Memo

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Date: September 14, 2022

To: David Morrison and Deborah Elliott (County of Napa)

From: Honey Walters and Brenda Hom (Ascent Environmental, Inc.)

Subject: Napa County Regional Greenhouse Gas Forecast (2019 – 2030)

1 INTRODUCTION

This technical memorandum presents an estimated forecast of communitywide greenhouse gas (GHG) emissions for the Napa County region (region), including forecasts for each of the six jurisdictions: American Canyon, Calistoga, the City of Napa, St. Helena, Yountville, and the unincorporated areas of Napa County (Unincorporated County) under "business-as-usual" (BAU) and legislative-adjusted BAU scenarios for the year 2030. These forecasts are based on the results of the 2019 communitywide GHG emissions inventory, as well as associated methods, assumptions, emissions factors, and data sources used to develop the updated emissions inventory described in the Napa County Region 2019 Community Greenhouse Gas Inventory Update Summary memorandum that was delivered to the County of Napa (County) on June 7, 2022.

This forecast provides an estimate of future GHG levels based on a continuation of current trends in activity, while also accounting for Federal and State legislative actions to reduce emissions in the future. Such that regional departments and agencies may also choose to expand the scope of their individual documents to address climate adaptation, GHG emissions forecasts provide insights to the scale of regional and local reductions needed to achieve GHG emissions reduction targets. Regional activities could include an incorporation of information contained herein into a General Plan, Climate Action Plan, or other planning document.

1.1 ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of three parts:

- **Section 1:** Summary of Inventory Results presents an overview of the region's 2019 GHG emissions inventories for each jurisdiction.
- **Section 2:** Communitywide GHG Emissions Forecasts summarizes the forecasted GHG emissions under BAU and legislative-adjusted BAU scenarios for 2030. 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 region's actions to reduce GHG emissions. This section will also describe the data, methods, and assumptions used to quantify the forecasted emissions.
- **Section 3:** GHG Emissions Forecast by Jurisdiction summarizes the regional GHG emissions forecasts by each jurisdiction. This section presents the results for each jurisdiction only without additional detail related to the data, methods, and assumptions, except those that are unique to the jurisdiction.

2 SUMMARY OF INVENTORY RESULTS

2.1 2019 REGIONAL GHG INVENTORY RESULTS

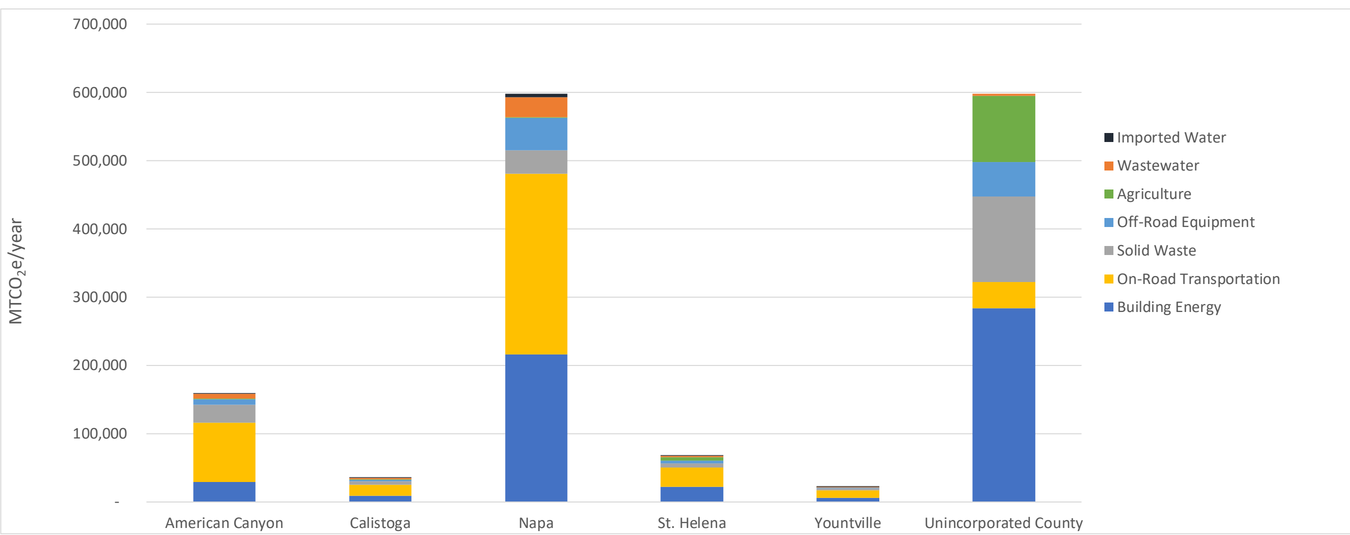
Based on the modeling conducted, regional communitywide sources generated 1,464,007 metric tons of carbon dioxide equivalent ($MTCO_2e$) in 2019. Major emissions sectors for the region included building energy use and on-road transportation. Emissions tend to be proportional to the level of economic activity in a jurisdiction (e.g., agricultural activity in the Unincorporated County, job and population centers in the City of Napa). Table 1 and Figures 1 and 2 present the region's 2019 GHG emissions inventory by jurisdiction and by sector.

Table 1 2019 Napa County Regional Greenhouse Gas Inventory by Jurisdiction and Sector ($MTCO_2e$/year)

Emissions Sector	American Canyon	Calistoga	Napa	St. Helena	Yountville	Unincorporated County	Total
Building Energy	29,045	8,388	216,026	21,535	5,500	283,843	564,336
On-Road Transportation	86,779	16,239	265,100	28,975	11,722	37,859	446,673
Solid Waste	25,938	4,981	34,236	5,676	2,601	125,429	198,862
Off-Road Equipment	8,998	2,880	47,238	4,502	1,328	50,602	115,548
Agriculture	154	274	1,086	4,415	75	97,378	103,381
Wastewater	7,822	1,992	29,542	2,270	1,040	3,191	45,858
Imported Water	983	229	4,383	285	65	0	5,943
Total	159,719	34,982	597,610	67,657	22,332	598,302	1,480,602

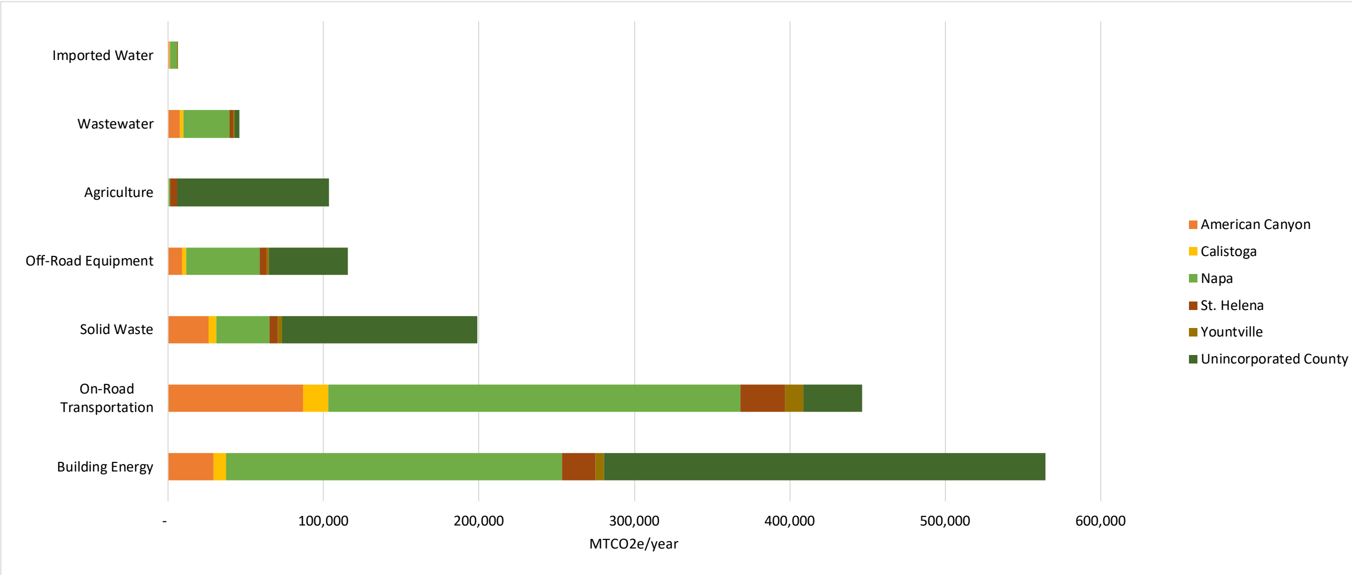
Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: Prepared by Ascent Environmental in 2022.



Source: Prepared by Ascent Environmental in 2022.

Figure 1 2019 Napa County Regional Greenhouse Gas Emissions Inventory by Jurisdiction and Sector ($MTCO_2e$/year)



Source: Prepared by Ascent Environmental in 2022.

Figure 2 **2019 Napa County Regional Greenhouse Gas Emissions Inventory by Sector and Jurisdiction ($MTCO_2e$/year)**

3 COMMUNITYWIDE GREENHOUSE GAS EMISSIONS FORECAST

The following 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 region's growth under a BAU scenario, a legislative-adjusted BAU forecast was prepared, which includes adopted legislative and regulatory actions at the local, State, federal levels that would affect emissions without any additional action. These include regulatory requirements to increase vehicle fuel efficiency and increase renewable energy sources in local 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, State, and local legislation and regulations and do not include goals established by executive orders or targets established by federal or State agencies. These forecasts provide the region with the information needed to focus efforts on emissions sectors and sources that have the greatest opportunities for GHG emissions reductions. The GHG emissions forecasts for 2030 are aligned with various legislative actions, as shown in Table 4, such as those supporting Senate Bill (SB) 32's target to reduce statewide emissions to 40 percent below 1990 levels by 2030.

For most emissions sectors, except for agriculture and waste-in-place emissions, the regional growth associated with both forecast scenarios were based on demographic and vehicle miles traveled (VMT) projections from 2019 to 2030. Population and employment projections are based on data provided by the cities of American Canyon, Calistoga, the City of Napa, St. Helena, and Yountville along with the County for the unincorporated area using forecasts from the California Department of Finance and local General Planning documents. Additionally, service population, which is the sum of population and employment, was used as a growth factor for specific sectors and sub-sector (e.g., wastewater) whose activities depend on growth in both population as well as employment. Agricultural emissions were scaled by extrapolated trends in historical agricultural land cover in Napa County over the last decade, as tracked by the county's crop reports (County of Napa 2021). Waste-in-place emissions were scaled by the decomposition of waste accumulated at each landfill within the region. All growth factors, except for those used for waste-in-place, were applied based on the percent change from 2019 activity levels for each target year. The applied growth rates for each sector are described in Section 4.

Throughout the region, population and employment are expected to increase by 18 and 17 percent, respectively, from 2019 to 2030. These growth factors were used to forecast emissions for most sectors. Annual VMT projections were developed using the origin-destination method using data from MTC's VMT Data Portal, which uses data from Plan Bay Area 2040 as Plan Bay Area's 2050 VMT data is not readily available by jurisdiction at this time (August 31, 2022). Annual VMT in the region is projected to increase by 11 percent from 2019 by 2030. VMT projections were used to scale emissions from the on-road transportation sector. Table 2 shows growth in population, employment, and annual VMT from 2019 to 2030. Refer to Table 18 for demographic and VMT forecasts by jurisdiction.

Table 2 Napa County Regional Demographic and Vehicle Miles Traveled Forecasts

Forecast Factor	2019	2030	Percent Change (2019-2030)
Population	139,608	164,666	18%
Households	48,908	63,178	29%
Employment	97,452	114,307	17%
Service Population[1]	237,060	278,973	18%
Annual VMT	795,545,462	884,221,850	11%

Notes: VMT = vehicle miles traveled.

[1] Service population is equal to the sum of population and employment.

Sources: Cooper, pers. comm., 2022.; DOF 2021; Mitchem, pers. comm., 2022.; City of Napa, 2022: 2-21.; City of St. Helena, 2022: 2-78.; Shelton, pers. comm., 2022; County of Napa 2008.; U.S. Census Bureau, 2019; MTC VMT Data Portal.

Table 3 shows baseline emissions in 2019 and BAU emissions forecasts for 2030. Under the BAU forecast, regional emissions are anticipated to increase by 16 percent from 2019 to 2030.

Table 3 Napa County Regional GHG Emissions Inventory and BAU Forecasts ($MTCO_2e$)

Sector	2019	2030	Percent Change	Difference
Agriculture	103,381	100,078	-3%	-3,303
Building Energy	564,336	690,404	22%	126,068
Imported Water	5,943	6,794	14%	851
Off-Road Equipment	115,548	140,634	22%	25,086
On-Road Transportation	446,673	496,462	11%	49,789
Solid Waste	198,862	224,520	13%	25,658
Wastewater	45,858	53,095	16%	7,237
Total	**1,480,602**	**1,711,987**	**16%**	**231,385**

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: Ascent Environmental 2022.

3.1 LEGISLATIVE-ADJUSTED EMISSIONS FORECASTS

Legislative-adjusted BAU emissions forecasts were prepared using the same BAU growth rates while also accounting for local, State, and federal laws and regulations that would affect regional emissions. These forecasts provide 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 4.

Table 4 Legislative Reductions Summary

Source	Legislative Reduction	Description	Sectors Applied
Local	Marin Clean Energy Power Procurements	By 2023, MCE aims to procure 95 percent of energy from GHG-free sources (MCE 2021:7).	Building Energy
State	California's Building Energy Efficiency Standards (2019 Title 24, Part 6)	Requires all new buildings in California to comply with energy efficiency standards established by CEC. Accounts for the energy efficiency gains associated with lighting, heating, cooling, ventilation, and water heating improvements, as well as onsite solar photovoltaic requirements for low-rise residential.	Building Energy
State	SB 100 (Renewables Portfolio Standard)	Requires California energy utilities to procure 60 percent of electricity from renewable sources by 2030 and 100 percent carbon-free electricity by 2045.	Building Energy
State	Advanced Clean Car Standards	Establishes GHG emission reduction standards for model years 2017-2025 that are more stringent than federal CAFE 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
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: CAFE = Corporate Average Fuel Economy; CEC = California Energy Commission; EPA = U.S. Environmental Protection Agency; GHG = greenhouse gas; MCE = Marin Clean Energy; SB = Senate Bill.

Source: Ascent Environmental in 2022.

The region's legislative-adjusted BAU emissions would have a modest increase compared to the BAU scenario, increasing by approximately 5 percent between 2019 and 2030, as shown below in Table 5 and Figure 3. Figure 3 also shows the emissions trend that would occur without anticipated legislative reductions, accounting mainly for population, employment, and VMT changes (i.e., BAU emissions). Without the legislative reductions, emissions would be 16 percent higher by 2030. Emissions forecasts for each sector are discussed in detail in the following sections.

Table 5 Napa County Regional GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Sector	2019	2030	Percent Change	Difference
Agriculture	103,381	91,545	-11%	-11,836
Building Energy	564,336	652,690	16%	88,353
Imported Water	5,943	4,529	-24%	-1,414
Off-Road Equipment	115,548	130,620	13%	15,072
On-Road Transportation	446,673	391,761	-12%	-54,913
Solid Waste	198,862	224,520	13%	25,658
Wastewater	45,858	53,095	16%	7,237
Total	**1,480,602**	**1,548,761**	**5%**	**68,159**

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: Ascent Environmental 2022.

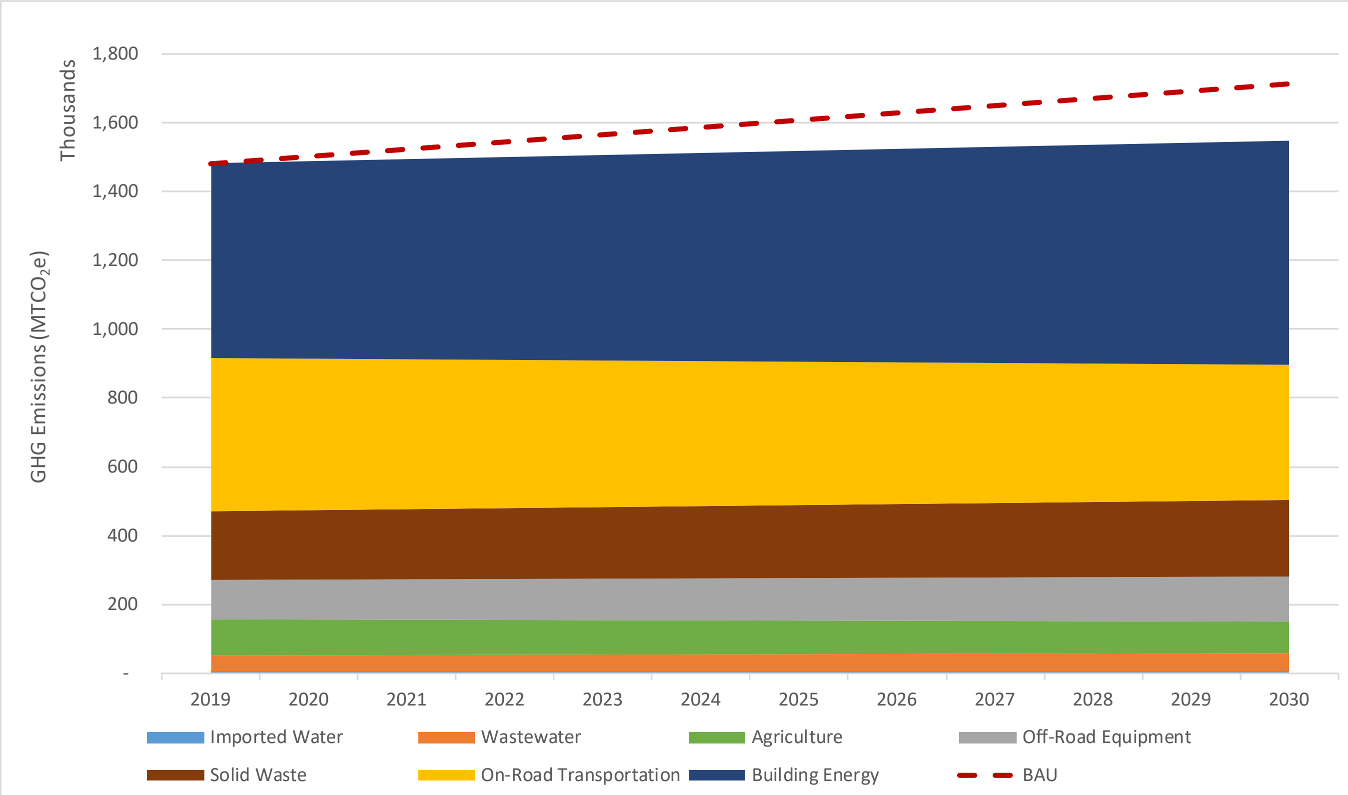


Figure 3 Napa County Regional GHG Emissions Forecasts

3.2 BUILDING ENERGY

Building Energy Assumptions

Building energy emissions in the region result directly from onsite combustion of natural gas and indirectly from electricity consumption. Pacific Gas & Electric (PG&E) is the main electricity and natural gas provider in Northern California. Marin Clean Energy (MCE) is a community choice aggregation (CCA) program which provides renewable electricity options to several northern Bay Area counties, including Napa County. MCE customers are automatically enrolled in a default energy service option, Light Green, or they may elect either the Deep Green or Local Sol service options for an extra fee to increase to 100 percent renewable energy, or opt out of MCE altogether to maintain service with PG&E. Refer to the Inventory memorandum for detailed discussion of the assumptions used to estimate the 2019 building energy emissions.

2030 ELECTRICITY EMISSIONS FACTORS

PG&E's carbon dioxide (CO_2) emissions factor for 2030 was calculated by interpolating 2020 emission factors (160.05 pounds [lb] of CO_2/megawatt-hour [MWh]) available from PG&E's Power Content Label, available from the California Energy Commission (CEC), and a zero emissions factor for 2045 (CEC 2021). This latter assumption assumes that PG&E would achieve carbon neutrality (i.e., 100 percent GHG-free electricity) by 2045, per SB 100. Methane (CH_4) and nitrous oxide (N_2O) emission factors were calculated in a similar way. However, because these factors were not available for PG&E, 2020 California-specific electricity emissions factors for CH_4 and N_2O were obtained from the U.S. Environmental Protection Agency's (EPA's) Emissions & Generation Resource Integrated Database for the CAMX region (eGRID) (EPA 2021). Thus, the 2030 CH_4 and N_2O emission factors were also interpolated between eGRID factors for 2020 and a zero emissions factor for 2045. In 2030, PG&E's average emissions factor is expected to be 97.5 lb CO_2e/MWh.

MCE's 2030 emissions factor is based on MCE's plan to achieve a 95 percent GHG-free energy portfolio for its Light Green service option starting in 2023 and continuing through 2030, as reported in MCE's 2021 Impact Report (MCE 2021:7). The other five percent is assumed to be sourced from "unspecified sources of power," consistent with MCE's current Power Content Label (MCE 2020). The emission factors for the "unspecified sources of power" were assumed to be equal to the average emission factors for the state via eGRID for the CAMX region. The 2030 eGRID emission factors were interpolated between 2019 reported factors and a zero-emission factor in 2045, per the carbon neutrality targets under SB 100. Based on this approach, in 2030, MCE's average emissions factor for the Light Green service option is expected to be 16.2 lb CO_2e/MWh. Deep Green and Local Sol options are anticipated to continue to have a zero emissions factor through 2030.

To put the impact of PG&E and MCE emission factors into context, 85 percent of electricity use in the region are related to subscriptions to MCE's service options, as of 2019. Out of the residential electricity usage, 88 percent are subscribed to MCE. Of the non-residential electricity usage, 83 percent are subscribed to MCE (Herrick, pers. comm., 2022). This makes the overall regional emission factors more heavily weighed and dependent on changes to MCE's energy profile.

2030 NATURAL GAS EMISSIONS FACTORS

2030 natural gas emission factors would remain unchanged from 2019. These are based on emissions factors obtained from The Climate Registry's (TCR's) 2020 Default Emission Factors, which are estimated to be 5.3 kilograms of carbon dioxide per therm (kg CO_2/therm) (TCR 2020). 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. Refer to Table 10 of the previous inventory memorandum for further details.

ENERGY EFFICIENCY

Energy intensity factors were adjusted to reflect increased 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 construction. The 2019 Title 24 standards apply to projects constructed after January 1, 2020, and the next standards will apply after January 1, 2023. To estimate the energy efficiency from Title 24 requirements in new construction, an adjustment factor was calculated from the difference in the average energy use in residential and non-residential buildings between those built to 2019 Title 24 standards and those built to "historical" standards. Both energy efficiency rates (e.g., kilowatt hours (kWh) and therms per square foot (SF)) were estimated using the California Air Pollution Control Officers Association California Emissions Estimator Model (CalEEMod) Version 2020.4.0. In addition to accounting for Title 24 requirements by land use type, it also has estimates for energy usage rates by climate zone, and Napa County's climate zone (Zone 4) was selected for this analysis. This adjustment factor was then applied to the BAU growth in energy use, to determine the energy consumption and associated GHG emissions of future development with legislative adjustments.

BUILDING ENERGY RESULTS

Emissions from future electricity and natural gas 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 to reflect current regulations and adopted targets. PG&E electricity emissions factors are assumed to decline linearly to 100 percent GHG-free electricity by 2045 based on RPS targets pursuant to SB 100. MCE's electricity emissions factors are also anticipated to decrease based on MCE's goal to be 95 percent GHG-free by 2023 for its Light Green service option (MCE 2021). The assumptions for future electricity emissions factors are described below. Table 6 summarizes the scaling factors and legislative reductions used to forecast building use by energy type.

Table 6 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.	SB100 scheduled targets (i.e., 100 percent renewable by 2045) applied to PG&E's electricity emissions factors. MCE's 95% GHG-free target for Light Green was applied to MCE's Light Green electricity emissions factors. Deep Green/Local Sol factors remain at 100% GHG-free. Accounts for Title 24 energy efficiency gains in new construction based on the best available data for average building energy efficiency.
Natural Gas		

Notes: MCE = Marin Clean Energy; RPS = Renewables Portfolio Standard; PG&E = Pacific Gas & Electric.

Source: Ascent Environmental 2022.

Residential Building Energy

Between 2019 and 2030, electricity and natural gas emissions from residential buildings would increase by approximately 17. percent from 388,309 to 452,453 $MTCO_2e$ with legislative adjustments. Table 7 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the residential building energy sector by fuel type for 2030.

Table 7 Regional Residential Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts ($MTCO_2e$/ year)

Fuel Type	2019	2030	Percent Change	Difference
Electricity	6,160	5,647	-8%	-513
Natural Gas	382,148	446,806	17%	64,658
Total	**388,309**	**452,453**	**17%**	**64,145**

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: Ascent Environmental 2022.

Nonresidential Building Energy

Between 2019 and 2030, electricity and natural gas emissions from nonresidential buildings would increase by approximately 14 percent from 176,028 to 200,237 $MTCO_2e$ with legislative adjustments, generally in line with anticipated overall employment growth of approximately 17 percent over the same time. Table 8 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the nonresidential building energy sector by fuel type for 2030.

Table 8 Regional Nonresidential Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Fuel Type	2019	2030	Percent Change	Difference
Electricity	10,079	10,736	7%	656
Natural Gas	165,949	189,501	14%	23,552
Total	**176,028**	**200,237**	**14%**	**24,209**

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: Ascent Environmental 2022.

3.3 TRANSPORTATION

ON-ROAD TRANSPORTATION

Between 2019 and 2030, GHG emissions from on-road vehicles would decrease by approximately 12 percent from 446,673 to 391,761 $MTCO_2e$, accounting for an increase in VMT of approximately 11 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 MTC's VMT Data Portal for 2030. 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 (ACC) Standards, and fuel efficiency standards for medium- and heavy-duty vehicles. These policies, including those that are expected to increase the number of electric vehicles in the county in the future, are included in EMFAC2021's emissions factor estimates and forecasts. 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 9 summarizes the scaling factors and legislative reductions used to forecast on-road transportation emissions.

Table 9 On-Road Transportation Emissions Forecast Methods

Source	Forecast Methods	
	Growth Factor	Applied Legislative Reductions
On-Road Transportation	Scaled by VMT estimates provided by MTC.	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 ACC Standards, federal CAFE standards, and fuel efficiency standards for medium- and heavy-duty vehicles, as well as truck and bus regulations. Legislative actions that are anticipated to impact the number of electric vehicles in the future are incorporated into the emissions factors obtained from EMFAC2021.

Notes: ACC = Advanced Clean Cars; CAFE = Corporate Average Fuel Economy; EMFAC2021 = California Air Resources Board's EMisson FACtor 2021 model, MTC = Metropolitan Transportation Commission

Source: Ascent Environmental 2022.

Table 10 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from on-road transportation for 2030.

Table 10 Regional On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	Percent Change	Difference
Commercial	147,981	139,105	-6%	-8,876
Non-Commercial	298,693	252,656	-15%	-46,037
Total	**446,673**	**391,761**	**-12%**	**-54,913**

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

Source: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

Between 2019 and 2030, emissions associated with off-road vehicles and equipment used in the region would increase by 13 percent from 115,548 to 130,620 $MTCO_2e$, 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, the 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, with the exception of entertainment equipment, emissions were obtained from OFFROAD2007. (Entertainment equipment emissions were excluded because OFFROAD2021 does not include forecasts for this source and the emissions from this source account for less than one percent of total offroad emissions.) 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.

Napa County-level emissions from off-road vehicles and equipment were scaled using changes in city-specific demographic factors. Table 11 summarizes the scaling factors and legislative reductions used to forecast off-road vehicle and equipment emissions.

Table 11 Off-Road Vehicles and Equipment Forecast Methods by Source

Source	Forecast Methods	
	Growth Factor	Applied Legislative Reductions
Airport Ground Support	Population	OFFROAD2021 emissions factor considerations include EPA off-road compression-ignition engine standards implementation schedule.
Commercial Harbor Craft	Employment	
Construction and Mining	Service Population	
Industrial	Employment	
Lawn and Garden Equipment	Population	
Light Commercial Equipment	Employment	
Pleasure Craft	All assumed to occur in the Unincorporated County	
Portable Equipment	Employment	
Railyard Operations	Employment	
Recreational Equipment	Population	
Transport Refrigeration Units	Service Population	

Notes: EPA = U.S. Environmental Protection Agency; OFFROAD2021 = California Air Resources Board's OFFROAD2021 model. Excludes Entertainment equipment off-road sources, for which OFFROAD 2021 does not have forecasts.

Source: Ascent Environmental 2022.

Table 12 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the off-road vehicles and equipment sector for 2030.

Table 12 Regional Off-Road Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/year)

Source	2019	2030	Percent Change	Difference
Industrial	5,490	6,479	18%	989
Airport Ground Support	0	0	18%	0
Commercial Harbor Craft	140	166	18%	25
Construction and Mining	12,294	15,378	25%	3,085
Lawn and Garden Equipment	28,726	35,014	22%	6,288
Light Commercial Equipment	24,282	15,437	-36%	-8,845
Pleasure Craft	28,896	39,691	37%	10,796
Portable Equipment	10,088	11,911	18%	1,823
Railyard Operations	383	450	17%	66
Recreational Equipment	2,687	3,343	24%	656

Transport Refrigeration Units	2,561	2,751	7%	190
Total	**115,548**	**130,620**	**13%**	**15,072**

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: Ascent Environmental 2022.

3.4 AGRICULTURE

Between 2019 and 2030, emissions generated from agricultural activities in the region would decrease by approximately 11 percent from 103,381 to 91,545 $MTCO_2e$, accounting for the change in historical agricultural land cover as reported in the County's historical agricultural crop reports. Livestock emissions were assumed to change in proportion to changes in rangeland and pastureland and were subsequently scaled by the extrapolated historical change in rangeland and pastureland as reported in the county's crop reports. Between 2009 and 2021, rangeland and pastureland acreage decreased by 32 percent. Based on this historical trend, rangeland and pastureland acreage, along with livestock emissions, are anticipated to decline by 38 percent from 2019 to 2030.

For other emissions (i.e., agricultural offroad equipment, fertilizer application, and irrigation pumps), these were assumed to change in proportion to the change in non-rangeland and pastureland (e.g., fruit and nut crops, hay, olives, vegetables). Although some of this activity may be associated with livestock operations, it is assumed that the majority of this activity is associated with non-livestock operations. Between 2009 and 2021, non-rangeland acreage increased by six percent. Based on this historical trend, non-rangeland acreage, along with non-livestock emissions, are anticipated to increase by four percent from 2019 to 2030.

These two agricultural acreage trends stand in contrast to the overall population growth of approximately 18 percent over the same time. The only legislative adjustment made in this sector is for the agricultural offroad equipment, which are subject to the same legislative adjustments as discussed in Section 4.2. The decrease in agricultural offroad emissions are primarily due to changes in equipment emission regulations and not due to growth. Table 13 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the agriculture sector for 2030.

Table 13 Regional Agriculture GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	Percent Change	Difference
Agricultural Offroad	47,682	41,211	-14%	-6,471
Fertilizer Application	21,948	22,897	4%	949
Irrigation Pumps	15,417	16,084	4%	667
Livestock	18,334	11,354	-38%	-6,980
Total	**103,381**	**91,545**	**-11%**	**-11,836**

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

Source: Ascent Environmental 2022.

3.5 SOLID WASTE

Waste Generation and Waste-in-Place

The ICLEI Community Protocol recommends that community GHG inventories include emissions from both solid waste facilities located in the community (i.e., "waste-in-place") and waste generated by the community (ICLEI 2019). Waste-in-place CH_4 emissions from landfill gas (LFG) generated at solid waste facilities located within the unincorporated area accounted for approximately 58 percent of emissions from the solid waste sector in 2019. Between 2019 and 2030, waste generation emissions were scaled to 2030 levels based on change in population in the region.

Waste-in-place emissions were calculated based on the existing and future waste tonnages at two landfills located within the region: Clover Flat Landfill and American Canyon Landfill. Both landfills are located in the Unincorporated County. Open from 1966 to 1995, the American Canyon Landfill's methane emissions likely peaked around 1996, after its closure, and will continue to decline into the future through 2030 based the decay model available in CARB's Landfill Gas Tool and annual disposal tonnage reports from EPA (CARB 2021, EPA 2022). Clover Flat Landfill, on the other hand, is an active landfill that has been open since 1963 and plans to close in 2056. Assuming average annual disposal rates between 2010 and 2019 continue through 2056, waste-in-place emissions from Clover Flat will continue to rise through 2030 and likely peak around 2057, as modeled in the Landfill Gas Tool. Although emissions from the American Canyon Landfill are expected to decline by six percent, emissions from Clover Flat Landfill would be twice as high given its greater capacity and is also expected to increase by 17 percent.

Between 2019 and 2030, solid waste emissions generated from community activities in the region would increase by approximately 19 percent from 84,243 to 100,400 $MTCO_2e$ per year, accounting for overall population growth of approximately 18 percent over the same time. Solid waste generation emissions include CH_4 emissions from the decay of waste generated annually, which were scaled by population growth within the region between 2019 and 2030.

Total solid waste emissions, including both community-generated waste and waste-in-place emissions, would increase by 13 percent from 198,862 to 224,520 $MTCO_2e$ per year. Table 14 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the solid waste sector for 2030.

Table 14 Regional Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	Percent Change	Difference
Community-Generated Solid Waste	84,243	100,400	19%	16,157
Waste-in-Place Emissions	114,619	124,121	8%	9,502
American Canyon Landfill	*42,800*	*40,084*	*-6%*	-2,715
Clover Flat Landfill	*71,819*	*84,036*	*17%*	12,217
Total	**198,862**	**224,520**	**13%**	**25,658**

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

Source: Ascent Environmental 2022.

3.6 IMPORTED WATER

Between 2019 and 2030, imported water emissions generated from community activities in the region would be decrease by 24 percent from 5,943 to 4,529 $MTCO_2e$. These emissions include upstream emissions from electricity generation use to extract, convey, treat, and distribute imported water to the region. For local water supply sources , 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 community. The reduction in emissions is largely attributed to improvements in the renewable portfolio in the state. Average electricity emissions factors were obtained for the state using EPA's eGRID database for the CAMX region. Electricity usage associated with water consumption is subject to RPS targets, pursuant to SB 100 requirements, which is expected to reach carbon neutrality (i.e., a zero emissions rate) by 2045. Based on these assumptions and the 2019 eGRID emission factors, the average GHG emissions factor is anticipated to decline by 33 percent between 2019 and 2030.

Table 15 summarizes the scaling factor and legislative reduction used to forecast water supply emissions.

Table 15 Imported Water Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Imported Water	Scaled by population growth.	Assumes electricity use for extraction, conveyance, distribution, and treatment aligns with the trajectory toward the 2045 carbon-free electricity requirements under SB100.

Source: Ascent Environmental in 2022.

Table 16 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the water supply sector for 2030.

Table 16 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/year)

Source	2019	2030	Percent Change	Difference
Imported Water	5,943	4,529	-24%	-1,414

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

Source: Ascent Environmental in 2022.

3.7 WASTEWATER TREATMENT

Between 2019 and 2030, community wastewater emissions would increase by 16 percent from 45,858 to 53,095 $MTCO_2e$. This change reflects an increase in wastewater generation resulting from population growth within the region of approximately 18 percent over the same time. Wastewater-related emissions are generated from centralized wastewater treatment plants (WWTPs) and septic systems for the region. Table 17 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from wastewater treatment sources for 2030.

Table 17 Regional Wastewater Treatment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/ year)

Source	2019	2030	Percent Change	Difference
Septic Systems	2,961	3,841	30%	880
Centralized WWTPs	42,897	49,254	15%	6,357
Total	**45,858**	**53,095**	**16%**	**7,237**

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

Source Ascent Environmental 2022.

3.8 DISCUSSION

The community BAU emissions would increase by approximately 16 percent between 2019 and 2030, while legislative-adjusted BAU emissions would only increase five percent between 2019 and 2030. The relatively lower increase under the legislative-adjusted BAU forecast scenario, despite growth, is associated with reductions that would be achieved from several legislative actions, including:

- a greater renewable mix in PG&E's and State electricity supply (60 percent by 2030 and 100 percent by 2045);
- carbon-free electricity supplied by MCE;
- improved building energy efficiency through compliance with Title 24 standards;
- reductions in on-road vehicle emissions factors from State vehicle standards as forecasted in EMFAC2021; and

- reductions in off-road vehicle and equipment emissions factors forecasted in OFFROAD2021.

Without future legislative actions and despite future growth, emissions would decline from 2019 through 2045. 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.

4 GREENHOUSE GAS EMISSIONS FORECAST BY JURISDICTION

Various demographic factors were used to estimate future activity levels for each emissions sector and are shown in Table 18. Demographic and VMT projections were used to inform the emissions forecasts for each jurisdiction.

Table 18 Napa County Regional Community Demographic and Vehicle Miles Traveled Forecasts

Forecast Factor	2019	Data Source	2030	Data Source	Percent Change
American Canyon					
Population	20,996	DOF 2021	26,829	Cooper, pers. comm., 2022	28%
Households	5,955	DOF 2021	7,811	Cooper, pers. comm., 2022	31%
Employment	6,200	Plan Bay Area 2040	8,642	Cooper, pers. comm., 2022	39%
Annual VMT	154,556,520	MTC 2015	176,281,057	MTC 2015	14%
Calistoga					
Population	5,348	Mitchem, pers. comm., 2022	5,508	Mitchem, pers. comm., 2022	3%
Households	2,413	Mitchem, pers. comm., 2022	2,511	Mitchem, pers. comm., 2022	4%
Employment	2,811	Mitchem, pers. comm., 2022	3,333	Mitchem, pers. comm., 2022	19%
Annual VMT	28,922,407	MTC 2015	32,650,803	MTC 2015	13%
Napa					
Population	79,300	Walker, pers. comm., 2022	88,676	Walker, pers. comm., 2022	12%
Households	30,700	Walker, pers. comm., 2022	34,786	Walker, pers. comm., 2022	13%
Employment	51,200	Walker, pers. comm., 2022	56,857	Walker, pers. comm., 2022	11%
Annual VMT	472,155,386	MTC 2015	518,294,070	MTC 2015	10%
St. Helena					
Population	6,094	DOF 2021	6,655	Derosa, pers. comm., 2022	9%
Households	2,420	Derosa, pers. comm., 2022	2,620	Derosa, pers. comm., 2022	8%
Employment	5,762	Derosa, pers. comm., 2022	5,820	Derosa, pers. comm., 2022	1%
Annual VMT	51,605,089	MTC 2015	60,774,785	MTC 2015	18%
Yountville					
Population	2,793	DOF 2021	3,385	Shelton, pers. comm., 2022	21%
Households	1,754	U.S. Census, 2020	2,126	Scaled by Population[1]	21%
Employment	1,100	Bureau of Labor Statistics	1,333	Scaled by Population[1]	21%
Annual VMT	20,876,900	MTC 2015	23,197,949	MTC 2015	11%

Forecast Factor	2019	Data Source	2030	Data Source	Percent Change
Unincorporated County					
Population	25,077	DOF 2021	33,613	County of Napa 2008	34%
Households	5,666	County of Napa 2008	13,325	County of Napa 2008	135%
Employment	30,379	County of Napa 2008	38,322	County of Napa 2008	26%
Annual VMT	67,429,161	MTC 2015	73,023,186	MTC 2015	8%
Total					
Population	139,608	Calculated	164,666	Calculated	18%
Households	48,908	Calculated	63,178	Calculated	29%
Employment	97,452	Calculated	114,307	Calculated	17%
Annual VMT	795,545,462	Calculated	884,221,850	Calculated	11%

Notes: VMT = vehicle miles traveled, MTC = Metropolitan Transportation Commission, DOF = Department of Finance

[1] Forecasts for these metrics were not readily available and were subsequently scaled in proportion to the relative growth in population.

Sources: Cooper, pers. comm., 2022.; DOF 2019; Mitchem, pers. comm., 2022.; City of Napa, 2022: 2-21.; City of St. Helena, 2022: 2-78.; Shelton, pers. comm., 2022; County of Napa 2008.; U.S. Census Bureau, 2019; MTC 2015.

4.1 AMERICAN CANYON

Emissions Summary

Table 19 shows a summary of American Canyon's emissions inventory and legislative-adjusted forecast. American Canyon's emissions are anticipated to increase by six percent between 2019 and 2030. As shown in Table 19, on-road transportation will continue to remain the target sector in American Canyon's inventory in the future although emissions will decrease by 10 percent based on VMT forecasts from MTC for American Canyon (MTC 2015). Emissions from on-road transportation are also anticipated to have the greatest decrease between 2019 and 2030 across all sectors.

Table 19 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: American Canyon ($MTCO_2e$/year)

Sector	2019	2030	Percent Change	Difference
Agriculture	154	132	-14%	-22
Building Energy	29,045	35,168	21%	6,123
Imported Water	983	854	-13%	-129
Off-Road Equipment	8,998	11,278	25%	2,280
On-Road Transportation	86,779	78,103	-10%	-8,676
Solid Waste	25,938	33,145	28%	7,206
Wastewater	7,822	10,202	30%	2,380
Total	159,842	168,882	6%	9,163

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

Source: Ascent Environmental 2022.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, American Canyon's building energy-related emissions are anticipated to increase by 21 percent between 2019 and 2030.

Table 20 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: American Canyon ($MTCO_2e$/ year)

Energy Type	2019	2030	Percent Change
Residential			
Electricity	661	664	0%
Natural Gas	26,825	31,973	19%
Subtotal	27,486	32,637	19%
Non-Residential			
Electricity	1,085	1,907	76%
Natural Gas	474	624	32%
Subtotal	1,559	2,531	62%
Total	29,045	35,168	21%

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

Source: Ascent Environmental 2022.

ON-ROAD TRANSPORTATION

American Canyon's on-road transportation emissions are anticipated to decrease by 10 percent between 2019 and 2030, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, CARB's ZEV mandate, and other adopted regulations as discussed in Section 4.2, which reduce average vehicle GHG emissions per mile.

Table 21 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Trip Type	2019	2030	Percent Change
Commercial Trips	28,749	27,732	-4%
Non-Commercial Trips	58,029	50,370	-13%
Total	**86,779**	**78,103**	**-10%**

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: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

American Canyon's off-road equipment emissions are anticipated to increase by 25 percent between 2019 and 2030, consistent with various growth forecasts (e.g., population, employment) that best match each off-road equipment category, as shown in Table 11. Additionally, legislative adjustments, such as emissions standards for off-road equipment, were also considered, via factors available in CARB's OFFROAD 2021 model. In particular, most sectors are anticipated to increase by 30-40 percent except for light commercial equipment, pleasure craft, airport ground support equipment, and transportation refrigeration units. There are no pleasure craft or airports within American Canyon.

Table 22 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts, American Canyon ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Industrial	349	492	41%
Airport Ground Support	0	0	0%
Commercial Harbor Craft	9	13	41%
Construction and Mining	1,410	1,956	39%
Lawn and Garden Equipment	4,320	5,794	34%
Light Commercial Equipment	1,545	1,174	-24%
Pleasure Craft	0	0	0%
Portable Equipment	642	907	41%
Railyard Operations	24	34	39%
Recreational Equipment	404	558	38%
Transport Refrigeration Units	294	350	19%
Total	**8,998**	**11,278**	**25%**

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

Source: Ascent Environmental 2022.

AGRICULTURE

As an incorporated city, American Canyon does not have a substantial presence of agricultural activity within its jurisdiction. Table 23 shows that the limited agricultural activities in the city (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline between 2019 and 2030 by 10 percent, in proportion with regional trends in the reduction in agricultural acres over the last decade. Emissions from irrigation pumps were excluded as no irrigation pump permits were identified in American Canyon.

Table 23. Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Agricultural Offroad Equipment	84	68	-18%
Fertilizer Application	38	38	-1%
Livestock	32	32	-1%
Total	**154**	**138**	**-10%**

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

Source: Ascent Environmental 2022.

SOLID WASTE

Waste Generation

American Canyon generated approximately 68,259 tons of solid waste in 2019 which generated 25,938 MTCO2e in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both American Canyon's waste disposal and related emissions are anticipated to increase by 28 percent from 2019 to 2030, commensurate with population growth.

Table 24 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Annual waste tonnage delivered from jurisdiction (tons)	68,529	87,567	28%
Solid Waste Generation Emissions ($MTCO_2e$/year)	25,938	33,145	28%

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

Source: Ascent Environmental 2022.

Waste-in-Place

American Canyon does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

American Canyon is anticipated to increase its usage of imported water by 30 percent by 2030 from 2019 levels, commensurate with population growth. However, emissions from imported water are expected to decline by 13 percent over the same period. This is due to the change in emissions factors associated with the electricity used for pumping imported water (i.e., from the state water project). The average California electricity emissions factors, available from EPA's eGRID database for the CAMX region, are anticipated to decline by 33 percent between 2019 and 2030. Emissions associated with locally sourced water are captured in the building energy sector.

Table 25 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Imported Water Usage (MG/year)	661	862	30%
Imported Water Emissions ($MTCO_2e$/year)	983	854	-13%

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

Source: Ascent Environmental 2022.

WASTEWATER

American Canyon's emissions from wastewater are anticipated to increase by proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within American Canyon.

Table 26 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: American Canyon ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Population served by WWTP	27,196	35,471	30%
WWTP Process Emissions	7,822	10,202	30%

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

Source: Ascent Environmental 2022.

4.2 CALISTOGA

Emissions Summary

Table 27 shows a summary of Calistoga's emissions inventory and legislative-adjusted forecast. Calistoga's emissions are anticipated to decline by five percent between 2019 and 2030. As shown in Table 27, on-road transportation will continue to remain the target sector in Calistoga's inventory in the future although emissions will decrease by 11percent based on VMT forecasts from MTC for Calistoga (MTC 2015). Emissions from on-road transportation are also anticipated to have the greatest decrease between 2019 and 2030.

Table 27 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Calistoga ($MTCO_2e$/year)

Sector	2019	2030	Percent Change	Difference
Agriculture	274	235	-14%	-39
Building Energy	8,388	8,420	0%	32
Imported Water	229	165	-28%	-64
Off-Road Equipment	2,880	2,825	-2%	-54
On-Road Transportation	16,239	14,466	-11%	-1,773
Solid Waste	4,981	5,130	3%	149
Wastewater	1,992	2,159	8%	167
Total	**34,982**	**33,400**	**-5%**	-1,582

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

Source: Ascent Environmental 2022.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, Calistoga's building energy-related emissions are anticipated to remain relatively unchanged between 2019 and 2030.

Table 28 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Calistoga ($MTCO_2e$/ year)

Energy Type	2019	2030	Percent Change
Residential			
Electricity	225	177	-21%
Natural Gas	7,682	7,841	2%
Subtotal	7,907	8,018	1%
Non-Residential			
Electricity	314	210	-33%
Natural Gas	167	192	15%
Subtotal	481	402	-16%
Total	**8,388**	**8,420**	**0%**

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

Source: Ascent Environmental 2022.

ON-ROAD TRANSPORTATION

Calistoga's on-road transportation emissions are anticipated to decrease by 11 percent between 2019 and 2030, consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards, CARB's ZEV mandate, and other adopted regulations as discussed in Section 4.2, which reduce average vehicle GHG emissions per mile.

Table 29 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Trip Type	2019	2030	Percent Change
Commercial Trips	5,380	5,137	-5%
Non-Commercial Trips	10,859	9,330	-14%
Total	**16,239**	**14,466**	**-11%**

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

Source: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

Consistent with various growth forecasts (e.g., population, employment) that best match each off-road equipment category (refer to Table 11), Calistoga's off-road equipment emissions are anticipated to decrease by 2 percent between 2019 and 2030, as shown in Table 30 below. Additional legislative adjustments, such as emissions standards for off-road equipment, were also taken into account via factors available in CARB's OFFROAD 2021 model. Most sectors are anticipated to increase by 15-19 percent except for airport ground support, pleasure craft, equipment, and transportation refrigeration units. There are no pleasure craft or airports within Calistoga.

Table 30 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Industrial	158	189	19%
Airport Ground Support	0	0	0%
Commercial Harbor Craft	4	5	19%
Construction and Mining	423	487	15%
Lawn and Garden Equipment	1,100	1,139	4%
Light Commercial Equipment	700	450	-36%
Pleasure Craft	0	0	0%
Portable Equipment	291	347	19%
Railyard Operations	11	13	19%
Recreational Equipment	103	107	4%
Transport Refrigeration Units	88	87	-1%
Total	**2,880**	**2,825**	**-2%**

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

Source: Ascent Environmental 2022.

AGRICULTURE

Calistoga does not have a substantial presence of agricultural activity within its jurisdiction. Table 31 shows that the limited agricultural activities in the city (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline between 2019 and 2030 by 10 percent, in proportion with regional trends in the reduction in agricultural acres over the last decade. Emissions from irrigation pumps were excluded as no irrigation pump permits were identified in Calistoga.

Table 31 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Agricultural Offroad Equipment	148	121	-18%
Fertilizer Application	68	68	-1%
Livestock	57	56	-1%
Total	274	245	-10%

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

Source: Ascent Environmental 2022.

SOLID WASTE

Waste Generation

Calistoga generated approximately 12,513 tons of solid waste in 2019 which generated 4,981 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both Calistoga's waste disposal and related emissions are anticipated to increase by three percent from 2019 to 2030, commensurate with population growth.

Table 32 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga

Source	2019	2030	Percent Change
Solid Waste Generation Tonnage	12,513	12,887	3%
Solid Waste Generation Emissions	4,981	5,130	3%

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

Source: Ascent Environmental 2022.

Waste-in-Place

Calistoga does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

Calistoga is anticipated to increase its usage of imported water by 8 percent by 2030 from 2019 levels, commensurate with population growth. However, emissions from imported water are expected to decline by 28 percent over the same period. This is due to the change in emissions factors associated with the electricity used for pumping imported water (i.e., from the state water project). The average California electricity emissions factors, available from EPA's eGRID database for the CAMX region, are anticipated to decline by 33 percent between 2019 and 2030. Emissions associated with locally sourced water are captured in the building energy sector.

Table 33 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Imported Water Usage (MG/year)	154	167	8%
Imported Water Emissions ($MTCO_2e$/year)	229	165	-28%

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

Source: Ascent Environmental 2022.

WASTEWATER

Calistoga's emissions from wastewater are anticipated to increase proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within Calistoga.

Table 34 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Calistoga ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Service population served by WWTP	8,159	8,841	8%
WWTP Process Emissions	1,992	2,159	8%

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

Source: Ascent Environmental 2022.

4.3 CITY OF NAPA

Emissions Summary

Table 35 shows a summary of the 2019 emissions inventory and legislative-adjusted forecast for the City of Napa. Napa's emissions are anticipated to decline by two percent between 2019 and 2030. As shown in Table 35, on-road transportation will remain the highest emitting sector in Napa's inventory in the future although emissions will decrease by one percent based on VMT forecasts from MTC for Napa (MTC 2015). Emissions from imported water will decrease the most (30 percent) between 2019 and 2030. Emissions from on-road transportation are also anticipated to have the greatest decrease between 2019 and 2030.

Table 35 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Napa ($MTCO_2e$/year)

Sector	2019	2030	Percent Change	Difference
Agriculture	1,086	1,014	-7%	-71
Building Energy	216,026	233,783	8%	17,757
Imported Water	4,383	3,258	-26%	-1,125
Off-Road Equipment	47,238	46,949	-1%	-289
On-Road Transportation	265,100	229,634	-13%	-35,466
Solid Waste	34,236	38,283	12%	4,048
Wastewater	29,542	32,945	12%	3,403
Total	597,610	585,867	-2%	-11,743

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

Source: Ascent Environmental 2022.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, City of Napa's building energy-related emissions are anticipated to increase by eight percent between 2019 and 2030.

Table 36 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Napa ($MTCO_2e$/ year)

Energy Type	2019	2030	Percent Change
Residential			
Electricity	2,974	2,504	-16%
Natural Gas	130,448	141,103	8%
Subtotal	133,422	143,606	8%
Non-Residential			
Electricity	3,454	3,963	15%
Natural Gas	79,150	86,214	9%
Subtotal	82,604	90,177	9%
Total	**216,026**	**233,783**	**8%**

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

Source: Ascent Environmental 2022.

ON-ROAD TRANSPORTATION

Consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards per CARB's ZEV mandate, and other adopted regulations which can reduce average vehicle GHG emissions per mile Napa's on-road transportation emissions are anticipated to decrease by 13 percent between 2019 and 2030, see Table 37.

Table 37 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Trip Type	2019	2030	Percent Change
Commercial Trips	87,826	81,538	-7%
Non-Commercial Trips	177,274	148,096	-16%
Total	**265,100**	**229,634**	**-13%**

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

Source: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

Table 38 displays inventory and legislative adjusted forecasts for off-road equipment for Napa. As shown in Table 37, Napa's off-road equipment emissions are anticipated to decrease by one percent between 2019 and 2030. Emissions generated from light commercial equipment are expected to decrease the most (40 percent) with consideration of future emission standards for off-road equipment from CARB's OFFROAD 2021 model. Most off-road equipment sources are anticipated to increase 11-16 percent except construction and mining equipment, recreational equipment, transportation refrigeration units, and light commercial equipment.

Table 38 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Industrial	2,884	3,217	12%
Airport Ground Support	0	0	0%
Commercial Harbor Craft	74	82	11%
Construction and Mining	6,768	8,020	19%
Lawn and Garden Equipment	16,317	18,631	14%
Light Commercial Equipment	12,758	7,664	-40%
Pleasure Craft	0	0	0%
Portable Equipment	5,300	5,910	11%
Railyard Operations	201	224	11%
Recreational Equipment	1,526	1,766	16%
Transport Refrigeration Units	1,410	1,435	2%
Total	**47,238**	**46,949**	**-1%**

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

Source: Ascent Environmental 2022.

AGRICULTURE

As an incorporated city, Napa does not have a substantial presence of agricultural activity within its jurisdiction. Table 39 shows that the limited agricultural activities in the city (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline between 2019 and 2030 by six percent, in proportion with regional trends in the reduction in agricultural acres over the last decade. Emissions from irrigation pumps were excluded as no irrigation pump permits were identified in Napa.

Table 39 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Agricultural Offroad Equipment	346	283	-18%
Fertilizer Application	159	157	-1%
Irrigation Pumps	448	443	-1%
Livestock	133	132	-1%
Total	**1,086**	**1,015**	**-6%**

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

Source: Ascent Environmental 2022.

SOLID WASTE

Waste Generation

The City of Napa generated approximately 50,755 tons of solid waste in 2019 which generated 34,236 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both Napa's waste disposal and related emissions are anticipated to increase by 12 percent from 2019 to 2030, commensurate with population growth..

Table 40 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Solid Waste Generation Tonnage	50,755	56,756	12%
Solid Waste Generation Emissions	34,236	38,283	12%

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

Source: Ascent Environmental 2022.

Waste-in-Place

Napa does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

The City of Napa is anticipated to increase its usage of imported water by 12 percent by 2030 from 2019 levels, commensurate with population growth. However, emissions from imported water are expected to decline by 26 percent over the same period. This is due to the change in emissions factors associated with the electricity used for pumping imported water (i.e., from the state water project). The average California electricity emissions factors, available from EPA's eGRID database for the CAMX region, are anticipated to decline by 33 percent between 2019 and 2030. Emissions associated with locally sourced water are captured in the building energy sector.

Table 41 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Imported Water Usage (MG/year)	2,948	3,288	12%
Imported Water Emissions ($MTCO_2e$/year)	4,383	3,258	-26%

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

Source: Ascent Environmental 2022.

WASTEWATER

Napa's emissions from wastewater are anticipated to increase by proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within Napa.

Table 42 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Napa ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Service population served by WWTP	130,500	145,533	12%
WWTP Process Emissions	29,542	32,945	12%

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

Source: Ascent Environmental 2022.

4.4 ST. HELENA

Emissions Summary

Table 43 shows a summary of the 2019 emissions inventory and legislative-adjusted forecast for the City of St. Helena. St. Helena's emissions are anticipated to decrease by two percent between 2019 and 2030, largely due to the increase in building energy and solid waste emissions. As shown in Table 43, on-road transportation will remain the highest emitting sector in St. Helena inventory in the future although emissions are anticipated to decrease by seven percent based on VMT forecasts from MTC for St. Helena (MTC 2015). Emissions from on-road transportation are also anticipated to have the greatest decrease between 2019 and 2030.

Table 43 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: St. Helena ($MTCO_2e$/year)

Sector	2019	2030	Percent Change	Difference
Agriculture	4,415	4,273	-3%	-141
Building Energy	21,535	22,211	3%	676
Imported Water	285	200	-30%	-85
Off-Road Equipment	4,502	4,079	-9%	-423
On-Road Transportation	28,975	26,927	-7%	-2,048
Solid Waste	5,676	6,199	9%	523
Wastewater	2,270	2,389	5%	119
Total	**67,657**	**66,277**	**-2%**	**-1,380**

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

Source: Ascent Environmental 2022.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, St. Helena's building energy-related emissions are anticipated to increase by three percent between 2019 and 2030.

Table 44 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: St. Helena ($MTCO_2e$/ year)

Energy Type	2019	2030	Percent Change
Residential			
Electricity	332	253	-24%
Natural Gas	11,477	12,207	6%
Subtotal	11,809	12,459	6%
Non-Residential			
Electricity	512	463	-10%
Natural Gas	9,214	9,289	1%
Subtotal	9,726	9,752	0%
Total	21,535	22,211	3%

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

Source: Ascent Environmental 2022.

ON-ROAD TRANSPORTATION

Consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards per CARB's ZEV mandate, and other adopted regulations which can reduce average vehicle GHG emissions per mile Napa's on-road transportation emissions are anticipated to decrease by 7 percent between 2019 and 2030, see Table 45.

Table 45 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena (MTCO$_2$e/year)

Trip Type	2019	2030	Percent Change
Commercial Trips	9,599	9,561	-0.4%
Non-Commercial Trips	19,375	17,366	-10%
Total	**28,975**	**26,927**	**-7%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; MTCO$_2$e = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

Table 46 displays inventory and legislative adjusted forecasts for off-road equipment for St. Helena. As shown in Table 46, St. Helen's off-road equipment emissions are anticipated to decrease by 9 percent between 2019 and 2030. Emissions generated from light commercial equipment are expected to decrease the most (46 percent) with consideration of future emission standards for off-road equipment from CARB's OFFROAD 2021 model. Most off-road equipment sources are anticipated to increase by less than 10 percent except construction and mining, lawn and garden equipment, recreational equipment, transportation refrigeration units, and light commercial equipment.

Table 46 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena (MTCO$_2$e/year)

Source	2019	2030	Percent Change
Industrial	325	329	1%
Airport Ground Support	0	0	0%
Commercial Harbor Craft	8	8	1%
Construction and Mining	615	687	12%
Lawn and Garden Equipment	1,254	1,392	11%
Light Commercial Equipment	1,436	782	-46%
Pleasure Craft	0	0	0%
Portable Equipment	596	603	1%
Railyard Operations	23	23	1%
Recreational Equipment	117	132	12%
Transport Refrigeration Units	128	123	-4%
Total	**4,502**	**4,079**	**-9%**

Notes: BAU = business-as-usual; GHG = greenhouse gas; MTCO$_2$e = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2022.

AGRICULTURE

St. Helena does not have a substantial presence of agricultural activity within its jurisdiction. Table 47 shows that the limited agricultural activities in the city (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline by five percent between 2019 and 2030, in proportion with regional trends in the reduction in agricultural acres over the last decade.

Table 47 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Agricultural Offroad Equipment	971	796	-18%
Fertilizer Application	447	442	-1%
Irrigation Pumps	2,623	2,595	-1%
Livestock	373	370	-1%
Total	4,415	4,203	-5%

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

Source: Ascent Environmental 2022.

SOLID WASTE

Waste Generation

St. Helena generated approximately 14,258 tons of solid waste in 2019 which generated 5,676 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both St. Helena's waste disposal and related emissions are anticipated to increase by nine percent from 2019 to 2030, commensurate with population growth.

Table 48 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Solid Waste Generation Tonnage	14,258	15,571	9%
Solid Waste Generation Emissions	5,676	6,199	9%

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

Source: Ascent Environmental 2022.

Waste-in-Place

St. Helena does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

St. Helena is anticipated to increase its usage of imported water by 5 percent by 2030 from 2019 levels, commensurate with population growth. However, emissions from imported water are expected to decline by 30 percent over the same period. This is due to the change in emissions factors associated with the electricity used for pumping imported water (i.e., from the state water project). The average California electricity emissions factors, available from EPA's eGRID database for the CAMX region, are anticipated to decline by 33 percent between 2019 and 2030. Emissions associated with locally sourced water are captured in the building energy sector.

Table 49 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Imported Water Usage (Gallons/year)	191	201	5%
Imported Water Emissions	285	200	-30%

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

Source: Ascent Environmental 2022.

WASTEWATER

St. Helena's emissions from wastewater are anticipated to increase by proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within St. Helena.

Table 50 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: St. Helena ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Service population served by WWTP	11,856	12,475	5%
WWTP Process Emissions	2,270	2,389	5%

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

Source: Ascent Environmental 2022.

4.5 YOUNTVILLE

Emissions Summary

Table 51 shows a summary of the 2019 emissions inventory and legislative-adjusted forecast for the Town of Yountville. Yountville's emissions are anticipated to remain relatively constant between 2019 and 2030. As shown in Table 51, on-road transportation will remain the highest emitting sector in Yountville's inventory in the future although emissions are anticipated to decrease by 12 percent based on VMT forecasts from MTC for Yountville (MTC 2015). The decrease in on-road transportation emissions is balanced by the increase in emissions from other sectors (e.g., solid waste, building energy, wastewater).

Table 51 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Yountville ($MTCO_2e$/year)

Sector	2019	2030	Percent Change	Difference
Agriculture	75	65	-14%	-11
Building Energy	5,500	6,032	10%	532
Imported Water	65	52	-19%	-13
Off-Road Equipment	1,328	1,501	13%	172
On-Road Transportation	11,722	10,278	-12%	-1,444
Solid Waste	2,601	3,153	21%	551
Wastewater	1,040	1,261	21%	221
Total	22,332	22,342	<1%	10

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

Source: Ascent Environmental 2022.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, Yountville's building energy-related emissions are anticipated to increase by 10 percent between 2019 and 2030.

Table 52 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Yountville ($MTCO_2e$/ year)

Energy Type	2019	2030	Percent Change
Residential			
Electricity	117	100	-15%
Natural Gas	4,566	5,235	15%
Subtotal	4,684	5,335	14%
Non-Residential			
Electricity	507	335	-34%
Natural Gas	309	362	17%
Subtotal	817	698	-15%
Total	**5,500**	**6,032**	**10%**

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

Source: Ascent Environmental 2022.

ON-ROAD TRANSPORTATION

Consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards per CARB's ZEV mandate, and other adopted regulations which can reduce average vehicle GHG emissions per mile Yountville's on-road transportation emissions are anticipated to decrease by 12 percent between 2019 and 2030, see Table 53.

Table 53 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Trip Type	2019	2030	Percent Change
Commercial Trips	3,883	3,649	-6%
Non-Commercial Trips	7,838	6,629	-15%
Total	**11,722**	**10,278**	**-12%**

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

Source: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

Table 54 displays inventory and legislative adjusted forecasts for off-road equipment for Yountville. As shown in Table 54, Yountville's off-road equipment emissions are anticipated to increase by 13 percent between 2019 and 2030. Most off-road equipment sources are anticipated to increase by 21-26 percent except construction and mining, recreational equipment, transportation refrigeration units, and light commercial equipment. Emissions generated from light commercial equipment are expected to decrease the most (46 percent) due to future emission standards for off-road equipment from CARB's OFFROAD 2021 model.

Table 54 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Industrial	62	76	22%
Airport Ground Support	0	0	0%
Commercial Harbor Craft	2	2	22%
Construction and Mining	202	260	29%
Lawn and Garden Equipment	575	723	26%
Light Commercial Equipment	274	180	-34%
Pleasure Craft	0	0	0%
Portable Equipment	114	139	22%
Railyard Operations	4	5	21%
Recreational Equipment	54	69	29%
Transport Refrigeration Units	42	47	11%
Total	**1,328**	**1,501**	**13%**

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

Source: Ascent Environmental 2022.

AGRICULTURE

Yountville does not have a substantial presence of agricultural activity within its jurisdiction. Table 55 shows that the limited agricultural activities in the town (e.g., agricultural offroad equipment, use of fertilizers, and limited livestock presence) would decline by 10 percent between 2019 and 2030, in proportion with regional trends in the reduction in agricultural acres over the last decade. Emissions from irrigation pumps were excluded as no irrigation pump permits were identified in Yountville.

Table 55 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Agricultural Offroad Equipment	41	33	-18%
Fertilizer Application	19	19	-1%
Livestock	16	16	-1%
Total	75	67	-10%

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

Source: Ascent Environmental 2022.

SOLID WASTE

Waste Generation

Yountville generated approximately 6,535 tons of solid waste in 2019 which generated 2,601 $MTCO_2e$ in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both Yountville's waste disposal and related emissions are anticipated to increase by 21 percent from 2019 to 2030, commensurate with population growth.

Table 56 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Solid Waste Generation Tonnage	6,535	7,920	21%
Solid Waste Generation Emissions	2,601	3,153	21%

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

Source: Ascent Environmental 2022.

Waste-in-Place

The Town of Yountville does not have any landfills located within its jurisdiction. Thus, there are no waste-in-place emissions attributable to this jurisdiction.

IMPORTED WATER

Yountville is anticipated to increase its usage of imported water by 21 percent by 2030 from 2019 levels, commensurate with population growth. However, emissions from imported water are expected to decline by 19 percent over the same period. This is due to the change in emissions factors associated with the electricity used for pumping imported water (i.e., from the state water project). The average California electricity emissions factors, available from EPA's eGRID database for the CAMX region, are anticipated to decline by 33 percent between 2019 and 2030. Emissions associated with locally sourced water are captured in the building energy sector.

Table 57 Imported Water GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Imported Water Usage (Gallons/year)	43	53	21%
Imported Water Emissions	65	52	-19%

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

Source: Ascent Environmental 2022.

WASTEWATER

Yountville's emissions from wastewater are anticipated to increase by proportionally with service population. These emissions would primarily come from central wastewater treatment plants. There are no knowns septic systems operating within Yountville.

Table 58 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Yountville ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Service population served by WWTP	3,893	4,718	21%
WWTP Process Emissions	1,040	1,261	21%

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

Source: Ascent Environmental 2022.

4.6 UNINCORPORATED NAPA COUNTY

Emissions Summary

Table 59 shows a summary of the 2019 emissions inventory and legislative-adjusted forecast for the Unincorporated County. The Unincorporated County emissions are anticipated to increase by 12 percent between 2019 and 2030 based on demographic and employment forecasts from the County's General Plan estimates and legislative adjustments (County of Napa 2008). As shown in Table 59, building energy will remain the highest emitting sector in the County's inventory. Emissions from agriculture are also anticipated to have the greatest decrease between 2019 and 2030, with a 12 percent reduction.

Table 59 Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Unincorporated County ($MTCO_2e$/year)

Sector	2019	2030	Percent Change	Difference
Agriculture	97,378	85,826	-12%	-11,552
Building Energy	283,843	347,075	22%	63,232
Off-Road Equipment	50,602	63,989	26%	13,387
On-Road Transportation	37,859	32,353	-15%	-5,506
Solid Waste	125,429	138,611	11%	13,181
Wastewater	3,191	4,140	30%	948
Total	**598,302**	**671,993**	**12%**	**73,691**

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

Source: Ascent Environmental 2022.

BUILDING ENERGY

Accounting for population and employment growth, changes in utility emission factors, and greater efficiencies in newer construction per Title 24 Building Energy Efficiency Standards, the Unincorporated County's building energy-related emissions are anticipated to increase by 22 percent between 2019 and 2030.

Table 60 Building Energy GHG Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts: Unincorporated County ($MTCO_2e$/year)

Energy Type	2019	2030	Percent Change
Residential			
Electricity	1,850	1,949	5%
Natural Gas	201,150	248,448	24%
Subtotal	203,000	250,397	23%
Non-Residential			
Electricity	4,208	3,857	-8%
Natural Gas	76,635	92,820	21%
Subtotal	80,843	96,677	20%
Total	**283,843**	**347,075**	**22%**

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

Source: Ascent Environmental 2022.

ON-ROAD TRANSPORTATION

Consistent with the VMT forecasts provided by MTC and anticipated improvement in vehicle emissions standards per CARB's ZEV mandate, and other adopted regulations which can reduce average vehicle GHG emissions per mile on-road transportation emissions in the county are anticipated to decrease by 15 percent between 2019 and 2030, see Table 61.

Table 61 On-Road Transportation GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County $MTCO_2e$/year)

Trip Type	2019	2030	Percent Change
Commercial Trips	12,543	11,488	-8%
Non-Commercial Trips	25,317	20,866	-18%
Total	**37,859**	**32,353**	**-15%**

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

Source: Ascent Environmental 2022.

OFF-ROAD EQUIPMENT

Table 62 displays inventory and legislative adjusted forecasts for off-road equipment for unincorporated Napa County. As shown in Table 61, off-road equipment emissions in the county are anticipated to increase by 26 percent between 2019 and 2030. Most off-road equipment sources are anticipated to increase by 26-38 percent except lawn and garden equipment, light commercial equipment, recreational equipment, and transportation refrigeration units. Emissions generated from light commercial equipment are expected to decrease the most (31 percent) due to future emission standards for off-road equipment (CARB 2021).

Table 62 Off-Road Transportation Vehicles and Equipment GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Industrial	1,711	2,176	27%
Airport Ground Support	<1	<1	18%[1]
Commercial Harbor Craft	44	56	27%
Construction and Mining	2,876	3,967	38%
Lawn and Garden Equipment	5,160	7,336	42%
Light Commercial Equipment	7,569	5,187	-31%
Pleasure Craft	28,896	39,691	37%
Portable Equipment	3,145	4,005	27%
Railyard Operations	120	151	26%
Recreational Equipment	483	711	47%
Transport Refrigeration Units	599	710	18%
Total	**50,602**	**63,989**	**26%**

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

[1] This represents a change from 163 to 192 grams of CO_2e per year, per outputs from OFFROAD2021 and the region's population growth.

Source: Ascent Environmental 2022.

AGRICULTURE

Most agricultural activity within the region takes places in the unincorporated county. Table 63 shows that agricultural activities in the county (e.g., agricultural offroad equipment, use of fertilizers, and livestock) would decline between 2019 and 2030 by 12 percent, in proportion with regional trends in the reduction in both rangeland and non-rangeland agricultural acres over the last decade. The greatest decline is anticipated in the livestock category (38 percent decrease), which is proportional to the anticipated decline in rangeland and pastureland acreage. Emissions from agricultural offroad equipment, although adjusted for growth in non-rangeland acreage, would have the next sharpest decline (14 percent decrease), primarily resulting from improvements in offroad emissions standards and requirements, as modeled in OFFROAD2021. Emissions from other agricultural sources (i.e., fertilizer application and irrigation pumps) are anticipated to increase by four percent, commensurate with historical trends of growth in non-rangeland agricultural land (e.g., fruit and nut crops, olives, hay, vegetables).

Table 63 Agricultural GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County (MTCO_2e/year)

Source	2019	2030	Percent Change
Agricultural Offroad	46,092	39,837	-14%
Fertilizer Application	21,216	22,134	4%
Irrigation Pumps	12,347	12,880	4%
Livestock	17,723	10,975	-38%
Total	**97,378**	**85,826**	**-12%**

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

Source: Ascent Environmental 2022.

SOLID WASTE

Solid waste emissions in the Unincorporated County are anticipated to increase by 11 percent from 2019 to 2030 from 125,428 to 138,611 MTCO_2e/year, largely due to the expected increases in waste-in-place emissions at the two landfills located within the area.

Waste Generation

Unincorporated Napa County generated approximately 28,105 tons of solid waste in 2019 which generated 10,810 MTCO_2e in emissions. Solid waste generation is anticipated to grow proportionally to population growth. Given that waste generation emissions are proportional to amount of waste generated, both the Unincorporated County's waste disposal and related emissions are anticipated to increase by 34 percent from 2019 to 2030, commensurate with population growth.

Table 64 Solid Waste GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County (MTCO_2e/year)

Source	2019	2030	Percent Change
Solid Waste Generation Tonnage	28,105	37,671	34%
Solid Waste Generation Emissions	10,810	14,490	34%

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

Source: Ascent Environmental 2022.

Waste-in-Place

Two major landfills are located within the Unincorporated County: Clover Flat Landfill and American Canyon Landfill. Table 65 shows that emissions from waste-in-place from both landfills are anticipated to increase by eight percent from 2019 to 2030. Section 3.5 describes the methodology used to quantify these forecasts.

Table 65 Waste in Place GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	Percent Change
American Canyon Landfill	42,800	40,084	-6%
Clover Flat Landfill	71,819	84,036	17%
Total	**114,619**	**124,121**	**8%**

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

Source: Ascent Environmental 2022.

IMPORTED WATER

Unincorporated Napa County did not utilize imported water in 2019, thus this sector was not further evaluated for 2030 forecasts.

WASTEWATER

Emissions from wastewater are anticipated to increase proportionally with service population in the unincorporated county. These emissions would primarily come from septic systems as the majority of the population in the Unincorporated County resides in rural areas. A smaller proportion of the population are location near the incorporated cities and have access to central wastewater treatment plants.

Table 66 Wastewater GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts: Unincorporated County ($MTCO_2e$/year)

Source	2019	2030	Percent Change
Service population served by septic systems	24,459	31,797	30%
Service population served by WWTP	618	803	30%
Septic Process Emissions	2,961	3,841	30%
WWTP Process Emissions	230	299	30%
Total Emissions	**3,191**	**4,140**	**30%**

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

Source: Ascent Environmental 2022.

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