon-free power for each OCPA portfolio was estimated by taking OCPA's overall ratio of carbon-free energy to renewable energy and multiplying that ratio by each portfolio's percentages of renewable content. This percentage of carbon-free power was then subtracted from 100 percent to yield a percentage of carbon-emitting power. Finally, this percent of carbon-emitting power was multiplied by 0.428 MTCO2e/MWh to yield an emissions factor. Table 8 below shows the results of this calculation.

Table 8 Derivation of 2030 OCPA Emissions Factors, by Portfolio

Calculation Factor	OCPA Basic Choice Plan	OCPA Smart Choice Plan	OCPA 100% Renewable Choice Plan
Percent Renewable	38%	69%	100%
Percent Carbon-Free	43%	78%	100%
Percent Carbon-Emitting Power	57%	22%	0%
Emissions Factor ($MTCO_2e$ / MWh)	0.244	0.094	0

Notes: OCPA = Orange County Power Authority; $MTCO_2e$ = metric tons of carbon dioxide equivalent. MWh = megawatt-hour.

Source: Data modeled by Ascent in 2024, based on data from Orange County Power Authority (2022).

Emissions factors for 2040 were calculated assuming implementation of SB 1020 (see Table 5, Legislative Reductions Summary). This bill requires 95 percent of all retail sales of electricity to California end-use customers to be from renewable or zero-carbon resources by December 31, 2040. This implies 5 percent emitting power, and thus 0.021

$MTCO_2e$/MWh based on the CARB emissions factor of 0.428 $MTCO_2e$/MWh shown in Table 7 above. It was assumed that the OCPA 100 percent renewable portfolio would remain at 100 percent renewable, as it is already above the 95 percent renewable or zero-carbon requirement of SB 1020.

Natural Gas Emissions Factors

Natural gas emissions are based on emissions factors obtained from The Climate Registry's (TCR's) 2020 Default Emission Factors, which are estimated to be 11.7 pounds of carbon dioxide equivalent per therm (lb CO_2e/therm). Emissions factors associated with natural gas combustion are not anticipated to change over time, as there are no legislative actions that would reduce the carbon intensity of natural gas.

Diesel Emissions Factors

Emissions from diesel fuel used to power backup generators are based on emissions factors from TCR, which are estimated to be 22.6 pounds of carbon dioxide equivalent per gallon (lb CO_2e/gal). Emissions factors associated with diesel combustion are not anticipated to change over time, as there are no legislative actions that would reduce the carbon intensity of diesel.

Gasoline Emissions Factors

Emissions from gasoline fuel used to power backup generators are based on emissions factors also from TCR, which are estimated to be 19.4 lb CO_2e/gal. Emissions factors associated with gasoline combustion are not anticipated to change over time, as there are no legislative actions that would reduce the carbon intensity of gasoline.

Energy Efficiency and Fuel Source

Future energy use was adjusted to reflect increased emissions-intensity stringency under California's Building Energy Efficiency Standards (California Code of Regulations Title 24 Part 6, hereafter referred to as "Title 24"). Title 24 standards apply to new residential and nonresidential construction. The 2019 Title 24 standards apply to projects constructed after January 1, 2020, and the 2022 Title 24 standards apply after January 1, 2023. To estimate adjusted future energy consumption resulting from Title 24 requirements in new construction, electricity- and natural gas-specific adjustment factors were calculated using the difference in the average energy use in residential and nonresidential buildings between those built to 2019 Title 24 standards and those built to 2022 Title 24 standards. Adjustment factors were calculated using data available from the California Energy Commission (CEC) that were developed for the 2022 Title 24 standards. In addition to accounting for Title 24 requirements by land use type (i.e., residential and nonresidential), CEC also developed estimates for energy usage rates by climate zone, and the city's climate zone (Zone 8) was used for the residential buildings analysis. Climate zone-specific data for nonresidential buildings were unavailable; therefore, nonresidential adjustment factors relied on statewide averages.

The adjustment factors (specific to both building type and energy type) were applied to the BAU growth in building energy use to estimate the energy consumption and associated GHG emissions of future development with legislative adjustments. It is important to note that although average electricity use in new residential buildings is anticipated to rise (due to an increase in electrical demand associated with electric appliances installed instead of natural gas appliances), emissions from new residential buildings are expected to be lower than they would be under 2019 Title 24 as a result of overall lower building emissions intensities (due to lower emissions factors associated with electricity compared to natural gas).

BUILDING ENERGY RESULTS

Emissions from future electricity, natural gas, and backup generator (i.e., diesel, natural gas, and gasoline) use were estimated by multiplying anticipated energy use by forecasted emissions factors. Future energy use was forecasted in two parts. First, energy use was scaled by population and employment growth factors detailed above. Second, energy emissions factors were adjusted as described in the previous section. Natural gas, diesel, and gasoline emissions factors were not adjusted, as the emissions intensity of these energy sources is anticipated to stay constant. Table 9 summarizes the scaling factors and legislative reductions used to forecast building use by energy type.

Table 9 Building Energy Emissions Forecast Methods by Energy Type

Energy Type	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Electricity	Scaled by population growth for residential building energy; scaled by employment growth for nonresidential building energy.	Emissions factors derived from SCE and OCPA IRP plans. Accounts for Title 24 energy efficiency gains in new construction based on the best available data for average building energy efficiency.
Natural Gas		Accounts for Title 24 energy efficiency gains in new construction based on the best available data for average building energy efficiency.

Notes: IRP = Integrated Resource Plan; OCPA = Orange County Power Authority; RPS = Renewables Portfolio Standard; SCE = Southern California Edison.

Source: Prepared by Ascent in 2024.

RESIDENTIAL BUILDING ENERGY

Between 2019 and 2040, emissions from residential building energy would decrease by approximately 34 percent from 291,405 to 193,301 $MTCO_2e$ with legislative adjustments, despite overall population growth of approximately 17 percent over the same time. Table 10 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the residential building energy sector by energy type for 2030 and 2040.

Table 10 Residential Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts (Annual $MTCO_2e$)

Energy Type	2019	2030	2040
Electricity	116,584	22,304	5,424
Natural Gas	174,820	181,255	187,459
Total	**291,405**	**203,559**	**193,301**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

NONRESIDENTIAL BUILDING ENERGY

Between 2019 and 2040, emissions from nonresidential building energy would decrease by approximately 63 percent from 550,138 to 200,979 $MTCO_2e$ with legislative adjustments, despite overall employment growth of approximately 23 percent over the same time. Table 11 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the nonresidential building energy sector by energy type for 2030 and 2040.

Table 11 Nonresidential Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Energy Type	2019	2030	2040
Electricity	385,130	74,797	18,398
Natural Gas	160,501	169,735	178,853
Backup Generators	4,507	3,401	3,728
Total	**550,138**	**247,934**	**200,979**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Prepared by Ascent in 2024.

2.2.2 Transportation

ON-ROAD TRANSPORTATION

Between 2019 and 2040, GHG emissions from on-road vehicles would decrease by approximately 71 percent from 1,140,206 to 334,698 $MTCO_2e$, accounting for an increase in VMT of approximately 2.6 percent, and future vehicle emissions factors modeled in California Air Resources Board's (CARB's) Emissions FACtor (EMFAC2021) model. VMT projections were developed using the origin-destination method and data from the ITAM model. With respect to the legislative adjustments included in this forecast, State and federal laws and regulations incorporated in the on-road transportation sector include the Pavley Clean Car Standards Advanced Clean Car I and II (ACC I and II) Standards, and fuel efficiency standards for medium- and heavy-duty vehicles. Pavley Clean Car Standards and fuel efficiency standards are included in EMFAC2021's emissions factor estimates and forecasts. Vehicle fleet assumptions were adjusted to account for the effect of Advanced Clean Car II (ACC II) Standards, including assumed new sales of battery electric vehicles and plug-in hybrids (CARB 2022: 5). The Low Carbon Fuel Standard was excluded in EMFAC2021 forecasts because the emissions benefits originate from upstream fuel production and do not directly reduce vehicle tailpipe emissions that affect the city's GHG emissions forecasts. Table 12 summarizes the scaling factors and legislative reductions used to forecast on-road transportation emissions.

Table 12 On-Road Transportation Emissions Forecast Methods

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
On-Road Transportation	Scaled by VMT estimates provided by Iteris.	EMFAC2021 forecasts vehicle fleet distributions by vehicle type and the emissions factors anticipated for each vehicle category based on both vehicle emissions testing and approved legislative reductions. EMFAC2021's forecasts incorporate the effects of federal standards and fuel efficiency standards for medium- and heavy-duty vehicles, as well as truck and bus regulations. Vehicle fleet assumptions were adjusted to account for the effect of Advanced Clean Car II (ACC II) Standards, including assumed new sales of battery electric vehicles and plug-in hybrids.

Notes: ACC II= Advanced Clean Cars II; CAFE = Corporate Average Fuel Economy; EMFAC2021 = California Air Resources Board's EMisson FACtor 2021 model.

Source: Prepared by Ascent in 2024.

Table 13 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from on-road transportation for 2030 and 2040.

Table 13 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
On-Road Transportation	1,140,206	793,628	334,698

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Source: Data modeled by Ascent in 2024.

OFF-ROAD VEHICLES AND EQUIPMENT

Between 2019 and 2040, emissions associated with off-road vehicles and equipment used in the city would increase by 27 percent from 68,756 to 87,531 $MTCO_2e$, with legislative adjustments applied and overall growth in various demographics. Emissions were obtained primarily from CARB's latest off-road emissions model, OFFROAD2021, as well as from CARB's OFFROAD2007 model. With respect to the legislative adjustments in the off-road vehicle sector, OFFROAD2021 was used, which incorporates regulatory actions such as reformulated fuels and more stringent emissions standards. However, some off-road vehicle and equipment sources that are included in the OFFROAD2007 model are excluded from OFFROAD2021. For these sectors, emissions were obtained from OFFROAD2007. In addition, OFFROAD2021 provides CO_2 emissions but does not provide emissions from CH_4 and N_2O. Ratios of CH_4 and N_2O to CO_2 reported in OFFROAD2007 were calculated and applied to CO_2 data from OFFROAD2021 to calculate CH_4 and N_2O emissions, as recommended by CARB.

Orange County-level emissions from off-road vehicles and equipment were downscaled to the city, using changes in city-specific demographic factors. Table 14 summarizes the scaling factors and legislative reductions used to forecast off-road vehicle and equipment emissions.

Table 14 Off-Road Vehicles and Equipment Forecast Methods by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Construction and Mining	Service Population	OFFROAD2021 emissions factor considerations include EPA off-road compression-ignition engine standards implementation schedule.
Entertainment Equipment	Employment	
Industrial Equipment	Employment	
Lawn and Garden Equipment	Population	
Light Commercial Equipment	Employment	
Portable Equipment	Employment	
Recreational Equipment	Population	
Transport Refrigeration Units	Service Population	

Notes: EPA = U.S. Environmental Protection Agency; OFFROAD2021 = California Air Resources Board's OFFROAD2021 model.

Source: Data modeled by Ascent in 2024..

Table 15 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the off-road vehicles and equipment sector for 2030 and 2040.

Table 15 Off-Road Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Construction and Mining	19,536	21,614	24,668
Entertainment Equipment	267	295	341
Industrial Equipment	25,201	27,892	32,233
Lawn and Garden Equipment	708	776	874
Light Commercial Equipment	5,330	5,899	6,817
Portable Equipment	14,647	16,212	18,734
Recreational Equipment	267	293	329
Transport Refrigeration Units	2,799	3,097	3,534
Total	**68,756**	**76,077**	**87,531**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.2.3 Solid Waste

Between 2019 and 2040, solid waste emissions generated from community activities in the city would increase by approximately 17 percent from 160,626 to 188,141 $MTCO_2e$, accounting for overall population growth of approximately 17 percent over the same time. Solid waste sector emissions include CH_4 emissions from the decay of waste generated annually, which were scaled by population growth within the city between 2019 and 2040. No additional legislative reductions could be applied to this sector, so legislative-adjusted BAU emissions are equivalent to BAU emissions. Table 16 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the solid waste sector for 2030 and 2040.

Table 16 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Community-Generated Solid Waste	160,626	175,038	188,141

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.2.4 Water Supply

Between 2019 and 2040, water supply emissions generated from community activities in the city would decrease by 94 percent due to a decline in electricity emissions factors. It was assumed that certain proportions of water used within the city was extracted, conveyed, treated, and distributed within and outside the city boundary. For the water supply from local sources within the city, the electricity usage associated with extracting, conveying, treating, and distributing water is captured in the building energy sector because these activities take place within the city. Therefore, the electricity usage and emissions associated with extracting, conveying, treating, and distributing water from outside the city boundary was applied to the water sector. Electricity usage associated with water consumption is subject to RPS targets, pursuant to SB 100 requirements. Table 17 summarizes the scaling factor and legislative reduction used to forecast water supply emissions.

Table 17 Water Supply Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Water Consumption	Scaled by population growth.	See Section 2.1.1 (Building Energy), Electric Emissions Factors subsection, for legislative reductions applied to the electric sector.

Source: Data modeled by Ascent in 2024.

Table 16 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the water supply sector for 2030 and 2040. Weighted average electric emissions factors shown in Table 7 were used to derive these figures.

Table 18 Water Supply GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Water Supply	30,798	9,973	1,831

Notes: BAU = business-as-usual; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: Data modeled by Ascent in 2024.

2.2.5 Wastewater Treatment

Between 2019 and 2040, community wastewater treatment emissions would increase by approximately 17 percent from 5,665 to 6,620 $MTCO_2e$. This change reflects an increase in wastewater generation resulting from population growth within the city of approximately 17 percent over the same time. Wastewater treatment-related emissions are generated from centralized wastewater treatment plants (WWTPs) providers for the city. Table 19 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from wastewater treatment sources for 2030 and 2040.

Table 19 Wastewater Treatment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Centralized WWTPs	5,665	6,173	6,620

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; WWTP = wastewater treatment plant.

Source: Data modeled by Ascent in 2024.

2.3 MUNICIPAL OPERATIONS FORECAST RESULTS

Estimated municipal operations BAU emissions forecasts were based on predicted growth in City employment between 2019 and 2040. Municipal employment is expected to increase by 17 percent between 2019 and 2040. Change in municipal employment was the sole factor used to forecast BAU emissions for 2030 and 2040 for all sectors in the municipal operations inventory. Table 20 shows 2019 municipal employment and anticipated change in municipal employment for the forecast years.

Table 20 City of Irvine Municipal Operations Demographic Forecasts

Forecast Factor	2019	2030	2040
City Employment	1,586	1,728	1,858

Source: Ascent Environmental 2023.

Table 21 shows 2019 baseline emissions and BAU emissions forecasts for 2030 and 2040.

Table 21 City of Irvine Municipal Operations GHG Emissions Inventory and BAU Forecasts (Annual $MTCO_2e$)

Sector	2019	2030	2040
Buildings and Facilities	12,003	13,080	14,059
Employee Commute	3,032	3,304	3,551
Wastewater Treatment	1,144	1,246	1,340
Vehicle Fleet	1,127	1,228	1,320
Streetlights and Traffic Signals	1,097	1,195	1,285
Solid Waste	159	174	187
Water Supply	4	5	5
Total	**18,566**	**20,232**	**21,746**
Percent Change from 2019 Levels	—	*9%*	*17%*

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

Legislative-adjusted BAU emissions forecasts provide an assessment of how the City's municipal operations emissions would change over time without further action from the City. The legislative-adjusted BAU forecast accounts for laws and regulations at the regional, State, and federal levels that would affect emissions, such as regulatory requirements to increase vehicle fuel efficiency and building energy efficiency. These forecasts provide the City with the information needed to focus efforts on certain municipal operations emissions sectors and sources that have the most GHG reduction opportunities. A summary of legislative reductions applied is provided in Table 5. Municipal operations legislative-adjusted BAU emissions would decrease by approximately 74 percent between 2019 and 2040, as shown in Table 22 and Figure 4.

Table 22 City of Irvine Municipal Operations GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Sector	2019	2030	2040
Buildings and Facilities	12,003	1,950	2,022
Employee Commute	3,032	2,192	842
Wastewater Treatment	1,144	1,246	1,340
Vehicle Fleet	1,127	912	501
Streetlights and Traffic Signals	1,097	0	-
Solid Waste	159	174	187
Water Supply	4	2	1
Total	**18,566**	**6,477**	**4,892**
Percent Change from 2019 Levels		**-65%**	**-74%**

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

Figure 4 also shows the emissions trend that would occur without anticipated legislative reductions, accounting only for changes in municipal employment (i.e., BAU emissions). 2040 legislative-adjusted emissions are approximately 22 percent of 2040 BAU emissions. Emissions forecasts for each sector are discussed in detail in the following sections.

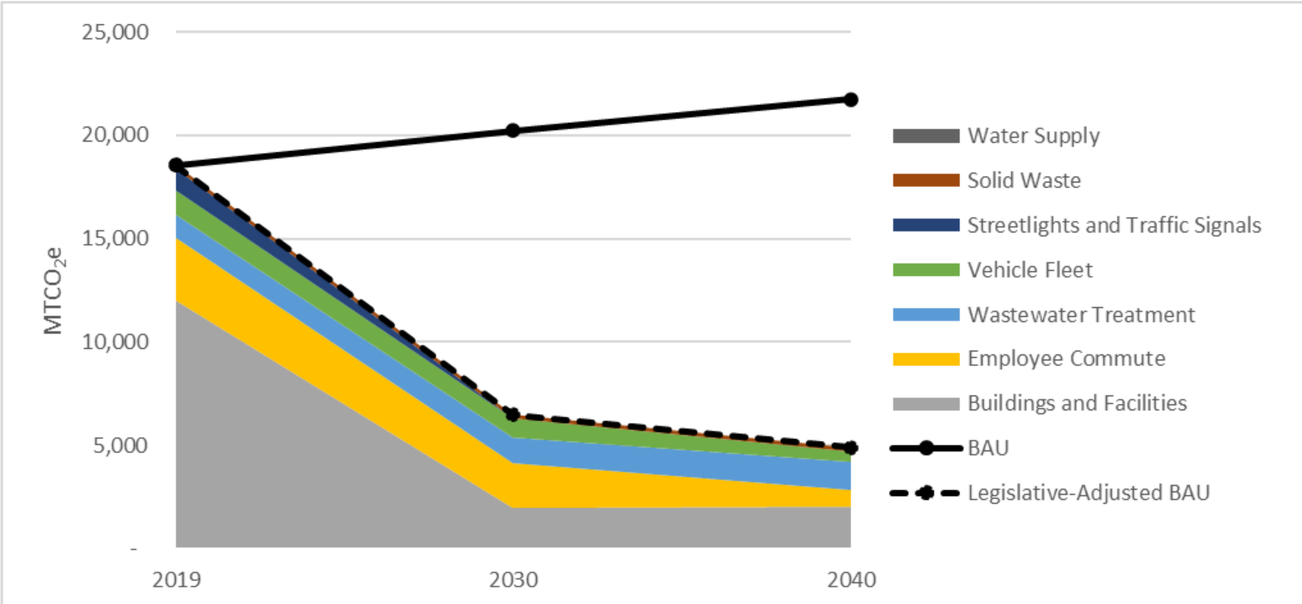

Figure 4 City of Irvine Municipal Operations GHG Emissions Inventory and Forecasts

Note: BAU = Business-as-usual; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.4 MUNICIPAL OPERATIONS FORECAST METHODS BY SECTOR

2.4.1 Buildings and Facilities Energy

Emissions from future electricity, natural gas, and backup generator use in City buildings and facilities were estimated by multiplying anticipated energy use by forecasted emissions factors. Future energy use was forecasted in two parts, as described in Section 2.1.1. Table 23 summarizes the legislative reductions used to forecast buildings and facilities emissions by energy type.

Table 23 Buildings and Facilities Energy Emissions Forecast Legislative Reductions by Energy Type

Energy Type	Applied Legislative Reductions
Electricity	Municipal buildings are subscribed to OCPA's 100% Renewable portfolio; therefore, electricity consumption in City buildings is modeled as zero-carbon (i.e., zero GHG emissions) by 2030. Increased energy efficiency due to 2022 Building Energy Efficiency Standards Title 24 was applied to new construction, based on the best available data for average building energy efficiency.
Natural Gas	Increased energy efficiency due to 2022 Building Energy Efficiency Standards Title 24 were applied to new construction, based on the best available data for average building energy efficiency.

Notes: OCPA = Orange County Power Authority.

Source: Ascent Environmental 2022.

Between 2019 and 2040, emissions from electricity, natural gas, and backup generators from municipal buildings and facilities would decrease by approximately 83 percent from 12,003 to 2,022 $MTCO_2e$, accounting for legislative adjustments and municipal employment changes. This change reflects increases in emissions from natural gas and backup generators combined with the City's automatic enrollment in OCPA's carbon-free option. Table 24 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the municipal operations buildings and facilities energy sector by energy type for 2030 and 2040.

Table 24 Buildings and Facilities Energy GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Energy Type	2019	2030	2040
Electricity	10,138	0	0
Natural Gas	1,862	1,947	2,019
Backup Generators	3	3	3
Total	**12,003**	**1,950**	**2,022**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

ELECTRICITY EMISSIONS FACTORS

Electricity emissions factors would reduce to zero by 2030, per enrollment of municipal buildings in OCPA's carbon free option (as shown in Table 21).

NATURAL GAS EMISSIONS FACTORS

Natural gas emissions are based on data from TCR, as described in Section 2.1.1. Emissions factors associated with natural gas combustion are not anticipated to change over time, as there are no legislative actions that would reduce the energy intensity of natural gas.

DIESEL EMISSIONS FACTORS

Emissions from diesel fuel used to power backup generators are based on emissions factors from TCR, as described in Section 2.1.1. Emissions factors associated with diesel combustion are not anticipated to change over time, as there are no legislative actions that would reduce the energy intensity of diesel fuel.

2.4.2 Streetlights and Traffic Signals

Between 2019 and 2040, emissions from streetlights and traffic signals would be reduced to zero. This reflects the City's automatic enrollment of municipal accounts in OCPA's carbon-free option. Table 25 summarizes the legislative reductions used to forecast streetlight and traffic signal emissions.

Table 25 Streetlights and Facilities Emissions Forecast Legislative Reductions

Source	Applied Legislative Reductions
Electricity	OCPA's carbon-free option was applied to OCPA's electricity emissions factors.

Notes: OCPA = Orange County Power Authority.

Source: Prepared by Ascent in 2024.

Table 26 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the streetlights and traffic signals sector for 2030 and 2040.

Table 26 Streetlights and Traffic Signals GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Streetlights and Traffic Signals	1,097	0	0

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.4.3 Employee Commute

Between 2019 and 2040, GHG emissions from employee commutes would decrease by approximately 72 percent from 3,032 to 842 $MTCO_2e$, accounting for future vehicle emissions factors modeled in CARB's EMFAC2021 model and municipal employment change. It was assumed that employees that commute to work all use light-duty vehicles. With respect to the legislative adjustments included in this forecast, State and federal laws and regulations incorporated in the employee commute sector include the Pavley Clean Car Standards and ACC II Standards. Pavley Clean Car Standards are already included in EMFAC2021's emissions factor estimates and forecasts. Additional calculations were performed to incorporate the effects of ACCII.

It should be noted that the Low Carbon Fuel Standard was excluded in EMFAC2021 forecasts because most of the emissions benefits originate from upstream fuel production and do not directly reduce emissions in the City's municipal operations GHG emissions forecasts. Table 27 summarizes the legislative reductions used to forecast employee commute emissions.

Table 27 Employee Commute Forecast Legislative Reductions

Source	Applied Legislative Reductions
Employee Commute	EMFAC2021 forecasts vehicle fleet distributions and emissions factors based on vehicle emissions testing and approved legislative reductions. EMFAC2021's forecasts incorporate the effects of the CAFE standards. Separate calculations were performed to incorporate the effects of ACC II.

Notes: ACC II= Advanced Clean Cars II; CAFE = Corporate Average Fuel Economy; EMFAC2021 = California Air Resources Board's EMisson FACtor 2021 model.

Source: Prepared by Ascent in 2024.

Table 28 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from municipal employee commutes for 2030 and 2040.

Table 28 Employee Commute GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Employee Commute	3,032	2,192	842

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.4.4 Vehicle Fleet

Between 2019 and 2040, emissions associated with the City's municipal vehicle fleet would decrease by approximately 56 percent from 1,127 to 501 $MTCO_2e$, accounting for legislative adjustments and municipal employment change. Vehicle fleet fuel consumption data (i.e., gallons of gasoline and diesel fuel) for 2019 were provided by the City for all City-owned vehicles and equipment. Because additional vehicle fleet data were unavailable, total emissions for gasoline and diesel fuel were estimated using emissions factors obtained from TCR. With respect to the legislative adjustments in the vehicle fleet sector, improvements in fuel efficiency reported by CARB's EMFAC2021 model, as described in Section 2.1.2, were applied to BAU emissions forecasts. Effects of ACCII standards were incorporated using calculations performed separately. Table 29 summarizes the legislative reductions used to forecast vehicle fleet emissions.

Table 29 Vehicle Fleet Forecast Legislative Reductions

Source	Applied Legislative Reductions
Vehicle Fleet	EMFAC2021 forecasts vehicle fleet distributions by vehicle type and the emissions factors anticipated for each vehicle category based on both vehicle emissions testing and approved legislative reductions. EMFAC2021's forecasts incorporate the effects of the CAFE standards. Additional calculations were performed to incorporate the effects of ACCII.

Notes: ACC II= Advanced Clean Cars II; CAFE = Corporate Average Fuel Economy; EMFAC2021 = California Air Resources Board's EMisson FACtor 2021 model.

Source: Prepared by Ascent in 2024.

Table 30 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the vehicle fleet sector by fuel source for 2030 and 2040.

Table 30 Vehicle Fleet GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Gasoline	954	772	424
CNG	173	140	77
Total	**1,127**	**912**	**501**

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; CNG = compressed natural gas; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.4.5 Solid Waste

Between 2019 and 2040, municipal operations solid waste emissions would increase by approximately 17 percent from 159 to 187 $MTCO_2e$, accounting for municipal employment change. No additional legislative reductions could be applied to this sector, so legislative-adjusted BAU emissions are equivalent to BAU emissions. Table 31 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the municipal operations solid waste sector for 2030 and 2040.

Table 31 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Source	2019	2030	2040
Solid Waste	159	174	187

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.4.6 Water Supply

Between 2019 and 2040, emissions from water supplied for municipal operations would be reduced by 80 percent due to an increase in low-carbon electricity used for water pumping. For the water supply from local sources within the city, the electricity usage associated with extracting, conveying, treating, and distributing water is captured in the buildings and facilities energy sector because these activities take place within the city. Therefore, the electricity usage and emissions associated with extracting, conveying, treating, and distributing water from outside the city boundary was applied to the municipal water sector. Table 32 summarizes the legislative reductions used to forecast water supply emissions.

Table 32 Water Supply Forecast Legislative Reductions

Source	Applied Legislative Reductions
Water Consumption	SB 100 applied to SCE electric emissions factors: 60 percent renewable by 2030, 100 percent renewable by 2045.

Notes: RPS = Renewables Portfolio Standard; SB 100 = Senate Bill 100; SCE = Southern California Edison.

Source: Prepared by Ascent in 2024.

Table 33 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from municipal operations water supply for 2030 and 2040.

Table 33 Water Supply GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Activity	2019	2030	2040
Water Supply Emissions	4	2	1

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.4.7 Wastewater Treatment

Between 2019 and 2040, wastewater treatment emissions from municipal operations would increase by approximately 17 percent from 1,144 to 1,340 $MTCO_2e$, accounting for legislative reductions and municipal employment change. This reflects both an increase in wastewater generation and lower electricity emissions factors related to the 2030 and 2045 RPS targets for SCE, pursuant to SB 100, due to treatment processes located outside of the OCPA service area. Although electricity intensity factors are reduced through 2045, increases in process and fugitive emissions resulting from wastewater collection and treatment offset decreased electricity emissions. Table 34 summarizes the legislative reductions used to forecast emissions from municipal operations wastewater treatment.

Table 34 Wastewater Treatment Forecast Legislative Reductions

Source	Applied Legislative Reductions
Wastewater Treatment	SB 100 applied to SCE electric emissions factors: 60 percent renewable by 2030, 100 percent renewable by 2045.

Notes: RPS = Renewables Portfolio Standard; SCE = Southern California Edison.

Source: Data modeled by Ascent in 2024.

Table 35 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from wastewater treatment for 2030 and 2040.

Table 35 Wastewater Treatment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (Annual $MTCO_2e$)

Activity	2019	2030	2040
Wastewater Treatment	1,144	1,246	1,340

Notes: BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Data modeled by Ascent in 2024.

2.5 DISCUSSION

The community and municipal legislative-adjusted BAU emissions would decrease by approximately 55 percent and 74 percent between 2019 and 2040, respectively. This is a result of reductions that would be achieved from several legislative actions, including:

- a greater proportion of renewable and carbon-free electricity sources in SCE and OCPA;
- improved building energy efficiency through compliance with Title 24 standards; and
- reductions in on-road vehicle emissions factors due to State vehicle standards and ACC II.

Going forward, new legislative actions that would affect emissions may be adopted by State and federal agencies; however, because information regarding these regulatory changes is currently unavailable or not final, emissions reductions from future potential legislative actions are not quantified in this memorandum. Where new State regulations or programs are imminent and reasonably foreseeable, they can be incorporated as complementary actions to locally based GHG reduction measures.

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