

Appendix A

Greenhouse Gas Emissions Inventory and Forecasts

Memo



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Date: February 16, 2021

To: Elaine Marshall (City of Milpitas)

From: Honey Walters, Hannah Kornfeld, and Sam Ruderman (Ascent Environmental)

Subject: City of Milpitas Climate Action Plan Update, Greenhouse Gas Emissions Inventory Update – Technical Memorandum

INTRODUCTION

In 2013, the City of Milpitas (City) adopted its first Climate Action Plan (CAP), which served as a roadmap to meet the State's 2020 greenhouse gas (GHG) emissions reduction target (i.e., 15 percent below 2005 baseline emissions). The 2005 inventory included GHG emissions generated by community activities but did not include the emissions associated with the City's municipal operations. The City is now updating the 2005 GHG emissions inventory for baseline year 2019 in preparation of its Climate Action Plan Update (CAP Update). The CAP Update will include both GHG emissions generated from activities occurring in the community as well as GHG emissions from municipal operations. To gauge progress since 2005, the original 2005 inventory has been revised to account for new data and methods in alignment with the 2019 inventory update. In addition to updating the City's community baseline inventory to 2019, a 2015 inventory has been developed as a representative interim year for the City.

The CAP Update is intended to reduce GHG emissions for target years of 2030, 2040, and 2045. The long-term target year of 2045 was chosen to better align with newer State GHG targets such as the statewide carbon neutrality goal, rather than the previously issued 2050 goal of 80 percent reduction from 1990 levels. This first phase in preparation of the CAP Update includes: (1) revising the 2005 GHG emissions inventory baseline to be consistent with current methodologies and (2) developing GHG emissions inventories for 2015 and 2019 for both the community and municipal operations. This technical memorandum provides the results of the revised 2005 GHG emissions inventory, the 2015 and 2019 inventories, as well as associated methods, assumptions, emissions factors, and data sources.

The updated GHG emissions inventories will provide a foundation for the forthcoming phases of the CAP Update process, including forecasting future emissions, developing GHG emissions reduction targets, defining GHG emissions reduction measures, and an action plan that will help the City achieve identified targets.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of two main parts:

- ▶ **Section 1: Summary of Inventory Results** presents an overview of the revised 2005 community GHG emissions inventory and the 2015 and 2019 community and municipal operations inventories for each sector, including new sources and methods not previously included in the 2005 inventory. Key components include:
 - a review of the original and revised 2005 inventories,
 - a summary of 2015 and 2019 community emissions by sector,
 - a general comparison of community emissions to the baseline 2005 inventory, and
 - a summary of 2015 and 2019 municipal emissions by sector.
- ▶ **Section 2: Data, Methods, and Assumptions** summarizes data, methods, and assumptions used in the 2015 and 2019 inventories and provides activity data and GHG emissions estimates by sector.

1 SUMMARY OF INVENTORY RESULTS

1.1 REVISED 2005 COMMUNITY INVENTORY

Since the original 2005 GHG inventory was prepared, new protocols have been developed for calculating community GHG emissions in various sectors. These changes reflect refinements in the planning process that have resulted from research in the field and shared knowledge from local governments engaged in climate action planning. For this CAP Update, 2005 GHG emissions estimates were revised using current methodologies and guidance provided by ICLEI – Local Governments for Sustainability (ICLEI) (discussed further in Section 2.2.1). The revisions to the 2005 inventory allow for consistency and enable direct comparison with the 2015 and 2019 inventories.

Based on the modeling conducted for the revised inventory, community activities in the city generated approximately 547,972 metric tons of carbon dioxide equivalent (MTCO₂e) in 2005. Major emissions sectors included on-road transportation, residential and nonresidential building energy use, and solid waste. Table 1 presents the original 2005 inventory compared to the revised 2005 inventory, and Figure 1 displays the revised 2005 community emissions inventory.

Table 1 Original and Revised 2005 Milpitas Community Greenhouse Gas Emissions Inventories

Sectors	Original 2005 Inventory		Revised 2005 Inventory	
	MTCO ₂ e/year	Percent of Total	MTCO ₂ e/year	Percent of Total
On-Road Transportation	320,990	50	252,864	46
Nonresidential Building Energy	183,800	29	183,424	33
Residential Building Energy	64,230	10	64,108	12
Solid Waste	54,410	8	26,998	5
Off-Road Vehicles and Equipment	15,140	2	15,034	3
Water Supply	1,960	<1	4,466	1
Wastewater Treatment	1,070	<1	1,078	<1
Light Rail	1,070	<1	NA ¹	NA ¹
Total	642,670	100	547,972	100

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year; NA = not applicable.

¹Light rail was excluded from the revised 2005 inventory. Further details are included below.

Source: Original 2005 inventory prepared by the City of Milpitas in 2013; revised 2005 inventory prepared by Ascent Environmental in 2021.

The revised 2005 inventory estimates an approximately 15 percent decrease in emissions below the original 2005 inventory. In general, differences in GHG emissions estimates between the inventories can be explained by:

- ▶ the use of different global warming potential (GWP) values between inventories (see Section 2.1 below for explanation of GWP values),
- ▶ differences in data sources between inventories, and
- ▶ adjustments in calculation methodologies (e.g., equations and emissions factors).

Differences in data sources and calculation methodologies associated with the on-road transportation, solid waste, and water supply sectors were responsible for nearly all of the changes between the original and revised 2005 inventories. Emissions from the on-road transportation sector in the revised 2005 inventory were calculated using

emissions factors obtained from an updated transportation model (discussed further in Sections 2.2.1 and 2.2.3). Calculations for the solid waste sector were adjusted to align with current data sources and methods that were not used in the original 2005 inventory. Water supply emissions in the revised 2005 inventory were estimated using adjusted energy intensity factors (described in detail in Section 2.2.5). All changes were made in accordance with industry-leading GHG emissions inventorying guidance provided by ICLEI.

In addition, while light rail emissions were included in the original 2005 inventory, this sector was excluded from the revised 2005 inventory because the local transit operator, Valley Transit Authority (VTA), has prepared GHG emissions inventories of its own operations, which account for these emissions. VTA is using its inventories to develop strategies to reduce GHG emissions from its operations.

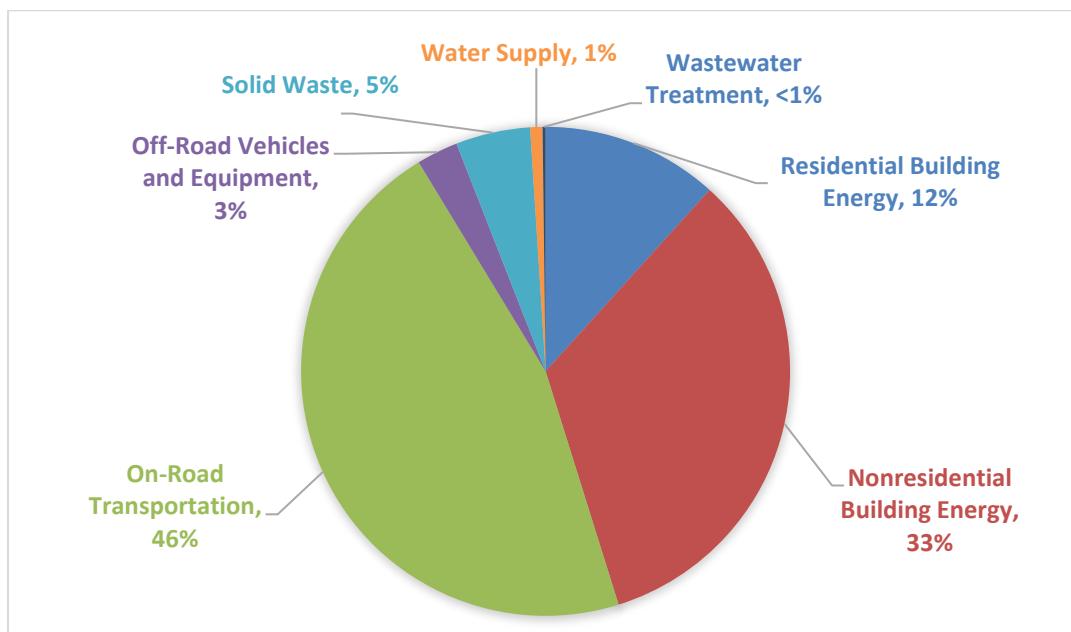


Figure 1 Revised 2005 Milpitas Community Greenhouse Gas Emissions Inventory

1.2 2015 AND 2019 COMMUNITY INVENTORIES

Based on the modeling conducted, community activities generated approximately 588,414 MTCO₂e in 2015 and 441,557 MTCO₂e in 2019. Table 2 presents the city's 2015 and 2019 GHG emissions inventories by sector, and Figure 2 illustrates the 2019 community inventory. The 2019 inventory will act as the city's updated GHG emissions baseline, which will be used to set future emissions reductions targets. For this reason, figures show 2019 emissions, rather than 2015 emissions. A description of each emissions sector, including key sources of emissions, is provided in further detail in Section 2, "Data, Methods, and Assumptions."

Table 2 2015 and 2019 Milpitas Community Greenhouse Gas Emissions Inventories

Sectors	2015 Inventory		2019 Inventory	
	MTCO ₂ e/year	Percent of Total	MTCO ₂ e/year	Percent of Total
Residential Building Energy	57,581	10	42,218	10
Nonresidential Building Energy	202,368	34	98,319	22
On-Road Transportation	278,061	46	259,627	59
Off-Road Vehicles and Equipment	16,511	3	15,554	4
Solid Waste	28,984	5	23,566	5
Water Supply	2,974	1	694	<1
Wastewater Treatment	1,935	<1	1,578	<1
Total	588,414	100	441,557	100

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

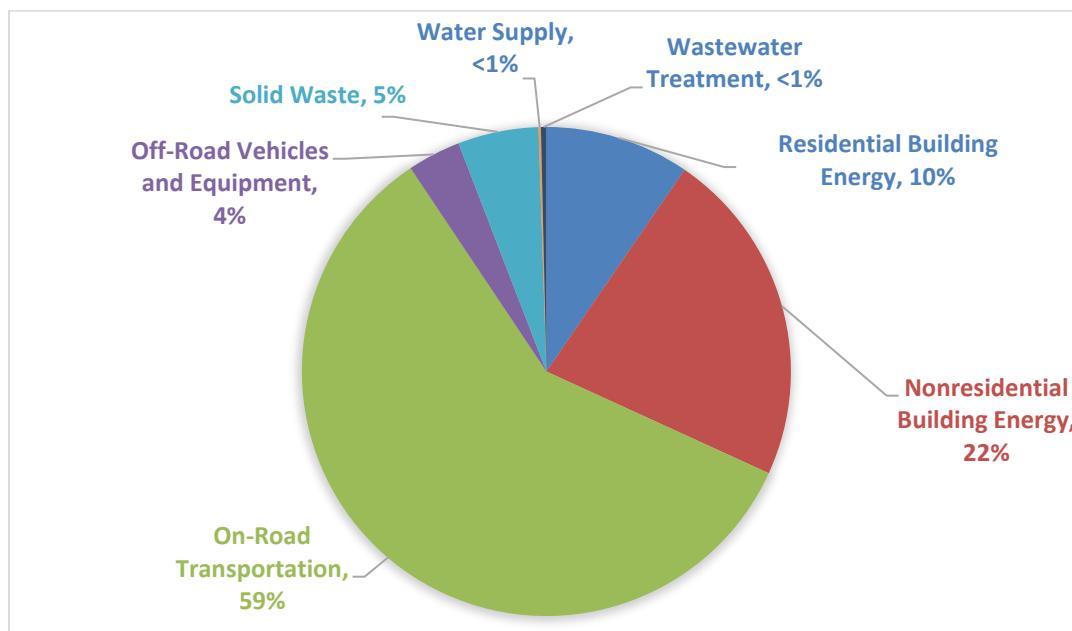


Figure 2 2019 Milpitas Community Greenhouse Gas Emissions Inventory

The organization of the revised 2005 inventory is generally consistent with the updated 2015 and 2019 inventories. One difference is that while the building energy sectors of the 2015 and 2019 inventories include energy consumption from nonresidential backup generators, these data were not available for 2005. Therefore, the building energy sector of the revised 2005 inventory does not estimate GHG emissions from nonresidential backup generators. Similarly, emissions from composting are included in the 2015 and 2019 inventories, but composting data were unavailable for 2005 and thus, composting emissions are not included in the revised 2005 inventory. Table 3 and Figure 3 show the 2005 community inventory alongside the updated 2015 and 2019 community results.

Table 3 Comparison of Milpitas Community Greenhouse Gas Emissions Inventories

Sector	Revised 2005 Inventory (MTCO ₂ e/year)	2015 Inventory (MTCO ₂ e/year)	2019 Inventory (MTCO ₂ e/year)	Percent Change 2005 – 2019
Residential Building Energy	252,864	57,581	42,218	-34
Nonresidential Building Energy	183,424	202,368	98,319	-46
On-Road Transportation	64,108	278,061	259,627	3
Off-Road Vehicles and Equipment	26,998	16,511	15,554	3
Solid Waste	15,034	28,984	23,566	-13
Water Supply	4,466	2,974	694	-84
Wastewater Treatment	1,078	1,935	1,578	46
Total	547,972	588,414	441,557	-19

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Revised 2005 inventory and 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

Based on the modeling conducted, community GHG emissions increased by approximately 7 percent above the revised 2005 baseline in 2015 as a result of population and employment growth in the city. In 2019, community GHG emissions decreased by approximately 19 percent below the revised 2005 baseline. Although population and employment continued to rise in 2019, the reduction in emissions between the revised 2005 inventory and the 2019 inventory can be explained by:

- ▶ improvements in vehicle and equipment fuel efficiency due to State and federal regulations,
- ▶ reductions in the carbon intensity of grid electricity due to State regulations, and
- ▶ the supply of near-zero-emissions grid electricity from Silicon Valley Clean Energy (SVCE) to the city starting in 2018.

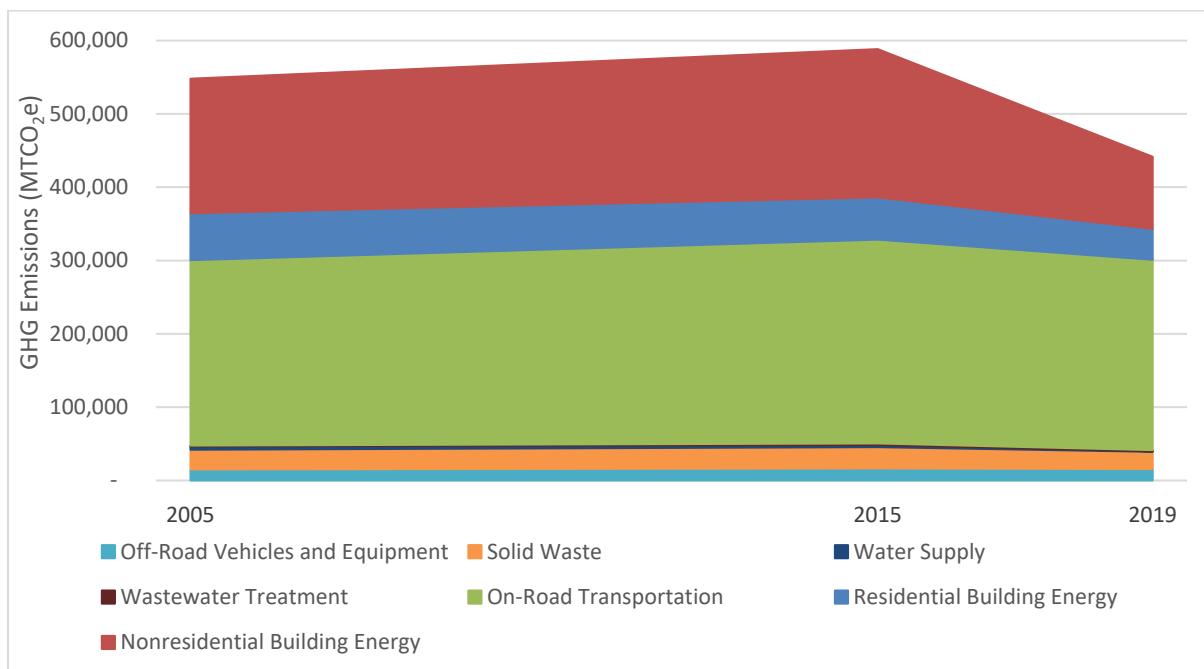


Figure 3 Comparison of Milpitas Community Greenhouse Gas Emissions Inventories

1.3 2015 AND 2019 MUNICIPAL OPERATIONS INVENTORY RESULTS

Based on the modeling conducted, the City's municipal operations generated approximately 5,019 MTCO₂e in 2015 and 3,252 MTCO₂e in 2019. Major emissions sectors included buildings and facilities, streetlights and traffic signals, employee commute, and vehicle fleet. Table 4 presents the City's 2015 and 2019 municipal operations GHG emissions inventories by sector, and Figure 4 illustrates the 2019 municipal operations inventory.

Table 4 2015 and 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventories

Sector	2015 Inventory		2019 Inventory	
	MTCO ₂ e/year	Percent of Total	MTCO ₂ e/year	Percent of Total
Buildings and Facilities	2,001	40	870	27
Streetlights and Traffic Signals	564	11	3	<1
Employee Commute	1,304	26	1,195	37
Vehicle Fleet	1,017	20	1,081	33
Solid Waste	52	1	53	2
Water Supply	70	1	41	1
Wastewater Treatment	11	<1	9	<1
Total	5,019	100%	3,252	100%

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

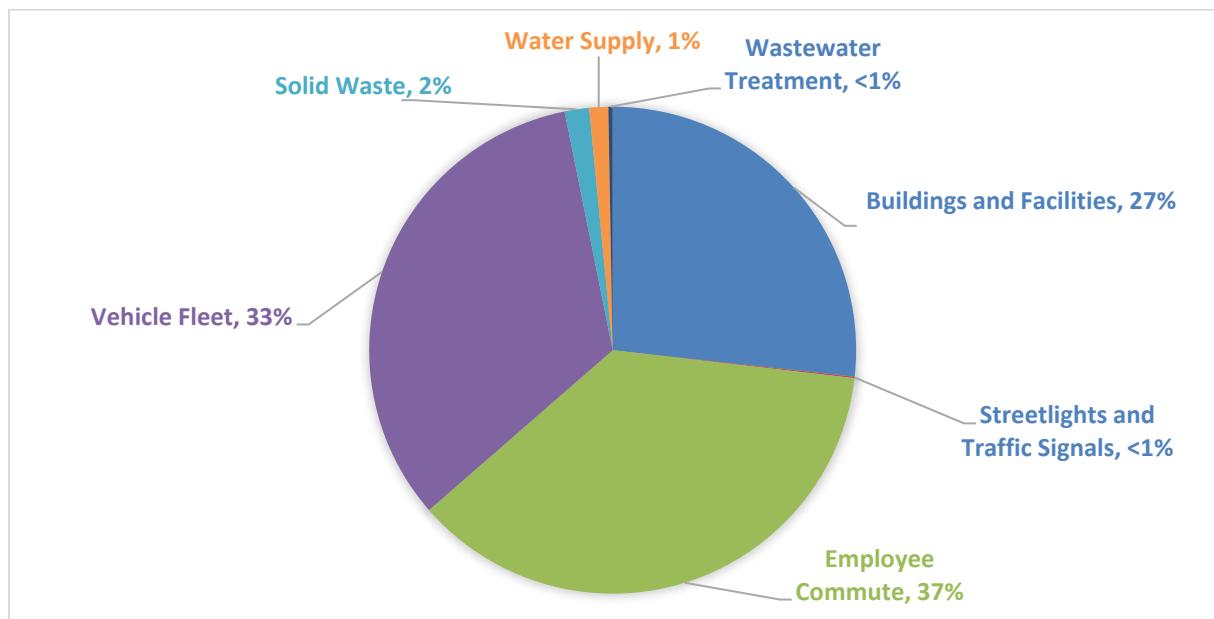


Figure 4 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventory

GHG emissions from municipal operations decreased approximately 35 percent between 2015 and 2019. These reductions can be explained primarily by the supply of near-zero-emissions grid electricity from SVCE for municipal operations beginning in 2018.

2 DATA, METHODS, AND ASSUMPTIONS

2.1 OVERALL ASSUMPTIONS AND DATA

2.1.1 Utility Emissions Factors

Emissions of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) per megawatt-hour (MWh) of electricity or therm of natural gas can vary by location and from year to year depending on numerous factors. Utility-specific factors for GHG emissions were obtained and used throughout the 2015 and 2019 inventories to estimate GHG emissions from electricity and natural gas consumption. Sources for electricity and natural gas emissions factors are shown below.

- ▶ **Electricity:** Utility electricity emissions factors for CO₂, CH₄, and N₂O were obtained from Pacific Gas and Electric (PG&E), SVCE, and the U.S. Environmental Protection Agency's (EPA's) Emissions & Generation Resource Integrated Database (eGRID). For 2015, PG&E provided the CO₂ emissions factor, and CH₄ and N₂O emissions factors were obtained from eGRID's 2016 Annual Output Emissions Rates (EPA 2020). For 2019, PG&E's CO₂ emissions factor was interpolated using the 2018 emissions factor provided by PG&E and the requirements of the Renewables Portfolio Standard included in Senate Bill (SB) 100. The same approach was taken for CH₄ and N₂O emissions factors from eGRID's 2018 Annual Output Emissions Rates (EPA 2020). SVCE's emissions factor for CO₂ in 2019 was provided by SVCE.
- ▶ **Natural Gas:** Utility natural gas emissions factors for CO₂, CH₄, and N₂O were obtained from The Climate Registry's (TCR's) 2020 Default Emission Factors (TCR 2020).

Specific utility emissions factors used in the inventory calculations are shown below in Table 5.

Table 5 2015 and 2019 Milpitas Utility Emissions Factors

Source and Unit	Emissions Factor	
	2015	2019
SVCE – Electricity		
lb CO ₂ /MWh	NA	2.34
lb CH ₄ /MWh	NA	0
lb N ₂ O/MWh	NA	0
PG&E – Electricity		
lb CO ₂ /MWh	404.51	197.81
lb CH ₄ /MWh	0.0330	0.0327
lb N ₂ O/MWh	0.0040	0.00385
PG&E – Natural Gas		
lb CO ₂ /therm	11.7	11.7
lb CH ₄ /therm	0.000227	0.000227
lb N ₂ O/therm	0.00000454	0.00000454

Notes: CH₄ = methane; CO₂ = carbon dioxide; lb = pounds; MWh = megawatt-hours; N₂O = nitrous oxide; NA = not applicable; PG&E = Pacific Gas & Electric; SVCE = Silicon Valley Clean Energy.

Source: Utility emissions factors provided by PG&E, SVCE, EPA, and TCR. Table compiled by Ascent Environmental in 2021.

2.1.2 Global Warming Potentials

GHG emissions other than CO₂ generally have a stronger insulating effect and thus, a greater ability to warm the earth's atmosphere through the greenhouse effect. This effect is measured in terms of a pollutant's GWP. CO₂ has a GWP factor of one while all other GHGs have GWP factors measured in multiples of one. This conversion of non-CO₂ gases to one unit enables the reporting of all emissions in terms of carbon dioxide equivalent (CO₂e), which allows consideration of all gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to climate change. MTCO₂e is the standard unit for reporting emissions.

Consistent with the best available science, these inventories use GWP factors published in the Fifth Assessment Report from the Intergovernmental Panel on Climate Change, where CH₄ and N₂O have GWP factors of 28 and 265, respectively (IPCC 2014). This means that CH₄ is 28 times stronger than CO₂ and N₂O is 265 times stronger than CO₂ in their potential to insulate solar radiation within the atmosphere.

2.1.3 Population and Employment

Population and employment data were used to scale activity levels for certain emissions sources and sectors.

Population and employment data were obtained from Metropolitan Transportation Commission's (MTC's) Plan Bay Area 2040 for 2015 and 2019. Data for 2005 was estimated by extrapolating backwards (i.e., "back-casting") using the average annual growth rate reported by MTC from 2010 to 2040.

2.2 COMMUNITY INVENTORIES DATA AND ASSUMPTIONS

2.2.1 Sector-Specific Assumptions and Methods for Community Inventories

Several inventory protocols have been developed to provide guidance for communities and local governments to account for emissions accurately and consistently. In coordination with other partners, ICLEI has developed guidance for local-scale accounting of emissions that many local governments use to develop their GHG inventories. The most recent guidance for community-scale emissions inventories is ICLEI's July 2019 publication *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (U.S. Community Protocol), Version 1.2 (ICLEI 2019).

The following summarizes data sources and methods used in estimating community GHG emissions in 2015 and 2019:

- ▶ **Building Energy:** Annual electricity and natural gas usage data for the city and utility emissions factors were provided by PG&E and SVCE (see Table 5 above). Additional emissions factors were obtained from eGRID and TCR. Annual nonresidential backup generator usage was provided by Bay Area Air Quality Management District (BAAQMD). Emissions factors for backup generator fuels was obtained from TCR.
- ▶ **Transportation:** For the on-road transportation sector, daily vehicle miles traveled (VMT) were obtained from MTC for the city, using the SB 375 Regional Technical Advisory Committee's (RTAC's) origin-destination method. Vehicle emissions factors were derived from California Air Resources Board's (CARB's) 2021 EMissions FACtor (EMFAC2021) model. Off-road vehicle emissions were estimated from CARB's OFFROAD2007 and OFFROAD2017 models and scaled by population, employment, or share of road miles.
- ▶ **Solid Waste:** Emissions associated with waste generated by residents and businesses in the city were estimated using disposal data available from the California Department of Resources Recycling and Recovery (CalRecycle) for landfills receiving waste from the city. Landfill gas (LFG) collection information was available from EPA.

- **Water Supply:** Water supply emissions were estimated using region-specific energy intensity factors obtained from the California Public Utilities Commissions (CPUC) in combination with water consumption volumes provided by the city's water purveyors, San Francisco Public Utilities Commission (SFPUC), Santa Clara Valley Water District (Valley Water), and South Bay Water Recycling (SBWR). PG&E utility emissions factors were used to estimate GHG emissions¹.
- **Wastewater:** Wastewater sector emissions depend on the types of treatment processes and equipment that each wastewater treatment plant uses. Data regarding treatment processes, population served, digester gas production and combustion, biological oxygen demand (BOD) load, and average nitrogen load were obtained from the San Jose–Santa Clara Regional Wastewater Facility (RWF).

2.2.2 Building Energy

Residential and nonresidential building energy use in 2015 resulted in approximately 259,949 MTCO₂e and in 2019 resulted in approximately 140,537 MTCO₂e. This sector generated approximately 32 percent of the city's emissions in 2019 and represents the second largest emissions sector in the inventory. Most of these emissions were a result of electricity and natural gas use in homes and business, primarily for lighting and heating, ventilation, air condition, and cooling (HVAC), as well as to power appliances. A small proportion of nonresidential building energy emissions are associated with diesel and natural gas consumption in backup generators. In 2019, electricity from both residential and nonresidential buildings accounted for approximately 22 percent of emissions from the building energy sector. Natural gas use accounted for approximately 78 percent, and backup generators accounted for less than 1 percent, of emissions from the building sector in 2019. Annual electricity, natural gas, and backup generator usage and GHG emissions are shown in Table 6.

Table 6 2015 and 2019 Milpitas Community Building Energy Use Greenhouse Gas Emissions

Source	2015		2019	
	Quantity	GHG Emissions	Quantity	GHG Emissions
Electricity	MWh/year	MTCO₂e/year	MWh/year	MTCO₂e/year
Residential	117,026	21,578	121,801	581
Nonresidential	784,254	144,603	708,759	29,880
<i>Electricity Total</i>	<i>901,280</i>	<i>166,180</i>	<i>830,560</i>	<i>30,461</i>
Natural Gas	therms/year	MTCO₂e/year	therms/year	MTCO₂e/year
Residential	6,779,674	36,003	7,840,602	41,637
Nonresidential	10,875,823	57,756	12,772,616	67,828
<i>Natural Gas Total</i>	<i>17,655,497</i>	<i>93,759</i>	<i>20,613,218</i>	<i>109,466</i>
Backup Generators		MTCO₂e/year		MTCO₂e/year
Nonresidential	NA	10	NA	611
Energy Combined		MTCO₂e/year		MTCO₂e/year
Residential	NA	57,581	NA	42,218
Nonresidential	NA	202,368	NA	98,319
Total	NA	259,949	NA	140,537

Notes: Totals in columns may not sum exactly due to independent rounding. GHG = greenhouse gas; MMBTU = million British thermal units; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; MWh = megawatt-hours; NA = not applicable.

¹ Based on communications with the City, it was assumed that SFPUC was supplied by carbon-free electricity in 2019.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

RESIDENTIAL ENERGY

Residential energy emissions result indirectly from electricity consumption and directly from onsite combustion of natural gas. SVCE and PG&E are the providers of residential energy in the city. In 2015, PG&E provided electricity to residents in the city, and in 2019, both PG&E and SVCE provided electricity to the city's residents. SVCE is a public, not-for profit community choice energy provider that was formed to serve the communities of Silicon Valley, including Milpitas. It began providing clean, near-zero-emissions electricity to the city in 2018 and currently serves approximately 97 percent of residential and nonresidential accounts, while the remaining electricity accounts are served by PG&E. As SVCE provides near-zero-emissions electricity, residential electricity emissions in 2019 were generated almost entirely by PG&E customers. Residential natural gas was provided by PG&E in both 2015 and 2019.

Annual residential electricity usage data for 2015 and 2019 in the city was obtained from PG&E and SVCE, expressed as MWh per year (MWh/year). To calculate the MTCO₂e of residential electricity consumption, emissions factors (shown in Table 5) for CO₂, CH₄, and N₂O were applied to electricity consumption data.

Annual residential natural gas consumption for 2015 and 2019 in the city was obtained from PG&E and SVCE, expressed as therms per year (therms/year). CO₂, CH₄, and N₂O emissions factors for natural gas were applied to consumption data to estimate MTCO₂e from residential natural gas usage.

NONRESIDENTIAL ENERGY

Nonresidential energy emissions, which are generated by commercial and industrial uses, result indirectly from electricity consumption and directly from onsite combustion of natural gas. PG&E and SVCE provide nonresidential electricity in the city. PG&E provided all nonresidential electricity in 2015, and both PG&E and SVCE provided nonresidential electricity in 2019. Nearly all emissions generated from nonresidential electricity consumption are associated with customers that opted out of SVCE-supplied electricity and thus are due to PG&E electricity use. Nonresidential natural gas was in the city was provided by PG&E in 2015 and 2019.

Annual nonresidential electricity usage data for 2015 and 2019 were obtained from PG&E and SVCE, expressed as MWh/year, and annual nonresidential natural gas consumption in the city was obtained from PG&E and SVCE, expressed as therms/year. Emissions associated with nonresidential energy consumption were quantified using the same methods as described above for residential energy calculations.

Data for annual nonresidential backup generators were obtained from BAAQMD, expressed as gallons per year (gallons/year) for diesel fuel, and standard cubic feet per year (scf/year) for natural gas. Emissions factors obtained from TCR were applied to fuel consumption data to estimate GHG emissions associated with nonresidential backup generator usage.

2.2.3 Transportation

ON-ROAD TRANSPORTATION

The on-road transportation sector represents the largest emissions-generator sector in the city. Based on modeling conducted, on-road transportation in the city resulted in approximately 278,061 MTCO₂e in 2015 and 259,627 MTCO₂e in 2019, or 59 percent of the city's 2019 inventory. Passenger vehicles represented 66 percent of emissions in 2015 and 67 percent of emissions from this sector in 2019, and commercial vehicles represented 34 percent of

emissions in 2015 and 33 percent of emissions in 2019. Annual VMT and GHG emissions from on-road transportation are shown in Table 7.

Table 7 2015 and 2019 Milpitas Community On-Road Transportation Greenhouse Gas Emissions

Vehicle Type	2015		2019	
	VMT/year	GHG Emissions (MTCO ₂ e/year)	VMT/year	GHG Emissions (MTCO ₂ e/year)
Passenger Vehicles	492,014,849	182,927	509,968,096	173,746
Commercial Vehicles	67,476,778	95,134	62,921,403	85,881
Total	559,491,627	278,061	572,889,499	259,627

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; VMT/year = vehicle miles traveled per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

On-road transportation emissions are primarily the result of the combustion of gasoline and diesel fuels in passenger vehicles (i.e., cars, light-duty trucks, and motorcycles), medium- and heavy-duty trucks, and other types of vehicles permitted to operate "on-road." To a smaller degree, emissions from on-road vehicles also result from upstream electricity generation for electric vehicles; these emissions are represented in annual electricity emissions in the city. Due to lack of available data, emissions from the combustion of natural gas and other non-electric alternative fuels in on-road vehicles were not included in the community inventory and are assumed to have minimal contribution to total emissions.

MTC is the regional metropolitan planning organization responsible for regional transportation planning in the San Francisco Bay Area. MTC conducted a VMT study that provides daily VMT by city for the years 2015 and 2020. These VMT estimates are associated with trips that begin or end in the city. VMT estimates included 100 percent of vehicle trips that both originate from and end in the city (i.e., fully internal trips), 50 percent of trips that either end in or depart from the city (i.e., internal-external or external-internal trips), and zero percent of vehicle trips that are simply passing through the city boundaries (i.e., external-external, or "pass-through," trips). This vehicle trip accounting method is consistent with the RTAC origin-destination method established through SB 375 and CARB recommendations. Daily VMT was annualized by applying region-specific annualization factors, or the average amount of days driven by residents and visitors of the city. The annualization factors were 352.3 and 355.3 in 2015 and 2019, respectively (Caltrans 2021).

An overall emissions rate for citywide VMT was derived from the statewide mobile source emissions inventory model EMFAC2021, developed by CARB. EMFAC2021 was used to generate emission rates for the city for calendar years 2015 and 2019 with all vehicle classes, model years, speeds, and fuel types. The citywide MTCO₂e/mile emissions factor was calculated based on the distribution of VMT for each vehicle class and its emissions factor.

The reduction in on-road transportation emissions between 2015 and 2019 can be explained by two factors. First, VMT from commercial vehicles decreased. While passenger vehicle VMT increased, emissions factors for commercial vehicles (i.e., medium- and heavy-duty vehicles) are much higher than passenger vehicle emissions factors, so changes in commercial vehicle VMT generate proportionally larger impacts on total emissions compared to changes in passenger vehicle VMT. Second, emissions factors for both passenger and commercial vehicles were reduced between 2015 and 2019. This improvement is due to the turnover of older vehicles in the vehicle fleet and increased fuel efficiencies of newer vehicles introduced into the fleet.

OFF-ROAD VEHICLES AND EQUIPMENT

Based on modeling conducted, off-road vehicles and equipment operating in the city emitted approximately 16,511 MTCO₂e in 2015 and 15,554 MTCO₂e in 2019, or 4 percent of the 2019 inventory. The largest emissions-generating off-road transportation categories include industrial equipment, construction and mining equipment, lawn and garden equipment, and light commercial equipment. The estimated annual emissions and scaling factors used are presented in Table 8 below by equipment type.

Table 8 2015 and 2019 Milpitas Community Off-Road Vehicles and Equipment Greenhouse Gas Emissions

Off-Road Vehicles and Equipment Type	GHG Emissions (MTCO ₂ e/year)		Scaling Method
	2015	2019	
Construction and Mining Equipment	4,661	3,478	population + employment
Entertainment Equipment	45	44	population
Industrial Equipment	8,469	8,590	employment
Lawn and Garden Equipment	1,561	1,602	population
Light Commercial Equipment	1,291	1,290	employment
Railyard Operations	1	1	employment
Recreational Equipment	376	430	population
Transportation Refrigeration Units	107	118	share of road miles
Total	16,511	15,554	NA

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; NA = not applicable.

Source: Data provided by Ascent Environmental in 2021, based on modeling from OFFROAD2007 and OFFROAD2017.

Emissions from the off-road vehicles and equipment sector result from fuel combustion in off-road vehicles and equipment. Data associated with this sector were available from CARB's OFFROAD2007 and OFFROAD2017 models. These models provide emissions details at the State, air basin, or county level. Santa Clara County emissions data from OFFROAD2007 and OFFROAD2017 were apportioned to the city using custom scaling factors depending on the off-road fleet type. For example, due to the likely correlation between commercial activity and employment, the city's portion of emissions from light commercial equipment in the county is assumed to be proportional to the number of jobs in the city as compared to the county as a whole.

OFFROAD2007 provides emissions details for all off-road vehicle and equipment types, but OFFROAD2017 only provides details for certain types of off-road vehicles and equipment that are relevant to the city (i.e., construction and mining equipment, industrial equipment, and transport refrigeration units). CARB recommends using OFFROAD2007 where desired information is unavailable from the OFFROAD2017 model, so data from both models was used (CARB 2020). Additionally, while OFFROAD2017 provides estimates of CO₂ emissions, it does not provide estimates for CH₄ and N₂O emissions. To estimate CH₄ and N₂O emissions from the vehicle and equipment types included in OFFROAD2017, ratios of CH₄ to CO₂ and N₂O to CO₂ were obtained from OFFROAD2007 and applied to CO₂ data from OFFROAD2017 to calculate CH₄ and N₂O emissions.

2.2.4 Solid Waste

Based on modeling conducted, the solid waste sector was responsible for approximately 28,984 MTCO₂e in 2015 and 23,566 MTCO₂e in 2019, or 5 percent of the 2019 community GHG inventory. Solid waste emissions are associated

primarily with the decomposition of solid waste generated by the city in landfills. Smaller proportions of solid waste emissions are produced by the decomposition of alternative daily cover (ADC) generated by the city, as well as from composting organic waste. Landfill disposed waste accounted for approximately 93 percent of emissions in 2015 and 94 percent of emissions in 2019. ADC represented 5 percent of emissions in 2015 and 4 percent of emissions in 2019, and composting accounted for approximately 1 percent of solid waste emissions in 2015 and 2 percent in 2019. Table 9 summarizes emissions from the solid waste sector. Additional details regarding calculation methods and assumptions are discussed below.

Table 9 2015 and 2019 Milpitas Community Solid Waste Greenhouse Gas Emissions

Source	2015		2019	
	Quantity (tons/year)	GHG Emissions (MTCO ₂ e/year)	Quantity (tons/year)	GHG Emissions (MTCO ₂ e/year)
Landfill Disposed Waste	69,762	27,031	57,763	22,040
Alternative Daily Cover	2,905	1,561	734	973
Composting	4,605	391	6,509	553
Total	77,272	28,984	65,006	23,566

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

SOLID WASTE GENERATION

CH₄ emissions generated by landfill disposed waste occur from the decay of waste generated annually by residences and businesses in the city. A total of 69,762 tons of landfilled waste was reported for the city in 2015 and 57,763 tons was reported in 2019. In addition to landfilled waste, communities send ADC to landfills. ADC is non-earthen material used to cover an active surface of a landfill at the end of each operating day to control for vectors, fires, odors, blowing litter, and scavenging. This material can include compost, construction and demolition waste, sludge, green material, shredded tires, spray-on cement, and fabric. Given that ADC can also include organic material, CH₄ emissions from landfills result from organic decomposition in both waste disposal and ADC. ADC from the city was reported to be 2,905 tons in 2015 and 734 tons in 2019. Data for landfilled waste and ADC was obtained from CalRecycle.

Total solid waste generation and ADC by amount and receiving landfill was available from CalRecycle. However, the city is aware that there is an error in CalRecycle's reporting of 2019 waste figures for the city; currently, CalRecycle's report significantly overestimates the city's total disposed waste. The city provided an estimate for total disposed waste for 2019, but it was unable to provide the quantities of waste sent to each receiving landfill. Therefore, the quantity of waste sent to each landfill in 2019 was estimated by applying the proportion of total waste from the city received by landfills in 2018 to the total quantity of landfilled waste provided by the city for 2019.

The amount of CH₄ released from community-generated waste depends on the LFG management systems of the landfills at which the waste is disposed. Information regarding the use of an LFG capture system was available from EPA's Landfill Methane Outreach Program. All facilities that included an LFG capture system applied the default LFG collection efficiency of 0.75, as recommended by the U.S. Community Protocol. Facilities that did not include an LFG capture rate received no efficiency adjustments. Default waste characterization emissions factors obtained from EPA were used in calculations.

COMPOSTING

In addition to solid waste pickup and disposal, the City offers green waste (i.e., yard trimmings) composting services to reduce GHG emissions associated with the decomposition of organic waste that would be sent to landfills. Yard trimmings include flowers and leaves, ivy and weeds, grass clippings, small branches, small tree stumps, and untreated dimensional lumber. All composting is conducted off-site at private facilities.

Composting data were available from the City. Emissions from composting operations were calculated using CARB's *Method for Estimating Greenhouse Gas Emission Reductions from Diversion of Organic Waste from Landfills to Compost Facilities* (CARB 2016). The equations used for calculation included transportation emissions from transferring organic waste, process emissions from composting, and fugitive emissions from composting. Composting results in emissions from the decomposition of waste, but it also results in a reduction of emissions by avoiding landfill disposal. Composting resulted in avoidance of 2,349 MTCO₂e in 2015 and 3,320 in 2019. As shown in Table 9, emissions associated with composting were 391 MTCO₂e in 2015 and 553 MTCO₂e in 2019.

2.2.5 Water Supply

Based on modeling conducted, water supply emissions accounted for approximately 2,974 MTCO₂e in 2015 and 694 MTCO₂e in 2019, or less than 1 percent of the city's 2019 GHG inventory. GHG emissions associated with water consumption occur from the indirect use of energy associated with water extraction, conveyance, treatment, and distribution to the point of use (e.g., residences, businesses). Water supply emissions were estimated by applying energy intensity factors (i.e., the total amount of energy required to produce a unit of water for a particular use) to water consumption values provided by each water supplier for the city in 2015 and 2019. The methods used are explained in more detail below. Table 10 presents water supply and associated GHG emissions for the city.

Table 10 2015 and 2019 Milpitas Community Water Supply Greenhouse Gas Emissions

	2015		2019	
	Quantity	GHG Emissions (MTCO ₂ e/year)	Quantity	GHG Emissions (MTCO ₂ e/year)
Water consumption (MGY)	3,010	2,974	3,428	694
Energy consumption (MWh/year)	16,131		17,322	

Notes: GHG = greenhouse gas; MGY = million gallons per year; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; MWh/year = megawatt-hours per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

ENERGY INTENSITY FACTOR

An energy intensity factor, regarding water supply emissions, is defined by the amount of energy (e.g., electricity, natural gas) required to produce a unit of water for a particular use. Electricity is the primary source of energy used for water extraction, conveyance, treatment, and distribution in the San Francisco Bay hydrologic region. Other energy sources may include fossil fuel-powered pumps and backup generators at treatment plants, but these sources that may be used were considered negligible. Thus, for purposes of this analysis, energy intensity is based on electricity use only, and is expressed as kilowatt-hours per million gallons (kWh/MG).

In 2015, the CPUC commissioned a study of hydrologic zones in California and their relative energy intensities for water extraction, conveyance, treatment, and distribution. The city is within the San Francisco Bay hydrologic zone, which has specific energy intensities by supply type (e.g., local surface water, imported deliveries). The City's General Plan Draft Environmental Impact Report describes the city's water supply. Approximately two-thirds of the water

supplied to the city comes from SFPUC, 85 percent of which is derived from the Tuolumne River, with 15 percent supplied by local surface water sources. Approximately one-third of the city's water is supplied by Valley Water. The water that Valley Water provides to the city comes from the State Water Project, which is supplied by storage reservoirs owned by the California Department of Water Resources, and federal storage reservoirs operated by the Central Valley Project (City of Milpitas 2020). The city also receives some recycled water from SBWR, which originates from water treated at the RWF.

Using the energy intensities for the San Francisco Bay hydrologic zone, a weighted factor for water extraction, conveyance, treatment, and distribution was derived for each water purveyor. This resulted in specific energy intensity factors of 4,475 kWh/MG for SFPUC, 7,200 kWh/MG for Valley Water, and 2,998 kWh/MG for SBWR.

ENERGY CONSUMPTION

The three water purveyors in the city all provided 2015 and 2019 water consumption volumes. To estimate water supply emissions, the energy intensity factors discussed above were applied to total water consumption volumes reported by each water supplier. GHG emissions were estimated using electricity emissions factors in 2015, as described in the building energy sector. In 2019, GHG emissions associated with water supplied by Valley Water and SBWR were also estimated based on these electricity emissions factors, but emissions associated with water supplied by SFPUC were assumed to be zero because the utility was supplied by carbon-free electricity in 2019 (Marshall, pers. comm., 2020).

2.2.6 Wastewater Treatment

Based on modeling conducted, wastewater treatment resulted in GHG emissions of approximately 1,935 MTCO₂e in 2015 and 1,578 MTCO₂e in 2019, which represents less than 1 percent of the city's total 2019 emissions. Wastewater emissions are estimated in three components: (1) energy-related emissions from the energy required to convey wastewater from the source to the treatment facility, and then to treat wastewater, (2) wastewater treatment process emissions, and (3) stationary emissions from the combustion of digester gas. Each is discussed separately below. GHG emissions associated with the treatment of wastewater from the city is shown in Table 11.

Table 11 2015 and 2019 Milpitas Wastewater Treatment Greenhouse Gas Emissions

Wastewater Emission Type	GHG Emissions (MTCO ₂ e/year)	
	2015	2019
Energy-Related Emissions	1,796	1,435
Process Emissions	134	138
Stationary Emissions	5	6
Total	1,935	1,578

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

ENERGY-RELATED EMISSIONS

The RWF is the primary agency responsible for sewer conveyance and wastewater treatment for the city. Wastewater is collected from customers' homes and businesses via sewer collection pipes operated by the City's Public Works Department. Wastewater is then conveyed and pumped through a network of lower lateral and main pipes owned

and operated by the City. These pipes are connected to larger interceptor pipelines, which ultimately convey the wastewater to the RWF.

Energy-related emissions result from the energy required for wastewater treatment operations. This includes the energy used in wastewater conveyance as well as energy used throughout wastewater treatment processes and to provide power to the RWF. The RWF provided data for electricity and natural gas consumption for 2015 and 2019. Energy-related emissions were calculated using the same methods described in the building energy sector.

PROCESS EMISSIONS

Treatment process emissions at the RWF include process CH₄ from treatment lagoons, process N₂O from nitrification/denitrification, and fugitive N₂O from wastewater effluent. The RWF provided data for BOD load in kilograms per day (kg/day) and average nitrogen load in kg/day, and wastewater treatment process emissions for the RWF were calculated in accordance with the U.S. Community Protocol, Version 1.2. Specifically, the following equations/methods from the U.S. Community Protocol were used to capture all emissions types that occur at the RWF.

- ▶ Equation WW.6 for process CH₄ emissions from treatment lagoons.
- ▶ Equation WW.7 for process N₂O emissions from nitrification/denitrification.
- ▶ Equation WW.12 for fugitive N₂O emissions from effluent discharge.

STATIONARY EMISSIONS

Anaerobic digesters used in the wastewater treatment processes produce biogas, or digester gas. The RWF employs anaerobic digesters and thus produces digester gas, which is collected and combusted onsite. Annual production of digester gas, in scf/day, and the fraction of CH₄ in the digester gas, was provided by the RWF. The quantity of digester gas was scaled to the service population of Milpitas, and default assumptions and emissions factors from Equations WW.1 and WW.2 from the U.S. Community Protocol, Version 1.2, were used to estimate emissions from the combustion of digester gas.

2.3 MUNICIPAL OPERATIONS INVENTORIES DATA AND ASSUMPTIONS

2.3.1 Sector-Specific Assumptions and Methods

Like community GHG emissions inventories, ICLEI has developed guidance to assist local governments in conducting municipal operations inventories. The most recent standardized guidance for municipal operations-scale emissions inventories is ICLEI's May 2010 publication *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories* (ICLEI 2010).

The following summarizes data sources and methods used in estimating the City's municipal operations GHG emissions in 2015 and 2019:

- ▶ **Buildings and Facilities:** Annual municipal electricity and natural gas usage data for the City and utility emissions factors were provided by PG&E and SVCE. Additional emissions factors were obtained from eGRID and TCR. Annual municipal backup generator usage was provided by the City, and emissions factors for backup generators were available from TCR.

- ▶ **Streetlights and Traffic Signals:** Annual municipal electricity use for all streetlights and traffic signals was provided by the City. The same PG&E and SVCE utility electricity emissions factors used in the buildings and facilities sector were used for streetlights and traffic signals.
- ▶ **Employee Commute:** Emissions associated with municipal employee commutes were calculated using employment data provided by the City, including the number of temporary and permanent employees, and employees' home and work zip codes. Vehicle emissions factors were derived using EMFAC2021.
- ▶ **Vehicle Fleet:** Municipal vehicle fleet fuel consumption data was provided by the City. The municipal vehicle fleet includes both on-road vehicles as well as off-road vehicles and equipment. Emissions factors were obtained from TCR.
- ▶ **Solid Waste:** Because annual municipal-generated solid waste was unavailable, solid waste generation estimates were conducted using the number of municipal employees provided by the City, and average solid waste disposal per public administration employee data from CalRecycle. Emissions factors were obtained from EPA.
- ▶ **Water Supply:** Water supply data was provided by the City's water purveyors, SFPUC, Valley Water, and SBWR. Emissions were estimated by applying the region-specific energy intensity factors to the municipal water consumption volumes provided by each water purveyor. PG&E utility emissions factors were used to estimate GHG emissions².
- ▶ **Wastewater Treatment:** Data regarding treatment processes, population served, digester gas production and combustion, BOD load, and nitrogen load were obtained from the RWF.

2.3.2 Buildings and Facilities

Municipal buildings and facilities accounted for approximately 2,001 MTCO₂e in 2015 and 870 MTCO₂e in 2019, or 27 percent of total municipal operations emissions in 2019. This sector includes emissions from energy (i.e., electricity, natural gas, diesel) used for all City buildings and facilities, primarily for lighting, HVAC, pumps, generators, and other equipment. Natural gas accounted for approximately 95 percent of emissions from this sector in 2019, while diesel backup generators and electricity accounted for 4 percent and 1 percent, respectively. Buildings and facilities include City-owned and leased buildings, as well as other infrastructure such as park buildings, park lighting and irrigation controllers, and other facilities. Building energy use and emissions by source are presented in Table 12 below.

Table 12 2015 and 2019 Milpitas Municipal Operations Buildings and Facilities Greenhouse Gas Emissions

Source	2015		2019	
	Quantity	GHG Emissions (MTCO ₂ e/year)	Quantity	GHG Emissions (MTCO ₂ e/year)
Electricity (MWh/year)	6,357	1,192	7,568	8
Natural Gas (therms/year)	150,551	799	155,596	826
Backup Generators (gallons/year)	903	9	3,456	35
Total	NA	2,001	NA	870

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; MWh/year = megawatt-hours per year; NA = not applicable.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

² Based on communications with the City, it was assumed that SFPUC was supplied by carbon-free electricity in 2019.

Buildings and facilities utility energy use data for 2015 and 2019 was provided by PG&E and SVCE, and generator fuel usage was provided by the City. In 2015, all municipal electricity was provided by PG&E, so buildings and facilities GHG emissions were estimated using 2015 utility electricity emissions factors provided by PG&E and eGRID. Municipal electricity was provided by SVCE in 2019, so emissions factors from SVCE were used to estimate 2019 emissions. Emissions factors for diesel fuel in backup generators were obtained from TCR. GHG emissions were estimated using the same methods as described in the building energy sector.

2.3.3 Streetlights and Traffic Signals

City streetlights and traffic signals accounted for approximately 564 MTCO₂e in 2015 and 3 MTCO₂e in 2019, or less than 1 percent of total municipal operations emissions in 2019. This sector includes emissions associated with electricity consumption to power City-owned streetlights and traffic signals, including road and highway lights. Streetlights and traffic signals electricity usage and GHG emissions are shown in Table 13.

Table 13 2015 and 2019 Milpitas Municipal Operations Streetlights and Traffic Signals Greenhouse Gas Emissions

Source	2015		2019	
	Quantity	GHG Emissions (MTCO ₂ e/year)	Quantity	GHG Emissions (MTCO ₂ e/year)
Electricity (MWh/year)	3,007	564	2,951	3

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; MWh/year = megawatt-hours per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

Electricity consumption from streetlights and traffic signals was provided by the City. GHG emissions were estimated using the methods and emissions factors as described in the buildings energy sector.

2.3.4 Employee Commute

Employee commute accounted for approximately 1,304 MTCO₂e in 2015 and 1,195 MTCO₂e in 2019, approximately 37 percent of total municipal operations emissions in 2019. This sector estimates GHG emissions associated with fuel use and VMT for City of Milpitas employees commuting to and from work. Table 14 shows employee commute VMT and GHG emissions.

Table 14 2015 and 2019 Milpitas Municipal Operations Employee Commute Greenhouse Gas Emissions

Source	2015		2019	
	VMT/year	GHG Emissions (MTCO ₂ e/year)	VMT/year	GHG Emissions (MTCO ₂ e/year)
Employee Commute	3,508,561	1,304	3,508,561	1,195

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year; VMT/year = vehicle miles traveled per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

Anonymized employee home and work zip code information was available for all City employees 2019. This data was used to calculate an average employee daily VMT estimate³. This figure was applied to the number of temporary and

³ Employee commute one-way driving distances estimated to be greater than 100 miles were excluded from VMT calculations.

permanent employees in 2015 and 2019, separate data that was provided by the City. It was assumed that temporary employees commute to work 2.5 days per week on average, while permanent employees commute 5 days per week on average. To account for holidays and vacations, an annualization factor of 48 weeks was applied to weekly employee commute VMT estimates. Emissions were estimated using emissions factors derived from EMFAC2021, as discussed in the on-road transportation sector.

2.3.5 Vehicle Fleet

City-owned vehicle fleet emissions accounted for 1,017 MTCO₂e in 2015 and 1,081 MTCO₂e in 2019, approximately 33 percent of total municipal operations emissions in 2019. This sector includes emissions estimated from on-road and off-road vehicles and equipment owned and operated by the City. Table 15 displays vehicle fleet usage and GHG emissions.

Table 15 2015 and 2019 Milpitas Municipal Operations Vehicle Fleet Greenhouse Gas Emissions

Source	2015		2019	
	Fuel Use (gallons/year)	GHG Emissions (MTCO ₂ e/year)	Fuel Use (gallons/year)	GHG Emissions (MTCO ₂ e/year)
Gasoline	88,875	790	92,606	823
Diesel	22,030	228	24,975	258
Total	110,905	1,017	117,581	1,081

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

Vehicle fleet fuel consumption data (i.e., gallons of gasoline and diesel fuel) for 2015 and 2019 were provided by the City for all City-owned vehicles and equipment. Because additional vehicle fleet data was unavailable, total emissions for gasoline and diesel fuel were estimated using emissions factors obtained from TCR. Fuel-specific CO₂ emissions factors were available for both gasoline and diesel, while the CH₄ and N₂O emissions factors were aggregated factors for both gasoline and diesel fuel in passenger cars and light-duty trucks.

2.3.6 Solid Waste

Municipal solid waste disposal accounted for approximately 52 MTCO₂e in 2015 and 53 MTCO₂e in 2019, or 2 percent of total municipal operations emissions in 2019. Solid waste emissions are generated from the decomposition of organic material in landfills. Table 16 presents estimated tons of solid waste disposal and associated GHG emissions from municipal operations.

Table 16 2015 and 2019 Milpitas Municipal Operations Solid Waste Greenhouse Gas Emissions

Source	2015		2019	
	Quantity (tons/year)	GHG Emissions (MTCO ₂ e/year)	Quantity (tons/year)	GHG Emissions (MTCO ₂ e/year)
Landfill Disposed Waste	154	52	157	53

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

Annual municipal disposed solid waste data was unavailable, so municipal-generated solid waste tonnages were estimated using an average solid waste disposal per public administration employee (tons/employee/year) figure obtained from CalRecycle (CalRecycle 2020). This figure was applied to the number of the City's municipal employees to calculate municipal tons of disposed solid waste. Methods used to estimate GHG emissions associated with solid waste disposal from municipal operations are consistent with those described in the community solid waste sector.

2.3.7 Water Supply

Water supplied for the City's municipal operations resulted in approximately 70 MTCO₂e in 2015 and 41 MTCO₂e in 2019, or 1 percent of total municipal operations GHG emissions in 2019. GHG emissions associated with this sector result from the electricity used in the extraction, conveyance, treatment, and distribution of water for the City's municipal operations. This includes potable water as well as recycled water and water used for irrigation. Water usage and associated electricity consumption is provided in Table 17.

Table 17 2015 and 2019 Milpitas Municipal Operations Water Supply Greenhouse Gas Emissions

Source	2015		2019	
	Quantity	GHG Emissions (MTCO ₂ e)	Quantity	GHG Emissions (MTCO ₂ e)
Water consumption (MGY)	77	70	155	41
Energy consumption (MWh/year)	380		729	

Notes: GHG = greenhouse gas; MGY = million gallons per year; MWh/year = megawatt-hours per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

Municipal water consumption volumes from were provided by the City. Recycled water consumption volume was assumed to be supplied by SBWR. Total potable water supplied for municipal operations was provided, but it was not broken down by water purveyor. It was assumed that 60 percent of this water was supplied by SFPUC, and 40 percent was supplied by Valley Water (Marshall, pers. comm., 2021). This assumption was based on the location of municipal buildings and facilities in relation to the supply zones of each water purveyor. To obtain municipal water supply energy use and calculate associated GHG emissions, the region-specific energy intensity factors, methods, and emissions factors described in the community water supply sector were applied.

2.3.8 Wastewater Treatment

Wastewater emissions associated with municipal operations accounted for approximately 11 MTCO₂e in 2015 and 9 MTCO₂e in 2019, or less than 1 percent of total municipal operations emissions in 2019. Municipal wastewater GHG emissions associated with this sector included emissions generated by the energy used to treat municipal wastewater as well as emissions that are produced as a result as wastewater treatment processes. GHG emissions from municipal wastewater are shown in Table 18.

Table 18 2015 and 2019 Milpitas Municipal Operations Wastewater Greenhouse Gas Emissions

Source	GHG Emissions (MTCO ₂ e/year)	
	2015	2019
Wastewater Treatment	11	9

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2015 and 2019 inventories prepared by Ascent Environmental in 2021.

The RWF facility provided wastewater-related data for the City's municipal operations, including annual wastewater treated, BOD load, and nitrogen load. Methods for estimating emissions from these sources are identical to what was described in the community wastewater sector. The RWF also provided total annual digester gas combustion and total annual energy consumption from its operations. To estimate emissions associated with the digester gas combustion and energy consumption, data was scaled to the total number of employees of the City of Milpitas. GHG emissions were estimated using PG&E utility emissions factors.

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Attachment A

GHG Inventory Data and Calculations

2005, 2015, and 2019 Milpitas Community Greenhouse Gas Emissions Inventories



Emissions Sector	2005 GHG Emissions				2015 GHG Emissions				2019 GHG Emissions			
	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total
Building Energy			247,533	45.17%			259,949	44.18%			140,537	31.83%
Electricity	114,391	MWh	25,528	10.3%	117,026	MWh	21,578	8.3%	121,801	MWh	581	0.4%
Natural Gas	7,265,000	Therms	38,580	15.6%	6,779,674	Therms	36,003	13.9%	7,840,602	Therms	41,637	29.6%
Residential Subtotal			64,108	25.9%			57,581	22.2%			42,218	30.0%
Electricity	545,800	MWh	121,802	49.2%	784,254	MWh	144,603	55.6%	708,759	MWh	29,880	21.3%
Natural Gas	11,604,000	Therms	61,623	24.9%	10,875,823	Therms	57,756	22.2%	12,772,616	Therms	67,828	48.3%
Backup Generators (Diesel)					964	Gallons	10	0.0%	58,522	Gallons	599	0.4%
Backup Generators (Natural Gas)					0	Scf	0	0.0%	221,027	Scf	12	0.0%
Non-Residential Subtotal			183,424	74.1%			202,368	77.8%			98,319	70.0%
On-Road Transportation	483,632,677	VMT	252,864	46.15%	559,491,627	VMT	278,061	47.26%	572,889,499	VMT	259,627	58.80%
Passenger Vehicles	434,135,841	VMT	181,172	71.6%	492,014,849	VMT	182,927	65.8%	509,968,096	VMT	173,746	66.9%
Commercial Vehicles	49,496,836	VMT	71,692	28.4%	67,476,778	VMT	95,134	34.2%	62,921,403	VMT	85,881	33.1%
Off-Road Vehicles			15,034	2.74%			16,511	2.81%			15,554	3.52%
Construction and Mining Equipment			3,813	25.4%			4,661	28.2%			3,478	22.4%
Entertainment Equipment			36	0.2%			45	0.3%			44	0.3%
Industrial Equipment			8,490	56.5%			8,469	51.3%			8,590	55.2%
Lawn and Garden Equipment			1,192	7.9%			1,561	9.5%			1,602	10.3%
Light Commercial Equipment			1,193	7.9%			1,291	7.8%			1,290	8.3%
Railyard Operations			1	0.0%			1	0.0%			1	0.0%
Recreational Equipment			212	1.4%			376	2.3%			430	2.8%
Transport Refrigeration Units			98	0.7%			107	0.6%			118	0.8%
Solid Waste	68,512	Tons	26,998	4.93%	72,667	Tons	28,984	4.93%	58,497	Tons	23,566	5.34%
Solid Waste Generation	68,512	Tons	26,998	100.0%	72,667	Tons	28,592	98.6%	58,497	Tons	23,013	97.7%
Composting					4,605	Tons	391	1.4%	6,509	Tons	553	2.3%
Water Supply	3,575	MGY	4,466	0.81%	3,010	MGY	2,974	0.51%	3,428	MGY	694	0.16%
Wastewater Treatment			1,078	0.20%			1,935	0.33%			1,578	0.36%
Energy-Related			981	91.0%			1,796	92.8%			1,435	90.9%
Process			94	8.7%			134	6.9%			138	8.7%
Stationary			4	0.3%			5	0.3%			6	0.4%
Total MTCO₂e/yr			547,972	100%			588,414	100%			441,557	100%

Electricity																
Source	MWh/year	2005			2015			2019			Emission Factor (lb CO ₂ /MWh)	Emission Factor (lb CH ₄ /MWh)	Emission Factor (lb N ₂ O/MWh)	Total MT CO ₂ e/year		
		Emission Factor (lb CO ₂ /MWh)	Emission Factor (lb CH ₄ /MWh)	Emission Factor (lb N ₂ O/MWh)	MWh/year	Emission Factor (lb CO ₂ /MWh)	Emission Factor (lb CH ₄ /MWh)	Emission Factor (lb N ₂ O/MWh)	MWh/year	Emission Factor (lb CO ₂ /MWh)	Emission Factor (lb CH ₄ /MWh)	Emission Factor (lb N ₂ O/MWh)	Total MT CO ₂ e/year			
Residential Electricity (PG&E)	114,391	489	0.03024	0.00808	25,528	117,026	404.51	0.033	0.004	21,578	48,292	197.81	0.0327	0.0039	568.89	
Non-Residential Electricity (PG&E)	545,800	489	0.03024	0.00808	121,802	784,254	404.51	0.033	0.004	144,603	281,013	197.81	0.0327	0.0039	29,267.79	
Residential Electricity (SVCE)	--	--	--	--	--	--	--	--	--	--	--	73,509	2.34	0.0000	0.0000	11.90
Non-Residential Electricity (SVCE)	--	--	--	--	--	--	--	--	--	--	427,746	2.34	0.0000	0.0000	611.98	
Total					147,330					166,180					30,461	

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Milpitas Electricity and Natural Gas 2015-2019, provided by SVCE

Source: Electricity Emissions Factors, provided by SVCE

Source: Emissions Inventory Tool, provided by SVCE

Natural Gas															
Source	therms/year	2005			2015			2019			Emission Factors (lb/therm)	CO ₂	CH ₄	N ₂ O	Total MT CO ₂ e/year
		CO ₂	CH ₄	N ₂ O	therms/year	CO ₂	CH ₄	N ₂ O	therms/year	CO ₂	CH ₄	N ₂ O	therms/year	CO ₂	
Residential Natural Gas (PG&E)	7,265,000	11.7	0.000226742	0.000005	38,580	6,779,674	11.7	0.000226742	0.000005	36,003	7,840,602	11.7	0.000226742	0.000005	41,637
Non-Residential Natural Gas (PG&E)	11,604,000	11.7	0.000226742	0.000005	61,623	10,875,823	11.7	0.000226742	0.000005	57,756	12,772,616	11.7	0.000226742	0.000005	67,828
Total					11,708	100,203				93,759					109,466

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Milpitas Electricity and Natural Gas 2015-2019, provided by SVCE

Backup Generators																			
Source	gallons/year	2005			2015			2019			Emissions Factor (kg CO ₂ /gal)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Total MT CO ₂ e/year	gallons/year	Emissions Factor (kg CO ₂ /gal)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Total MT CO ₂ e/year
		Emissions Factor (kg CO ₂ /gal)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Emissions Factor (kg CO ₂ /gal)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Emissions Factor (kg CO ₂ /gal)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)									
Diesel					964	10.21	0.9	0.4	9.86	58,522	10.21	0.9	0.4	598.57					
Source	scf/year	Emissions Factor (kg CO ₂ /gal)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Total MT CO ₂ e/year	scf/year	Emissions Factor (kg CO ₂ /scf)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Total MT CO ₂ e/year	scf/year	Emissions Factor (kg CO ₂ /scf)	Emissions Factor (g CH ₄ /MMBTU)	Emissions Factor (g N ₂ O/MMBTU)	Total MT CO ₂ e/year				
Natural Gas					-	0	0.05444	0.9	0.9	-	221,027	0.05444	0.9	0.9	12				
Total										10					611				

Source: Generator Permits, provided by BAAQMD

Building Energy Efficiency Assumptions

Sector	Code	% Reduction	Notes	Source
Residential	Energy efficiency improvement of 2013 code above 2008 code	25%		http://www.energy.ca.gov/2014_releases/2014-07-01_new_title24_c.pdf
	Energy efficiency improvement of 2016 code above 2013 code	28%	Lighting, heating, cooling, ventilation, and water heating	http://www.energy.ca.gov/2016standards/rulesmaking/documents/2016_title24/
	Energy efficiency improvement of 2019 code above 2016 code	53%	Includes onsite solar requirement	http://www.energy.ca.gov/2019code/
Commercial	Energy efficiency improvement of 2013 code above 2008 code	30%		http://www.energy.ca.gov/2014_releases/2014-06-01_new_title24_c.pdf
	Energy efficiency improvement of 2016 code above 2013 code	5%		http://www.energy.ca.gov/2016standards/rulesmaking/documents/2016_title24/
	Energy efficiency improvement of 2019 code above 2016 code	30%		http://www.energy.ca.gov/2019code/
Total Residential Reduction		74.62%		
Total Commercial Reduction		53.45%		

On-Road Transportation

Milpitas Greenhouse Gas Inventory

**On-Road Transportation****2005****2015****2019**

Source	VMT/year	MTCO2e/year	VMT/year	MTCO2e/year	VMT/year	MTCO2e/year
Passenger	434,135,841	181,172	492,014,849	182,927	509,968,096	173,746
Commercial	49,496,836	71,692	67,476,778	95,134	62,921,403	85,881
Total	483,632,677	252,864	559,491,627	278,061	572,889,499	259,627

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Milpitas Transportation 2015-2019 Data, provided by SVCE

Source: Transportation Calculations

Sources: CalTrans, BAAQMD, MTC

VMT

Growth	2005	2015	2019
Percent Change from 2019			0.00%

VMT Compound Annual Growth Rate	0.903%
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	2005	2015	2019
VMT Per Capita	7,885	6,389	6,363

Off-Road Vehicles and Equipment

	Scaling Factor	2005				2015				2019						
		CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2 (MT/yr)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2 (MT/yr)		
Construction and Mining Equipment	Service Population	11.43381	0.00219	0.00008	11.5	3,813	14.02545	0.00114	0.00007	14.1	4,661	10.46594	0.00080	0.00006	10.5	3,478
Entertainment Equipment	Population	0.10787	0.00001	0.00000	0.1	36	0.13422	0.00001	0.00000	0.1	45	0.13369	0.00001	0.00000	0.1	44
Industrial Equipment	Employment	24.45336	0.02192	0.00216	25.6	8,490	24.98387	0.00796	0.00140	25.6	8,469	25.36609	0.00738	0.00140	25.9	8,590
Lawn and Garden Equipment	Population	2.85385	0.00564	0.00222	3.6	1,192	3.87925	0.00587	0.00254	4.7	1,561	3.99420	0.00588	0.00257	4.8	1,602
Light Commercial Equipment	Employment	3.39614	0.00186	0.00058	3.6	1,193	3.70840	0.00105	0.00061	3.9	1,291	3.71626	0.00089	0.00058	3.9	1,290
Railyard Operations	Employment	0.00183	0.00000	0.00000	0.0	1	0.00175	0.00000	0.00000	0.0	1	0.00167	0.00000	0.00000	0.0	1
Recreational Equipment	Population	0.39255	0.00346	0.00057	0.6	212	0.70072	0.00591	0.00102	1.1	376	0.80246	0.00665	0.00117	1.3	430
Transport Refrigeration Units	Share of Road Miles	0.29162	0.00013	0.00000	0.3	98	0.32192	0.00003	0.00000	0.3	107	0.35620	0.00003	0.00000	0.4	118
Total						15,034					16,511				15,554	

Source: CARB's OFFROAD2007 and OFFROAD2017, CA DOT

OFFROAD2007 to OFFROAD2017 Conversion for CH4 and N2O Emissions

Equipment Sector	2005		2015		2019	
	CH4:CO2	N2O:CO2	CH4:CO2	N2O:CO2	CH4:CO2	N2O:CO2
Construction and Mining Equipment	0.000191468	0.000006773	0.00009932	0.00000627	0.00007602	0.00000609
Industrial Equipment	0.000896235	0.000088317	0.00031876	0.00005585	0.00029105	0.00005503
Light Commercial Equipment	0.000547932	0.000172167	0.00028264	0.00016345	0.00023875	0.00015691
Transport Refrigeration Units	0.000447062	0.000013985	0.00008775	0.00000751	0.00007389	0.00000633

Share of Road Miles

	2005	2015	2019
Milpitas Road Miles	127.91	126.29	127.34
Total Santa Clara County Road Miles	4873.58	4832.31	4,648.99
Milpitas Share of Road Miles	0.026245594	0.026134499	0.027390896

Source: CA DOT

Solid Waste
Milpitas Greenhouse Gas Inventory



	2015				2019			
	Tons	% of Tons	Emissions	% of Emissions	Tons	% of Tons	Emissions	% of Emissions
Total Solid Waste	69,762	90.28%	27,031	93.26%	57,763	88.86%	22,040	93.52%
Total ADC	2,905	3.76%	1,561	5.39%	734	1.13%	973	4.13%
Composted Yard Trimmings	4,605.06	5.96%	391.43	1.35%	6,509.46	10.01%	553.30	2.35%

	2005	2015	2019
Waste Generation	26,998	28,592	23,013
Composting		391	553
Total (MTCO2e/year)	26,998	28,984	23,566

SW.4 Community-Generated Waste

Sent to Landfills

Receiving Landfill	Tonnage Disposed by City	2005				2015				2019						
		Total ADC	LFG collection?	Methane Emissions with LFG Capture (MT CH4)	MT CO2e	Tonnage Disposed by City	Total ADC	LFG collection?	Generated Methane Emissions with LFG Capture (MT CH4)	MT CO2e	Tonnage Disposed by City	Total ADC	LFG collection?	Methane Emissions with LFG Capture (MT)	MT CO2e	
Altamont Landfill & Resource Recovery	40.14	88.39	Yes	2	49	92.5	12.9	Yes	1	40	35.49	18.16	Yes	1	20	
Azusa Land Reclamation Landfill	82.51	0.82	Yes	1	31	12.8	-	Yes	0	5	5.02	-	Yes	0	2	
Bakersfield Metropolitan Sanitary Landfill	1.81	0.00	Yes	0	1											
Corinda Los Trancos Landfill				-	-	40.7	1,185.5	Yes	17	463	112.04	-	Yes	2	42	
Covanta Stanislaus Resource Recovery Facility				-	-	-	21.8	Yes	0	8						
Fink Road Landfill				-	-	11.0	71.4	Yes	1	31						
Foothill Sanitary Landfill	0.5	0	Yes	0	0	1.6	-	Yes	0	1	5.71	-	Yes	0	2	
Forward Landfill	62	0	Yes	1	23											
Guadalupe Sanitary Landfill	458.8	41.1	Yes	7	189	41.0	269.0	Yes	4	117	362.72	-	Yes	5	137	
John Smith Road Landfill	74.79	0	Yes	1	28											
Keller Canyon Landfill	11.29	1444.24	Yes	20	550	1.4	14.8	Yes	0	6	-	15.96	Yes	0	6	
Kirby Canyon Recycling & Disposal Facility	39.73	730.27	Yes	10	291	113.8	9.7	Yes	2	47	38,978.22	-	Yes	526	14,734	
Monterey Peninsula Landfill				-	-	5,147.3	-	Yes	69	1,946	12,223.96	-	Yes	165	4,621	
Newby Island Sanitary Landfill	62,501.4	79.4	Yes	845	23,656	62,147.0	847.2	Yes	850	23,812	5,567.10	-	Yes	75	2,104	
North County Landfill & Recycling Center				-	-	1,098.8	-	Yes	15	415						
Potrero Hills Landfill	1562	0	Yes	21	590	35.2	64.7	Yes	1	38	77.32	-	Yes	1	29	
Recology Hay Road	78.37	0	Yes	1	30	408.3	-	Yes	6	154	163.28	-	Yes	2	62	
Recology Pacheco Pass	0.84	0	Yes	0	0						0.01	-	Yes	0	0	
Tri-Cities Recycling & Disposal Facility	0	19.02	Yes	0	7											
Vasco Road Sanitary Landfill	224	0	Yes	3	85	27.9	-	Yes	0	11	50.31	86.34	Yes	2	52	
Zanker Material Processing Facility	571.81	0	No	31	865	512.0	408.3	No	50	1,392	181.33	613.54	No	43	1,202	
Zanker Road Resource Recovery Operation	398.5	0	No	22	603	70.6	0.2	No	4	107						
Total	66,109	2,403		964	26,998	69,762	2,905		1,021	28,592	57,763	734		822	23,013	
Total Solid Waste									Total Solid Waste		965	27,031		Total Solid Waste		787 22,040
Total ADC									Total ADC		56	1,561		Total ADC		35 973

[Source: 2005 Milpitas GHG Inventory, provided by the City](#)

[Source: Jurisdiction Disposal by Facility, provided by CalRecycle](#)

[Source: Solid Waste Email from the City](#)

	2005	2015	2019
Waste	Total Annual (tons)	Total Annual (tons)	Total Annual (tons)
Composted Yard Trimmings	NA	4,605.06	6,509.46
Compost Emission Reduction Factor for Yard Trimmings (MTCO2e/ton)		0.44	0.44
Transportation Emissions Factor (MTCO2e/ton)		0.008	0.008
Process Emissions Factor (MTCO2e/ton)		0.007	0.007
Fugitive CH4 Emissions Factor (MTCO2e/ton)		0.049	0.049
Fugitive N2O Emissions Factor (MTCO2e/ton)		0.021	0.021
Overall Emissions from Composting (MTCO2e)		391.43	553.30
Composting Benefits Emissions Factor (MTCO2e/ton)		0.51	0.51
Composting Benefits (MTCO2e)		2,348.58	3,319.82

[Source: CARB Compost Emissions Reduction Factors 2016](#)

Table SW.5 CH4 Yield for Solid Waste Components		
Waste Component	Emissions Factor, EF _i (mt CH ₄ /wet short ton waste)	Source
Mixed MSW*	0.06	U.S. EPA AP-42
* – Mixed MSW factor may be used for entire MSW waste stream if waste composition data is unavailable.		
U.S. EPA AP-42 – U.S. EPA Emission Factor Database, Chapter 2.4 Municipal Solid Waste Landfills (1998) WARM—Documentation for Greenhouse Gas Emissions and Energy Factors		
Waste Diversion Target		
Milpitas per resident disposal target	6.3	75% diversion
Milpitas per resident disposal rate	4.2	83% diversion

[Source: Milpitas Diversion/Disposal Rate, provided by CalRecycle](#)

The overall emissions from composting are represented by the following equation:

$$E_{total} = T_e + P_e + F_e \quad (1)$$

$$CERF = (ALF_b + ((E_b + F_b + H_b) * C_{use})) - E_{total}$$

$$B_{total} = ALF_b + ((E_b + F_b + H_b) * C_{use}) \quad (2)$$

where,
 E_{total} = Total emissions from composting (MTCO₂E/ton of feedstock)
 T_e = Net additional transportation emissions from composting as compared to landfilling (MTCO₂E/ton of feedstock)
 P_e = Net additional process emissions from composting as compared to landfilling (MTCO₂E/ton of feedstock)
 F_e = Fugitive emissions from composting (MTCO₂E/ton of feedstock)
 ALF_b = Compost emission reduction factor (MTCO₂E/ton of feedstock)
 E_b = Emission reductions associated with the avoidance of methane emissions at MSW landfills (MTCO₂E/ton of feedstock)
 F_b = Factor to account for decreased soil erosion (MTCO₂E/ton of compost)
 H_b = Factor to account for the reduced fertilizer use (MTCO₂E/ton of compost)
 C_{use} = Conversion factor used to convert from tons of compost to feedstock
 E_{total} = Emissions due to the composting process (MTCO₂E/ton of feedstock)
 C_{use} = Conversion factor used to convert from tons of compost to tons of feedstock.

Water Supply

Milpitas Greenhouse Gas Inventory

ASCENT
ENVIRONMENTAL

Water	2005						2015						2019						
	Water Provider	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)
SFPUC		1,674	7,489	489.00	0.0302	0.0081	1,671	1,652	7,391	404.51	0.0330	0.0040	1,363	2,160	9,663	0.0	0.000	0.000	-
SCVWD		1,623	11,687	489.00	0.0302	0.0081	2,608	1,111	8,001	404.51	0.0330	0.0040	1,475	918	6,607	197.81	0.0327	0.0039	59
SBWR		278	834	489.00	0.0302	0.0081	186	246	739	404.51	0.0330	0.0040	136	351	1,053	197.81	0.0327	0.0039	95
Total		3,575	20,010				4,466		3,009.55		16,131			2,974		3,428.32		17,322	64

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Water and Wastewater 2015-2019 data, provided by the City

Electric Energy Intensity - San Francisco Bay Hydrologic Region

Water Provider		Extraction/ Conveyance	Distribution	Treatment	Percent of Total	Total (kWh/AF)	Total (kWh/MG)	Source	Notes
SFPUC	Local deliveries (kWh/AF)	10	977	443	15%	1,458.05	4,474.59	General Plan DEIR p. 3.15-4: Two thirds of the water supplied to the City comes from SFPUC, of which 85 percent is derived from the Tuolumne River, through the Hetch Hetchy reservoir in the Sierra Nevada Mountains, with 15 percent originating from local surface water sources.	
	Local imported deliveries (kWh/AF)	43	977	443	85%				
SCVWD	SWP (kWh/AF)	926	977	443	100%	2,346.00	7,199.60	General Plan DEIR p. 3-15-4: About one third of the City's water is supplied by the SCVWD. More than half of SCVWD's total supply, and all of its supply to the City, comes from the State Water Project (supplied by the California Department of Water Resources from State-owned storage reservoirs) and the Central Valley Project (supplied by Federal water storage under the supervision of the US Bureau of Reclamation).	To be conservative, assuming 100% of the SWP/CVP water supply is coming from SWP because breakdown is not available.
	CVP and other federal deliveries (kWh/AF)	273	977	521	NA	1,771.00	5,434.99		
SBWR	Recycled (kWh/AF)	0	977	521	100%	977.00	2,998.30		The City noted that SBWR is part of the Regional Wastewater Facility and the recycled water supply comes from their treated wastewater. So, Treatment Energy Intensity removed from SBWR's total Energy Intensity

Source: Milpitas General Plan Draft Environmental Impact Report

Source: Milpitas General Plan Draft Environmental Impact Report

Wastewater Treatment Characteristics

WWTP/Septic System	Description
San Jose - Santa Clara Regional Wastewater Facility	Solids are lagooned for approximately three years. Secondary treatment process is a step-feed Biological Nutrient Removal (BNR) process that achieves full nitrification (all ammonia is converted to nitrate) and partial de-nitrification (about 65% nitrogen removed as an annual average, about 70% removed in the dry season). The BNR process also removes approximately 90% of the incoming phosphorus. Anaerobic digestion used onsite.

Wastewater Emissions Totals	2005	2015	2019
Energy-Related Emissions	980.6	1796.5	1434.8
Process Emissions	93.8	133.9	137.7
Stationary Emissions	3.6	4.9	5.6
Total (MT CO₂e/year)	1,078	1,935	1,578

WW.1a Stationary Methane Emissions from Combustion of Digester Gas

	2005	2015	2019
Volume of Digester Gas Produced per Day (scf/day)		1,320,780	1,589,958
Fraction of CH ₄ in Digester Gas		0.61	0.61
BTU of CH ₄	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001
CH ₄ emissions factor (kg CH ₄ /MMBTU)	0.0032	0.0032	0.0032
MT CH ₄ /year	0	0.06	0.07
Total MT CO₂e/year	0.00	1.70	1.96

Source: Water and Wastewater 2015-2019 data, provided by the City

WW.1(alt) Stationary Methane Emissions from Combustion of Digester Gas

	2005	2015	2019
Population of Milpitas Served	61,334		
Fraction of CH ₄ in Digester Gas	0.61		
BTU of CH ₄	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001
CH ₄ emissions factor (kg CH ₄ /MMBTU)	0.0032	0.0032	0.0032
MT CH ₄ /year	0.0450	0	0
Total MT CO₂e/year	1.26	0.00	0.00

Source: Water and Wastewater 2015-2019 data, provided by the City

WW.2a Stationary Nitrous Oxide Emissions from Combustion of Digester Gas

	2005	2015	2019
Volume of Digester Gas Produced per Day (scf/day)		1,320,780	1,589,958
Fraction of CH ₄ in Digester Gas		0.61	0.61
BTU of N ₂ O	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001
N ₂ O emissions factor (kg CH ₄ /MMBTU)	0.00063	0.00063	0.00063
MT N ₂ O/year	0	0.01	0.01
Total MT CO₂e/year	0.00	3.16	3.65

Source: Water and Wastewater 2015-2019 data, provided by the City

WW.2a Stationary Nitrous Oxide Emissions from Combustion of Digester Gas

	2005	2015	2019
Population of Milpitas Served	61,334		
Fraction of CH ₄ in Digester Gas	0.61		
BTU of N ₂ O	1028	1028	1028

BTU to MMBTU conversion	0.000001	0.000001	0.000001
N2O emissions factor (kg CH4/MMBTU)	0.00063	0.00063	0.00063
MT N2O/year	0.0089	0	0
Total MT CO2e/year	2.35	0.00	0.00

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.6 Process Methane Emissions from Wastewater Treatment Lagoons	2005	2015	2019
BOD load (kg/day)	10.78	15.5463	16.4154
Fraction of BOD removed in primary treatment	0.99	0.99	0.99
Maximum CH4 producing capacity for domestic wastewater (kg CH4/kg BOD removed)	0.6	0.6	0.6
CH4 correction factor for anaerobic systems	0.8	0.8	0.8
MT CH4/year	0.02	0.03	0.03
Total MT CO2e/year	0.53	0.76	0.81

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.7 Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	2005	2015	2019
Population of Milpitas Served	61,334	87,570	90,030
Factor for industrial and commercial discharge	1.25	1.25	1.25
Emission factor for a WWTP with nitrification or denitrification (g N2O/ person / year)	7	7	7
MT N2O/year	1	0.8	0.8
Total MT CO2e/year	92	132.0	135.7

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.12 Fugitive Nitrous Oxide Emissions from Effluent Discharge	2005	2015	2019
Average total nitrogen per day (kg N/day)	1.04	1.5670	1.5235
Emission factor (kg N2O-N/kg sewage-N discharged)	0.005	0.005	0.005
Molecular weight ratio of N2O to N2	1.57	1.57	1.57
MT N2O/year	0.00	0.00	0.00
Total MT CO2e/year	0.79	1.19	1.16

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.15 Energy-related Emissions Associated with Wastewater Collection and Treatment	2005	2015	2019
MWh/year	11,576.43	17,231	25,684
Emission Factor (lb CO2/MWh)	489	206	198
Emission Factor (lb CH4/MWh)	0.0302	0.0340	0.0327
Emission Factor (lb N2O/MWh)	0.0081	0.0040	0.0039
Total Electricity (MTCO2e/year)	122	102	140
Natural Gas (therms/year)	3,427,462	5,101,718	4,063,308
Emission Factor (lb CO2/therm)	11.7	11.7	11.7
Emission Factor (lb CH4/therm)	0.000226742	0.000226742	0.000226742
Emission Factor (lb N2O/therm)	0.000005	0.000005	0.000005
Total Natural Gas (MTCO2e/year)	859	1,695	1,295
Total MT CO2e/year	981	1,796	1,435

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

[Source: Milpitas Wastewater Email](#)

	2005	2015	2019
Milpitas Population	61,334	87,570	90,030
WWTP Service Population	1,300,000	1,400,000	1,500,000
MDG	4.576	6.812	6.751

[Source: SJCRWF 2009 Annual Self Monitoring Report](#)

Assumptions and Conversion Factors
Milpitas Greenhouse Gas Inventory



Category	Value	Notes	Source
Conversion Factors			
g/MT	1000000		
g/lb	453.592		
g/kg	1000		
lb/MT	2204.62622		
kg/MT	1000		
MT/ton	0.907185		
g/ton	907185		
lb/kg	2.0462		
KWh/MWh	1000		
MWh/GWh	1000		
gal/cubic foot	7.480519481		
gal/liter	0.264172052		
Liter/gallon	3.785411784		
gallon/acrefoot	325,851.43		
days/year	365		
million gal/acre-feet	0.325851432		
MMBTU/gallon (diesel)	0.1374		
MMBTU/scf (natural gas)	0.001037		
GWP			
Source (Select)	IPCC Fifth Assessment Report (Avg)	<--drop down selection	
CO2	1		
CH4	28		
N2O	265		
Source	CO2 GWP	CH4 GWP	N2O GWP
IPCC Fourth Assessment Report (w/o climate carbon feedback)	1	25	265
IPCC Fourth Assessment Report (with climate carbon feedback)	1	34	298
IPCC Fourth Assessment Report (Avg)	1	25	298
IPCC Fifth Assessment Report (Avg)	1	28	265
IPCC Third Assessment Report	1	23	296
IPCC Second Assessment Report	1	21	310
Electricity Emission Factors			
	2005	2015	2018
PG&E EF (lb CO2/MWh)	489	404.51	206.29
CAMX EF (lb CH4/MWh)	0.03024	0.033	0.034
CAMX EF (lb N2O/MWh)	0.00808	0.004	0.004
CAMX EF (lb CO2/MWh) RPS Requirements	724.12	527.9	496.50
PG&E Percent Renewable Increase in Renewables (from 2018)		27%	30% 3%
SVCE EF (lb CO2/MWh)			2.34 SVCE Inventory

*2005 PG&E emissions factor provided by previous 2005 inventory and confirmed here: https://www.caig.org/sites/main/files/file-attachments/ghg_emission_factor_guidance.pdf

*2015 data is proxy data from 2016

Fuel Emission Factors	Fuel	Emission Factor	Unit	Source
Diesel (backup generators)		10.21	kg CO2/gal	Climate Registry 2020 Default
		0.9	g CH4/MMBTU	
		0.4	g N2O/MMBTU	
Natural Gas (backup generators)		0.05444	kg CO2/scf	Emission Factors 2020 Default
		0.9	g CH4/MMBTU	
		0.9	g N2O/MMBTU	

Demographics

Milpitas Greenhouse Gas Inventory



Subarea	Population			Employment			Service Population		
	2005	2015	2019	2005	2015	2019	2005	2015	2019
Milpitas	61,334	87,570	90,030	39,346	48,180	47,084	100,680	135,750	137,114
Rest of County	1,602,943	1,822,105	1,880,973	809,129	1,039,050	1,066,690	2,412,072	2,861,155	2,947,663
Total County	1,664,277	1,909,675	1,971,003	848,475	1,087,230	1,113,774	2,512,752	2,996,905	3,084,777

[Source: MTC Plan Bay Area Population 2010-2040](#)

Note: 2005 population and employment data were extrapolated backwards (i.e., backcast) using MTC data for 2010-2040

	Population			Employment			Service Population		
	2005	2015	2019	2005	2015	2019	2005	2015	2019
Percent Change from 2019			0.00%			0.00%			0.00%
Percent Change from 2040	--	--	--	--	--	--	--	--	--
Percent of Total County	3.69%	4.59%	4.57%	4.64%	4.43%	4.23%	4.01%	4.53%	4.44%

Population Compound Annual Growth Rate 0.69%

Employment Compound Annual Growth Rate 1.00%

Avg Annual Population Percent Change 0.74%

Avg Annual Employment Percent Change 1.11%

Milpitas Municipal Operations Greenhouse Gas Emissions Inventories



Emissions Sector	2015 GHG Emissions				2019 GHG Emissions			
	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total
Buildings and Facilities			2,001	39.86%			870	26.74%
Electricity	6,357	MWh	1,192	59.6%	7,568	MWh	8	0.9%
Natural Gas	150,551	Therms	799	40.0%	155,596	Therms	826	95.0%
Backup Generators (Diesel)	903	Gallons	9	0.5%	3,456	Gallons	35	4.1%
Streetlights and Traffic Signals	3,007	MWh	564	11.23%	2,951	MWh	3	0.10%
Electricity	3,007	MWh	564	100.0%	2,951	MWh	3	100.0%
Employee Commute	3,508,561	VMT	1,304	25.99%	3,508,561	VMT	1,195	36.76%
Employee Commute	3,508,561	VMT	1,304	100.0%	3,508,561	VMT	1,195	100.0%
Vehicle Fleet	110,905	Gallons	1,017	20.27%	117,581	Gallons	1,081	33.24%
Gasoline	88,875	Gallons	790	77.6%	92,606	Gallons	823	76.1%
Diesel	22,030	Gallons	228	22.4%	24,975	Gallons	258	23.9%
Solid Waste	154	Tons	52	1.03%	157	Tons	53	1.62%
Water Supply	77	MGY	70	1.40%	155	MGY	41	1.26%
Wastewater Treatment			11	0.23%			9	0.28%
Total MTCO₂e/yr			5,019	100%			3,252	100%

Electricity

Source	MWh/year	2015			2019				
		Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total MT CO2e/year	MWh/year	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)
Buildings & Facilities Electricity (PG&E)	6,357	404.51	0.033	0.004	1,192	--	--	--	--
Streetlights & Traffic Signals (PG&E)	3,007	404.51	0.033	0.004	564	--	--	--	--
Buildings & Facilities Electricity (SVCE)	--	--	--	--	--	7,568	2.34	0.0000	0.0000
Streetlights & Traffic Signals (SVCE)	--	--	--	--	--	2,951	2.34	0.0000	0.0000
Total					1,756				11

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Municipal Electricity and Natural Gas 2015, provided by the City

Source: Municipal Electricity and Natural Gas 2019, provided by the City

Natural Gas

Source	therms/year	Emission Factors (lb/therm)			Total MT CO2e/year	therms/year	Emission Factors (lb/therm)			Total MT CO2e/year
		CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	
Buildings & Facilities Natural Gas (PG&E)	150,551	11.7	0.000226742	0.000005	799	155,596	11.7	0.000226742	0.000005	826
Total					799					826

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Municipal Electricity and Natural Gas 2015, provided by the City

Source: Municipal Electricity and Natural Gas 2019, provided by the City

Backup Generators

Source	gallons/year	Emissions Factor (kg CO2/gal)	Emissions Factor (g CH4/MMBTU)	Emissions Factor (g N2O/MMBTU)	Total MT CO2e/year	gallons/year	Emissions Factor (kg CO2/gal)	Emissions Factor (g CH4/MMBTU)	Emissions Factor (g N2O/MMBTU)	Total MT CO2e/year
Diesel	903	10.21	0.9	0.4	9	3,456	10.21	0.9	0.4	35
Total					9					35

Source: Municipal Backup Generator Usage, provided by the City

Building Energy Efficiency Assumptions

Sector	Code	% Reduction	Notes	Source
Commercial	Energy efficiency improvement of 2013 code above 2008 code	30%		http://www.energy.ca.gov/commission/accomplishments/2014_code_accomplishments.pdf
	Energy efficiency improvement of 2016 code above 2013 code	5%		http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2015-06-
	Energy efficiency improvement of 2019 code above 2016 code	30%		
Commercial Reduction				53.45%

Employee Commute

Milpitas Municipal Operations Greenhouse Gas Inventories

**Employee Commute****2015****2019**

Source	VMT/year	MTCO2e/year	VMT/year	MTCO2e/year
Employee Commute	3,508,561	1,304	3,508,561	1,195
Total	3,508,561	1,304	3,508,561	1,195

Source: Municipal Employee data, provided by the City

Vehicle Fleet												
Source	2015						2019					
	gallons/year	Emissions Factor (kg CO ₂ /gal)	MT CO ₂ /year	Emissions Ratio (MT CH ₄ /MT CO ₂)	Emissions Ratio (MT N ₂ O/MT CO ₂)	Total MT CO _{2e} /year	gallons/year	Emissions Factor (kg CO ₂ /gal)	MT CO ₂ /year	Emissions Ratio (MT CH ₄ /MT CO ₂)	Emissions Ratio (MT N ₂ O/MT CO ₂)	Total MT CO _{2e} /year
Gasoline	88,875	8.78	780.32	0.0000237	0.0000429	789.71	92,606	8.78	813.08	0.0000237	0.0000429	822.86
Diesel	22,030	10.21	224.93	0.0000237	0.0000429	227.63	24,975	10.21	254.99	0.0000237	0.0000429	258.06
Total						1,017						1,081

[Source: Milpitas Municipal Vehicle Fleet Usage](#)

Solid Waste

Milpitas Municipal Operations Greenhouse Gas Inventories

**Solid Waste Emissions Totals****2015****2019**

Total (MTCO2e/year)	52	53
----------------------------	----	----

Municipal-Generated Solid Waste**2015****2019**

Municipal Employees	512	524
Average Solid Waste Disposal Per Employee (tons/employee/year)	0.3	0.3
Solid Waste Disposal (tons)	153.6	157.2
LFG Capture Rate	75%	75%
Percent of Landfills Accepting Waste from Milpitas with LFG Capture	89%	89%
Oxidation Rate	0.1	0.1
EPA Emissions Factor (MTCH4/wet short ton)	0.06	0.06
Total Emissions (MTCO2e/year)	51.61	52.82

Waste Diversion Target			
Milpitas per employee disposal target	9.7	75%	diversion
Milpitas per employee disposal rate	6	85%	diversion

Water		2015						2019					
Water Provider	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	
SFPUC	35	155	404.51	0.0330	0.0040	29	62	277	0.00	0.0000	0.0000	-	
SCVWD	23	166	404.51	0.0330	0.0040	31	41	297	197.81	0.0327	0.0039	27	
SBWR	20	59	404.51	0.0330	0.0040	11	52	154	197.81	0.0327	0.0039	14	
Total	77	380				70	154.79	729				41	

Municipal Water Use		
	2015	2019
Potable Water (HCF)	77181	138040
Recycled Water (HCF)	26113	68878

[Source: Milpitas Municipal Water 2015, provided by the City](#)

[Source: Milpitas Municipal Water 2019, provided by the City](#)

Wastewater Treatment Characteristics

WWTP/Septic System	Description	Wastewater Treatment Process, Fugitive and Stationary Greenhouse Gas Emission Sources	U.S. Community Protocol, Appendix F, Equations
San Jose - Santa Clara Regional Wastewater Facility	Solids are lagooned for approximately three years. Secondary treatment process is a step-feed Biological Nutrient Removal (BNR) process that achieves full nitrification (all ammonia is converted to nitrate) and partial de-nitrification (about 65% nitrogen removed as an annual average, about 70% removed in the dry season). The BNR process also removes approximately 90% of the incoming phosphorus. Anaerobic digestion used onsite.	full nitrification and partial de-nitrification, lagoon, anaerobic digestion	WW.1a and alt, WW.2a and alt, WW.6, WW.7, WW.12 and alt, WW.15

Wastewater Emissions Totals

	2015	2019
Total (MT CO ₂ e/year)	11	9

WW.1a Stationary Methane Emissions from Combustion of Digester Gas

	2015	2019
Volume of Digester Gas Produced per Day (scf/day)	483	555
Fraction of CH ₄ in Digester Gas	0.61	0.61
BTU of CH ₄	1028	1028
BTU to MMBTU conversion	0.000001	0.000001
CH ₄ emissions factor (kg CH ₄ /MMBTU)	0.0032	0.0032
MT CH ₄ /year	0.00035	0.00041
Total MT CO ₂ e/year	0.0099	0.0114

[Source: Municipal Wastewater 2015 and 2019 data, provided by the City](#)

WW.2a Stationary Nitrous Oxide Emissions from Combustion of Digester Gas

	2015	2019
Volume of Digester Gas Produced per Day (scf/day)	483	555
Fraction of CH ₄ in Digester Gas	0.61	0.61
BTU of N ₂ O	1028	1028
BTU to MMBTU conversion	0.000001	0.000001
N ₂ O emissions factor (kg CH ₄ /MMBTU)	0.00063	0.00063
MT N ₂ O/year	0.00007	0.00008
Total MT CO ₂ e/year	0.0185	0.0212

[Source: Municipal Wastewater 2015 and 2019 data, provided by the City](#)

WW.6 Process Methane Emissions from Wastewater Treatment Lagoons

	2015	2019
BOD load (kg/day)	0.0206	0.0362
Fraction of BOD removed in primary treatment	0.99	0.99
Maximum CH ₄ producing capacity for domestic wastewater (kg CH ₄ /kg BOD removed)	0.6	0.6
CH ₄ correction factor for anaerobic systems	0.8	0.8
MT CH ₄ /year	0.000036	0.000063
Total MT CO ₂ e/year	0.0010	0.0018

[Source: Municipal Wastewater 2015 and 2019 data, provided by the City](#)

WW.7 Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification

	2015	2019
Population of Milpitas Municipal Employees	512	524
Factor for industrial and commercial discharge	1.25	1.25
Emission factor for a WWTP with nitrification or denitrification (g N ₂ O/ person / year)	7	7
MT N ₂ O/year	0.0029	0.0030
Total MT CO ₂ e/year	0.77	0.79

[Source: Municipal Wastewater 2015 and 2019 data, provided by the City](#)

WW.12 Fugitive Nitrous Oxide Emissions from Effluent Discharge

	2015	2019
Average total nitrogen per day (kg N/day)	0.0017	0.0031
Emission factor (kg N ₂ O-N/kg sewage-N discharged)	0.005	0.005
Molecular weight ratio of N ₂ O to N ₂	1.57	1.57
MT N ₂ O/year	0.0000049	0.0000089
Total MT CO ₂ e/year	0.0013	0.0024

[Source: Municipal Wastewater 2015 and 2019 data, provided by the City](#)

WW.15 Energy-related Emissions Associated with Wastewater Collection and Treatment

	2015	2019
MWh/year	6.30	8.97
Emission Factor (lb CO ₂ /MWh)	206	198
Emission Factor (lb CH ₄ /MWh)	0.0340	0.0327
Emission Factor (lb N ₂ O/MWh)	0.0040	0.0039
Total Electricity (MTCO ₂ e/year)	0.595	0.813
Natural Gas (therms/year)	1,866	1,419
Emission Factor (lb CO ₂ /therm)	11.7	11.7
Emission Factor (lb CH ₄ /therm)	0.000226742	0.000226742
Emission Factor (lb N ₂ O/therm)	0.000005	0.000005
Total Natural Gas (MTCO ₂ e/year)	9.908	7.538
Total MT CO ₂ e/year	10.504	8.351

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

[Source: Milpitas Wastewater Email](#)

Population	2015	2019
Milpitas Municipal Employees	512	524
WWTP Service Population	1,400,000	1,500,000

[Source: Municipal Employee data, provided by the City](#)

Assumptions and Conversion Factors

Milpitas Municipal Operations Greenhouse Gas Inventories



Category	Value	Notes	Source
Conversion Factors			
g/MT	1000000		
g/lb	453.592		
g/kg	1000		
lb/MT	2204.622622		
kg/MT	1000		
MT/ton	0.907185		
g/ton	907185		
lb/kg	2.20462		
kWh/MWh	1000		
MWh/GWh	1000		
gal/cubic foot	7.480519481		
gal/Liter	0.264172052		
Liter/gallon	3.785411784		
gallon/acrefoot	325851.429		
days/year	365		
million gal/acre-feet	0.325851432		
MMBTU/gallon (diesel)	0.1374		
MMBTU/scf (natural gas)	0.001037		

GWP			
Source (Select)	IPCC Fifth Assessment Report (Avg)	<- drop down selection	
CO2	1		
CH4	28		
N2O	265		
Source	CO2 GWP	CH4 GWP	N2O GWP
IPCC Fourth Assessment Report (w/o climate carbon feedback)	1	25	265
IPCC Fourth Assessment Report (with climate carbon feedback)	1	34	298
IPCC Fourth Assessment Report (Avg)	1	25	298
IPCC Fifth Assessment Report (Avg)	1	28	265
IPCC Third Assessment Report	1	23	296
IPCC Second Assessment Report	1	21	310

Electricity Emission Factors	2005	2015	2018	2019	Source
PG&E EF (lb CO2/MWh)	489	404.51	206.29	197.8123	https://www.theclimateregistry.org/our-members/cris-public-reports/ eGRID (https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid)
CAMX EF (lb CH4/MWh)	0.03024	0.033	0.034	0.0327	0.0327 resource-integrated-database-egrid eGRID (https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid)
CAMX EF (lb N2O/MWh)	0.00808	0.004	0.004	0.00385	0.00385 resource-integrated-database-egrid eGRID (https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid)
CAMX EF (lb CO2/MWh) RPS Requirements	724.12	527.9	496.50	478.1111	resource-integrated-database-egrid
PG&E Percent Renewable Increase in Renewables (from 2018)		27%	30%	3%	
SVCE EF (lb CO2/MWh)				2.34	SVCF Inventory

Fuel Emission Factors			
Gasoline	8.78 kg CO2/gal		Climate Registry Default Emission Factors 2020
Boats - Gasoline 4-stroke	5.443 g CH4/gal		Climate Registry Default Emission Factors 2020
Boats - Gasoline 4-stroke	0.061 g N2O/gal		Climate Registry Default Emission Factors 2020

Fuel	Emission Factor	Unit	Source
Gasoline (transport fuel)	8.78 kg CO2/gal		
	0.0000237 MT CH4/MT CO2		
	0.0000429 MT N2O/MT CO2		
Diesel (transport fuel)	10.21 kg CO2/gal		
	0.0000237 MT CH4/MT CO2		Climate Registry
	0.0000429 MT N2O/MT CO2		2020 Default
Diesel (backup generators)	10.21 kg CO2/gal		Emission Factors
	0.9 g CH4/MMBTU		0.014442768
	0.4 g N2O/MMBTU		0.006419008
Natural Gas (backup generator)	0.05444 kg CO2/scf		1.157372351
	0.9 g CH4/MMBTU		0.000198416
	0.9 g N2O/MMBTU		0.000198416

Demographics

Milpitas Municipal Operations Greenhouse Gas Inventories



Municipal Employees	2015	2019
Milpitas	512	524
Percent Growth from 2019	--	0
Percent Growth from 2040	--	--

Employment Growth Rate 2019 to 2030 0.50%

Employment Growth Rate 2030 to 2045 0.25%

Note from City:

Given the numbers below with a 1% growth factor, I suggest a 0.5% growth factor until 2030 and then reduce it to 0.25%. By 2030, the City will be build out and we may only add staff for enhancng services.

Memo



1111 Broadway, Suite 300
Oakland, CA 94607
916.444.7301

Date: April 1, 2021

To: Elaine Marshall (City of Milpitas)

From: Honey Walters, Hannah Kornfeld, and Sam Ruderman (Ascent Environmental)

Subject: City of Milpitas Climate Action Plan Update, Greenhouse Gas Emissions Forecasts – Technical Memorandum

INTRODUCTION

In 2013, the City of Milpitas (City) adopted its first Climate Action Plan (CAP), which served as a roadmap to meet the State's 2020 greenhouse gas (GHG) emissions reduction target (i.e., 15 percent below 2005 baseline emissions). The CAP included GHG forecasts for the year 2020. The City is now updating its inventory, forecasts, and targets in preparation of its Climate Action Plan Update (CAP Update). The CAP Update is intended to reduce GHG emissions from community activities and municipal operations. The next step in this update process is to forecast these GHG emissions for target years 2030, 2040, and 2045. This technical memorandum provides the results of these forecasts as well as associated methods, assumptions, emissions factors, and data sources.

The GHG emissions forecasts will provide a foundation for the forthcoming steps of the CAP Update process, including the development of GHG emissions reduction targets and measures.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of two main parts:

- ▶ **Section 1: Summary of Inventory Results** presents an overview of the updated GHG emissions inventory (baseline 2019) for both community and municipal operations.
- ▶ **Section 2: Emissions Forecasts** summarizes the forecasted GHG emissions under "business-as-usual" (BAU) and legislative-adjusted BAU scenarios for years 2030, 2040, and 2045. A BAU scenario is one in which no GHG reductions from actions taken by local, regional, State, or federal agencies are accounted. A legislative-adjusted BAU scenario reflects policy or regulatory actions enacted by regional, State, or federal agencies, without considering any local (City) actions to reduce GHG emissions.

1 SUMMARY OF INVENTORY RESULTS

1.1 2019 COMMUNITY INVENTORY RESULTS

Based on the modeling conducted, the community generated approximately 441,557 metric tons of carbon dioxide equivalent (MTCO₂e) in 2019. Major emissions sectors included on-road transportation, residential and nonresidential building energy use, solid waste, and off-road vehicles and equipment. Table 1 and Figure 1 present the city's 2019 GHG emissions inventory by sector. A description of each emissions sector, including key sources of emissions, is provided in further detail in Technical Memorandum #1, dated February 16, 2021.

Table 1 2019 Milpitas Community Greenhouse Gas Emissions Inventory

Sector	2019 (MTCO ₂ e/year)	Percent of Total
Residential Building Energy	42,218	10
Nonresidential Building Energy	98,319	22
On-Road Transportation	259,627	59
Off-Road Vehicles and Equipment	15,554	4
Solid Waste	23,566	5
Water Supply	694	<1
Wastewater Treatment	1,578	<1
Total	441,557	100

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2019 inventory prepared by Ascent Environmental in 2021.

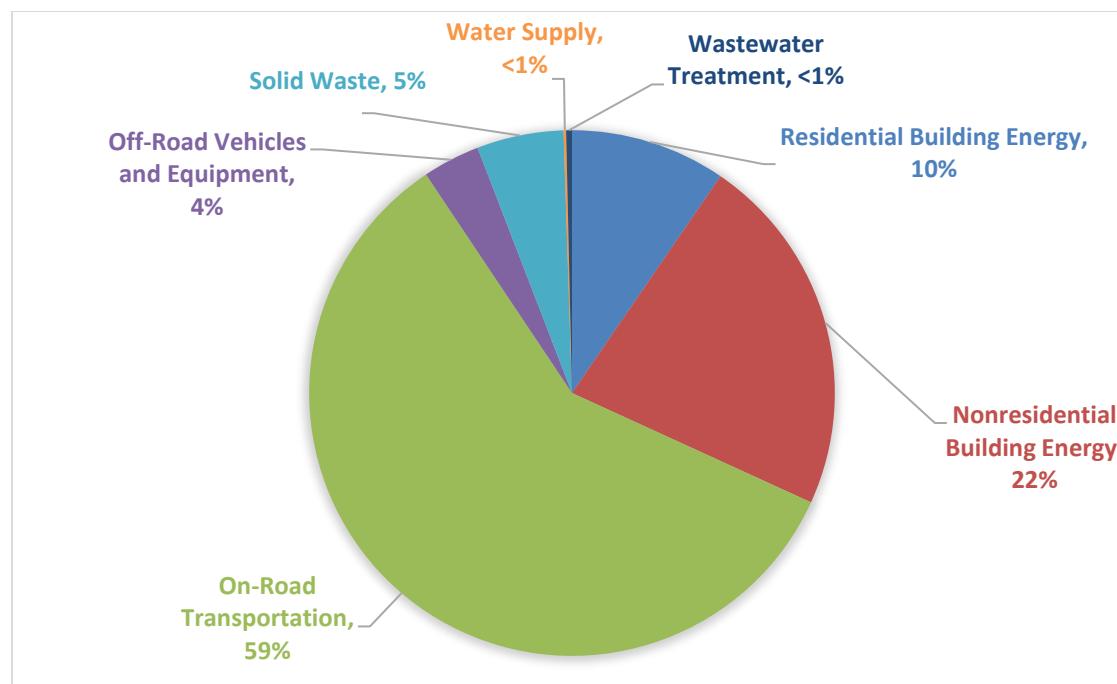


Figure 1 2019 Milpitas Community Greenhouse Gas Emissions Inventory

1.2 2019 MUNICIPAL OPERATIONS INVENTORY RESULTS

Based on the modeling conducted, the City's municipal operations generated approximately 3,252 MTCO₂e in 2019. Major emissions sectors included buildings and facilities, streetlights and traffic signals, employee commute, and vehicle fleet. A description of each emissions sector, including key sources of emissions, is provided in further detail in Technical Memorandum #1, dated February 16, 2021. Table 2 presents the 2019 municipal operations GHG emissions inventories by sector, and Figure 2 illustrates the 2019 municipal operations inventory by sector.

Table 2 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventory

Sector	2019 (MTCO ₂ e/year)	Percent of Total
Buildings and Facilities	870	27
Streetlights and Traffic Signals	3	<1
Employee Commute	1,195	37
Vehicle Fleet	1,081	33
Solid Waste	53	2
Water Supply	41	1
Wastewater Treatment	9	<1
Total	3,252	100%

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: 2019 inventory prepared by Ascent Environmental in 2021.

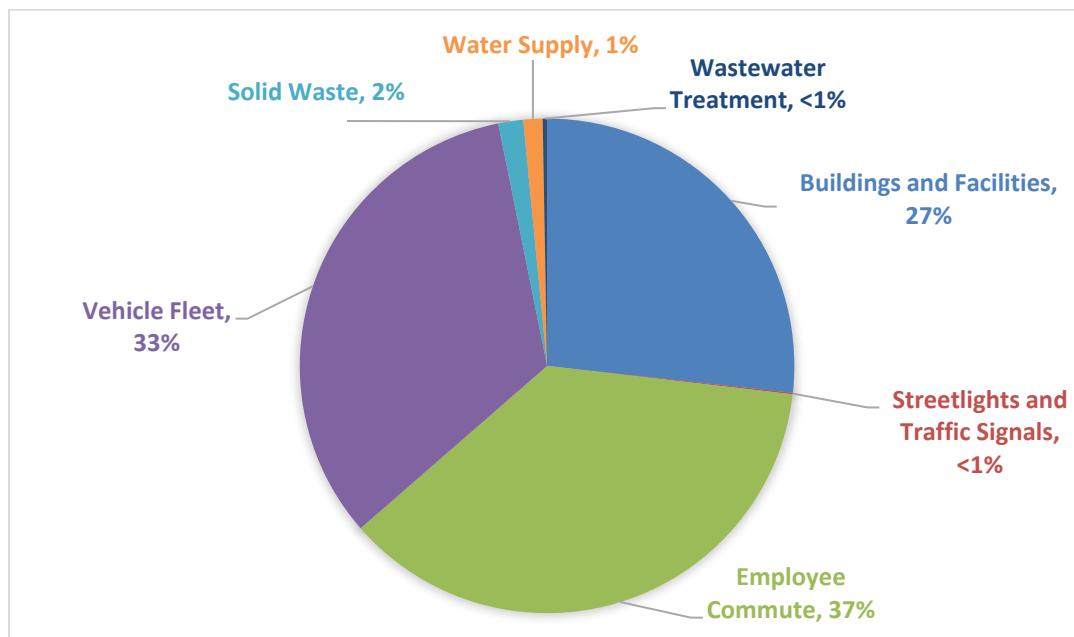


Figure 2 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventory

2 GREENHOUSE GAS EMISSIONS FORECASTS TO 2030, 2040, AND 2045

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 action. In addition to accounting for the city's growth under a BAU scenario, an adjusted BAU forecast was prepared, which includes adopted legislative actions at the State and federal levels that would affect emissions without any local action, such as 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 outside of adopted legislation and regulations. These forecasts provide the City with the information needed to focus efforts on certain emissions sectors and sources that have the greatest opportunities for GHG emissions reductions.

The BAU forecasts described in this section for 2030, 2040, and 2045 are aligned with the State's GHG reduction target years established in key legislation and policies, including Senate Bill (SB) 32 and Executive Order (EO) B-55-18, as well as the City's General Plan Update horizon year. The long-term target year of 2045 was chosen to better align with newer State GHG targets such as the statewide carbon neutrality goal, rather than the previously issued 2050 goal of 80 percent reduction from 1990 levels. The statewide GHG reduction targets are:

- ▶ 40 percent below 1990 levels by 2030 (SB 32); and
- ▶ to achieve carbon neutrality no later than 2045 (EO B-55-18).

Estimated BAU emissions forecasts were based on predicted growth in existing demographic forecasts, including population and employment changes between 2015 and 2040 for the City, as provided by the Metropolitan Transportation Commission (MTC). Population and employment are expected to increase by 0.69 and 0.75 percent year over year, respectively. These growth factors were used to forecast BAU emissions for 2030 and 2040 for most sectors in the inventory. The same average year over year growth rates were applied to 2045 because no other data is currently available. MTC also provided annual vehicle miles traveled (VMT) growth projections for the years 2015 through 2040. Based on these data, annual VMT is projected to increase by 0.68 percent year over year. VMT projections were used to scale emissions from the on-road transportation sector. The same average annual growth rates were applied to 2045 because there is currently no published information about demographic or VMT projections for the city after 2040. Table 3 shows anticipated growth in the city for the forecast years.

Table 3 Milpitas Community Demographic and Vehicle Miles Traveled Forecasts

Forecast Factor	2019	2030	2040	2045
Population	90,030	95,605	103,970	107,250
Employment	47,084	56,035	58,030	60,000
Annual VMT	572,889,499	633,251,901	662,346,271	687,876,785

Notes: VMT = vehicle miles traveled.

Source: BAAQMD 2015 and MTC 2020; adapted by Ascent Environmental in 2021.

Table 4 shows baseline emissions in 2019 and BAU emissions forecasts for 2030, 2040, and 2045.

Table 4 2019 Milpitas Community Greenhouse Gas Emissions Inventory and BAU Forecasts (MTCO₂e/year)

Sector	2019	2030	2040	2045
Residential Building Energy	42,218	44,917	48,815	50,357
Nonresidential Building Energy	98,319	117,517	121,949	126,077
On-Road Transportation	259,627	291,196	310,877	324,507
Off-Road Vehicles and Equipment	15,554	21,139	22,984	23,421
Solid Waste	23,566	25,026	27,215	28,074
Water Supply	694	737	801	827
Wastewater Treatment	1,578	1,676	1,822	1,880
Total	441,557	502,207	534,465	555,142

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

Legislative-adjusted BAU emissions forecasts were prepared using the same demographic and VMT data that were used for the BAU forecasts, while accounting for State and federal legislative actions that would affect local emissions. These forecasts provide the City with a more robust understanding to assist with the prioritization of emissions reduction measures developed to meet the GHG targets. A summary of the legislative reductions applied is provided in Table 5.

Table 5 Legislative Reductions Summary

Source	Legislative Reduction	Description	Sectors Applied
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, Water
State	California's Building Energy Efficiency Standards (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	Advanced Clean Car Standards	Establishes GHG emission reduction standards for model years 2017 through 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; SB = Senate Bill.

Source: Forecasts prepared by Ascent Environmental in 2021.

The city's legislative-adjusted BAU emissions would decrease by approximately 5 percent between 2019 and 2030, 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. Without the legislative reductions, emissions would be 40 percent higher in 2045 compared to the legislative-adjusted BAU forecast.

Table 6 2019 Milpitas Community Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Sector	2019	2030	2040	2045
Residential Building Energy	42,218	42,660	43,399	43,658
Nonresidential Building Energy	98,319	93,467	82,288	77,177
On-Road Transportation	259,627	236,310	218,898	221,388
Off-Road Vehicles and Equipment	15,554	21,139	22,984	23,421
Solid Waste	23,566	25,026	27,215	28,074
Water Supply	694	421	153	0
Wastewater Treatment	1,578	1,612	1,692	1,713
Total	441,557	420,636	396,629	395,432

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

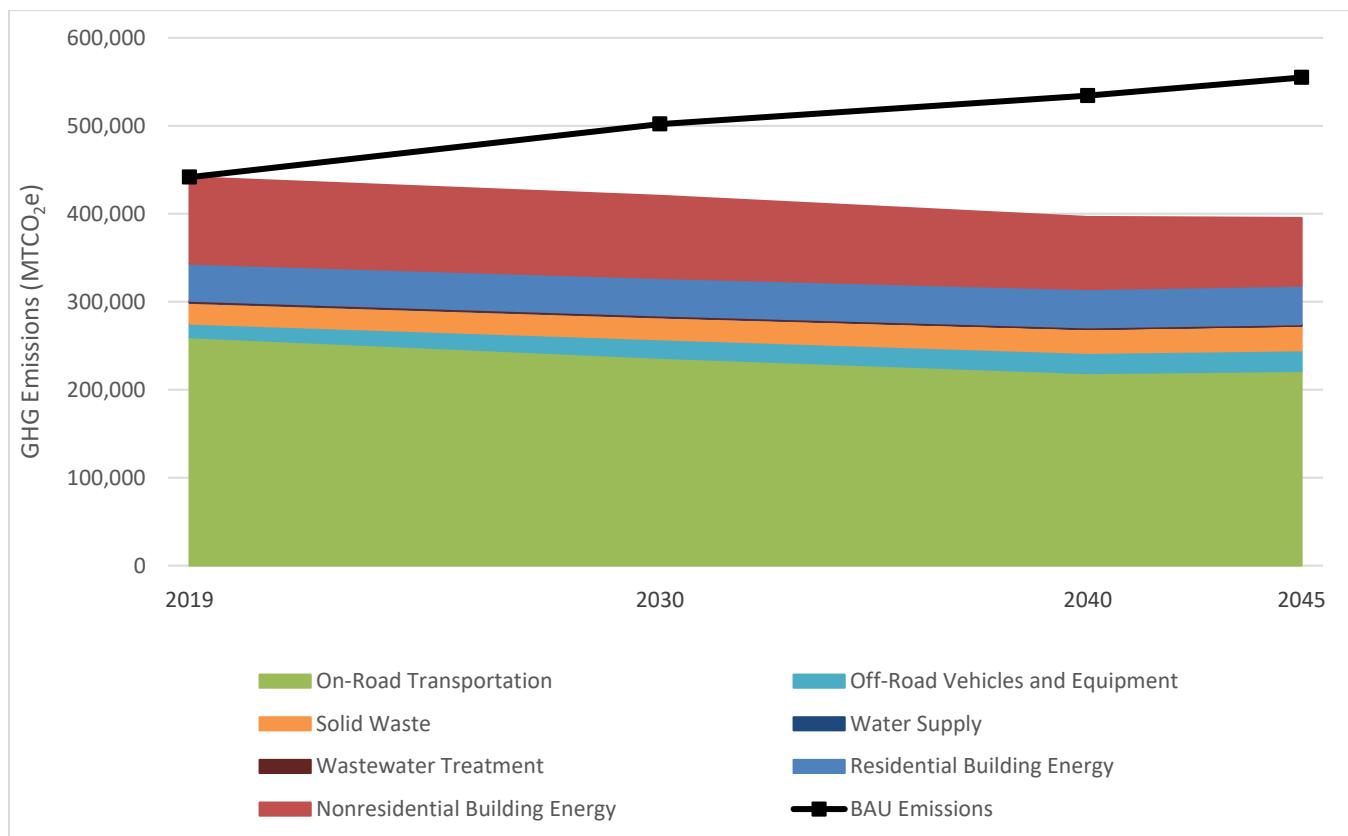


Figure 3 2019 Milpitas Community Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts

Emissions forecasts are detailed for each sector and discussed below.

2.1.1 Building Energy

Emissions from future electricity, natural gas, and backup generator use were estimated by multiplying anticipated energy use with forecasted emissions factors. Future energy use was forecasted in three parts. First, energy use was scaled by population and employment growth factors detailed in Table 3. Second, electricity emissions factors were adjusted to reflect California's Renewables Portfolio Standard (RPS) targets pursuant to SB 100. Electricity emissions factors are anticipated to decline based on current regulations, while natural gas and diesel emissions factors are anticipated to be constant. Third, 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"). The 2019 Title 24 standards, which became effective in 2020, are expected to achieve decreases in electricity consumption in new construction. The assumptions for energy efficiency and future electricity emissions factors are described below. Table 7 summarizes the scaling factors and legislative reductions used to forecast building use by energy type.

Table 7 Building Energy Emissions Forecast Methods and Legislative Reductions by Source

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.	RPS achieved to date and scheduled targets (i.e., 33 percent renewable by 2020, 60 percent renewable by 2030) applied to PG&E's and SVCE's emissions factors. Accounts for 2008 to 2019 Title 24 energy efficiency gains in new construction.
Natural Gas		
Backup Generators	Scaled by employment growth for nonresidential building energy.	Accounts for 2008 to 2019 Title 24 energy efficiency gains in new nonresidential construction.

Notes: PG&E = Pacific Gas & Electric; RPS = Renewables Portfolio Standard; SVCE = Silicon Valley Clean Energy.

Source: Forecasts prepared by Ascent Environmental in 2021.

RESIDENTIAL BUILDING ENERGY

Between 2019 and 2030, electricity and natural gas emissions from residential buildings would increase by approximately 1 percent from 42,218 to 42,660 MTCO₂e per year with legislative adjustments and overall population growth of 6 percent over the same time. While GHG emissions associated with residential electricity usage are anticipated to decline through 2030 and reflect SB 100 requirements, emissions from residential natural gas consumption are expected to rise gradually. This increase is due to population growth in the city and reflects currently adopted legislation. Table 8 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the residential building energy sector by energy type for 2030, 2040, and 2045.

Table 8 2019 Residential Building Energy Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Emissions Forecasts (MTCO₂e/year)

Energy Type	2019	2030	2040	2045
Electricity	581	369	125	0
Natural Gas	41,637	42,292	43,273	43,658
Total	42,218	42,660	43,399	43,658

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

NONRESIDENTIAL BUILDING ENERGY

Between 2019 and 2030, electricity, natural gas, and back-up generator emissions from nonresidential buildings would decrease by 5 percent from 98,319 to 93,467 MTCO₂e per year with legislative adjustments and overall employment growth of 19 percent over the same time. Table 9 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the nonresidential building energy sector by energy type for 2030, 2040, and 2045.

Table 9 2019 Nonresidential Building Energy Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Energy Type	2019	2030	2040	2045
Electricity	29,880	18,973	6,443	0
Natural Gas	67,828	73,831	75,169	76,490
Backup Generators	611	664	676	687
Total	98,319	93,467	82,288	77,177

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

Electricity Emissions Factors

Emissions from the building energy sector are anticipated to gradually decline through 2045 without additional City action, despite growth, due to State measures already in place that affect the carbon intensity of grid electricity. Pacific Gas and Electric's (PG&E's) carbon dioxide (CO₂) emissions factor for 2019 was interpolated using the 2018 emissions factor provided by PG&E and the requirements of RPS pursuant to SB 100. Silicon Valley Clean Energy's (SVCE's) emissions factor for CO₂ in 2019 was provided by SVCE. Electricity emissions factors for methane (CH₄) and nitrous oxide (N₂O) were obtained from the U.S. Environmental Protection Agency's (EPA's) Emissions & Generation Resource Integrated Database (eGRID) 2018 Annual Output Emissions Rates (EPA 2020).

California utility providers, including PG&E and SVCE, were scheduled to reach a 33 percent renewable electricity generation mix in 2020 and, pursuant to SB 100, are scheduled to achieve 60 percent renewable electricity by 2030 and 100 percent carbon-free electricity by 2045. PG&E's 2030 and 2040 emissions factors are 113.0 and 37.7 pounds of CO₂ per megawatt hour (lb CO₂/MWh), respectively. SVCE's 2030 and 2040 emissions factors are 1.3 and 0.4 lb CO₂/MWh, respectively. The carbon-free electricity requirement results in a 2045 emissions factor of 0 lb CO₂/MWh for both utilities. CH₄ and N₂O electricity emissions factors in future years are assumed to follow the same trends as the CO₂ emissions factors.

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 CO₂e/therm) for stationary combustion in buildings and 1.2 lb CO₂e/therm for electricity generation in backup generators (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 energy 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 24.6 pounds of carbon dioxide equivalent per gallon (lb CO₂e/gal). 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.

Energy Efficiency

Title 24 standards apply to both new construction and existing buildings. The 2019 Title 24 standards went into effect January 2020. The California Energy Commission (CEC) estimates that new residential buildings built to the 2019 standards are 53 percent more efficient than residential buildings built to the previous standards (CEC 2018). CEC estimates that new nonresidential buildings built to the 2019 standards are 30 percent more efficient than nonresidential buildings built to the previous standards (CEC 2018).

In addition to the current iteration of Title 24, previous versions of the standards have also achieved energy efficiencies for residential and nonresidential buildings. Since 2008, energy efficiency savings have been quantified and the collective effect of Title 24 was accounted for in the forecasted emissions. It is assumed that collectively, all new residential construction occurring between 2020 and 2045 would be 75 percent more energy efficient than buildings constructed under previous Title 24 standards, and nonresidential construction would be 53 percent more energy efficient compared to buildings constructed under previous Title 24 standards. This includes the energy efficiencies gained through the 2008, 2013, 2016, and 2019 versions of Title 24. Additional efficiencies to be achieved in future code cycles are yet unknown and therefore not factored into the forecast.

2.1.2 Transportation

ON-ROAD TRANSPORTATION

Between 2019 and 2030, GHG emissions from on-road vehicles would decrease by approximately 9 percent from 259,627 to 236,310 MTCO₂e per year, accounting for an increase in VMT of 11 percent and future vehicle emissions factors modeled in California Air Resources Board's (CARB's) EMissions FACtor (EMFAC2021) model. With respect to the legislative adjustments included in this forecast, State and federal policies and associated regulations incorporated in the on-road vehicle sector include the Pavley Clean Car Standards, Advanced Clean Car (ACC) Standards, and fuel efficiency standards for medium- and heavy-duty vehicles. These policies are included in EMFAC2021's emissions factor estimates and forecasts. It should be noted that 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 10 summarizes the scaling factor and legislative reductions used to forecast on-road transportation emissions.

Table 10 On-Road Transportation Forecast Methods and Legislative Reductions

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
On-Road Vehicles	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.

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

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 11 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from on-road transportation for 2030, 2040, and 2045.

Table 11 2019 On-Road Transportation Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Passenger Vehicles	173,746	153,600	146,494	149,831
Commercial Vehicles	85,881	82,711	72,405	71,556
Total	259,627	236,310	218,898	221,388

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

OFF-ROAD VEHICLES AND EQUIPMENT

Between 2019 and 2030, emissions associated with off-road vehicles and equipment used in the city would increase by 36 percent from 15,554 to 21,139 MTCO₂e per year, with legislative adjustments applied and overall growth in various demographics. Emissions were obtained from CARB's OFFROAD2007 and OFFROAD2017 models. With respect to the legislative adjustments in the off-road vehicle sector, CARB's latest off-road emissions model, OFFROAD2017, was used, which incorporates regulatory actions such as reformulated fuels and more stringent emission standards. However, some off-road vehicle and equipment sources that are included in the OFFROAD2007 model are excluded from OFFROAD2017. For these sectors, emissions were obtained from OFFROAD2007. In addition, OFFROAD2017 provides CO₂ emissions but does not provide emissions from CH₄ and N₂O. Ratios of CH₄ and N₂O to CO₂ reported in OFFROAD2007 were calculated and applied to CO₂ data from OFFROAD2017 to calculate CH₄ and N₂O emissions, as recommended by CARB.

Santa Clara County-level emissions from off-road vehicles and equipment were scaled using changes in city-specific demographic factors. Table 12 summarizes the scaling factors and legislative reductions used to forecast off-road vehicle and equipment emissions.

Table 12 Off-Road Vehicles and Equipment Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Construction and Mining Equipment	Service population	OFFROAD2007 and OFFROAD2017 emission factor considerations include EPA off-road compression-ignition engine standards implementation schedule.
Entertainment Equipment	Population	
Industrial Equipment	Employment	
Lawn and Garden Equipment	Population	
Light Commercial Equipment	Employment	
Railyard Operations	Employment	
Recreational Equipment	Population	
Transport Refrigeration Units	Share of road miles	

Notes: EPA = U.S. Environmental Protection Agency; OFFROAD2007 = California Air Resources Board's OFFROAD2007 model; OFFROAD2017 = California Air Resources Board's OFFROAD2017 model.

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 13 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the off-road vehicles and equipment sector for 2030, 2040, and 2045.

Table 13 2019 Off-Road Vehicles and Equipment Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Construction and Mining Equipment	3,478	5,903	6,244	6,470
Entertainment Equipment	44	42	40	41
Industrial Equipment	8,590	11,151	12,206	12,317
Lawn and Garden Equipment	1,602	1,663	1,724	1,781
Light Commercial Equipment	1,290	1,652	1,814	1,818
Railyard Operations	1	1	1	1
Recreational Equipment	430	588	802	831
Transport Refrigeration Units	118	140	155	163
Total	15,554	21,139	22,984	23,421

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.1.3 Solid Waste

Between 2019 and 2030, solid waste emissions generated from community activities in the city would increase by approximately 6 percent from 23,566 to 25,026 MTCO₂e per year, accounting for overall population growth of 6 percent over the same time. No additional legislative reductions could be applied to this sector because the city is already meeting California's 50 percent waste diversion goal under Assembly Bill (AB) 939, as reported by the California Department of Resources Recycling and Recovery (CalRecycle) (CalRecycle 2020). Therefore, legislative-adjusted BAU emissions are equivalent to BAU emissions, which account for the CH₄ and CO₂ emissions from the decay of waste generated annually and were scaled by population growth within the city between 2019 and 2030.

Table 14 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the solid waste sector for 2030, 2040, and 2045.

Table 14 2019 Solid Waste Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Landfill Disposed Waste	22,040	23,405	25,452	26,255
Alternative Daily Cover	973	1,033	1,124	1,159
Composting	553	588	639	659
Total	23,566	25,026	27,215	28,074

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.1.4 Water Supply

Between 2019 and 2030, water supply emissions from community activities in the city would decrease by approximately 39 percent from 694 to 421 MTCO₂e per year, accounting for legislative adjustments and overall

population growth of 6 percent over the same time. This change reflects an increase in water consumption with lower electricity factors related to the 2030 and 2045 RPS targets, pursuant to SB 100 requirements.

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

Table 15 Water Supply Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Water Consumption	Scaled by population growth.	Assumes electricity use for extraction, conveyance, distribution, and treatment follow the 2030 RPS schedule and 2045 carbon-free electricity requirements.

Notes: RPS = Renewables Portfolio Standard.

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 16 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the water supply sector for 2030, 2040, and 2045.

Table 16 2019 Water Supply Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Water Supply	694	421	153	0

Notes: BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.1.5 Wastewater Treatment

Between 2019 and 2030, wastewater treatment emissions from the community would increase by 2 percent from 1,578 to 1,612 MTCO₂e per year, accounting for overall population growth of 6 percent over the same time. This change reflects an increase in wastewater generation with lower electricity factors related to the 2030 and 2045 RPS targets, consistent with SB 100 legislative actions described above. While electricity factors are reduced through 2045, increases in natural gas usage result in an overall increase in energy-related emissions. Table 17 summarizes the scaling factor and legislative reduction used to forecast water supply emissions.

Table 17 Wastewater Treatment Forecast Methods and Legislative Reductions by Source

Source	Forecast Methods	
	Scale Factor	Applied Legislative Reductions
Wastewater Treatment	Scaled by population growth.	Assumes electricity use for collection and treatment of wastewater follow the 2030 RPS schedule and 2045 carbon-free electricity requirements.

Notes: RPS = Renewables Portfolio Standard.

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 18 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from wastewater treatment sources for 2030, 2040, and 2045.

Table 18 2019 Wastewater Treatment Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Energy-Related Emissions	1,435	1,460	1,526	1,543
Process Emissions	138	146	159	164
Stationary Emissions	6	6	6	7
Total	1,578	1,612	1,692	1,713

Notes: BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.1.6 Discussion

As discussed above and shown in Table 6 and Figure 3, the community legislative-adjusted BAU emissions would decrease by 5 percent between 2019 and 2030. This is a result of reductions that would be achieved from several legislative actions including:

- ▶ a greater renewable mix in California's electricity supply (60 percent by 2030);
- ▶ improved building energy efficiency through compliance with Title 24 standards (75 percent energy reduction for residential, 53 percent for nonresidential); and
- ▶ reductions in on-road vehicle emission factors forecasted in EMFAC2021.

From 2030 to 2045, new legislative actions that would affect emissions are anticipated to be adopted by State and federal agencies; however, because information regarding these regulatory changes is currently unavailable, emissions reductions from future potential legislative actions could not be quantified. Without future legislative actions and despite growth in the city, emissions would continue to decline gradually through 2045. The main legislative reductions beyond 2030 would come from achievement of SB 100's target of 100 percent carbon-free electricity by 2045. Additional reductions would be in forecasted improvements in vehicle fuel economy and increased VMT share by electric vehicles, as estimated in the EMFAC2021 model. Other previous legislative actions would also continue to apply in the future and ultimately outpace growth in population and employment.

2.2 MUNICIPAL OPERATIONS FORECAST RESULTS

Estimated BAU emissions forecasts were based on predicted growth in City employment between 2019 and 2045 for Milpitas, as provided by the City. Municipal employment is expected to increase by 0.5 percent year over year through 2030, and then by 0.25 percent year over year through 2045. Growth in municipal employment was the sole growth factor used to forecast BAU emissions for 2030, 2040, and 2045 for all sectors in the municipal operations inventory. Table 19 shows 2019 municipal employment and anticipated growth in municipal employment for the forecast years.

Table 19 Milpitas Municipal Operations Demographic Forecasts

Forecast Factor	2019	2030	2040	2045
City Employment	524	554	568	575

Source: City of Milpitas 2021.

Table 20 shows 2019 baseline emissions and BAU emissions forecasts for 2030, 2040, and 2045.

Table 20 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventory and BAU Forecasts (MTCO₂e/year)

Sector	2019	2030	2040	2045
Buildings and Facilities	870	919	942	954
Streetlights and Traffic Signals	3	3	3	3
Employee Commute	1,195	1,263	1,295	1,311
Vehicle Fleet	1,081	1,142	1,171	1,185
Solid Waste	53	56	57	58
Water Supply	41	43	44	45
Wastewater Treatment	9	10	10	10
Total	3,252	3,435	3,522	3,567

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

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. In addition to accounting for the City's municipal growth, the legislative-adjusted BAU forecast accounts for legislative actions at the local, 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. Annual municipal employment growth, described above, was the sole scaling factor applied to all sectors. A summary of legislative reductions applied is provided in Table 5.

Municipal operations legislative-adjusted BAU emissions would decrease by 10 percent between 2019 and 2030, as shown in Table 21 and Figure 4. Figure 4 also shows the emissions trend that would occur without anticipated legislative reductions and accounting only for changes in municipal employment. Without the legislative reductions, emissions would be 29 percent higher in 2045 compared to the legislative-adjusted BAU forecast.

Table 21 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Sector	2019	2030	2040	2045
Buildings and Facilities	870	889	897	900
Streetlights and Traffic Signals	3	2	1	0
Employee Commute	1,195	1,017	961	961
Vehicle Fleet	1,081	925	840	830
Solid Waste	53	56	57	58
Water Supply	41	25	8	0
Wastewater Treatment	9	9	9	9
Total	3,252	2,923	2,773	2,759

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

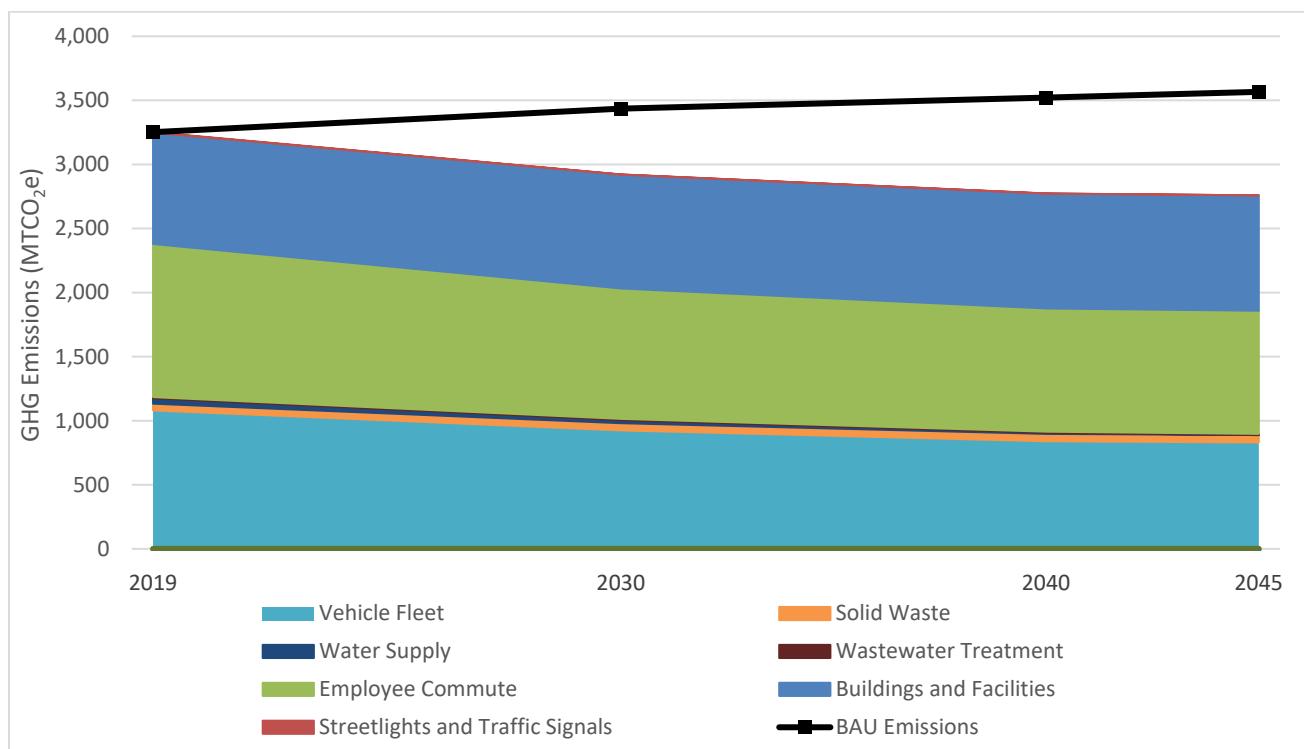


Figure 4 2019 Milpitas Municipal Operations Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts

Emissions forecasts are detailed for each sector and discussed below.

2.2.1 Buildings and Facilities Energy

Emissions from future electricity, natural gas, and backup generator use were estimated by multiplying anticipated energy use with forecasted emissions factors. Future energy use was forecasted in three parts. First, energy use was scaled by growth factors detailed in Table 19. Second, electricity emissions factors were adjusted to reflect California's RPS targets. Electricity emissions factors are anticipated to decline based on current regulations, while natural gas and diesel emissions factors are anticipated to be constant. Third, energy intensity factors were adjusted to reflect increased stringency under Title 24 standards (i.e., 2019 standards which became effective in 2020), which are expected to achieve decreases in electricity consumption in new nonresidential construction. The assumptions to energy efficiency and future electricity emission factors are described below. In addition, it is important to note that all municipal electricity is supplied by SVCE. Table 22 summarizes the legislative reductions used to forecast buildings and facilities emissions by energy type.

Table 22 Buildings and Facilities Energy Emissions Forecast Legislative Reductions by Energy Type

Energy Type	Applied Legislative Reductions
Electricity	RPS achieved to date and scheduled targets (i.e., 33 percent renewable by 2020, 60 percent renewable by 2030) applied to SVCE's emissions factors. Accounts for 2008 to 2019 Title 24 energy efficiency gains in new nonresidential construction.
Natural Gas	
Backup Generators	Accounts for 2008 to 2019 Title 24 energy efficiency gains in new nonresidential construction.

Notes: RPS = Renewables Portfolio Standard; SVCE = Silicon Valley Clean Energy.

Source: Forecasts prepared by Ascent Environmental in 2021.

Between 2019 and 2030, emissions from electricity, natural gas, and backup generator from municipal buildings and facilities would increase by 2 percent from 870 to 889 MTCO₂e per year, accounting for legislative adjustments and municipal growth. This change reflects increases in emissions from natural gas and backup generators combined with decreases in electricity emissions due to lower electricity factors related to the 2030 and 2045 RPS targets, pursuant to SB 100. Table 23 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the municipal operations buildings and facilities energy sector by energy type for 2030, 2040, and 2045.

Table 23 2019 Buildings and Facilities Energy Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Energy Type	2019	2030	2040	2045
Electricity	8	5	2	0
Natural Gas	826	848	858	863
Backup Generators	35	36	37	37
Total	870	889	897	900

Notes: Totals may not sum exactly due to independent rounding. MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

ELECTRICITY EMISSIONS FACTORS

Emissions from the buildings and facilities sector are anticipated to increase slightly through 2045 without additional City action. This slight rise in sector emissions would be due to increases in natural gas and backup generator emissions, despite State measures already in place that would result in decreased electricity emissions. SVCE electricity emissions factors and changes through 2045 are described in Section 2.1.1.

NATURAL GAS EMISSIONS FACTORS

Natural gas emissions are based on TCR's 2020 default emissions factors, which are estimated to be 11.7 lb CO₂e/therm for stationary combustion in buildings and facilities. 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, which are estimated to be 24.6 lb CO₂e/gal. 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.

ENERGY EFFICIENCY

Title 24 standards apply to both new construction and existing buildings. The 2019 Title 24 standards went into effect January 2020. The CEC estimates that new nonresidential built to the 2019 standards are 30 percent more efficient than nonresidential buildings built to the previous standards (CEC 2018). In addition to the current iteration of Title 24, previous versions of have also achieved energy efficiencies for nonresidential buildings. Since 2008, energy

efficiency savings have been quantified and the collective effect of Title 24 was accounted for in the forecasted emissions.

Forecasts of future building energy accounts for Title 24 standards. It is assumed that all new construction occurring between 2020 and 2045 would have energy efficiencies 53 percent better than energy usage rates for nonresidential buildings. This includes the energy efficiencies gained through the 2008, 2013, 2016, and 2019 versions of Title 24.

2.2.2 Streetlights and Traffic Signals

Between 2019 and 2030, emissions from streetlights and traffic signals would decrease from 3 to 2 MTCO₂e per year, accounting for legislative adjustments and municipal growth. This change reflects lower electricity factors related to the 2030 and 2045 RPS targets, consistent with SB 100 legislative actions. Table 24 summarizes the legislative reduction used to forecast streetlight and traffic signal emissions.

Table 24 Streetlights and Facilities Emissions Forecast Legislative Reductions

Source	Applied Legislative Reductions
Electricity	RPS achieved to date and scheduled targets (i.e., 33 percent renewable by 2020, 60 percent renewable by 2030) applied to SVCE's emissions factors.

Notes: RPS = Renewables Portfolio Standard; SVCE = Silicon Valley Clean Energy.

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 25 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions for the streetlights and traffic signals sector for 2030, 2040, and 2045.

Table 25 2019 Streetlights and Traffic Signals Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Streetlights and Traffic Signals	3	2	1	0

Notes: BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.2.3 Employee Commute

Between 2019 and 2030, GHG emissions from employee commutes would decrease by approximately 15 percent from 1,195 to 1,017 MTCO₂e per year, accounting for future vehicle emissions factors modeled in CARB's EMFAC2021 model and municipal growth. It was assumed that all employees commute to work using passenger vehicles. With respect to the legislative adjustments included in this forecast, State and federal policies and associated regulations incorporated in the employee commute sector include the Pavley Clean Car Standards and ACC Standards. These policies are already included in EMFAC2021's emissions factor estimates and forecasts. 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 26 summarizes the legislative reductions used to forecast employee commute emissions.

Table 26 Employee Commute Forecast Legislative Reductions

Source	Applied Legislative Reductions
Employee Commute	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, as well as federal CAFE standards.

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

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 27 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from municipal employee commutes for 2030, 2040, and 2045.

Table 27 2019 Employee Commute Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Employee Commute	1,195	1,017	961	961

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.2.4 Vehicle Fleet

Between 2019 and 2030, emissions associated with the City's municipal vehicle fleet would decrease by 14 percent from 1,081 to 925 MTCO₂e per year, accounting for legislative adjustments and municipal growth. Because VMT data for on-road vehicles were unavailable, and usage hours and mileage data were unavailable for off-road vehicles and equipment, gasoline and diesel fuel consumption data were used to forecast emissions. Gasoline was assumed to be used by passenger vehicles, while diesel was assumed to be used by heavy-duty vehicles. 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. Table 28 summarizes the legislative reductions used to forecast vehicle fleet emissions.

Table 28 Vehicle Fleet Forecast Legislative Reductions by Source

Source	Applied Legislative Reductions
Gasoline (passenger vehicles)	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.
Diesel (heavy-duty vehicles)	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.

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

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 29 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the vehicle fleet sector by fuel source for 2030, 2040, and 2045.

Table 29 2019 Vehicle Fleet Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Gasoline (passenger vehicles)	823	700	662	662

Diesel (heavy-duty vehicles)	258	224	178	169
Total	1,081	925	840	830

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.2.5 Solid Waste

Between 2019 and 2030, municipal operations solid waste emissions would rise by 6 percent from 53 to 56 MTCO₂e per year, accounting for municipal growth. No additional legislative reductions could be applied to this sector because the City is already meeting California's 50 percent waste diversion goal under AB 939, as reported by the CalRecycle (CalRecycle 2020). Therefore, legislative-adjusted BAU emissions are equivalent to BAU emissions.

Table 30 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from the municipal operations solid waste sector for 2030, 2040, and 2045.

Table 30 2019 Solid Waste Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Source	2019	2030	2040	2045
Landfill Disposed Waste	53	56	57	58

Notes: Totals may not sum exactly due to independent rounding. BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.2.6 Water Supply

Between 2019 and 2030, emissions from water supplied for municipal operations would decrease by 40 percent from 41 to 25 MTCO₂e per year, accounting for legislative adjustments and municipal growth. This change reflects an increase in water consumption with lower electricity factors related to the 2030 and 2045 RPS targets, pursuant to SB 100 requirements. Table 31 summarizes the legislative reductions used to forecast water supply emissions.

Table 31 Water Supply Forecast Legislative Reductions

Source	Applied Legislative Reductions
Water Consumption	Assumes electricity use for extraction, conveyance, distribution, and treatment follow the 2030 RPS schedule and 2045 carbon-free electricity requirements.

Notes: RPS = Renewables Portfolio Standard.

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 32 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from municipal operations water supply for 2030, 2040, and 2045.

Table 32 2019 Water Supply Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Activity	2019	2030	2040	2045
Water Supply Emissions	41	25	8	0

Notes: BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent per year.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.2.7 Wastewater Treatment

Between 2019 and 2030, wastewater treatment emissions from municipal operations would stay constant at 9 MTCO₂e per year, accounting for legislative reductions and municipal growth. This reflects an increase in wastewater generation with lower electricity intensity factors related to the 2030 and 2045 RPS targets, pursuant to SB 100. Although electricity factors are reduced through 2045, increases in natural gas usage resulting from wastewater collection and treatment offset decreased electricity emissions. Table 33 summarizes the legislative reductions used to forecast emissions from municipal operations wastewater treatment.

Table 33 Wastewater Treatment Forecast Legislative Reductions by Source

Source	Applied Legislative Reductions
Wastewater Treatment	Assumes electricity use for collection and treatment of wastewater follow the 2030 RPS schedule and 2045 carbon-free electricity requirements.

Notes: RPS = Renewables Portfolio Standard.

Source: Forecasts prepared by Ascent Environmental in 2021.

Table 34 shows the 2019 inventory and legislative-adjusted BAU forecasted emissions from wastewater treatment for 2030, 2040, and 2045.

Table 34 2019 Wastewater Treatment Greenhouse Gas Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e/year)

Activity	2019	2030	2040	2045
Wastewater Treatment	9	9	9	9

Notes: BAU = business-as-usual; MTCO₂e/year = metric tons of carbon dioxide equivalent.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.3 DISCUSSION

As discussed above and shown in Table 21 and Figure 4, municipal operations legislative-adjusted BAU emissions would decrease by 10 percent between 2019 and 2030. This is a result of reductions that would be achieved from numerous legislative actions including:

- ▶ a greater renewable mix in California's electricity supply (60 percent by 2030);
- ▶ improved building energy efficiency through compliance with Title 24 standards (53 percent for nonresidential); and
- ▶ reductions in on-road vehicle emission factors forecasted in EMFAC2021.

With respect to emissions beyond 2030, most adopted State and federal legislation and regulations have specific targets and policies that only address activities up to the year 2025 or 2030. While advances in new technologies and State policies may allow for additional significant GHG reductions in the future, specific legislative reductions that may occur between 2030 and 2045 are largely unknown at this time. One notable exception is SB 100, which establishes a 100 percent carbon-free electricity target for retail electricity sales by 2045. Many of the strategies outlined in the *California 2017 Climate Change Scoping Plan* have not yet been implemented and sufficient information is not yet available to estimate the timing and magnitude of their effect on activities and sources within the City's jurisdiction.

Where new State regulations or programs are imminent and reasonably foreseeable, they can be incorporated as complementary actions to locally based GHG reduction measures, as will be discussed in subsequent technical memoranda.

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Attachment A

GHG Forecasts Data and Calculations

Emissions Sector	Milpitas Community Greenhouse Gas Emissions Inventories and Forecasts												ASCENT																		
	2005 GHG Emissions				2015 GHG Emissions				2019 GHG Emissions				2030 GHG Emissions				2040 GHG Emissions				2045 GHG Emissions										
	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total			
Building Energy		247,533	45.17%			259,949	44.18%			140,537	31.83%			162,433	32.34%	136,128	32.36%			170,764	31.95%	125,886	31.69%			176,433	31.78%	120,836	30.56%		
Electricity	114,391	MWh	25,528	10.3%	117,026	MWh	21,578	8.3%	121,801	MWh	581	0.4%	129,344	MWh	701	0.4%	369	0.3%	140,661	MWh	731	0.4%	125	0.1%	145,098	MWh	755	0.4%	0	0.0%	
Natural Gas	7,265,000	Therms	38,580	15.6%	6,779,674	Therms	36,003	13.9%	7,840,602	Therms	41,637	29.6%	8,326,122	Therms	44,215	27.2%	42,292	31.1%	9,054,619	Therms	48,084	28.2%	43,273	34.4%	9,340,270	Therms	49,601	28.1%	43,658	36.1%	
Residential Subtotal		64,108	25.9%			57,581	22.2%			42,218	30.0%			44,917	27.7%	42,660	31.3%			48,815	28.6%	43,399	34.5%			50,357	28.5%	43,658	36.1%		
Electricity	545,800	MWh	121,802	49.2%	784,254	MWh	144,603	55.6%	708,759	MWh	29,880	21.3%	843,499	MWh	36,068	22.2%	18,973	13.9%	873,530	MWh	37,601	22.0%	6,443	5.1%	903,184	MWh	38,865	22.0%	0	0.0%	
Natural Gas	11,604,000	Therms	61,623	24.9%	10,875,823	Therms	57,756	22.2%	12,772,616	Therms	67,828	48.3%	15,200,780	Therms	80,723	49.7%	73,831	54.2%	15,741,970	Therms	83,597	49.0%	75,169	59.8%	16,276,378	Therms	86,435	49.0%	76,490	63.3%	
Backup Generators (Diesel)						964	Gallons	10	0.0%	58,522	Gallons	599	0.4%	69,648	Gallons	711	0.4%	650	0.5%	72,127	Gallons	736	0.4%	662	0.5%	74,576	Gallons	761	0.4%	674	0.6%
Backup Generators (Natural Gas)						0	Scf	0	0.0%	221,027	Scf	12	0.0%	263,046	Scf	14	0.0%	13	0.0%	272,411	Scf	15	0.0%	281,659	Scf	15	0.0%	281,659	Scf		
Non-Residential Subtotal		183,424	74.1%			202,368	77.8%			98,319	70.0%			117,517	72.3%	93,467	68.7%			121,949	71.4%	82,288	65.5%			126,077	71.5%	77,177	63.9%		
On-Road Transportation	483,632,677	VMT	252,864	46.15%	559,491,627	VMT	278,061	47.26%	572,889,499	VMT	259,627	58.80%	633,251,901	VMT	291,196	57.98%	236,310	56.18%	662,346,271	VMT	310,877	58.17%	218,898	55.19%	687,876,785	VMT	324,507	58.45%	221,388	55.99%	
Passenger Vehicles	434,135,841	VMT	181,172	71.6%	492,014,849	VMT	182,927	65.8%	509,968,096	VMT	173,746	66.9%	559,587,179	VMT	190,651	65.5%	153,600	65.0%	579,143,509	VMT	197,314	63.5%	146,494	66.9%	599,858,891	VMT	204,372	63.0%	149,831	67.7%	
Commercial Vehicles	49,496,836	VMT	71,692	28.4%	67,476,778	VMT	95,134	34.2%	62,921,403	VMT	85,881	33.1%	73,664,721	VMT	100,545	34.5%	82,711	35.0%	83,202,762	VMT	113,563	36.5%	72,405	33.1%	88,017,894	VMT	120,135	37.0%	71,556	32.3%	
Off-Road Vehicles		15,034	2.74%			16,511	2.81%			15,554	3.52%			21,139	4.21%	21,139	5.03%			22,984	4.30%	22,984	5.79%			23,421	4.22%	23,421	5.92%		
Construction and Mining Equipment	3,813		25.4%			4,661	28.2%			3,478	22.4%			5,903	27.9%	5,903	27.9%			6,244	27.2%	6,244	27.2%			6,470	27.6%	6,470	27.6%		
Entertainment Equipment		38	0.2%			45	0.3%			44	0.3%			42	0.2%	42	0.2%			40	0.2%	40	0.2%			41	0.2%	41	0.2%		
Industrial Equipment	8,490		55.8%			8,490	53.3%			8,598	55.2%			11,111	52.3%	11,151	52.1%			12,289	53.1%	12,206	53.1%			12,417	53.0%	12,317	52.6%		
Lawn and Garden Equipment	1,192		7.9%			1,561	9.5%			1,602	10.3%			1,653	7.9%	1,653	7.9%			1,724	7.4%	1,724	7.5%			1,781	7.6%	1,781	7.5%		
Light Commercial Equipment	1,193		7.9%			1,291	7.8%			1,290	8.3%			1,652	7.8%	1,652	7.8%			1,814	7.5%	1,814	7.5%			1,818	7.8%	1,818	7.8%		
Railyard Operations	1		0.0%			1	0.0%			1	0.0%			1	0.0%	1	0.0%			1	0.0%	1	0.0%			1	0.0%	1	0.0%		
Recreational Equipment	212		1.4%			376	2.3%			430	2.8%			588	2.8%	588	2.8%			802	3.5%	802	3.5%			831	3.5%	831	3.5%		
Transport Refrigeration Units	98		0.7%			107	0.6%			118	0.8%			140	0.7%	140	0.7%			155	0.7%	155	0.7%			163	0.7%	163	0.7%		
Solid Waste	68,512	Tons	26,998	4.93%	72,667	Tons	28,984	4.93%	58,497	Tons	23,566	5.34%	69,031	Tons	25,026	4.98%	25,026	5.95%	75,071	Tons	27,215	5.05%	27,215	6.86%	77,440	Tons	28,074	5.06%	28,074	7.10%	
Solid Waste Generation	68,512	Tons	26,998	100.0%		72,667	Tons	28,592	98.6%	58,497	Tons	23,013	97.7%	62,119	Tons	24,438	97.7%	67,554	Tons	26,576	97.7%	69,685	Tons	27,415	97.7%	27,415	97.7%				
Composting						4,605	Tons	391	1.4%	6,509	Tons	553	2.3%	6,913	Tons	588	2.3%	588	2.3%	7,517	Tons	639	2.3%	639	2.3%	7,755	Tons	659	2.3%	659	2.3%
Water Supply	3,575	MGY	4,466	0.81%	3,010	MGY	2,974	0.51%	3,428	MGY	694	0.16%	3,641	MGY																	

On-Road Transportation															
Source	2005		2015		2019		2030		2040		2045				
	VMT/year	MTCO ₂ e/year	VMT/year	MTCO ₂ e/year	VMT/year	MTCO ₂ e/year	VMT/year	BAU MTCO ₂ e/year	VMT/year	MTCO ₂ e/year	VMT/year	BAU MTCO ₂ e/year			
Passenger	434,135,841	181,172	492,014,849	182,927	509,968,096	173,746	559,587,179	190,651	579,143,509	197,314	599,858,891	204,372			
Commercial	49,496,836	71,692	67,476,778	95,134	62,921,403	85,881	73,664,721	100,545	82,711	83,202,762	113,563	72,405			
Total	483,632,677	252,864	559,491,627	278,061	572,889,499	259,627	633,251,901	291,196	236,310	662,346,271	310,877	218,898	687,876,785	324,507	221,388

Source: 2005 Milpitas GHG Inventory, provided by the City

Source: Milpitas Transportation 2015-2019 Data, provided by SVCE

Source: Transportation Calculations

Sources: CalTrans, BAAQMD, MTC

VMT						
Growth	2005	2015	2019	2030	2040	
Percent Change from 2019			0.00%	10.54%	15.62%	20.07%
VMT Compound Annual Growth Rate						
	0.903%					
	2005	2015	2019	2030	2040	2045
VMT Per Capita	7,885	6,389	6,363	6,624	6,371	6,414

Off-Road Vehicles and Equipment		2005				2015				2019				2030				2040				2045										
	Scaling Factor	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2e (MT/yr)	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2e (MT/yr)	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2e (MT/yr)	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	CO2e (tons/day)	CO2e (MT/yr)	Scaling Factor						
Construction and Mining Equipment	Service Population	11.43381	0.00219	0.00008	11.5	3,813	14.02545	0.00114	0.00007	14.1	4,661	10.46594	0.00080	0.00006	10.5	3,478	17.77665	0.00084	0.00011	17.8	5,903	18.80375	0.00078	0.00011	18.9	6,244	19.48648	0.00081	0.00012	19.5	6,470 Service Population	
Entertainment Equipment	Population	0.10787	0.00001	0.00000	0.1	36	0.13422	0.00001	0.00000	0.1	45	0.13369	0.00001	0.00000	0.1	44	0.12617	0.00000	0.00000	0.1	42	0.11989	0.00000	0.00000	0.1	40	0.12367	0.00000	0.00000	0.1	41 Population	
Industrial Equipment	Employment	24.45336	0.02192	0.00216	25.6	8,490	24.98387	0.00796	0.00140	25.6	8,469	25.36609	0.00738	0.00140	25.9	8,590	32.937	0.00920	0.00181	33.7	11,151	36.053	0.01005	0.00199	36.9	12,206	36.38216	0.01014	0.00201	37.2	12,317 Employment	
Lawn and Garden Equipment	Population	2.85385	0.00564	0.00222	3.6	1,192	3.87925	0.00587	0.00254	4.7	1,561	3.99420	0.00588	0.00257	4.8	1,602	4.15243	0.00602	0.002646	5.0	1,663	4.30443	0.00624	0.00274	5.2	1,724	4.44023	0.00649	0.00285	5.4	1,781 Population	
Light Commercial Equipment	Employment	3.39614	0.00186	0.00058	3.6	1,193	3.70840	0.00105	0.00061	3.9	1,291	3.71626	0.00089	0.00058	3.9	1,290	4.76820	0.00098	0.00073	5.0	1,652	5.23587	0.00107	0.00080	5.5	1,814	5.24871	0.00107	0.00080	5.5	1,818 Employment	
Railyard Operations	Employment	0.00183	0.00000	0.00000	0.0	1	0.00175	0.00000	0.00000	0.0	1	0.00167	0.00000	0.00000	0.0	1	0.00184	0.00000	0.00000	0.0	1	0.00177	0.00000	0.00000	0.0	1 Employment	0.0	1 Employment	0.0	1 Employment	0.0	1 Employment
Recreational Equipment	Population	0.39255	0.00346	0.00057	0.6	212	0.70072	0.00591	0.00102	1.1	376	0.80246	0.00665	0.00117	1.3	430	1.09008	0.00919	0.001611	1.8	588	1.48360	0.01275	0.00220	2.4	802	1.53041	0.01327	0.00229	2.5	831 Population	
Transport Refrigeration Units	Share of Road Miles	0.29162	0.00013	0.00000	0.3	98	0.32192	0.00003	0.00000	0.3	107	0.35620	0.00003	0.00000	0.4	118	0.42195	0.00003	0.00000	0.4	140	0.46609	0.00003	0.00000	0.5	155	0.48987	0.00003	0.00000	0.5	163 Share of Road Miles	
Total						15,034					16,511					15,554					21,139					22,984				23,421		

Source: CARB's OFFROAD2007 and OFFROAD2017, CA DOT

Water Supply		Milpitas Greenhouse Gas Inventory and Forecasts																			
Milpitas Greenhouse Gas Inventory and Forecasts		S C A N I V E R T Y																			
Water																					
2005																					
2015																					
2040																					
2045																					
Water Provider	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)										
SFPUC	1,674	7,489	489.00	0.0302	0.0081	1,671	1,652	7,391	404.51	0.0330	0.0040										
SCVWD	1,623	11,687	489.00	0.0302	0.0081	2,608	1,111	8,001	404.51	0.0330	0.0040										
SBWR	278	834	489.00	0.0302	0.0081	186	246	739	404.51	0.0330	0.0040										
Total	3,575	20,010				4,466	3,009.55	16,131													
2030																					
2040																					
2045																					
Water Provider	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)										
SFPUC	2,293	10,261	0	0.0000	0.0000	-	2,494	11,159	0	0.0000	0.0000										
SCVWD	599	9,747	11,016	13.0564	0.0189	1,475	918	6,607	19.81	0.327	0.0039										
SBWR	61	1,060	7,630	13.0564	0.0189	363	695	1,093	17.81	0.327	0.0039										
Total	2,974	3,428.32	17,322			694															
2019																					
2040																					
2045																					
Water Provider	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)										
SFPUC	2,583	11,151	0	0.0000	0.0000	-	2,583	11,151	0	0.0000	0.0000										
SCVWD	599	9,747	11,016	13.0564	0.0189	1,475	918	6,607	19.81	0.327	0.0039										
SBWR	69	1,060	7,630	13.0564	0.0189	363	695	1,093	17.81	0.327	0.0039										
Total	2,974	3,428.32	17,322			694															

Wastewater Treatment

Milpitas Greenhouse Gas Inventory and Forecasts



Wastewater Treatment Characteristics

WWTP/Septic System	Description	Wastewater Treatment Process, Fugitive and Stationary Greenhouse Gas Emission Sources	U.S. Community Protocol, Appendix F, Equations
San Jose - Santa Clara Regional Wastewater Facility	Solids are lagooned for approximately three years. Secondary treatment process is a step-feed Biological Nutrient Removal (BNR) process that achieves full nitrification (all ammonia is converted to nitrate) and partial de-nitrification (about 65% nitrogen removed as an annual average, about 70% removed in the dry season). The BNR process also removes approximately 90% of the incoming phosphorus. Anaerobic digestion used onsite.	full nitrification and partial de-nitrification, lagoon, anaerobic digestion	WW.1a and alt, WW.2a and alt, WW.6, WW.7, WW.12 and alt, WW.15

Wastewater Emissions Totals	2005	2015	2019	2030 BAU	2030 Leg-Adjust BAU	2040 BAU	2040 Leg-Adjust BAU	2045 BAU	2045 Leg-Adjust BAU
Energy-Related Emissions	980.6	1796.5	1434.8	1524	1,460	1,657	1,526	1,709	1,543
Process Emissions	93.8	133.9	137.7	146	146	159	159	164	164
Stationary Emissions	3.6	4.9	5.6	6	6	6	6	7	7
Total (MT CO₂e/year)	1,078	1,935	1,578	1,676	1,612	1,822	1,692	1,880	1,713

WW.1a Stationary Methane Emissions from Combustion of Digester Gas

	2005	2015	2019	2030	2040	2045
Volume of Digester Gas Produced per Day (scf/day)		1,320,780	1,589,958	1,688,414	1,836,143	1,894,069
Fraction of CH ₄ in Digester Gas		0.61	0.61	0.61	0.61	0.61
BTU of CH ₄	1028	1028	1028	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
CH ₄ emissions factor (kg CH ₄ /MMBTU)	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032
MT CH ₄ /year	0	0.06	0.07	0.07	0.08	0.08
Total MT CO₂e/year	0.00	1.70	1.96	2.08	2.26	2.33

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.1(alt) Stationary Methane Emissions from Combustion of Digester Gas

	2005	2015	2019	2030	2040	2045
Population of Milpitas Served	61,334					
Fraction of CH ₄ in Digester Gas	0.61					
BTU of CH ₄	1028	1028	1028	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
CH ₄ emissions factor (kg CH ₄ /MMBTU)	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032
MT CH ₄ /year	0.0450	0	0	0	0	0
Total MT CO₂e/year	1.26	0.00	0.00	0.00	0.00	0.00

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.2a Stationary Nitrous Oxide Emissions from Combustion of Digester Gas

	2005	2015	2019	2030	2040	2045
Volume of Digester Gas Produced per Day (scf/day)		1,320,780	1,589,958	1,688,414	1,836,143	1,894,069
Fraction of CH ₄ in Digester Gas		0.61	0.61	0.61	0.61	0.61
BTU of N ₂ O	1028	1028	1028	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
N ₂ O emissions factor (kg CH ₄ /MMBTU)	0.00063	0.00063	0.00063	0.00063	0.00063	0.00063
MT N ₂ O/year	0	0.01	0.01	0.01	0.02	0.02
Total MT CO₂e/year	0.00	3.16	3.65	3.88	4.21	4.35

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.2a Stationary Nitrous Oxide Emissions from Combustion of Digester Gas

	2005	2015	2019	2030	2040	2045
Population of Milpitas Served	61,334					
Fraction of CH ₄ in Digester Gas	0.61					
BTU of N ₂ O	1028	1028	1028	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
N ₂ O emissions factor (kg CH ₄ /MMBTU)	0.00063	0.00063	0.00063	0.00063	0.00063	0.00063
MT N ₂ O/year	0.0089	0	0	0	0	0
Total MT CO₂e/year	2.35	0.00	0.00	0.00	0.00	0.00

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.6 Process Methane Emissions from Wastewater Treatment Lagoons

	2005	2015	2019	2030	2040	2045
BOD load (kg/day)	10.78	15.5463	16.4154	17.432	18.957	19.555
Fraction of BOD removed in primary treatment	0.99	0.99	0.99	0.99	0.99	0.99

Maximum CH4 producing capacity for domestic wastewater (kg CH4/kg BOD removed)	0.6	0.6	0.6	0.6	0.6	0.6
CH4 correction factor for anaerobic systems	0.8	0.8	0.8	0.8	0.8	0.8
MT CH4/year	0.02	0.03	0.03	0.03	0.03	0.03
Total MT CO2e/year	0.53	0.76	0.81	0.86	0.93	0.96

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.7 Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification

	2005	2015	2019	2030	2040	2045
Population of Milpitas Served	61,334	87,570	90,030	95,605	103,970	107,250
Factor for industrial and commercial discharge	1.25	1.25	1.25	1.25	1.25	1.25
Emission factor for a WWTP with nitrification or denitrification (g N2O/ person / year)	7	7	7	7	7	7
MT N2O/year	1	0.8	0.8	0.8	0.9	0.9
Total MT CO2e/year	92	132.0	135.7	144.1	156.7	161.6

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.12 Fugitive Nitrous Oxide Emissions from Effluent Discharge

	2005	2015	2019	2030	2040	2045
Average total nitrogen per day (kg N/day)	1.04	1.5670	1.5235	1.6178	1.7594	1.8149
Emission factor (kg N2O-N/kg sewage-N discharged)	0.005	0.005	0.005	0.005	0.005	0.005
Molecular weight ratio of N2O to N2	1.57	1.57	1.57	1.57	1.57	1.57
MT N2O/year	0.00	0.00	0.00	0.00	0.01	0.01
Total MT CO2e/year	0.79	1.19	1.16	1.23	1.34	1.38

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

WW.15 Energy-related Emissions Associated with Wastewater Collection and Treatment

	2005	2015	2019	2030 BAU	2030 Leg-Adjust BAU	2040 BAU	2040 Leg-Adjust BAU	2045 BAU	2045 Leg-Adjust BAU
MWh/year	11,576.43	17,231	25,684	27,275	27,275	29,661	29,661	30,596.83	30,596.83
Emission Factor (lb CO2/MWh)	489	206	198	198	113	198	38	198	0
Emission Factor (lb CH4/MWh)	0.0302	0.0340	0.0327	0.0327	0.01889	0.0327	0.00630	0.0327	0
Emission Factor (lb N2O/MWh)	0.0081	0.0040	0.0039	0.0039	0.00222	0.0039	0.00074	0.0039	0
Total Electricity (MTCO2e/year)	122	102	140	148	85	161	31	166	-
Natural Gas (therms/year)	3,427,462	5,101,718	4,063,308	4,314,923	4,314,923	4,692,460	4,692,460	4,840,495.20	4,840,495.20
Emission Factor (lb CO2/therm)	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Emission Factor (lb CH4/therm)	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742
Emission Factor (lb N2O/therm)	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Total Natural Gas (MTCO2e/year)	859	1,695	1,295	1,375	1,375	1,496	1,496	1,543	1,543
Total MT CO2e/year	981	1,796	1,435	1,524	1,524	1,657	1,657	1,709	1,709

[Source: Water and Wastewater 2015-2019 data, provided by the City](#)

[Source: Milpitas Wastewater Email](#)

	2005	2015	2019
Milpitas Population	61,334	87,570	90,030
WWTP Service Population	1,300,000	1,400,000	1,500,000
MDG	4.576	6.812	6.751

[Source: SJCRWF 2009 Annual Self Monitoring Report](#)

Assumptions and Conversion Factors

Millipitas Greenhouse Gas Inventory and Forecasts



Category	Value	Notes	Source
Conversion Factors			
g/MT	1000000		
g/lb	453.592		
g/kg	1000		
lb/MT	2204.622622		
kg/MT	1000		
MT/ton	0.907185		
g/ton	907185		
lb/kg	2.20462		
kWh/MWh	1000		
MWh/GWh	1000		
gal/cubic foot	7.480519481		
gal/Liter	0.264172052		
Liter/gallon	3.785411784		
gallon/acrefoot	325,851.43		
days/year	365		
million gal/acre-feet	0.325851432		
MMBTU/gallon (diesel)	0.1374		
MMBTU/scf (natural gas)	0.001037		

GWP			
Source (Select)	IPCC Fifth Assessment Report (Avg)		<--drop down selection
Source	CO2 GWP	CH4 GWP	N2O GWP
IPCC Fourth Assessment Report (w/o climate carbon feedback)	1	25	265
IPCC Fourth Assessment Report (with climate carbon feedback)	1	34	298
IPCC Fourth Assessment Report (Avg)	1	25	298
IPCC Fifth Assessment Report (Avg)	1	28	265
IPCC Third Assessment Report	1	23	296
IPCC Second Assessment Report	1	21	310

Electricity Emission Factors	2005	2015	2018	2019	2020	2030	2040	2045	Source
PG&E EF (lb CO2/MWh)	489	404.51	206.29	197.8123	189.3347	113.0356	37.6785	0	reports/eGRID (https://www.theclimateregistry.org/our-members/cris-public-reports/)
CAMX EF (lb CH4/MWh)	0.03024	0.033	0.034	0.0327	0.0315	0.0189	0.0063	0	resource-integrated-database-egrid) eGRID (https://www.epa.gov/energy/emissions-generation/resource-integrated-database-egrid)
CAMX EF (lb N2O/MWh)	0.00808	0.004	0.004	0.00385	0.0037	0.0022	0.0007	0	resource-integrated-database-egrid) eGRID (https://www.epa.gov/energy/emissions-generation/resource-integrated-database-egrid)
CAMX EF (lb CO2/MWh)	724.12	527.9	496.50	478.1111	459.7222	275.8333	91.9444	0	resource-integrated-database-egrid)
PG&E									
Percent Renewable			27%	30%	33%	60%	87%	100%	
Increase in Renewables (from 2018)				3%	6%	33%	60%		
SVCE EF (lb CO2/MWh)				2.34	2.2397	1.3371	0.4457	0.0000	SVCE Inventory

lic- *2005 PG&E emissions factor provided by previous 2005 inventory and confirmed here: https://www.ca-ilg.org/sites/main/files/file-attachments/ghg_emission_factor_guidance.pdf

*2015 data is proxy data from 2014

Fuel Emission Factors			
Fuel	Emission Factor	Unit	Source
Diesel (backup generators)	10.21	kg CO2/gal	Climate Registry 2020 Default Emission Factors
	0.9	g CH4/MMBTU	
	0.4	g N2O/MMBTU	
Natural Gas (backup generators)	0.05444	kg CO2/scf	
	0.9	g CH4/MMBTU	
	0.9	g N2O/MMBTU	

22.5091702	lb CO ₂ /gal	
0.014442768	lb CH ₄ /gal	24.6146049 lb CO _{2e} /gal
0.006419008	lb N ₂ O/gal	
1.157372351	lb CO ₂ /therm	
0.000198416	lb CH ₄ /therm	1.215508297 lb CO _{2e} /therm
0.000198416	lb N ₂ O/therm	

Subarea	Population							Employment							Service Population						
	2005	2015	2019	2020	2030	2040	2045	2005	2015	2019	2020	2030	2040	2045	2005	2015	2019	2020	2030	2040	2045
Milpitas	61,334	87,570	90,030	90,645	95,605	103,970	107,250	39,346	48,180	47,084	46,810	56,035	58,030	60,000	100,680	135,750	137,114	137,455	151,640	162,000	167,250
Rest of County	1,602,943	1,822,105	1,880,973	1,895,690	2,122,150	2,434,350	2,556,799	809,129	1,039,050	1,066,690	1,073,600	1,142,330	1,231,830	1,270,386	2,412,072	2,861,155	2,947,663	2,969,290	3,264,480	3,666,180	3,827,185
Total County	1,664,277	1,909,675	1,971,003	1,986,335	2,217,755	2,538,320	2,664,049	848,475	1,087,230	1,113,774	1,120,410	1,198,365	1,289,860	1,330,386	2,512,752	2,996,905	3,084,777	3,106,745	3,416,120	3,828,180	3,994,435

Source: MTC Plan Bay Area Population 2010-2040

Note: 2005 population and employment data were extrapolated backwards (i.e., backcast) using MTC data for 2010-2040

	Population							Employment							Service Population						
	2005	2015	2019	2020	2030	2040	2045	2005	2015	2019	2020	2030	2040	2045	2005	2015	2019	2020	2030	2040	2045
Percent Change from 2019			0.00%	0.68%	6.1924%	15.48%	19.13%			0.00%	-0.58%	19.01%	23.25%	27.43%			0.00%	0.25%	10.59%	18.15%	21.98%
Percent Change from 2040	--	--	--	--	--	--	3.15%--	--	--	--	--	--	--	3.39%--	--	--	--	--	--	--	3.24%
Percent of Total County	3.69%	4.59%	4.57%	4.56%	4.31%	4.10%	4.03%	4.64%	4.43%	4.23%	4.18%	4.68%	4.50%	4.51%	4.01%	4.53%	4.44%	4.42%	4.44%	4.23%	4.19%

Population Compound Annual Growth Rate 0.69%
Employment Compound Annual Growth Rate 0.75%

Avg Annual Population Percent Change 0.74%
Avg Annual Employment Percent Change 1.11%

Milpitas Municipal Operations Greenhouse Gas Emissions Inventories and Forecasts																										
Emissions Sector	2015 GHG Emissions				2019 GHG Emissions				2030 GHG Emissions				2040 GHG Emissions				2045 GHG Emissions									
	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU		Leg-Adjust BAU		BAU		Leg-Adjust BAU		BAU		Leg-Adjust BAU							
									BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total	BAU Activity	Units	MTCO ₂ e	MTCO ₂ e % of Annual Total						
Buildings and Facilities		2,001	39.86%		870	26.74%		919	26.74%	889	30.42%		942	26.74%	897	32.33%	954	26.74%	900	32.64%						
Electricity	6,357	MWh	1,192	59.6%	7,568	MWh	8	0.9%	7,994	MWh	8	0.5%	8,196	MWh	9	0.9%	2	0.2%	8,299	MWh	9	0.9%				
Natural Gas	150,551	Therms	799	40.0%	155,596	Therms	826	95.0%	164,371	Therms	873	95.0%	848	95.4%	168,527	Therms	895	95.0%	858	95.7%	170,644	Therms	906	95.0%		
Backup Generators (Diesel)	903	Gallons	9	0.5%	3,456	Gallons	35	4.1%	3,651	Gallons	37	4.1%	36	4.1%	3,743	Gallons	38	4.1%	37	4.1%	3,790	Gallons	39	4.1%		
Streetlights and Traffic Signals	3,007	MWh	564	11.23%	2,951	MWh	3	0.10%	3,117	MWh	3	0.10%	2	0.06%	3,196	MWh	3	0.10%	1	0.02%	3,236	MWh	3	0.10%		
Electricity	3,007	MWh	564	100.0%	2,951	MWh	3	100.0%	3,117	MWh	3	100.0%	2	100.0%	3,196	MWh	3	100.0%	1	100.0%	3,236	MWh	3	100.0%		
Employee Commute	3,508,561	VMT	1,304	25.99%	3,508,561	VMT	1,195	36.76%	3,706,429	VMT	1,263	36.76%	1,017	34.81%	3,800,139	VMT	1,295	36.76%	961	34.66%	3,847,879	VMT	1,311	36.76%		
Employee Commute	3,508,561	VMT	1,304	100.0%	3,508,561	VMT	1,195	100.0%	3,706,429	VMT	1,263	100.0%	1,017	100.0%	3,800,139	VMT	1,295	100.0%	961	100.0%	3,847,879	VMT	1,311	100.0%		
Vehicle Fleet	110,905	Gallons	1,017	20.27%	117,581	Gallons	1,081	33.24%	124,212	Gallons	1,142	33.24%	925	31.64%	127,353	Gallons	1,171	33.24%	840	30.29%	128,952	Gallons	1,185	33.24%		
Gasoline	88,875	Gallons	790	77.6%	92,606	Gallons	823	76.1%	97,829	Gallons	869	76.1%	700	75.7%	100,302	Gallons	891	76.1%	662	78.8%	101,562	Gallons	902	76.1%		
Diesel	22,030	Gallons	228	22.4%	24,975	Gallons	258	23.9%	26,383	Gallons	273	23.9%	224	24.3%	27,051	Gallons	280	23.9%	178	21.2%	27,390	Gallons	283	23.9%		
Solid Waste	154	Tons	52	1.03%	157	Tons	53	1.62%	166	Tons	56	1.62%	56	1.91%	170	Tons	57	1.62%	57	2.06%	172	Tons	58	1.62%		
Water Supply	77	MGY	70	1.40%	155	MGY	41	1.26%	164	MGY	43	1.26%	25	0.85%	168	MGY	44	1.26%	8	0.30%	170	MGY	45	1.26%		
Wastewater Treatment			11	0.23%			9	0.28%			10	0.28%	9	0.32%			10	0.28%	9	0.33%			10	0.28%		
Total MTCO ₂ e/yr			5,019	100%			3,252	100%			3,435	100%	2,923	100%			3,522	100%	2,773	100%			3,567	100%	2,759	100%

Employee Commute	2015		2019		2030		2040		2045						
	Source	VMT/year	MTCO ₂ e/year	VMT/year	MTCO ₂ e/year	Scaling Factor	VMT/year	BAU MTCO ₂ e/year	Leg-Adjust BAU MTCO ₂ e/year	VMT/year	BAU MTCO ₂ e/year	Leg-Adjust BAU MTCO ₂ e/year	VMT/year	BAU MTCO ₂ e/year	Leg-Adjust BAU MTCO ₂ e/year
Employee Commute		3,508,561	1,304	3,508,561	1,195	Employment	3,706,429	1,263	1,017	3,800,139	1,295	961	3,847,879	1,311	961
Total		3,508,561	1,304	3,508,561	1,195		3,706,429	1,263	1,017	3,800,139	1,295	961	3,847,879	1,311	961

Source: Municipal Employee data, provided by the City

Vehicle Fleet
Milpitas Municipal Operations Greenhouse Gas Inventories and Forecasts

ASC

Vehicle Fleet	2015										2019										2030				2040				2045			
	Source	gallons/year	Emissions Factor (kg CO ₂ /gal)	MT CO ₂ /year	Emissions Ratio (MT CH ₄ /MT CO ₂)	Emissions Ratio (MT N ₂ O/MT CO ₂)	Total MT CO _{2e} /year	gallons/year	Emissions Factor (kg CO ₂ /gal)	MT CO ₂ /year	Emissions Ratio (MT CH ₄ /MT CO ₂)	Emissions Ratio (MT N ₂ O/MT CO ₂)	Total MT CO _{2e} /year	Scaling Factor	gallons/year	BAU Total MT CO _{2e} /year	Leg-Adjust BAU Total MT CO _{2e} /year	gallons/year	BAU Total MT CO _{2e} /year	Leg-Adjust BAU Total MT CO _{2e} /year	gallons/year	BAU Total MT CO _{2e} /year	Leg-Adjust BAU Total MT CO _{2e} /year	gallons/year	BAU Total MT CO _{2e} /year	Leg-Adjust BAU Total MT CO _{2e} /year						
Gasoline		88,875	8.78	780.32	0.0000237	0.0000429	789.79	92,606	8.78	813.08	0.0000237	0.0000429	822.86	Employment	97,829	869.27	700.33	100,302	891.25	661.70	101,562	902.44	661.61									
Diesel		22,030	10.21	224.93	0.0000237	0.0000429	227.63	24,975	10.21	254.99	0.0000237	0.0000429	258.06	Employment	26,383	272.63	224.26	27,051	279.51	178.21	27,390	283.02	168.53									
Total							1,017						1,081				1,142		925		1,171		840		1,185		830					

Source: Milpitas Municipal Vehicle Fleet Usage

Solid Waste

Milpitas Municipal Operations Greenhouse Gas Inventories and Forecasts



Solid Waste Emissions Totals	2015	2019	2030	2040	2045
Total (MTCO2e/year)	52	53	56	57	58
Municipal-Generated Solid Waste	2015	2019	2030	2040	2045
Municipal Employees	512	524	554	568	575
Average Solid Waste Disposal Per Employee (tons/employee/year)	0.3	0.3	0.3	0.3	0.3
Solid Waste Disposal (tons)	153.6	157.2	166.1	170.3	172.4
LFG Capture Rate	75%	75%	75%	75%	75%
Percent of Landfills Accepting Waste from Milpitas with LFG Capture	89%	89%	89%	89%	89%
Oxidation Rate	0.1	0.1	0.1	0.1	0.1
EPA Emissions Factor (MTCH4/wet short ton)	0.06	0.06	0.06	0.06	0.06
Total Emissions (MTCO2e/year)	51.61	52.82	55.80	57.21	57.93

Water Provider	2015					2019					2030					2040					2045												
	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	Total CO2e	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	BAU Total CO2e (MT/year)	Leg-Adjusted BAU Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	BAU Total CO2e (MT/year)	Leg-Adjusted BAU Total CO2e (MT/year)	MGY	Total MWh	Emission Factor (lb CO2/MWh)	Emission Factor (lb CH4/MWh)	Emission Factor (lb N2O/MWh)	BAU Total CO2e (MT/year)	Leg-Adjusted BAU Total CO2e (MT/year)
DPW	35	155	404.51	0.0330	0.0040	29	62	277	404.51	0.0330	0.0040	0.0000	61	293	404.51	0.0330	0.0040	0	0.0000	67	300	404.51	0.0330	0.0040	0	0.0000	68	304	404.51	0.0330	0.0040	0	0.0000
SCVWD	23	166	404.51	0.0330	0.0040	31	41	297	197.81	0.0327	0.0039	0.0039	27	44	314	113.0356164	0.0189	0.0022	28	45	322	37.67853881	0.0063	0.0007	29	45	326	0	0.0000	30	-		
SBWR	20	59	404.51	0.0330	0.0040	11	52	154	197.81	0.0327	0.0039	0.0039	14	54	163	113.0356164	0.0189	0.0022	15	56	167	37.67853881	0.0063	0.0007	15	57	169	0	0.0000	15	-		
Total	78	380				70	154.79	725				41	163.51	770				43	167.65	790			44	169.75	800			45					

Source: Milpitas Municipal Water 2015, provided by the City

Source: Milpitas Municipal Water 2019, provided by the City

Wastewater Treatment Characteristics

WWTP/Septic System	Description	Wastewater Treatment Process, Fugitive and Stationary Greenhouse Gas Emission Sources	U.S. Community Protocol, Appendix F, Equations
San Jose - Santa Clara Regional Wastewater Facility	Solids are digested for approximately three years. Secondary treatment process is a step-fed Biological Nutrient Removal (BNR) process that achieves full nitrification (all ammonia is converted to nitrate) and partial denitrification (50% nitrogen removed as an annual average). 40% nitrogen is removed in the dry season. The wastewater also removes approximately 90% of the incoming phosphorus. Anaerobic digestion used onsite.	full nitrification and partial denitrification, lagoon, anaerobic digestion	WW.1a and alt. WW.2a and alt. WW.6, WW.7, WW.12 and alt. WW.15

Wastewater Emissions Totals 2015 2019 2030 BAU 2030 Leg-Adjust 2040 BAU 2040 Leg-Adjust B:2045 BAU 2045 Leg-Adjust BAU

Total (MTCO ₂ /year)	11	9	10	9	10	9	10	9
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WW.1a Stationary Methane Emissions from Combustion of Digester Gas

	2015	2019	2030	2040	2045
Volume of Digester Gas Produced per Day (scf/day)	483	555	587	602	609
Fraction of CH ₄ in Digester Gas	0.61	0.61	0.61	0.61	0.61
BTU of CH ₄	1028	1028	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001	0.000001	0.000001
CH ₄ emissions factor (kg CH ₄ /MMBTU)	0.00032	0.00032	0.00032	0.00032	0.00032
MT CH ₄ /year	0.00035	0.00041	0.00043	0.00044	0.00045
Total MT CO ₂ /year	0.0099	0.0114	0.0120	0.0123	0.0125

Source: Municipal Wastewater 2015 and 2019 data, provided by the City

WW.2a Stationary Nitrous Oxide Emissions from Combustion of Digester Gas

	2015	2019	2030	2040	2045
Volume of Digester Gas Produced per Day (scf/day)	483	555	587	602	609
Fraction of CH ₄ in Digester Gas	0.61	0.61	0.61	0.61	0.61
BTU of CH ₄	1028	1028	1028	1028	1028
BTU to MMBTU conversion	0.000001	0.000001	0.000001	0.000001	0.000001
N ₂ O emissions factor (kg CH ₄ /MMBTU)	0.00063	0.00063	0.00063	0.00063	0.00063
MT N ₂ O/year	0.0007	0.0008	0.0008	0.0008	0.0009
Total MT CO ₂ /year	0.0185	0.0212	0.0224	0.0224	0.0225

Source: Municipal Wastewater 2015 and 2019 data, provided by the City

WW.6 Process Methane Emissions from Wastewater Treatment Lagoons

	2015	2019	2030	2040	2045
BOD removed	0.0206	0.0362	0.0382	0.0392	0.0397
Fraction of BOD removed in primary treatment	0.99	0.99	0.99	0.99	0.99
Maximum CH ₄ producing capacity for domestic wastewater (kg CH ₄ /kg BOD removed)	0.6	0.6	0.6	0.6	0.6
CH ₄ correction factor for anaerobic systems	0.8	0.8	0.8	0.8	0.8
MT CH ₄ /year	0.00036	0.00063	0.00067	0.00069	0.00070
Total MT CO ₂ /year	0.0010	0.0018	0.0019	0.0019	0.0019

Source: Municipal Wastewater 2015 and 2019 data, provided by the City

WW.7 Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification

	2015	2019	2030	2040	2045
Population of Milpitas Municipal Employees	512	524	554	568	575
Factor for industrial and commercial discharge	1.25	1.25	1.25	1.25	1.25
Emission factor for a WWTP with nitrification or denitrification (g N ₂ O/person/year)	7	7	7	7	7
MT N ₂ O/year	0.0029	0.0030	0.0031	0.0032	0.0033
Total MT CO ₂ /year	0.77	0.79	0.83	0.86	0.87

Source: Municipal Wastewater 2015 and 2019 data, provided by the City

WW.12 Fugitive Nitrous Oxide Emissions from Effluent Discharge

	2015	2019	2030	2040	2045
Average total nitrogen per day (kg N/day)	0.0017	0.0031	0.00327	0.00336	0.00346
Emission factor (kg N ₂ O-N/kg sewage-N discharged)	0.005	0.005	0.005	0.005	0.005
Molecular weight ratio of N ₂ O to N ₂	1.57	1.57	1.57	1.57	1.57
MT N ₂ O/year	0.000049	0.000089	0.000094	0.000096	0.000097
Total MT CO ₂ /year	0.0013	0.0024	0.0025	0.0025	0.0026

Source: Municipal Wastewater 2015 and 2019 data, provided by the City

WW.15 Energy-related Emissions Associated with Wastewater Collection and Treatment

	2015	2019	2030 BAU	2030 Leg-Adjust	2040 BAU	2040 Leg-Adjust B:2045 BAU	2045 Leg-Adjust BAU
MWh/year	6.30	8.97	9.48	9.72	9.84	9.84	9.84
Emission Factor (lb CO ₂ /MWh)	206	198	198	198	38	198	0
Emission Factor (lb CH ₄ /MWh)	0.0340	0.0327	0.01889	0.0327	0.00630	0.0327	0
Emission Factor (lb N ₂ O/MWh)	0.0040	0.0039	0.0022	0.0039	0.0074	0.0039	0
Total Electricity (MTCO ₂ /year)	0.595	0.813	0.809	0.880	0.892	0.892	0.892
Natural Gas (therm/year)	1,294	1,419	1,499	1,537	1,537	1,537	1,537
Emission Factor (lb CO ₂ /therm)	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Emission Factor (lb CH ₄ /therm)	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742	0.000226742
Emission Factor (lb N ₂ O/therm)	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Total Natural Gas (MTCO ₂ /year)	9.908	7.538	7.963	8.164	8.164	8.267	8.267
Total MT CO ₂ /year	10.504	8.351	8.822	8.454	9.045	8.332	9.158

Source: Water and Wastewater 2015-2019 data, provided by the City

Source: Milpitas Wastewater 2015

Assumptions and Conversion Factors
Milpitas Municipal Operations Greenhouse Gas Inventories and Forecasts



Category	Value	Notes	Source
Conversion Factors			
g/MT	1000000		
g/lb	453.592		
g/kg	1000		
lb/MT	2204.626262		
kg/MT	1.000		
MT/ton	0.001185		
g/ton	907185		
lb/kg	2.20462		
kWh/MWh	1000		
MWh/GWh	1000		
gal/cubic foot	7.480519481		
gal/Liter	0.264172052		
Liter/gallon	3.785411784		
gallon/acrefoot	325851.429		
dry ton	907		
million gal/acre-foot	0.325851432		
MMBtu/gallon (diesel)	0.1374		
MMBtu/scf (natural gas)	0.001037		

GWP			
Source (Select)	IPCC Fifth Assessment Report (Avg)	<--drop down selection	
CO2	1		
CH4	28		
N2O	265		
Source	CO2 GWP	CH4 GWP	N2O GWP
IPCC Fourth Assessment Report (w/o climate carbon feedback)	1	25	265
IPCC Fourth Assessment Report (with climate carbon feedback)	1	34	298
IPCC Fourth Assessment Report (Avg)	1	25	298
IPCC Fifth Assessment Report (Avg)	1	28	265
IPCC Third Assessment Report	1	23	296
IPCC Second Assessment Report	1	21	310

Electricity Emission Factors	2005	2015	2018	2019	2020	2030	2040	2045	Source
PG&E EF (lb CO2/MWh)	489	404.51	206.29	197.8123	189.3347	113.0356	37.6785		https://www.theclimateregistry.org/our-members/cris-public-0_repcr/
CAMX EF (lb CH4/MWh)	0.03024	0.033	0.034	0.0327	0.0315	0.0189	0.0063		eGRID (https://www.epa.gov/energy/missions-generation-resource-0_integrated-database-eGRID)
CAMX EF (lb N2O/MWh)	0.00808	0.004	0.004	0.00385	0.0037	0.0022	0.0007		eGRID (https://www.epa.gov/energy/missions-generation-resource-0_integrated-database-eGRID)
CAMX EF (lb CO2/MWh)	724.12	527.9	496.50	478.1111	459.7222	275.8333	91.9444		eGRID (https://www.epa.gov/energy/missions-generation-resource-0_integrated-database-eGRID)
RPS Requirements									
PG&E									
Percent Renewable				27%	30%	33%	60%	87%	100%
Increase in Renewables (from 2018)				3%	6%	33%	60%		
SVCE EF (lb CO2/MWh)				2.34	2.2397	1.3371	0.4457	0.0000	SVCE Inventory

Fuel Emission Factors			
Gasoline	8.78 kg CO2/gal	Climate Registry Default Emission Factors 2020	
Boats - Gasoline 4-stroke	5.443 g CH4/gal	Climate Registry Default Emission Factors 2020	
Boats - Gasoline 4-stroke	0.061 g N2O/gal	Climate Registry Default Emission Factors 2020	

Fuel Emission Factors	Emission Factor	Unit	Source
Gasoline (transport fuel)	8.78 kg CO2/gal		
	0.0004937 MT CH4/MT CO2	MT CH4/MT CO2	
	0.0004937 MT N2O/MT CO2	MT N2O/MT CO2	
Diesel (transport fuel)	10.21 kg CO2/gal		
	0.000237 MT CH4/MT CO2	MT CH4/MT CO2	
	0.000237 MT N2O/MT CO2	MT N2O/MT CO2	
Diesel (backup generators)	22.5091702 lb CO2/gal	2020 Default Emission Factors	
	0.014442768 lb CH4/gal		24.6146049 lb CO2e/gal
	0.006419008 lb N2O/gal		
	0.157372351 lb CO2/therm		
	0.000198416 lb CH4/therm		
Natural Gas (backup generator)	0.05444 kg CO2/scf		
	0.916 g CH4/MMBTU		1.215508297 lb CO2e/therm
	0.916 g N2O/MMBTU		0.000198416 lb N2O/therm

*2005 PG&E emissions factor provided by previous 2005 inventory and confirmed here:

https://www.ca-ilg.org/sites/main/files/file-attachments/ghg_emission_factor_guidance.pdf

*2015 data is proxy data from 2016

Demographics

Milpitas Municipal Operations Greenhouse Gas Inventories and Forecasts



Municipal Employees	2015	2019	2030	2040	2045
Milpitas	512	524	554	568	575
Percent Growth from 2019	--	0	0.0564	0.0831	0.0967
Percent Growth from 2040	--	--	--	0	0.012563

Employment Growth Rate 2019 to 2030 0.50%

Employment Growth Rate 2030 to 2045 0.25%

Note from City:

Given the numbers below with a 1% growth factor, I suggest a 0.5% growth factor until 2030 and then reduce it to 0.25%. By 2030, the City will be build out and we may only add staff for enhancing services.

Appendix B

**Greenhouse Gas Reduction Targets,
Measures, and Prioritization Matrices**

Memo



1111 Broadway, Suite 300
Oakland, CA 94607
916.444.7301

Date: October 1, 2021

To: Elaine Marshall (City of Milpitas)

From: Honey Walters, Hannah Kornfeld, and Sam Ruderman (Ascent Environmental)

Subject: City of Milpitas Climate Action Plan Update, Greenhouse Gas Reduction Measures – Technical Memorandum

1 INTRODUCTION

This technical memorandum outlines greenhouse gas (GHG) reduction strategies and measures and summarizes the preliminary draft results of the quantitative “gap analysis” process for the City of Milpitas’s (City’s) Climate Action Plan Update (CAP Update). The purpose of the gap analysis is to confirm and quantify the suite of GHG reduction measures that would set the City on course to meet its reduction targets for 2030, 2040, and 2045 for both the community and municipal operations.

The gap analysis process considers several steps in the climate action planning process, which are listed below and addressed in subsequent sections.

1. Summary of the 2030, 2040, and 2045 GHG emissions forecasts (per “City of Milpitas Climate Action Plan Update, Greenhouse Gas Emissions Forecasts – Technical Memorandum” dated April 1, 2021);
2. Summary of the 2030, 2040, and 2045 GHG emissions reduction targets (discussed further in this technical memorandum); and
3. Quantification of GHG emissions reduction measures and evaluation of the calculated gap between the estimated GHG reductions and the recommended targets, the primary focus of this technical memorandum. This section also identifies co-benefits for each measure.

2 GREENHOUSE GAS EMISSIONS FORECASTS

As part of the CAP Update development process, GHG emissions forecasts were calculated to estimate future levels of community and municipal operations emissions, absent City-specific reduction measures. Emissions forecasts were prepared for legislative-adjusted “business-as-usual” (BAU) scenarios for 2030, 2040, and 2045 for both the community and municipal operations. The community legislative-adjusted BAU forecast scenario accounts for anticipated growth in community emissions associated with changes and growth in the city, along with legislative actions to reduce emissions because of State and federal regulations, programs, or other mandated actions. The municipal operations legislative-adjusted BAU forecast scenario accounts for anticipated municipal growth as well as relevant State and federal legislative actions that are expected to reduce emissions. A summary of legislative reductions applied in the legislative-adjusted BAU forecast scenarios is provided in the City of Milpitas Climate Action Plan Update, Greenhouse Gas Emissions Forecasts – Technical Memorandum” dated April 1, 2021 (hereafter referenced as “Forecasts Memo”).

2.1 COMMUNITY GREENHOUSE GAS EMISSIONS FORECASTS

The legislative-adjusted BAU forecasts for the City's community GHG emissions are summarized in Table 1. Under the legislative-adjusted BAU forecast, the City's GHG emissions are projected to decrease by approximately 10 percent between 2019 and 2045, despite an increase of 19 percent in population. Further details with respect to the community GHG emissions forecasts are discussed in the Forecasts Memo.

Table 1 City of Milpitas 2019 Community GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e)

Sector	2019	2030	2040	2045
Residential Building Energy	42,218	42,660	43,399	43,658
Nonresidential Building Energy	98,319	93,467	82,288	77,177
On-Road Transportation	259,627	236,310	218,898	221,388
Off-Road Vehicles and Equipment	15,554	21,139	22,984	23,421
Solid Waste	23,566	25,026	27,215	28,074
Water Supply	694	421	153	0
Wastewater Treatment	1,578	1,612	1,692	1,713
Total	441,557	420,636	396,629	395,432

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent.

Source: Forecasts prepared by Ascent Environmental in 2021.

2.2 MUNICIPAL OPERATIONS GREENHOUSE GAS EMISSIONS FORECASTS

The legislative-adjusted BAU forecasts for the City's municipal operations GHG emissions are summarized in Table 2. Under the legislative-adjusted BAU forecast, municipal operations GHG emissions are projected to decrease by approximately 15 percent between 2019 and 2045, despite a 10 percent increase in municipal employment. Further details with respect to the municipal operations GHG emissions forecasts are discussed in the Forecasts Memo.

Table 2 City of Milpitas 2019 Municipal Operations GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts (MTCO₂e)

Sector	2019	2030	2040	2045
Buildings and Facilities	870	889	897	900
Streetlights and Traffic Signals	3	2	1	0
Employee Commute	1,195	1,017	961	961
Vehicle Fleet	1,081	925	840	830
Solid Waste	53	56	57	58
Water Supply	41	25	8	0
Wastewater Treatment	9	9	9	9
Total	3,252	2,923	2,773	2,759

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent.

Source: Forecasts prepared by Ascent Environmental in 2021.

3 GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

As directed in Assembly Bill (AB) 32, Senate Bill (SB) 32, Executive Order (EO) B-55-18, and EO S-3-05, the State aims to reduce annual GHG emissions to:

- ▶ 1990 levels by 2020;
- ▶ 40 percent below 1990 levels by 2030;
- ▶ carbon neutrality by 2045; and
- ▶ 80 percent below 1990 levels by 2050.

Signed in 2019, EO B-55-18 established a new statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and achieve net negative emissions thereafter. The carbon neutrality goal is separate from and complements existing statewide targets and goals for reducing GHG emissions. EO B-55-18 is the first California executive order or legislative action to explicitly mention the use of carbon sequestration to achieve GHG reduction targets and goals; therefore, it is distinct from other State reduction targets and goals and does not compete or conflict with existing policies.

The City aims to reduce GHG emissions in proportion to the State's targets and goals. Community emissions levels from 1990 are not available, which is the case for most local jurisdictions in California. Thus, community GHG reduction targets for the City's CAP Update were developed relative to the City's 2005 community emissions inventory, and municipal operations targets were developed relative to the 2019 municipal operations inventory, consistent with guidance provided by the California Air Resources Board (CARB). Community GHG emissions in 2005 were 547,972 metric tons of carbon dioxide equivalent (MTCO₂e), and municipal operations emissions in 2019 were 3,252 MTCO₂e. The methodology used to calculate the City's emissions reduction targets is described below.

3.1 CALIFORNIA'S 2017 CLIMATE CHANGE SCOPING PLAN AND 2005 GHG INVENTORY

CARB's 2017 Climate Change Scoping Plan (2017 Scoping Plan) reports statewide GHG emissions for eight sectors: agriculture, residential and commercial, electric power, high global warming potential (GWP) gases, industrial, recycling and waste, transportation, and cap-and-trade program (CARB 2017). CARB's 2005 California GHG inventory also reports statewide GHG emissions for these eight sectors (CARB 2020). For each sector, the 2017 Scoping Plan reports the 1990 emissions levels and ranges of reductions needed by 2030 for the State to achieve the SB 32 target of reducing statewide emissions to 40 percent below 1990 levels. CARB estimates that some emissions sectors will need to achieve greater proportional reductions than others to achieve the 2030 target because of multiple factors (e.g., the 2017 Scoping Plan assumes 2030 emissions reductions up to 72 percent below 1990 levels for the electric power sector, and up to 15 percent below 1990 levels for the industrial sector). This technical memorandum is based on the low end of the emissions range for each sector reported in the 2017 Scoping Plan because this scenario places less emphasis on reductions associated with the Cap-and-Trade Regulation and requires greater reductions from other State and local actions. Use of these emissions estimates resulted in the development of more stringent GHG reduction targets for the target years. CARB reports the overall statewide emissions reductions needed to achieve the State's 2050 goal, but to-date has not analyzed or reported needed emissions reductions by sector to achieve the 2050 goal, nor has it analyzed or reported reductions by sector required to meet the carbon neutrality goal in 2045.

Chapter 5, "Achieving Success," of the 2017 Scoping Plan recommends several approaches for local plan-level projects to show consistency with State targets. As an overall goal, "CARB recommends statewide targets of no more than six metric tons CO₂e per capita by 2030 and no more than two metric tons CO₂e per capita by 2050" (CARB 2017:99). However, not all emissions sector reductions can be achieved at the local level because local agencies often

do not have jurisdiction over the emissions sectors included in the statewide inventory used to develop the statewide targets. CARB includes the following recommendations for demonstrating how local jurisdictions can demonstrate consistency with statewide targets. The following language in the 2017 Scoping Plan is related to local plan-level GHG reduction goals (CARB 2017:100):

CARB advises that local governments also develop community-wide GHG emissions reduction goals necessary to reach 2030 and 2050 climate goals. Emissions inventories and reduction goals should be expressed in mass emissions, per capita emissions, and service population emissions. To do this, local governments can start by developing a community-wide GHG emissions target consistent with the accepted protocols as outlined in OPR's General Plan Guidelines Chapter 8: Climate Change. They can then calculate GHG emissions thresholds by applying the percent reductions necessary to reach 2030 and 2050 climate goals (i.e., 40 percent and 80 percent, respectively) to their community-wide GHG emissions target. Since the statewide per capita targets are based on the statewide GHG emissions inventory that includes all emissions sectors in the state, it is appropriate for local jurisdictions to derive evidence-based local per capita goals based on local emissions sectors and population projections that are consistent with the framework used to develop the statewide per capita targets. The resulting GHG emissions trajectory should show a downward trend consistent with the statewide objectives. The recommendation for a community-wide goal expands upon the reduction of 15 percent from "current" (2005-2008) levels by 2020 as recommended in the 2008 Scoping Plan.

As discussed above, the statewide per capita targets account for all emissions sectors in the State's GHG emissions inventory, statewide population forecasts for 2030 and 2050, and all statewide reductions necessary to achieve the 2030 statewide target under SB 32 in all sectors. The per capita targets reported in the Scoping Plan are framed as targets that must be met on a statewide basis; however, this does not mean that the statewide per capita targets must be applied uniformly to every local jurisdiction or special district.

3.2 COMMUNITY GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

Based on a review of the 2017 Scoping Plan and an understanding of activities occurring within the city, the City has direct or indirect jurisdiction over activities that generate emissions and contribute to reductions in four of the eight emissions sectors included in the 2017 Scoping Plan: residential and commercial, electric power, recycling and waste, and transportation. The City does not have jurisdiction over agricultural activities nor is any agriculture present within City boundaries. The City also has limited influence over high GWP gases, and industrial activities in the city are very limited. Lastly, no facilities regulated under the State's Cap-and-Trade Regulation exist within city boundaries. Therefore, by excluding these sectors under this approach, community GHG reduction targets would be established in proportion with statewide reductions for all sectors relevant to City jurisdiction to the extent feasible using available data. This target setting approach is consistent with the California Supreme Court decision in *Center for Biological Diversity v. California Department of Fish and Wildlife and Newhall Land and Farming* (2015) 62 Cal.4th 204, which determined that the approach of assessing a project's consistency with statewide emission reduction goals must include a "reasoned explanation based on substantial evidence" that links the project's emission to the statewide GHG reduction goals.

The first step in determining community targets under this approach is to compare the State's GHG inventories for 1990 and 2005 (i.e., the City's baseline inventory year) for the relevant sectors (i.e., excluding agriculture, high GWP, industrial, and Cap-and-Trade). All sectors that were included in the 2017 Scoping Plan are shown below in Table 3 for 1990, 2005, 2020, and 2030. According to the inventories available from CARB, statewide emissions from the relevant sectors were approximately 311 million MTCO₂e (MMTCO₂e) in 1990 and 346 MMTCO₂e in 2005 (CARB 2020) (note: sector-specific emissions totals and reductions reported in the 2017 Scoping Plan reflect rounding). Thus, 2005 statewide emissions were approximately 35 MMTCO₂e (11 percent) higher than the 1990 level and the State's 2020 GHG target (i.e., reduce emissions to 1990 levels by 2020).

Table 3 2017 Climate Change Scoping Plan Estimated Change in Emissions by Sector

GHG Emissions by Sector (MMTCO ₂ e)	1990	2005	2020	2030 ¹
Agriculture	26	34	36	24
Residential and Commercial	44	43	50	38
Electric Power	108	108	104	30
High GWP	3	9	31	8
Industrial	98	95	94	83
Recycling and Waste	7	8	9	8
Transportation	152	187	185	103
Cap-and-Trade	NA	NA	-78	-34
Natural and Working Lands Net Sink	-7	NA	NA	NA
Total	431	484	431	260
Adjusted Total (Excludes Agriculture, High GWP, Industrial, and Cap-and-Trade Sectors)	311	346	348	179

Notes: GHG = greenhouse gases; GWP = global warming potential; MMTCO₂e = million metric tons of carbon dioxide equivalent; NA = not applicable.

¹ The 2030 values shown are from the lower end of the ranges reported in the 2017 Climate Change Scoping Plan, Table 3.

Source: CARB 2014; CARB 2017; CARB 2020.

According to the 2017 Scoping Plan, statewide emissions from sectors relevant to the City's inventory must be reduced to 311 MMTCO₂e by 2020 for the State to achieve its 2020 goal. Relative to 2005 levels of 346 MMTCO₂e, this translates to a reduction of 35 MMTCO₂e, or 10 percent. In addition to this target, the City's 2013 CAP also included a target to reduce GHG emissions by 15 percent below 2005 levels by 2020.

Based on an updated inventory of GHG emissions, community emissions in the city in 2019 were 441,557 MTCO₂e. The 2019 emissions level represents a reduction of approximately 19 percent below 2005 levels and is lower than the City's estimated target for 2020 of 493,111 MTCO₂e, as shown in Table 4, as well as the target previously set in the City's 2013 CAP (i.e., a 15 percent reduction below 2005 levels by 2020). Consequently, no further reductions from 2005 emissions levels are needed from the relevant sectors to reach the 2020 target, so discussion regarding the 2020 target is excluded from the remainder of this technical memorandum.

According to the 2017 Scoping Plan, statewide emissions from the sectors relevant to the City's inventory must be reduced to 179 MMTCO₂e by 2030 for the State to achieve its 2030 goal. This represents an emissions reduction of approximately 167 MMTCO₂e, or 48 percent, by 2030, relative to 2005 levels of 346 MMTCO₂e. Consistent with the State's goal under EO B-55-18, the City has chosen to adopt a target to achieve carbon neutrality no later than 2045. An interim 2040 target was also established based on interpolation between the 2030 and 2045 targets. Therefore, consistent with State targets and goals and considering relevant emissions sectors, the City's community GHG reduction targets are as follows:

- ▶ 2030 target: 48 percent below 2005 levels (283,817 MTCO₂e);
- ▶ 2040 target: 83 percent below 2005 levels (94,606 MTCO₂e); and
- ▶ 2045 target: carbon neutrality (0 MTCO₂e).

Table 4 shows how the City's targets were derived based on adjusted statewide GHG emissions data and projections and summarizes the targets for 2020, 2030, 2040, and 2045.

Table 4 Statewide and City of Milpitas Community GHG Emissions Reduction Targets Below 2005 Levels

Source	2020	2030	2040	2045
2017 Scoping Plan Emissions Limit (MMTCO ₂ e)	431	260	NA	NA
Adjusted 2017 Scoping Plan Emissions Limit ¹ (MMTCO ₂ e)	311	179	NA	NA
City Community Target Percent Reduction from 2005 Levels	10%	48%	83%	Carbon Neutrality
City Community Target Annual Emissions (MTCO ₂ e)	493,111	283,817	94,606	0

Notes: GHG = greenhouse gases; MTCO₂e = metric tons of carbon dioxide equivalent; MMTCO₂e = million metric tons of carbon dioxide equivalent; NA = not applicable.

¹ Excludes agriculture, high GWP, industrial, and cap-and-trade sectors because they are not relevant to the City's inventory.

Source: Calculated by Ascent Environmental in 2021.

In 2021, the City conducted a 2019 GHG emissions inventory for community emissions. Based on the City's 2019 inventory, emissions were 441,557 MTCO₂e. Applying the above targets to the 2019 emissions level results in the following targets:

- ▶ 2030 target: 36 percent below 2019 levels (283,817 MTCO₂e);
- ▶ 2040 target: 79 percent below 2019 levels (94,606 MTCO₂e); and
- ▶ 2045 target: carbon neutrality (0 MTCO₂e).

The City's community targets relative to the 2019 emissions level are used throughout the remainder of this technical memorandum and will be used in the CAP. These targets, along with the legislative-adjusted BAU forecast emissions and estimated reductions required to achieve the targets, are summarized in Table 5.

Table 5 City of Milpitas Community Legislative-Adjusted BAU Emissions Forecast and GHG Emissions Reduction Targets Below 2019 Levels

Source	2019	2030	2040	2045
Community Emissions and Legislative-Adjusted BAU Forecast (MTCO ₂ e)	441,557	420,636	396,629	395,432
Community Target Percent Reduction Below 2019 Levels	NA	36%	79%	Carbon Neutrality
Community Target Annual Emissions (MTCO ₂ e)	NA	283,817	94,606	0
Reduction from 2019 Needed to Meet Target (MTCO ₂ e)	NA	136,819	302,023	395,432

Notes: BAU = business-as-usual; GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent per year; NA = not applicable.

Source: Calculations conducted by Ascent Environmental in 2021.

Figure 1 depicts the community legislative-adjusted BAU GHG emissions forecasts by sector, as distinguished by colored wedges, and the City's emissions reduction targets relative to the 2019 emissions inventory. The space between the trajectory of the black line (i.e., targets) and the top of the colored wedges (i.e., forecasted emissions) represents the "gap" in emissions that will need to be addressed through local actions for the City to meet its community GHG reduction targets.

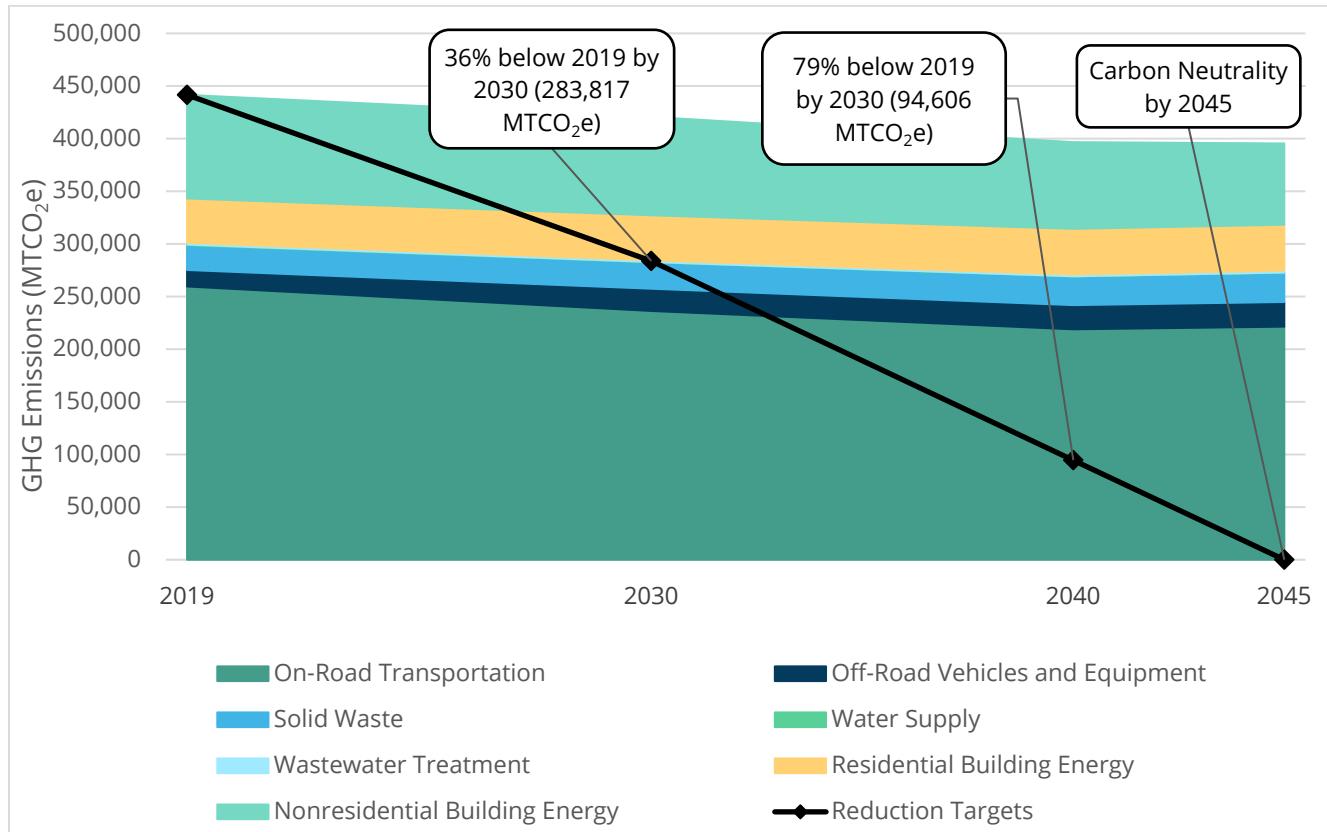


Figure 1 City of Milpitas Community Legislative-Adjusted BAU Emissions Forecast by Sector and GHG Emissions Reduction Targets: 2030, 2040, and 2045

3.3 MUNICIPAL OPERATIONS GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

The City aims to reduce its municipal operations emissions in proportion to the State's targets and goals (outlined in the beginning of Section 2). Like most local public agencies in California, municipal operations emissions levels for 1990 are not available, so GHG reduction targets for the City's municipal operations were developed relative to the City's municipal operations 2019 emissions inventory, consistent with CARB guidance. The methodology used to calculate the City's municipal operations emissions reduction targets for 2030, 2040, and 2045 is consistent with the methodology used to calculate community targets described in Section 2.1.

Municipal operations GHG emissions in 2019 were 3,252 MTCO₂e. Therefore, the City's municipal operations GHG reduction targets are as follows, consistent with State targets and goals:

- ▶ 2030 target: 36 percent below 2019 levels (2,090 MTCO₂e);
- ▶ 2040 target: 79 percent below 2019 levels (697 MTCO₂e); and
- ▶ 2045 target: carbon neutrality (0 MTCO₂e).

These targets, along with the legislative-adjusted BAU forecast emissions and estimated reductions required to achieve the targets, are summarized in Table 6.

Table 6 **City of Milpitas Municipal Operations Legislative-Adjusted BAU Emissions Forecast and GHG Emissions Reduction Targets Below 2019 Levels**

Source	2019	2030	2040	2045
Municipal Operations Emissions and Legislative-Adjusted BAU Forecast (MTCO ₂ e)	3,252	2,923	2,773	2,759
Municipal Operations Target Percent Reduction Below 2019 Levels	NA	36%	79%	Carbon Neutrality
Municipal Operations Target Annual Emissions (MTCO ₂ e)	NA	2,090	697	0
Reduction from 2019 Needed to Meet Target (MTCO ₂ e)	NA	832	2,076	2,759

Notes: BAU = business-as-usual; GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent per year; NA = not applicable.

Source: Calculations conducted by Ascent Environmental in 2021.

Figure 2 depicts the municipal operations legislative-adjusted BAU GHG emissions forecasts by sector, as distinguished by colored wedges, and the City's municipal operations emissions reduction targets relative to the 2019 emissions inventory. The space between the trajectory of the black line (i.e., targets) and the top of the colored wedges (i.e., forecasted emissions) represents the gap in emissions that will need to be addressed through local actions for the City to meet its municipal operations GHG reduction targets.

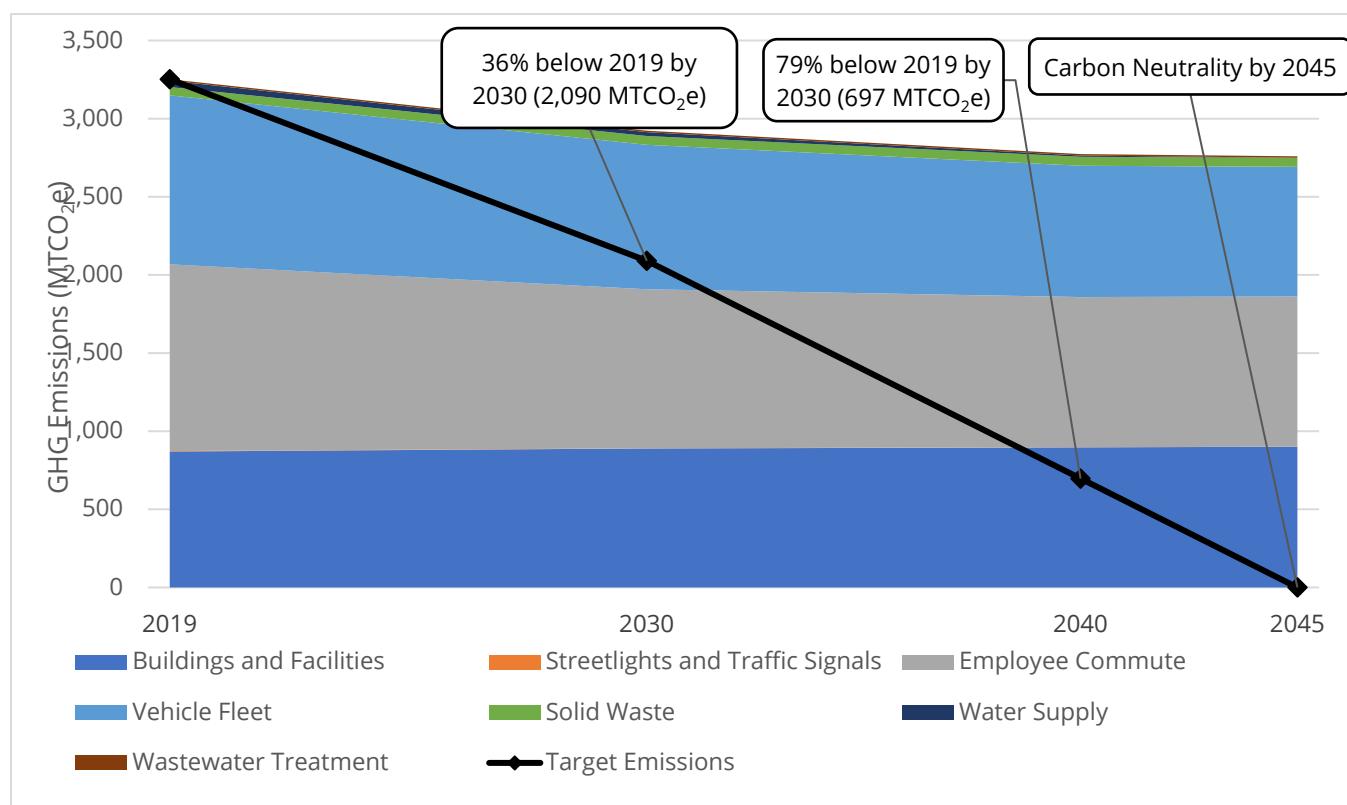


Figure 2 **City of Milpitas Municipal Operations Legislative-Adjusted BAU Emissions Forecast by Sector and Emissions Reduction Targets: 2030, 2040, and 2045**

4 GREENHOUSE GAS EMISSIONS REDUCTION MEASURES

4.1 COMMUNITY GREENHOUSE GAS EMISSIONS REDUCTION MEASURES

As discussed above, additional GHG reductions are needed to achieve the community emissions reduction targets for 2030, 2040, and 2045. Ascent worked with City staff to develop a draft list of recommended GHG reduction measures based on measures already identified in the City's 2013 CAP, 2020 General Plan, and other City plans, as well as new measures informed by community outreach and current best practices.

The measures presented below are organized under six categories that generally align with the emissions sectors included in Table 1: building energy (including residential and non-residential building energy), on-road transportation, off-road vehicles and equipment, solid waste, water and wastewater, and miscellaneous (note: this sector is not represented in the City's inventory or Table 1). Each category includes one or more broad strategies to reduce emissions, such as energy efficiency, renewable energy, and zero waste. The measures are organized under each strategy, which are more specific expressions of the strategies. Metrics are provided for measures that are quantified to help the City meet its reduction targets. These include performance indicators by which progress can be tracked and monitored for implementation. Although they are not included in this technical memorandum, the proposed measures are broken down into one or more actions that the City can implement to reduce GHG emissions. Many of the measures also include supporting activities, or initiatives that can be implemented that will support measures and are important in overall implementation but may not directly lead to quantifiable GHG reductions. The actions and supporting activities are not included in this gap analysis but will be included in the implementation chapter of the CAP Update document.

Additionally, co-benefits associated with each GHG reduction measure are identified, which may include improvements to local air quality, positive public health outcomes, enhanced resilience, cost savings, improved transportation options, economic development opportunities, improved water security, benefits to the natural environment and biodiversity, and consistency with other City plans. In the CAP, all measures and/or actions will also include an analysis of the staff time needed for implementation, and they will identify which agencies and departments will be responsible for implementation as well as stakeholder groups where partnerships can be formed to ensure success.

GHG reductions associated with these recommended measures were calculated in a stepwise manner for the future years of 2030, 2040, and 2045. In other words, GHG reductions (in MT CO₂e) are assessed during a snapshot in time in years 2030, 2040, and 2045. Measures are quantified for a single year rather than adding cumulative reductions from prior years, which aligns with the methodology used to derive the City's GHG reduction targets. Importantly, GHG emissions reductions were quantified for measures wherever substantial evidence and reasonable assumptions were available to support calculations. City staff and Ascent also identified measures that were not quantifiable because of lack of available data or quantification methods but would still be expected to reduce GHG emissions. These measures are listed in this technical memorandum and will be discussed qualitatively in the CAP Update document. They can be monitored for potential quantification opportunities in the future if data and/or quantification methods become available.

Preliminary estimates of GHG emissions reductions, along with an estimated emissions "gap" (i.e., the difference between the effective GHG reductions required to meet the targets and the total GHG reductions), are summarized in Table 7 below and illustrated in Figure 3 in Section 3.1.7. Descriptions of the measures are provided in the following sections. Detailed measure calculations and assumptions supporting the GHG reduction estimates are provided in Attachment A.

Table 7 Community GHG Emissions Reduction Measures

Measure Number	Strategy	Measure	GHG Reductions (MTCO ₂ e)			
			2030	2040	2045	
Building Energy						
BE-1.1	Energy Efficiency and Electrification	Facilitate energy audits for existing buildings to identify energy efficiency retrofit and electrification opportunities.	NA	NA	NA	
BE-1.2		Retrofit existing residential buildings to improve energy efficiency and facilitate fuel switching.	13,596	29,050	41,637	
BE-1.3		Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.	8,515	21,867	41,308	
BE-1.4		Reduce plug loads in existing buildings.	NA	NA	NA	
BE-2.1	Low Carbon Development	Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.	4,445	7,005	8,945	
BE-2.2		Facilitate all-electric development projects for industrial buildings.	NA	NA	NA	
BE-2.3		Expand the City's Green Building Program.	NA	NA	NA	
BE-3.1	Clean Energy	Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.	22,581	8,691	0	
BE-3.2		Develop innovative approaches to energy generation, distribution, and storage.	NA	NA	NA	
BE-3.3		Strengthen community awareness of energy efficiency, energy conservation, electrification, and clean energy.	NA	NA	NA	
			<i>Building Energy Subtotal</i>	49,138	66,613	
					91,890	
On-Road Transportation						
TR-1.1	Sustainable Transportation and Land Use Planning	Reduce VMT from new development in compliance with the City's requirements for SB 743.	3,852	7,029	10,714	
TR-1.2		Increase high-density, transit-oriented development that limits sprawl.	7,469	6,626	6,350	
TR-1.3		Create car-free commercial districts.	NA	NA	NA	
TR-2.1	Low- and Zero-Emission Vehicles	Increase EV charging infrastructure.	47,065	115,567	156,570	
TR-2.2		Increase EV and low-carbon vehicle adoption.				
TR-2.3		Reduce fossil fuel vehicles.				
TR-2.4		Increase low- and zero-emission fleet vehicles.				
TR-3.1	Transit System Improvements	Enhance and expand transit facilities and infrastructure.	14,418	16,124	18,852	
TR-3.2		Increase transit ridership.				
TR-4.1	Active Transportation	Improve active transportation options.	55	99	128	
TR-5.1	Transportation Demand Management	Increase implementation of transportation TDM strategies.	10,191	10,836	10,700	
TR-5.2		Reduce VMT from businesses.				
TR-6.1	Vehicle Idling	Reduce vehicle idling.	NA	NA	NA	
TR-7.1	Parking	Reduce the amount of parking such that it meets the needs of residents, workers, and visitors in a way that is consistent with the City's sustainability goals.	NA	NA	NA	
			<i>On-Road Transportation Subtotal</i>	83,076	156,282	
					203,314	

Measure Number	Strategy	Measure	GHG Reductions (MTCO ₂ e)			
			2030	2040	2045	
Off-Road Vehicles and Equipment						
OT-1.1	Electrification and Clean Alternatives	Reduce landscaping-related emissions.	962	1,681	1,759	
OT-1.2		Reduce construction-related emissions.	2,361	3,746	5,176	
<i>Off-Road Vehicles and Equipment Subtotal</i>			3,324	5,427	6,935	
Solid Waste						
SW-1.1	Zero Waste	Eliminate the disposal of organic solid waste in landfills.	9,385	17,010	21,055	
SW-1.2		Increase recycling and the diversion of other inorganic solid waste.				
SW-1.3		Reduce the generation of waste from residents and businesses.				
SW-1.4		Reduce the generation of construction and demolition waste.				
SW-1.5		Facilitate repair and reuse of consumer products.				
SW-2.1	Landfill Emissions	Dispose waste at innovative facilities.	NA	NA	NA	
SW-2.2		Support waste-to-energy facilities.	NA	NA	NA	
SW-3.1	Waste Policy	Engage with waste-related policy making.	NA	NA	NA	
<i>Solid Waste Subtotal</i>			9,385	17,010	21,055	
Water and Wastewater						
WA-1.1	Water Conservation	Reduce indoor water consumption in buildings.	128	62	0	
WA-1.2		Reduce water consumption for irrigation and landscaping.	110	48	0	
WA-2.1	Recycled Water	Increase the use of recycled water.	NA	NA	NA	
WA-3.1	Wastewater Treatment	Generate biogas at wastewater treatment plants.	NA	NA	NA	
<i>Water and Wastewater Subtotal</i>			237	110	0	
Miscellaneous						
MI-1.1	Urban Forestry and Open Space	Protect native trees and vegetation and enhance carbon sequestration.	2,632	6,601	8,586	
MI-2.1	Urban Heat Island Reduction	Reduce the urban heat island effect to conserve energy.	NA	NA	NA	
MI-3.1	Green Infrastructure	Increase the use of green infrastructure.	NA	NA	NA	
MI-4.1	Green Business and Jobs	Incentivize and promote green business practices.	NA	NA	NA	
MI-4.2		Support green jobs in the city.	NA	NA	NA	
MI-5.1	Carbon Sequestration and Embodied Emissions	Increase soil carbon content.	NA	NA	NA	
MI-5.2		Use low-carbon and carbon sequestering construction materials in new development.	NA	NA	NA	
<i>Miscellaneous Subtotal</i>			2,632	6,601	8,586	
Total Reductions from Measures			147,791	252,043	331,780	
Reduction Needed to Meet Target			136,819	302,023	395,432	
Target Met?			Yes	No	No	
Remaining Gap to Target			(10,971) ¹	49,980	63,651	

Notes: Total may not sum exactly due to independent rounding. EV = electric vehicle; GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent; NA = not applicable; SB = Senate Bill; TDM = transportation demand management; VMT = vehicle miles traveled.

1 Indicates target has been achieved with a surplus of reductions.

Source: Calculations conducted by Ascent Environmental in 2021.

4.1.1 Building Energy

ENERGY EFFICIENCY AND ELECTRIFICATION

Measure BE-1.1: Facilitate energy audits for existing buildings to identify energy efficiency retrofit and electrification opportunities.

Quantification assumptions: Not quantified.

Co-benefits: economic development, plan consistency

Measure BE-1.2: Retrofit existing residential buildings to improve energy efficiency and facilitate fuel switching.

Quantification assumptions: This measure assumes that 36 percent of existing residential buildings are retrofitted by 2030, 72 percent are retrofitted by 2040, and 100 percent are retrofitted by 2045, based on Zero-Carbon Buildings in California: A Feasibility Study (Mozingo 2021).

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

Measure BE-1.3: Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.

Quantification assumptions: This measure assumes that 13 percent of existing nonresidential buildings are retrofitted by 2030, 32 percent are retrofitted by 2040, and 60 percent are retrofitted by 2045, based on Zero-Carbon Buildings in California: A Feasibility Study (Mozingo 2021). It also assumes that 40 percent of fossil fuel-powered backup generators in existing development are converted to battery-powered backup systems by 2030 and 100 percent are converted by 2040.

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

Measure BE-1.4: Reduce plug loads in existing buildings.

Quantification assumptions: Not quantified.

Co-benefits: resilience, cost savings, water security, plan consistency

LOW CARBON DEVELOPMENT

Measure BE-2.1: Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.

Quantification assumptions: This measure assumes that all residential and nonresidential development built in 2023 or later is all-electric. It assumes that no fossil fuel-powered backup generators are installed in new development by 2030.

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

Measure BE-2.2: Facilitate all-electric development projects for industrial buildings.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

Measure BE-2.3: Expand the City's Green Building Program.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

CLEAN ENERGY

Measure BE-3.1: Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.

Quantification assumptions: This measure assumes that all electricity consumed within the city is generated from carbon-free sources by 2030 (either from Silicon Valley Clean Energy-supplied carbon-free grid electricity or on-site renewable energy installations).

Co-benefits: resilience, cost savings, plan consistency

Measure BE-3.2: Facilitate innovative approaches to energy generation, distribution, and storage (e.g., microgrids).

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, cost savings, economic development, plan consistency

Measure BE-3.3: Strengthen community awareness of energy efficiency, energy conservation, electrification, and clean energy.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

4.1.2 On-Road Transportation

SUSTAINABLE TRANSPORTATION AND LAND USE PLANNING

Measure TR-1.1: Reduce vehicle miles traveled (VMT) from new development in compliance with SB 743.

Quantification assumptions: This measure assumes all new development projects within the city comply with the City's SB 743 requirements and achieve a 15 percent reduction in new project-generated VMT by 2030, a 20 percent reduction by 2040 and a 25 percent reduction by 2045.

Co-benefits: local air quality, public health, natural environment and biodiversity, plan consistency

Measure TR-1.2: Increase high-density, transit-oriented development that limits sprawl.

Quantification assumptions: This measure assumes that the City amends existing and/or develops new zoning codes and ordinances that support and promote high-density, transit-oriented, mixed-use development and complete streets and neighborhoods within the city. This measure assumes that these actions result in a 3 percent decrease of existing passenger VMT, based on Zero-Carbon Buildings in California: A Feasibility Study (Mozingo 2021) and California Air Pollution Control Officers Association's (CAPCOA's) Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity (Handbook), Measure T-17 (CAPCOA 2021).

Co-benefits: local air quality, public health, resilience, cost savings, transportation options, natural environment and biodiversity, plan consistency

Measure TR-1.3: Create car-free commercial districts.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, natural environment and biodiversity

LOW- AND ZERO-EMISSION VEHICLES

Measure TR-2.1: Increase electric vehicle (EV) charging infrastructure.

Quantification assumptions: This measure assumes that the percentage of passenger EVs will be 36 percent of total passenger vehicles in the city in 2030, 59 percent in 2040, and 85 percent in 2045, consistent with the statewide EV targets under EO N-79-20 and CARB's Revised Draft 2020 Mobile Source Strategy (CARB 2021) (2020 MSS). This measure also assumes that the percentage of medium- and heavy-duty EVs in the city will increase by 26 percent by 2030, 102 percent by 2040, and 127 percent by 2045, consistent with the 2020 MSS.

Co-benefits: local air quality, public health, cost savings, transportation options, economic development, natural environment and biodiversity, plan consistency

Measure TR-2.2: Increase EV and low-carbon vehicle adoption.

Quantification assumptions: Quantified in combination with Measure TR-2.1.

Co-benefits: local air quality, public health, cost savings, transportation options, natural environment and biodiversity, plan consistency

Measure TR-2.3: Reduce fossil fuel vehicles.

Quantification assumptions: Quantified in combination with Measure TR-2.1.

Co-benefits: local air quality, public health, cost savings, natural environment and biodiversity, plan consistency

Measure TR-2.4: Increase low- and zero-emission fleet vehicles.

Quantification assumptions: Quantified in combination with Measure TR-2.1.

Co-benefits: local air quality, public health, natural environment and biodiversity, plan consistency

TRANSIT SYSTEM IMPROVEMENTS

Measure TR-3.1: Enhance and expand transit facilities and infrastructure.

Quantification assumptions: This measure assumes that comprehensive expansion of the transit network will result in a 10.3 percent reduction in citywide passenger VMT in 2030, 12.5 percent in 2040, and 14.8 percent in 2045 (Mozingo 2021).

Co-benefits: local air quality, public health, resilience, cost savings, transportation options, economic development, natural environment and biodiversity, plan consistency

Measure TR-3.2: Increase transit ridership.

Quantification assumptions: Quantified in combination with Measure TR-3.1.

Co-benefits: local air quality, public health, cost savings, transportation options, natural environment and biodiversity, plan consistency

ACTIVE TRANSPORTATION

Measure TR-4.1: Increase active transportation options.

Quantification assumptions: This measure assumes 50 miles of new bike lanes will be installed by 2030, 70 miles by 2040, and 80 miles by 2045. The City's new Trail, Pedestrian, and Bicycle Master Plan proposes approximately 50 miles of new bikeway by 2030 (City of Milpitas 2021). This measure assumes 25 miles of new pedestrian paths will be installed by 2030, 35 miles by 2040, and 40 miles by 2045.

Co-benefits: local air quality, public health, resilience, cost savings, transportation options, economic development, natural environment and biodiversity, plan consistency

TRANSPORTATION DEMAND MANAGEMENT

Measure TR-5.1: Increase implementation of transportation demand management (TDM) strategies.

Quantification assumptions: This measure assumes that commuting travel in the city is responsible for 28 percent of passenger VMT (AASHTO 2013). This measure assumes implementation of a suite of TDM strategies results in a 26 percent reduction in passenger commute VMT by 2030, 30 percent by 2040, and 30 percent by 2045, based on CAPCOA's Handbook, Measure T-5 (CAPCOA 2021).

Co-benefits: local air quality, public health, transportation options, economic development, natural environment and biodiversity, plan consistency

Measure TR-5.2: Reduce VMT from businesses.

Quantification assumptions: Quantified in combination with measure TR-5.1

Co-benefits: local air quality, public health, cost savings, transportation options, natural environment and biodiversity, plan consistency

VEHICLE IDLING

Measure TR-6.1: Reduce vehicle idling.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, cost savings, natural environment and biodiversity, plan consistency

PARKING

Measure TR-7.1: Reduce the amount of parking such that it meets the needs of residents, workers, and visitors in a way that is consistent with the City's sustainability goals.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, natural environment and biodiversity, plan consistency

4.1.3 Off-Road Vehicles and Equipment

ELECTRIFICATION AND CLEAN ALTERNATIVES

Measure OT-1.1: Reduce landscaping-related emissions.

Quantification assumptions: This measure assumes that all new landscaping equipment is electrified starting in 2024. This measure assumes that 60 percent of existing landscaping equipment will be replaced with zero-emission alternatives by 2030 and 100 percent by 2040.

Co-benefits: local air quality, public health, natural environment and biodiversity, plan consistency

Measure OT-1.2: Reduce construction-related emissions.

Quantification assumptions: This measure assumes that 40 percent of construction equipment will use renewable diesel or other zero-carbon alternatives by 2030, 60 percent by 2040, and 80 percent by 2045.

Co-benefits: local air quality, public health, natural environment and biodiversity, plan consistency

4.1.4 Solid Waste

ZERO WASTE

Measure SW-1.1: Eliminate the disposal of organic solid waste in landfills.

Quantification assumptions: This measure assumes an estimated waste diversion rate of 60 percent for the city in 2019¹. This measure assumes that the city's diversion rate increases to 75 percent by 2030, 85 percent by 2040, and 90 percent by 2045.

Co-benefits: plan consistency

Measure SW-1.2: Increase recycling and the diversion of other inorganic solid waste.

Quantification assumptions: Quantified in combination with Measure SW-1.1.

Co-benefits: plan consistency

Measure SW-1.3: Reduce the generation of waste from residents and businesses.

Quantification assumptions: Quantified in combination with Measure SW-1.1.

Co-benefits: cost savings, plan consistency

Measure SW-1.4: Reduce the generation of construction and demolition waste.

Quantification assumptions: Quantified in combination with Measure SW-1.1.

Co-benefits: local air quality, public health, cost savings, plan consistency

¹ The City's true waste diversion rate in 2019 is uncertain; data provided by CalRecycle differs significantly from the City's internally calculated rate. Quantification calculations assume an estimated diversion rate of 60 percent. This estimate is based on a combination of the data from CalRecycle, the City, and the statewide average diversion rate from 2010-2019.

Measure SW-1.5: Facilitate repair and reuse of consumer products.

Quantification assumptions: Quantified in combination with Measure SW-1.1.

Co-benefits: cost savings, plan consistency

LANDFILL EMISSIONS

Measure SW-2.1: Dispose waste at innovative facilities.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, plan consistency

Measure SW-2.2: Support waste-to-energy facilities.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, plan consistency

WASTE POLICY

Measure SW-3.1: Engage with waste-related policymaking.

Quantification assumptions: Not quantified.

Co-benefits: none

4.1.5 Water and Wastewater

WATER CONSERVATION

Measure WA-1.1: Reduce indoor water consumption in buildings.

Quantification assumptions: This measure assumes a 35 percent reduction in indoor water in new development consumption by 2030, a 45 percent reduction by 2040, and a 50 percent reduction by 2045, based on CAPCOA's Quantifying Greenhouse Gas Mitigation Measures Report, Measure WUW-1 (CAPCOA 2010). This measure also assumes a 30 percent reduction in indoor water consumption in existing development by 2030, 40 percent by 2040, and 45 percent by 2045.

Co-benefits: resilience, cost savings, water security, natural environment and biodiversity, plan consistency

Measure WA-1.2: Reduce water consumption for irrigation and landscaping.

Quantification assumptions: This measure assumes a 60 percent reduction in outdoor water consumption by 2030, 70 by 2040, and 75 by 2045 in new development. This measure assumes a 50 percent reduction in outdoor water consumption by 2030, 60 percent by 2040, and 65 percent by 2045 in existing development.

Co-benefits: resilience, cost savings, water security, natural environment and biodiversity, plan consistency

RECYCLED WATER

Measure WA-2.1: Increase the use of recycled water.

Quantification assumptions: Not quantified.

Co-benefits: resilience, cost savings, water security, natural environment and biodiversity, plan consistency

WASTEWATER TREATMENT

Measure WA-3.1: Generate biogas at wastewater treatment plants.

Quantification assumptions: Not quantified.

Co-benefits: resilience, plan consistency

4.1.6 Miscellaneous

URBAN FORESTRY AND OPEN SPACE

Measure MI-1.1: Protect native trees and vegetation and enhance carbon sequestration.

Quantification assumptions: This measure assumes that the tree coverage in the city increases from 13 percent in 2019 to 20 percent by 2030, 30 percent by 2040, and 35 percent by 2045.

Co-benefits: local air quality, public health, resilience, water security, natural environment and biodiversity, plan consistency

URBAN HEAT ISLAND REDUCTION

Measure MI-2.1: Reduce the urban heat island effect to conserve energy.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, cost savings, water security, natural environment and biodiversity, plan consistency

GREEN INFRASTRUCTURE

Measure MI-3.1: Increase the use of green infrastructure.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, economic development, water security, natural environment and biodiversity, plan consistency

GREEN BUSINESS AND JOBS

Measure MI-4.1: Incentivize and promote green business practices.

Quantification assumptions: Not quantified.

Co-benefits: economic development, plan consistency

Measure MI-4.2: Support green jobs in the city.

Quantification assumptions: Not quantified.

Co-benefits: economic development, water security, natural environment and biodiversity, plan consistency

CARBON SEQUESTRATION AND EMBODIED EMISSIONS

Measure MI-5.1: Increase soil carbon content.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, economic development, water security, natural environment and biodiversity, plan consistency

Measure MI-5.2: Require low-carbon and carbon sequestering construction materials in new development.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, resilience, economic development, natural environment and biodiversity, plan consistency

4.1.7 Community Conclusion

The total estimated GHG emissions reductions from all community measures quantified would be 147,791 MTCO₂e in 2030; 252,043 MTCO₂e in 2040; and 331,780 MTCO₂e in 2045. This would result in total community GHG emissions of 272,845 MTCO₂e in 2030; 144,586 MTCO₂e in 2040; and 63,651 MTCO₂e in 2045. The total estimated reductions from all proposed GHG reduction measures would be sufficient to meet the 2030 target.

The scale of reductions required to achieve the 2040 target of 94,606 MTCO₂e and the carbon neutrality target for 2045 discussed earlier would require significant improvements in the availability and/or cost of near-zero- and zero-emission technologies, as well as potential increased reductions from ongoing State and federal legislative actions that are currently unknown. Progress toward meeting future targets that could be set by the State would be part of the ongoing monitoring and updates to the CAP Update as new legislation or future updates to the State's Climate Change Scoping Plan are adopted.

Figure 3 shows the GHG reductions achieved by the proposed measures, organized by the sectors used for the inventories and forecasts (note: the nonresidential and residential building energy sectors have been combined, as have the water supply and wastewater treatment sectors). The chart shows the estimated GHG reductions due to carbon sequestered through measure MI-1.1 as a dashed line that is not associated with any particular emissions sector. Figure 3 shows the City's achievement of the 2030 target with the proposed GHG reduction measures and demonstrates progress toward the 2045 carbon neutrality target.

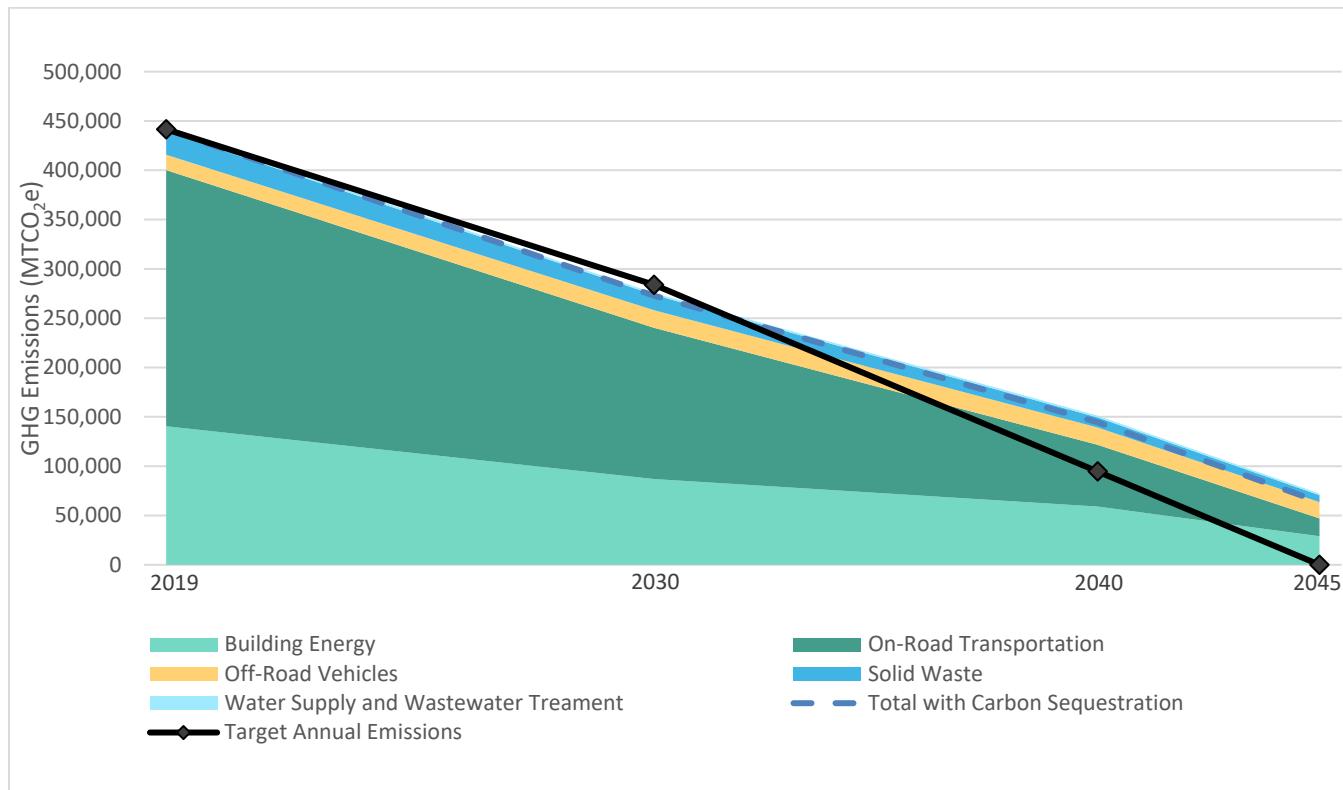


Figure 3 City of Milpitas Community Legislative-Adjusted BAU Emissions Forecast by Sector with Implementation of Proposed GHG Reduction Measures and Emissions Reduction Targets: 2030, 2040 and 2045

4.2 MUNICIPAL OPERATIONS GREENHOUSE GAS EMISSIONS REDUCTION MEASURES

As discussed above, additional GHG reductions are needed to achieve the municipal operations emissions reduction targets for 2030, 2040, and 2045. Ascent worked with City staff to develop a draft list of recommended GHG reduction measures based on policies and goals identified in the 2020 General Plan and other City sustainability planning efforts, as well as new measures informed by current best practices.

The measures presented below are organized under five categories that generally align with the emissions sectors included in Table 2: buildings and public lighting (i.e., buildings and facilities and streetlights and traffic signals), employee commute, vehicle fleet, solid waste, and water. The framework for this section is the same as Section 3.1; at least one strategy and measure are provided for each emissions category, and measures include quantified GHG emissions reductions (where feasible), performance indicator metrics, and identified co-benefits. Actions and supporting activities for municipal operations measures will also be included in the CAP Update document.

Preliminary estimates of GHG emissions reductions, along with an estimated emissions gap are summarized in Table 8 below and illustrated in Figure 4 in Section 3.2.6. Descriptions of the measures are provided in the following sections. Detailed measure calculations and assumptions supporting the GHG reduction estimates are provided in Attachment B.

Table 8 Municipal Operations GHG Emissions Reduction Measures

Measure Number	Strategy	Measure	GHG Reductions (MTCO ₂ e)			
			2030	2040	2045	
Buildings and Public Lighting						
ME-1.1	Energy Efficiency and Conservation	Reduce lighting-related energy consumption.	2	1	0	
ME-1.2		Increase energy efficiency.	<1	<1	0	
ME-1.3		Implement conservation best practices to reduce energy use.	NA	NA	NA	
ME-2.1	Electrification	Transition municipal buildings and facilities to be all-electric.	351	707	878	
ME-3.1	Clean Energy	Continue to use SVCE-supplied 100 percent carbon-free electricity.	NA	NA	NA	
ME-3.2		Transition to 100 percent clean energy for municipal operations.	NA	NA	NA	
			<i>Buildings and Public Lighting Subtotal</i>	<i>353</i>	<i>707</i>	
Employee Commute						
MEC-1.1	Sustainable Employee Commutes	Reduce employee commute VMT and support low-carbon alternatives.	406	576	769	
			<i>Employee Commute Subtotal</i>	<i>406</i>	<i>576</i>	
Vehicle Fleet						
MVF-1.1	Low- and Zero-Emission Fleet Vehicles and Equipment	Convert the City's fleet vehicles and equipment to all-electric or alternative fuels, such as renewable diesel, by 2030.	924	840	830	
			<i>Vehicle Fleet Subtotal</i>	<i>924</i>	<i>840</i>	
Solid Waste						
MSW-1.1	Zero Waste	Increase waste diversion and achieve zero waste by 2030.	20	35	43	
MSW-2.1	Responsible Consumption	Implement an environmentally preferable purchasing policy.	NA	NA	NA	
			<i>Solid Waste Subtotal</i>	<i>20</i>	<i>35</i>	
Water						
MWA-1.1	Water Efficiency and Conservation	Reduce municipal water consumption.	1	<1	0	
			<i>Water Subtotal</i>	<i>1</i>	<i><1</i>	
Total Reductions from Measures			1,703	2,158	2,520	
Reduction Needed to Meet Target			841	2,090	2,759	
Target Met?			Yes	Yes	No	
Remaining Gap to Target			(862)	(68)	239	

Notes: Total may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO₂e = metric tons of carbon dioxide equivalent; NA = not applicable; SVCE = Silicon Valley Clean Energy; VMT = vehicle miles traveled.

Parentheses indicate target has been met with a surplus of reductions.

Source: Calculations conducted by Ascent Environmental in 2021.

4.2.1 Buildings and Public Lighting

ENERGY EFFICIENCY AND CONSERVATION

Measure ME-1.1: Reduce lighting-related energy consumption.

Quantification assumptions: This measure assumes that the City implements a variety of lighting upgrades to interior and exterior lighting at municipal facilities, streetlights, sports fields, and parks by 2030. The measure assumes annual electricity savings of 3,110 megawatt-hours (MWh) in 2030, 3,368 MWh in 2040, and 3,410 MWh in 2045 (ENGIE 2020).

Co-benefits: cost savings, economic development, plan consistency

Measure ME-1.2: Increase energy efficiency.

Quantification assumptions: This measure assumes that the City implements energy efficiency upgrades to heating, ventilation, and air conditioning systems and installs high-efficiency transformers. The measure assumes annual electricity savings of 135 MWh in 2030, 137 MWh in 2040, and 139 MWh in 2045 (ENGIE 2020).

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

Measure ME-1.3: Implement conservation best practices to reduce energy use.

Quantification assumptions: Not quantified

Co-benefits: local air quality, public health, resilience, cost savings, economic development, water security, plan consistency

ELECTRIFICATION

Measure ME-2.1: Transition municipal buildings and facilities to be all-electric.

Quantification assumptions: This measure assumes that all new municipal development is all-electric by 2030. It assumes that 40 percent of existing municipal buildings and facilities are retrofitted to all-electric by 2030, 80 percent by 2040, and 100 percent by 2045. This measure also assumes 60 percent of existing diesel backup generators are retrofitted to all-electric alternatives by 2030 and 100 percent by 2040.

Co-benefits: local air quality, public health, cost savings, economic development, plan consistency

CLEAN ENERGY

Measure ME-3.1: Continue to use SVCE-supplied 100 percent carbon-free electricity.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, cost savings, plan consistency

Measure ME-3.2: Transition to 100 percent clean energy for municipal operations.

Quantification assumptions: Quantified in combination with Measures ME-2.1 and MVF-1.1.

Co-benefits: local air quality, public health, cost savings, economic development, water security, natural environment and biodiversity, plan consistency

4.2.2 Employee Commute

SUSTAINABLE EMPLOYEE COMMUTES

Measure MEC-1.1: Reduce employee commute VMT and support low-carbon alternatives.

Quantification assumptions: This measure assumes that the City implements a variety of initiatives to reduce employee commute emissions by 40 percent by 2030, 60 percent by 2040, and 80 percent by 2045.

Co-benefits: local air quality, public health, cost savings, transportation options

4.2.3 Vehicle Fleet

LOW- AND ZERO-EMISSION FLEET VEHICLES AND EQUIPMENT

Measure MVF-1.1: Convert the City's fleet vehicles and equipment to all-electric or alternative fuels, such as renewable diesel.

Quantification assumptions: This measure assumes that 100 percent of the City's on-road vehicle fleet is converted to all-electric or other zero-emission alternatives by 2030. The measure assumes 70 percent of off-road vehicles and equipment are converted by 2030, 85 percent are converted by 2040, and 100 percent are converted by 2045.

Co-benefits: local air quality, public health, cost savings, plan consistency

Measure MVF-1.2: Reduce vehicle idling at City facilities.

Quantification assumptions: Not quantified.

Co-benefits: local air quality, public health, cost savings

4.2.4 Solid Waste

ZERO WASTE

Measure MSW-1.1: Increase waste diversion and achieve zero waste by 2030.

Quantification assumptions: This measure assumes that the City's municipal operations waste diversion rate was 60 percent in 2019. It assumes a diversion rate of 75 percent in 2030, 85 percent in 2040, and 90 percent in 2045.

Co-benefits: local air quality, public health, cost savings

Measure MSW-1.2: Implement an environmentally preferable purchasing policy.

Quantification assumptions: Not quantified.

Co-benefits: plan consistency

4.2.5 Water

WATER EFFICIENCY AND CONSERVATION

Measure MWA-1.1: Reduce municipal water consumption.

Quantification assumptions: This measure assumes that upgrades to water fixtures and meters result in water savings of 5 million gallons (MG) in 2030, 5 MG in 2040, and 5 MG in 2045 (ENGIE 2020).

Co-benefits: resilience, cost savings, water security, plan consistency

4.2.6 Municipal Conclusion

The total estimated GHG emissions reductions from all municipal operations measures quantified would be 1,703 MTCO₂e in 2030; 2,158 MTCO₂e in 2040; and 2,520 MTCO₂e in 2045. This would result in total municipal operations GHG emissions of 1,210 MTCO₂e in 2030; 615 MTCO₂e in 2040; and 239 MTCO₂e in 2045. Therefore, the total estimated reductions from all proposed municipal operations GHG reduction measures would be sufficient to meet the 2030 and 2040 targets of 2,081 MTCO₂e and 683 MTCO₂e, respectively.

The scale of reductions required to achieve the carbon neutrality target for 2045 would require some improvements in the availability and/or cost of near-zero- and zero-emission technologies, as well as potential increased reductions from ongoing State and federal legislative actions that are currently unknown. Progress toward meeting future targets that could be set by the State would be part of the ongoing monitoring and updates to the CAP Update as new legislation or future updates to the State's Climate Change Scoping Plan are adopted.

Figure 4 shows the GHG reductions achieved by the proposed measures, organized by the same sectors used for the measures. Figure 4 shows the City's achievement 2030 and 2040 targets with the proposed GHG reduction measures and demonstrates progress toward the 2045 carbon neutrality target.

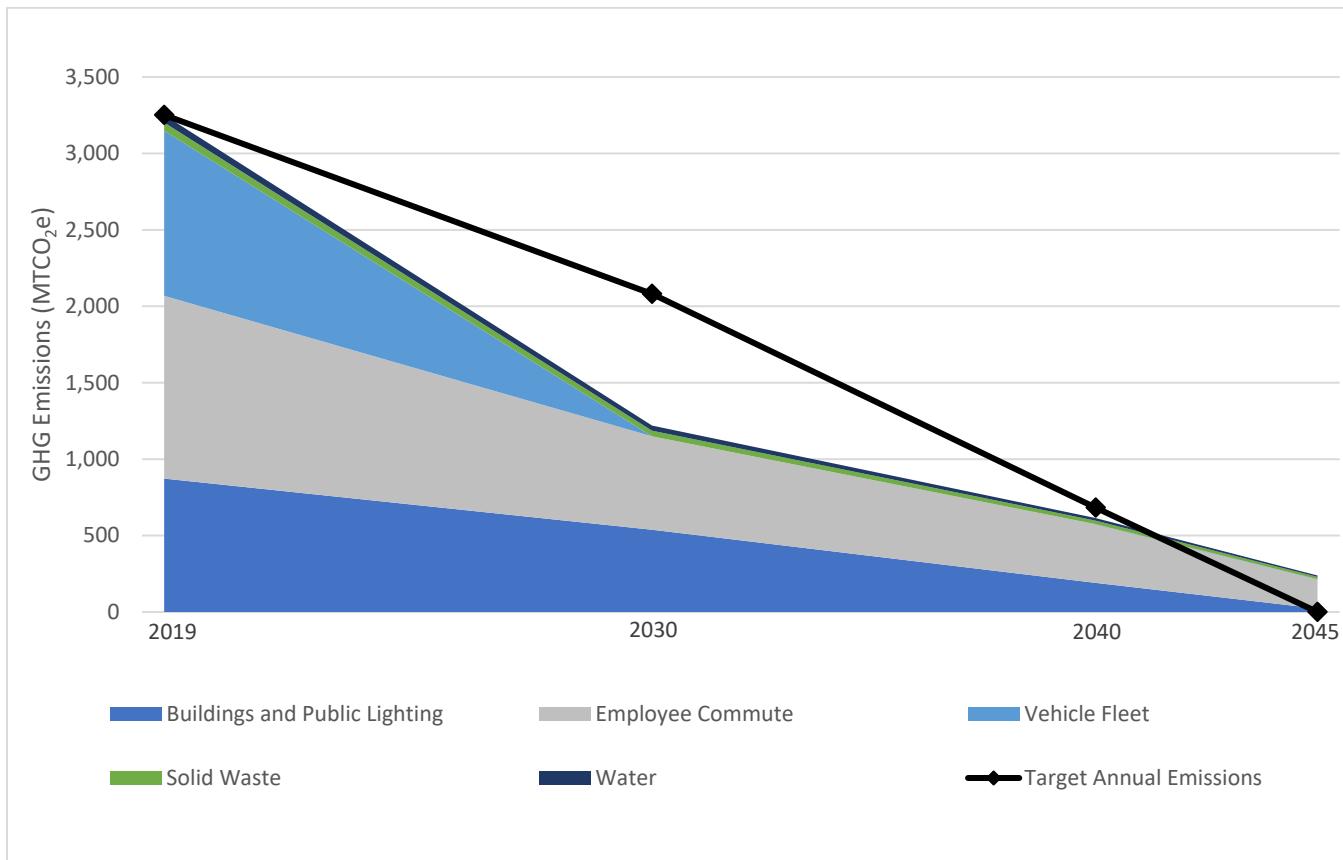


Figure 4 City of Milpitas Municipal Operations Legislative-Adjusted BAU Emissions Forecast by Sector with Implementation of Proposed GHG Reduction Measures and Emissions Reduction Targets: 2030, 2040 and 2045

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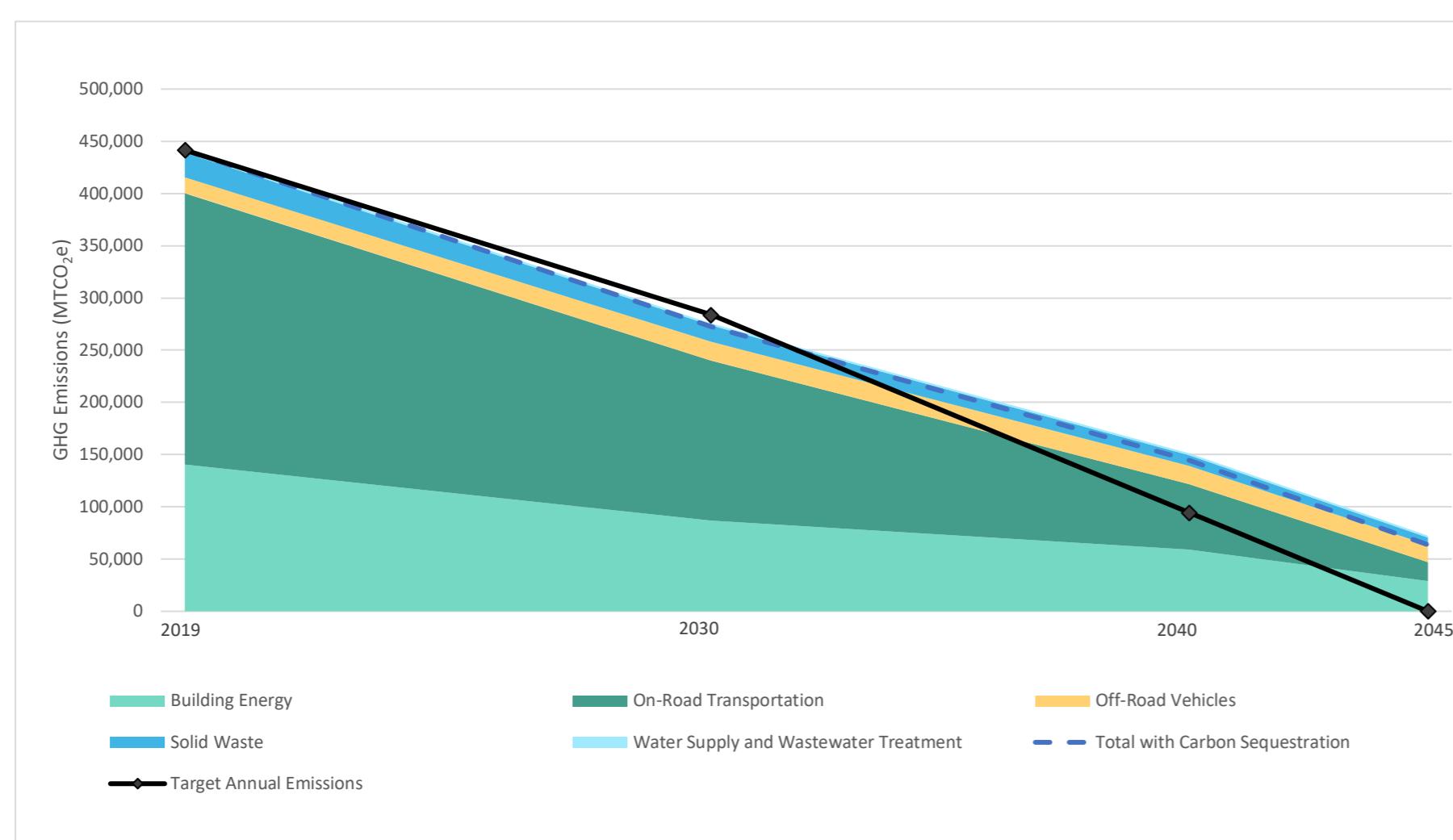
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Attachment A

GHG Reduction Measure Calculations

Measure Number	Measure Title	2030	2040	2045
Building Energy				
BE-1.1	Facilitate energy audits for existing buildings to identify energy efficiency retrofit and electrification opportunities.	NA	NA	NA
BE-1.2	Retrofit existing residential buildings to improve energy efficiency and facilitate fuel switching.	13,596	29,050	41,637
BE-1.3	Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.	8,515	21,867	41,308
BE-1.4	Reduce plug loads in existing buildings.	NA	NA	NA
BE-2.1	Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.	4,445	7,005	8,945
BE-2.2	Facilitate all-electric development projects for industrial buildings.	NA	NA	NA
BE-2.3	Expand the City's Green Building Program.	NA	NA	NA
BE-3.1	Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.	22,581	8,691	-
BE-3.2	Develop innovative approaches to energy generation, distribution, and storage.	NA	NA	NA
BE-3.3	Strengthen community awareness of energy efficiency, energy conservation, electrification, and clean energy.	NA	NA	NA
On-Road Transportation				
TR-1.1	Reduce VMT from new development in compliance with the City's requirements for Senate Bill 743.	3,852	7,029	10,714
TR-1.2	Increase high-density, transit-oriented development that limits sprawl.	7,496	6,626	6,350
TR-1.3	Create car-free commercial districts.	NA	NA	NA
TR-2.1	Increase electric vehicle (EV) charging infrastructure.	47,065	115,567	156,570
TR-2.2	Increase EV and low-carbon vehicle adoption.	NA	NA	NA
TR-2.3	Reduce fossil fuel vehicles.	NA	NA	NA
TR-2.4	Increase low- and zero-emission fleet vehicles.	NA	NA	NA
TR-3.1	Enhance and expand transit facilities and infrastructure.	14,418	16,124	18,852
TR-3.2	Increase transit ridership.	55	99	128
TR-4.1	Improve active transportation options.	10,191	10,836	10,700
TR-5.1	Increase implementation of transportation demand management (TDM) strategies.	NA	NA	NA
TR-5.2	Reduce VMT from businesses.	NA	NA	NA
TR-6.1	Reduce vehicle idling.	NA	NA	NA
TR-7.1	Reduce the amount of parking such that it meets the needs of residents, workers, and visitors in a way that is consistent with the City's sustainability goals.	NA	NA	NA
Off-Road Vehicles and Equipment				
OT-1.1	Reduce landscaping-related emissions.	962	1,681	1,759
OT-1.2	Reduce construction-related emissions.	2,361	3,746	5,176
Solid Waste				
SW-1.1	Eliminate the disposal of organic solid waste in landfills.	9,385	17,010	21,055
SW-1.2	Increase recycling and the diversion of other inorganic solid waste.	NA	NA	NA
SW-1.3	Reduce the generation of waste from residents and businesses.	NA	NA	NA
SW-1.4	Reduce the generation of construction and demolition waste.	NA	NA	NA
SW-1.5	Facilitate repair and reuse of consumer products.	NA	NA	NA
SW-2.1	Dispose waste at innovative facilities.	NA	NA	NA
SW-2.2	Support waste-to-energy facilities.	NA	NA	NA
SW-3.1	Engage with waste-related policymaking.	NA	NA	NA
Water and Wastewater				
WA-1.1	Reduce indoor water consumption in buildings.	85	39	0
WA-1.2	Reduce water consumption for irrigation and landscaping.	59	28	0
WA-2.1	Increase the use of recycled water.	NA	NA	NA
WA-3.1	Generate biogas at wastewater treatment plants.	NA	NA	NA
Miscellaneous				
MI-1.1	Protect native trees and vegetation and enhance carbon sequestration.	2,632	6,601	8,586
MI-2.1	Reduce the urban heat island effect to conserve energy.	NA	NA	NA
MI-3.1	Increase the use of green infrastructure.	NA	NA	NA
MI-4.1	Incentivize and promote green business practices.	NA	NA	NA
MI-4.2	Support green jobs in the city.	NA	NA	NA
MI-5.1	Increase soil carbon content.	NA	NA	NA
MI-5.2	Use low-carbon and carbon sequestering construction materials in new development.	NA	NA	NA
		Total Reductions from Measures	147,697	251,999
		Reduction Needed for Target	136,819	302,023
		Gap Needed to Achieve Target*	(10,878)	50,024
<small>*negative numbers mean target has been achieved; positive values means there is a gap</small>				
		Legislative-Adjusted BAU Emissions	420,636	396,629
		Legislative-Adjusted BAU Emissions - Reductions from Measures	272,938	144,629
		Total Target Emissions	283,817	94,606
Reductions by Sector				
		2030	2040	2045
		Building Energy	49,138	66,613
		On-Road	83,076	156,282
		Off-Road	3,324	5,427
		Solid Waste	9,385	17,010
		Water & Wastewater	144	67
		Miscellaneous	2,632	6,601
			2,632	8,586
Total			147,697	251,999
Emissions with Measures Applied				
		2019	2030	2040
		Building Energy	140,537	86,990
		On-Road Transportation	259,627	153,234
		Off-Road Vehicles	15,554	17,815
		Solid Waste	23,566	15,641
		Water Supply and Wastewater Treatment	2,272	1,889
		Total	441,557	275,477
Carbon Sequestration (Reduction)				
		2019	2030	2040
		Carbon Sequestration (Reduction)	-	-
		Total with Carbon Sequestration	441,557	272,938
		Target Annual Emissions	441,557	144,629
		Axis	-	-



Measure Number	Measure Title	2030	2040	2045
BE-1.1	Facilitate energy audits for existing buildings to identify energy efficiency retrofit and electrification opportunities.	NA	NA	NA
BE-1.2	Retrofit existing residential buildings to improve energy efficiency and facilitate fuel switching.	13,596	29,050	41,637
BE-1.3	Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.	8,515	21,867	41,308
BE-1.4	Reduce plug loads in existing buildings.	NA	NA	NA
BE-2.1	Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.	4,445	7,005	8,945
BE-2.2	Facilitate all-electric development projects for industrial buildings.	NA	NA	NA
BE-2.3	Expand the City's Green Building Program.	NA	NA	NA
BE-3.1	Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.	22,581	8,691	-
BE-3.2	Develop innovative approaches to energy generation, distribution, and storage.	NA	NA	NA
BE-3.3	Strengthen community awareness of energy efficiency, energy conservation, electrification, and clean energy.	NA	NA	NA
TR-1.1	Reduce VMT from new development in compliance with the City's requirements for Senate Bill 743.	3,852	7,029	10,714
TR-1.2	Increase high-density, transit-oriented development that limits sprawl.	7,496	6,626	6,350
TR-1.3	Create car-free commercial districts.	NA	NA	NA
TR-2.1	Increase electric vehicle (EV) charging infrastructure.			
TR-2.2	Increase EV and low-carbon vehicle adoption.	47,065	115,567	156,570
TR-2.3	Reduce fossil fuel vehicles.			
TR-2.4	Increase low- and zero-emission fleet vehicles.			
TR-3.1	Enhance and expand transit facilities and infrastructure.	14,418	16,124	18,852
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TR-4.1	Improve active transportation options.			
TR-5.1	Increase implementation of transportation demand management (TDM) strategies.	10,191	10,836	10,700
TR-5.2	Reduce VMT from businesses.			
TR-6.1	Reduce vehicle idling.	NA	NA	NA
	Reduce the amount of parking such that it meets the needs of residents, workers, and visitors in a way that is consistent with the City's sustainability goals.			
TR-7.1		NA	NA	NA
OT-1.1	Reduce landscaping-related emissions.	962	1,681	1,759
OT-1.2	Reduce construction-related emissions.	2,361	3,746	5,176
SW-1.1	Eliminate the disposal of organic solid waste in landfills.			
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SW-1.3	Reduce the generation of waste from residents and businesses.	9,385	17,010	21,055
SW-1.4	Reduce the generation of construction and demolition waste.			
SW-1.5	Facilitate repair and reuse of consumer products.			
SW-2.1	Dispose waste at innovative facilities.	NA	NA	NA
SW-2.2	Support waste-to-energy facilities.	NA	NA	NA
SW-3.1	Engage with waste-related policymaking.	NA	NA	NA
WA-1.1	Reduce indoor water consumption in buildings.	85	39	0
WA-1.2	Reduce water consumption for irrigation and landscaping.	59	28	0
WA-2.1	Increase the use of recycled water.	NA	NA	NA
WA-3.1	Generate biogas at wastewater treatment plants.	NA	NA	NA
MI-1.1	Protect native trees and vegetation and enhance carbon sequestration.	2,632	6,601	8,586
MI-2.1	Reduce the urban heat island effect to conserve energy.	NA	NA	NA
MI-3.1	Increase the use of green infrastructure.	NA	NA	NA
MI-4.1	Incentivize and promote green business practices.	NA	NA	NA
MI-4.2	Support green jobs in the city.	NA	NA	NA
MI-5.1	Increase soil carbon content.	NA	NA	NA
MI-5.2	Use low-carbon and carbon sequestering construction materials in new development.	NA	NA	NA
		Total Reductions from Measures	147,697	251,999
		Reduction Needed for Target	136,819	302,023
		Gap Needed to Achieve Target*	(10,878)	50,024
				63,651
<i>*negative numbers mean target has been achieved; positive values means there is a gap</i>				
		Legislative-Adjusted BAU Emissions	420,636	396,629
		Legislative-Adjusted BAU Emissions - Reductions from Measures	272,983	144,629
		Total Target Emissions	283,817	94,606
				-
Reductions by Sector			2030	2040
		Building Energy	49,138	66,613
		On-Road	83,076	156,282
		Off-Road	3,324	5,427
		Solid Waste	9,385	17,010
		Water & Wastewater	144	67
		Miscellaneous	2632	6601
Total			147,697	251,999
				331,780

Strategy	Measure Number	New/Existing	Sector	Measure	2030	2040	2045	Quantification approach
Energy Efficiency and Electrification	BE-1.1	Existing	Residential and Nonresidential	Facilitate energy audits for existing buildings to identify energy efficiency retrofit and electrification opportunities.	NA	NA	NA	Not quantifiable.
	BE-1.2	Existing	Residential	Retrofit existing residential buildings to improve energy efficiency and facilitate fuel switching.	13,596	29,050	41,637	Assumes 36% of existing residential development will be all-electric by 2030, 72% by 2040, and 100% by 2045.
	BE-1.3	Existing	Nonresidential	Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.	8,515	21,867	41,308	Assumes 13% of existing nonresidential development will be all-electric by 2030, 36% by 2040, and 60% by 2045.
	BE-1.4	Existing	Residential	Reduce plug loads in existing buildings.	NA	NA	NA	Not quantifiable.
Low Carbon Development	BE-2.1	New	Residential and Nonresidential	Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.	4,445	7,005	8,945	Assumes all-electric requirement for residential and nonresidential development in 2022 code.
	BE-2.2	New	Nonresidential	Facilitate all-electric development projects for industrial buildings.	NA	NA	NA	Not quantifiable.
	BE-2.3	New	Residential and Nonresidential	Expand the City's Green Building Program.	NA	NA	NA	Not quantifiable.
Clean Energy	BE-3.1	New and Existing	Residential and Nonresidential	Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.	22,581	8,691	-	Assumes 100% participation communitywide with carbon-free electricity by 2030.
	BE-3.2	New and Existing	Residential and Nonresidential	Develop innovative approaches to energy generation, distribution, and storage.	NA	NA	NA	Not quantifiable.
	BE-3.3	New and Existing	Residential and Nonresidential	Strengthen community awareness of energy efficiency, energy conservation, electrification, and clean energy.	NA	NA	NA	Not quantifiable.
Total					49,138	66,613	91,890	

BE-1.2

Retrofit existing residential buildings to improve energy efficiency and facilitate fuel switching.

	2019	2030	2040	2045
Removal of natural gas in existing residential buildings				
Existing residential buildings natural gas usage (therms)	7,840,602	7,840,602	7,840,602	7,840,602
Target electrification rate for existing residential buildings (natural gas) [1]		36%	72%	100%
Reduced natural gas usage (therms)		2,822,617	5,645,233	7,840,602
Natural gas emissions factor (MTCO2e/therm)		0.005310456	0.005310456	0.005310456
GHG reductions from existing development natural gas savings (MTCO2e)	14,989	29,979	41,637	
Additional electricity use and emissions				
Assumed average efficiency of natural gas heating (conservative) [2]		78%		
Assumed average efficiency of electric heating [3]		100%		
kWh per therm conversion	29.3001			
Total therms offset from natural gas heating use (therms)		2,822,617	5,645,233	7,840,602
Total electricity needed to offset natural gas heating (MWh)		64,508	129,017	179,190
Electricity emissions factor (MTCO2e/MWh)		0.02161	0.007202	0
Additional GHG emissions from electricity use (MTCO2e)	1,394	929	-	
GHG Reductions from BE-1.2 (MTCO2e)	13,596	29,050	41,637	

Sources:

[1] Mozingo. 2021. *Zero-Carbon Buildings in California: A Feasibility Study*

[2] Energy Solutions Center. 2021. *Natural Gas Furnaces*. Available: https://naturalgasefficiency.org/for-residential-customers/heat-gas_furnace/#:~:text>All%20furnaces%20built%20and%20sold,furnace%20with%20standing%20pilot%20E2%80%93%2050%25

[3] U.S. DOE. 2021. *Electric Resistance Heating*. Available: <https://www.energy.gov/energysaver/home-heating-systems/electric-resistance-heating#:~:text=Electric%20resistance%20heating%20is%20100,the%20fuel's%20energy%20into%20electricity>.

BE-1.3

Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.

	2019	2030	2040	2045
Removal of natural gas in existing non-residential buildings				
Existing nonresidential buildings natural gas usage (therms)	12,772,616	12,772,616	12,772,616	12,772,616
Target electrification rate for existing nonresidential buildings (natural gas) [1]		13%	32%	60%
Reduced natural gas usage (therms)	1,660,440	4,087,237	7,663,570	
Natural gas emissions factor (MTCO2e/therm)	0.005310456	0.005310456	0.005310456	
GHG reductions from existing nonresidential natural gas savings (MTCO2e)	8,818	21,705	40,697	
Additional electricity use and emissions				
Assumed average efficiency of natural gas heating (conservative) [2]	78%			
Assumed average efficiency of electric heating [3]	150%			
kWh per therm conversion	29.3001			
Total therms offset from natural gas heating use (therms)	1,660,440	4,087,237	7,663,570	
Total electricity needed to offset natural gas heating (MWh)	25,299	62,273	116,763	
Electricity emissions factor (MTCO2e/MWh)	0.02161	0.007202	0	
Additional GHG emissions from electricity use (MTCO2e)	547	448	-	
Elimination of fossil fuel backup generators				
Existing backup generator natural gas usage (therms)	2,292	2,292	2,292	2,292
Existing backup generator diesel usage (gallons)	58,522	58,522	58,522	58,522
Target elimination rate for backup generators		40%	100%	100%
Reduced natural gas use from elimination of backup generator permits by 2030 (therms)	917	2,292	2,292	2,292
Reduced diesel use from elimination of backup generator permits by 2030 (gallons)	23,409	58,522	58,522	58,522
Backup generator natural gas emissions factor (MTCO2e/therm)	0.005276123	0.005276123	0.005276123	
Backup generator diesel emissions factor (MTCO2e/gallon)	0.010228012	0.010228012	0.010228012	
GHG reductions from backup generator natural gas savings (MTCO2e)	5	12	12	12
GHG reductions from backup generator diesel savings (MTCO2e)	239	599	599	599
Summary				
GHG reductions from existing development natural gas savings (MTCO2e)	8,818	21,705	40,697	
Additional GHG emissions from electricity use (MTCO2e)	(547)	(448)	-	
GHG reductions from backup generator natural gas savings (MTCO2e)	5	12	12	12
GHG reductions from backup generator diesel savings (MTCO2e)	239	599	599	599
GHG Reductions from BE-1.3 (MTCO2e)	8,515	21,867	41,308	

Sources:

[1] Mozingo. 2021. *Zero-Carbon Buildings in California: A Feasibility Study*

[2] Energy Solutions Center. 2021. *Natural Gas Furnaces*. Available: https://naturalgasefficiency.org/for-residential-customers/heat-gas_furnace/#:~:text>All%20furnaces%20built%20and%20sold,furnace%20with%20standing%20pilot%20E2%80%93%2050%25

[3] U.S. DOE. 2021. *Electric Resistance Heating*. Available: <https://www.energy.gov/energysaver/home-heating-systems/electric-resistance-heating#:~:text=Electric%20resistance%20heating%20is%20100,the%20fuel's%20energy%20into%20electricity>.

BE-2.1

Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.

	2019	2022	2030	2040	2045
All-electric new development					
Annual residential natural gas usage with legislative reductions (therms)	7,840,602	7,874,209	7,963,827	8,148,719	8,221,218
New natural gas usage (therms)		33,607	123,225	308,118	380,616
Reduced residential natural gas usage from all-electric new residential development starting in <u>2023</u> (therms)			89,618	274,511	347,009
Annual nonresidential natural gas usage with legislative reductions (therms)	12,772,616	13,080,882	13,902,926	14,154,850	14,403,617
New nonresidential natural gas usage (therms)		308,266	1,130,310	1,382,234	1,631,001
Reduced nonresidential natural gas usage from all-electric new nonresidential development starting in <u>2023</u> (therms)			822,044	1,073,968	1,322,735
Total reduced natural gas usage in new development (therms)			911,662	1,348,479	1,669,744
Natural gas emissions factor (MTCO2e/therm)			0.005310456	0.005310456	0.005310456
GHG reductions from new development natural gas savings (MTCO2e)			4,841	7,161	8,867
Additional electricity use and emissions					
Assumed average efficiency of natural gas heating (conservative) [1]		78%			
Assumed average efficiency of electric heating [2]		100%			
kWh per therm conversion		29.3001			
Therms offset from natural gas heating use (therms)			911,662	1,348,479	1,669,744
Electricity needed to offset natural gas heating (MWh)			20,835	30,818	38,160
Electricity emissions factor (MTCO2e/MWh)			0.021606088	0.007202029	0
Additional GHG emissions from electricity use (MTCO2e)			450	222	-
Prohibiting fossil fuel backup generators in new nonresidential development by 2030					
Annual backup generator natural gas usage with legislative reductions (therms)	2,292		2,495	2,540	2,585
Annual backup generator diesel usage with legislative reductions (gallons)	58,522		63,701	64,855	65,995
New backup generator natural gas usage (therms)			203	248	293
New backup generator diesel usage (gallons)			5,179	6,333	7,473
Reduced natural gas use from prohibiting fossil fuel backup generators in new nonresidential development by 2030 (therms)			203	248	293
Reduced diesel use from prohibiting fossil fuel backup generators in new development by 2030 (gallons)			5,179	6,333	7,473
Backup generator natural gas emissions factor (MTCO2e/therm)			0.005276123	0.005276123	0.005276123
Backup generator diesel emissions factor (MTCO2e/gallon)			0.010228012	0.010228012	0.010228012
GHG reductions from new backup generator natural gas savings (MTCO2e)			1	1	2
GHG reductions from new backup generator diesel savings (MTCO2e)			53	65	76
Summary					
GHG reductions from new development natural gas savings (MTCO2e)			4,841	7,161	8,867
Additional GHG emissions from electricity use (MTCO2e)			(450)	(222)	-
GHG reductions from backup generator natural gas savings (MTCO2e)			1	1	2
GHG reductions from backup generator diesel savings (MTCO2e)			53	65	76
GHG Reductions from BE-2.1 (MTCO2e)			4,445	7,005	8,945

Sources:

[1] Energy Solutions Center. 2021. Natural Gas Furnaces. Available: https://naturalgasefficiency.org/for-residential-customers/heat-gas_furnace/#:~:text>All%20furnaces%20built%20and%20sold,furnace%20with%20standing%20pilot%20E2%80%93%2050%25

[2] U.S. DOE. 2021. Electric Resistance Heating. Available: <https://www.energy.gov/energysaver/home-heating-systems/electric-resistance-heating#:~:text=Electric%20resistance%20heating%20is%20100,the%20fuel's%20energy%20into%20electricity>.

BE-3.1

Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.

	2019	2030	2040	2045
Total electricity emissions (MTCO2e)		19,342	6,569	0
<i>Additional electricity emissions from other measures (MTCO2e)</i>				
<i>E-1.2</i>		1,394	929	0
<i>E-1.3</i>		547	448	0
<i>E-2.1</i>		450	222	0
<i>T-2.1</i>		811	502	0
<i>O-1.1</i>		38	21	0
<i>Total</i>		3,240	2,123	0
Adjusted electricity emissions reductions from 100% carbon-free electricity		22,581	8,691	0
GHG Reductions from BE-3.1 (MTCO2e)		22,581	8,691	-

Strategy	Measure Number	New/Existing	Sector	Measure	2030	2040	2045	Quantification approach
Sustainable Transportation and Land Use Planning	TR-1.1	New	On-Road Transportation	Reduce VMT from new development in compliance with the City's requirements for Senate Bill 743.	3,852	7,029	10,714	Assumes a 15% reduction in total new VMT in 2030, 20% in 2040, and 25% in 2045.
	TR-1.2	New and Existing	On-Road Transportation	Increase high-density, transit-oriented development that limits sprawl.	7,496	6,626	6,350	Assumes a 3.3% reduction in VMT from mixed-used, transit-oriented development and a 3.2% reduction from complete streets and neighborhoods.
	TR-1.3	New and Existing	On-Road Transportation	Create car-free commercial districts.	NA	NA	NA	Not quantifiable.
Low- and Zero-Emission Vehicles	TR-2.1	New and Existing	On-Road Transportation	Increase electric vehicle (EV) charging infrastructure.	47,065	115,567	156,570	Measures 2.1 to 2.4 combined. New EV methodology based on state targets and existing conditions for EVs in the city.
	TR-2.2	New	On-Road Transportation	Increase EV and low-carbon vehicle adoption.				
	TR-2.3	New and Existing	On-Road Transportation	Reduce fossil fuel vehicles.				
	TR-2.4	New and Existing	On-Road Transportation	Increase low- and zero-emission fleet vehicles.				
Transit System Improvements	TR-3.1	New and Existing	On-Road Transportation	Enhance and expand transit facilities and infrastructure.	14,418	16,124	18,852	Assumes a 10.3% reduction in existing VMT in 2030, a 12.5% reduction in 2040, and a 14.8% reduction in 2045.
	TR-3.2	New and Existing	On-Road Transportation	Increase transit ridership.				
Active Transportation	TR-4.1	New and Existing	On-Road Transportation	Improve active transportation options.	55	99	128	
Transportation Demand Management	TR-5.1		On-Road Transportation	Increase implementation of transportation demand management (TDM) strategies.	10,191	10,836	10,700	Assumes a 15% reduction in VMT in 2030, a 25% reduction in 2040, and a 30% reduction in 2045. Combined with TR-5.2
	TR-5.2	New and Existing	On-Road Transportation	Reduce VMT from businesses.				Combined with TR-5.1
Vehicle Idling	TR-6.1	New and Existing	On-Road Transportation	Reduce vehicle idling.	NA	NA	NA	Not quantifiable.
Parking	TR-7.1	New and Existing	On-Road Transportation	Reduce the amount of parking such that it meets the needs of residents, workers, and visitors in a way that is consistent with the City's sustainability goals.	NA	NA	NA	Not quantifiable.
Total					83,076	156,282	203,314	

TR-1.1

Reduce VMT from new development in compliance with the City's requirements for Senate Bill 743.

	2019	2030	2040	2045
Annual passenger vehicle miles traveled (VMT)	509,968,096	559,587,179	579,143,509	599,858,891
New passenger VMT		49,619,084	69,175,414	89,890,795
Percent VMT reduction from SB 743		15%	20%	25%
Reduced passenger VMT from SB 743		7,442,863	13,835,083	22,472,699
Passenger vehicle emissions factor (MTCO2e/mile)		0.000274487	0.000252949	0.000249778
GHG reductions from passenger vehicles (MTCO2e)		2,043	3,500	5,613
Annual commercial vehicle miles traveled (VMT)	62,921,403	73,664,721	83,202,762	88,017,894
New commercial VMT		10,743,318	20,281,359	25,096,491
Percent VMT reduction from SB 743		15%	20%	25%
Reduced commercial VMT from SB 743		1,611,498	4,056,272	6,274,123
Commercial vehicle emissions factor (MTCO2e/mile)		0.001122798	0.00087022	0.000812973
GHG reductions from commercial vehicles (MTCO2e)		1,809	3,530	5,101
GHG Reductions from TR-1.1 (MTCO2e)		3,852	7,029	10,714

TR-1.2	2019	2030	2040	2045
Increase high-density, transit-oriented development that limits sprawl.				
Annual existing passenger vehicle miles traveled (VMT) forecast*	509,968,096	509,968,096	509,968,096	509,968,096
Passenger VMT reductions from other Measures				
<i>T-3.1; T-3.2</i>	52,526,714	63,746,012	75,475,278	
<i>T-4.1</i>	199,619	391,254	511,026	
<i>T-5.1; T-5.2</i>	37,125,677	42,837,320	42,837,320	
<i>Total VMT reductions from other measures</i>	89,852,011	106,974,586	118,823,624	
Adjusted existing passenger VMT	420,116,085	402,993,510	391,144,472	
Higher density, mixed use development				
Adjusted existing passenger VMT	420,116,085	402,993,510	391,144,472	
Percent reduction in VMT [1] [2]	3.3%	3.3%	3.3%	
Annual VMT Reduced	13,863,831	13,298,786	12,907,768	
Passenger vehicle emissions factor (MTCO2e/mile)	0.000274487	0.000252949	0.000249778	
GHG reductions from higher density, mixed use development (MTCO2e)	3,805	3,364	3,224	
Complete streets and neighborhoods				
Adjusted existing passenger VMT	420,116,085	402,993,510	391,144,472	
Percent reduction in VMT per CAPCOA T-17	3.2%	3.2%	3.2%	
Annual VMT reduced	13,443,715	12,895,792	12,516,623	
Passenger vehicle emissions factor (MTCO2e/mile)	0.000274487	0.000252949	0.000249778	
GHG reductions from complete streets and neighborhoods (MTCO2e)	3,690	3,262	3,126	
GHG Reductions from TR-1.2 (MTCO2e)	7,496	6,626	6,350	

Sources:

[1] Mazing. 2021. *Zero-Carbon Buildings in California: A Feasibility Study* 0.4% to 7.7%
[2] CAPCOA T-17 3.20%

* VMT reductions are only quantified for existing VMT because Measure T-SB 743 addresses all new VMT

T-2.1 to T-2.4				
Low- and Zero-Emission Vehicles	2019	2030	2040	2045
State-level EV Forecasts and Targets				
Statewide Light Duty Population [1]	21,740,485	22,517,421	23,785,035	24,319,224
Statewide Light Duty EV population [1]	301,208	1,293,127	1,915,316	2,061,762
Statewide EV Population Target under EO N-79-20 (5 million baseline scenario, 8 million high scenario) [2]	8,000,000	14,000,000	20,671,341	
Target Percent EVs in Passenger Vehicles	36%	59%	85%	
Target Percent EVs in Passenger Vehicles for Milpitas	36%	59%	85%	
EMFAC 2021 Forecasts				
Light Duty eVMT in Santa Clara County [1]	3,836,710	4,508,768	4,706,110	
Light Duty VMT in Santa Clara County [1]	38,943,557	41,349,174	42,592,559	
Percent eVMT in Santa Clara County	10%	11%	11%	
Forecasted eVMT in Milpitas				
Milpitas Passenger VMT after Measures	434,984,761	432,139,262	433,138,177	
Forecasted eVMT in Milpitas	42,854,592	47,121,025	47,858,027	
Target eVMT in Milpitas	154,541,589	254,359,506	368,167,451	
Additional eVMT needed to meet State Targets	111,686,997	207,238,481	320,309,424	
Additional GHG emissions from EV charger use				
Additional eVMT needed to meet State Targets	111,686,997	207,238,481	320,309,424	
Average Efficiency of EV LDV (kWh/100-mi) [3]	34	34	34	
Electricity emissions factor (MTCO2e/MWh)	0.02161	0.00720	-	
Charged amount (kWh)	37,558,108	69,690,166	107,713,667	
Additional GHG emissions from EVs (MTCO2e)	811	502	-	
Emissions from Equivalent Gasoline/Diesel Vehicles				
Additional eVMT needed to meet State Targets	111,686,997	207,238,481	320,309,424	
Avg emissions factor for non-electric passenger vehicles (MTCO2e/mi)	0.0002745	0.0002529	0.0002498	
Equivalent GHG emissions avoided from increased EV chargers (MTCO2e)	30,657	52,421	80,006	
GHG Reductions from T-2.1 to T-2.4 (MTCO2e)	29,845	51,919	80,006	

Sources:

[1] EMFAC 2021. Statewide light duty EV population. (EMFAC 2021 does not account for statewide targets under EO N-79-20)

[2] Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment (Staff Report). January 2021.

[3] <https://www.driveclean.ca.gov/pev/Charging.php>

TR-3.1; TR-3.2	2019	2030	2040	2045
Enhance and expand transit facilities and infrastructure. Increase transit ridership.				
Annual existing passenger vehicle miles traveled (VMT)	509,968,096	509,968,096	509,968,096	509,968,096
Percent reduction in existing citywide passenger VMT from comprehensive expansion of transit network (estimated 5.8% to 14.8%)				
[1] [2]	10.3%	12.5%	14.8%	
Passenger VMT reduction	52,526,714	63,746,012	75,475,278	
Passenger vehicle emissions factor (MTCO2e/mi)	0.0002745	0.0002529	0.0002498	
GHG reductions from passenger vehicles (MTCO2e)	14,418	16,124	18,852	
GHG Reductions from TR-3.1; TR-3.2 (MTCO2e)	14,418	16,124	18,852	

Sources:

[1] Mazing. 2021. *Zero-Carbon Buildings in California: A Feasibility Study* 5.8% to 14.8%

[2] Handy, S. et al. (2013). *Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document*. California Air Resources Board. Retrieved from: <https://arb.ca.gov/cc/sb375/policies/policies.htm> 0.5% to 10.5%

TR-4.1
Improve active transportation options.

	2019	2030	2040	2045
New bike lanes in Milpitas				
New bikeway miles proposed in Master Plan [1]	50	70	80	
Days per year that new bicycle lanes would be used?	365	365	365	
Daily Vehicle Miles of Travel in Milpitas [2]	536,790	536,790	536,790	
Maintained Miles in Milpitas [2]	128	128	128	
Annual Average Daily Traffic on Parallel Roadways near bike paths (based on average AADT on Milpitas roadways)	1,651	2,311	2,642	<-Based on HPMS Data.
Bicycle Adjustment factor [3]	0.0038	0.0038	0.0038	<-Conservative adjustment factor based on low AADT
Bicycle Activity Center Credit [3]	0.0015	0.0015	0.0015	<- assumed that new lanes would be placed near at least 3 activity centers within a half a mile of facilities
Annual Vehicle Trips reduced	3,194	4,471	5,110	
Annual VMT Reduced	159,696	313,003	408,821	
New pedestrian paths in Milpitas				
New pedestrian path miles	25	35	40	<- Assume 50% of bike lane/path are also ped paths.
Days per year that new pedestrian paths would be used?	365	365	365	
Daily Vehicle Miles of Travel in Milpitas [2]	536,790	536,790	536,790	
Maintained Miles in Milpitas [2]	128	128	128	
Annual Average Daily Traffic on Parallel Roadways near ped paths (based on average AADT on Milpitas roadways)	826	1,156	1,321	<-Based on HPMS Data.
Pedestrian Adjustment Factor [3]	0.0038	0.0038	0.0038	<-Conservative adjustment factor based on low AADT
Activity Center Credit	0.0015	0.0015	0.0015	<- assumed that new lanes would be placed near at least 3 activity centers within a half a mile of facilities
Annual Vehicle Trips reduced	1,597	2,236	2,555	
Annual VMT Reduced	39,924	78,251	102,205	
Total Annual VMT Reduced	199,619	391,254	511,026	
Emissions per mile for passenger vehicles (MTCO2e/mi)	0.00027449	0.00025295	0.00024978	
GHG emissions reductions from active transportation (MTCO2e)	55	99	128	
GHG Reductions from TR-4.1 (MTCO2e)	55	99	128	

Sources:
[1] <https://milpitasplanreview.althousing.org/>
[2] <https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/california-public-road-data/prd-2019-011v.pdf>
[3] <https://www.tpl.org/sites/default/files/Climate-smart%20Cities%20Methodology%20Active%20Transport%20exec%20summary.pdf>

$$VT_{RP} = (BIKE \times D \times AADT \times [A + C]) + (PED \times D \times AADT \times [A + C])$$

Where:

VT_{RP} = Annual vehicle trips reduced due to bicycling and walking

BIKE = Binary variable indicating whether the project has a bicycle component

PED = Binary variable indicating whether the project has a pedestrian component

D = Number of days per year that people use the facility

AADT = Annual average daily traffic on a parallel roadway

A = Adjustment factor (based on AADT, facility length, and whether the project is located in a university area; see Table 1) [\(1\)](#)

C = Activity center credit (based on the number of activity centers located within a quarter- or half-mile of the project; see Table 2) [\(2\)](#)

2.2.3 REDUCED VMT

The methodology calculates reduced vehicle miles traveled (VMT) by multiplying the number of trips shifted to bicycling, walking, and transit by the average trip lengths for each mode:

$$VMT = VT_B * L_B + VT_P * L_P + VT_T * L_T$$

Where:

VMT = Annual VMT reduced

VT_B = Annual vehicle trip reductions due to bicycling

L_B = Average length of bicycle trips

VT_P = Annual vehicle trip reductions due to walking

L_P = Average length of pedestrian trips

VT_T = Annual vehicle trip reductions due to transit

L_T = Average length of transit trips

Facility Length (mi)

AADT on parallel roadway >2
12,000 0.0038
24,000 0.0027
3,000 0.0019

Notes

New Bike/Ped Master Plan:

"The proposed network includes over 50 miles of new low-stress bikeways" - p.8

"<2% of residents walk or bike to work."

Existing Class I bikeway miles: 8

Existing Class II bikeway miles: 25

Existing Class III bikeway miles: 15

Total existing bikeway miles: 48

"For 11 of these schools, the City has designated Suggested Walking Routes along nearly 45 miles of roadways." - p.26

Table 6
2019 Maintained Miles & Daily Vehicle Miles of Travel Estimates by Jurisdiction

COUNTRY JURISDICTION	MAINTAINED MILES			DAILY VEHICLE MILES OF TRAVEL (DVMT) [1,000]
	RURAL	URBANIZED	TOTAL	
SANTA CLARA				
Cities:				
CAMPBELL	90.94	99.94		422.70
CUPERTINO	129.00	129.00		479.69
GILROY	1.01	110.53	111.54	0.46
MOUNTAIN VIEW		11.54		297.34
NEW ALTO		1.95		297.80
LOS ALTOS HILLS TOWN		68.97	68.97	333.00
LOS GATOS TOWN	0.47	109.63	110.10	2.1
MILPITAS		127.50	127.50	536.79
MOUNTAIN VIEW		14.34		22.44
MOUNTAIN VIEW		119.09	119.09	404.56
MOUNTAIN VIEW		140.50	140.50	404.56
PALO ALTO	8.16	185.98	194.14	95.10
SILICON VALLEY	0.64	134.35	134.35	880.41
SANTA CLARA		245.79	245.79	975.51
SARATOGA		132.91	132.91	1,508.44
SUNNYVALE		255.23	255.23	347.89
SUNNYVALE				347.89
SANTA CLARA TOTAL				1,222.32
	379.35	4,276.42	4,654.76	1,916.16
				38,061.82
				39,976.98

Table 1 and Table 2 summarize the adjustment factors and activity center credits used in the methodology.

TABLE 1: ADJUSTMENT FACTORS (A) BY AADT, FACILITY LENGTH, AND WHETHER THE PROJECT IS LOCATED IN A UNIVERSITY AREA

AADT on parallel roadway	Facility length (mi)		
	<1	1-2	>2
NON-UNIVERSITY AREA			
12,000	0.0019	0.0029	0.0038
24,000	0.0014	0.002	0.0027
30,000	0.001	0.0014	0.0019
UNIVERSITY AREA			
12,000	0.0104	0.0155	0.0207
24,000	0.0073	0.0109	0.0145
30,000	0.0052	0.0078	0.0104

TABLE 2: ACTIVITY CENTER CREDITS (C) BY NUMBER OF ACTIVITY CENTERS AND DISTANCE FROM THE FACILITY

Number of activity centers	Within 1/2 mile of the facility	Within 1/4 mile of the facility
<3	0	0
3	0.0005	0.001
4-6	0.001	0.002
>6	0.0015	0.003

TR-5.1; TR-5.2**Increase implementation of transportation demand management (TDM) strategies.****Reduce VMT from businesses.**

	2019	2030	2040	2045
Annual existing passenger vehicle miles traveled (VMT)	509,968,096	509,968,096	509,968,096	509,968,096
Percent of household VMT for commuting [1]	28%	28%	28%	28%
Passenger VMT from commuting	142,791,067	142,791,067	142,791,067	142,791,067
Percent reduction in passenger commute VMT from TDM measures [2]	26%	30%	30%	30%
Reduction in passenger commute VMT from TDM measures	37,125,677	42,837,320	42,837,320	42,837,320
Passenger vehicle emissions factor (MTCO2e/mi)	0.0002745	0.0002529	0.0002498	0.0002498
GHG reductions in passenger commute VMT (MTCO2e)	10,191	10,836	10,700	10,700
GHG Reductions from TR-5.1; TR-5.2 (MTCO2e)	10,191	10,836	10,700	

Source:

[1] https://traveltrends-dev.transportation.org/wp-content/uploads/sites/62/2019/07/B2_CIA_Role-Overall-Travel_web_2.pdf AASHTO Commuting in America 2013

[2] CAPCOA T-5

[Note: 78% of residents commute to work by driving alone](#)

VMT Reduction Check

Annual VMT reduction by Measure (Passenger VMT only)

	2030	2040	2045
<i>TR-1.1</i>	7,442,863	13,835,083	22,472,699
<i>TR-3.1; TR-3.2</i>	52,526,714	63,746,012	75,475,278
<i>TR-4.1</i>	199,619	391,254	511,026
<i>TR-5.1; TR-5.2</i>	37,125,677	42,837,320	42,837,320
<i>TR-1.2</i>	27,307,546	26,194,578	25,424,391
<i>Total VMT Reduction from Measures</i>	124,602,419	147,004,247	166,720,713
<i>TOTAL Passenger VMT Forecast</i>	559,587,179	579,143,509	599,858,891
<i>%Reduction in VMT from measures</i>	22%	25%	28%
<i>Total Passenger VMT with Reductions</i>	434,984,761	432,139,262	433,138,177

-- Ideal range: 20-75%. CAPCOA max reduction for urban areas is 75%. 20% for suburban centers. Milpitas is somewhere in between, leaning toward suburban center.

2015 Passenger VMT	492,014,849
2019 Passenger VMT	509,968,096
2045 Passenger VMT with measures	433,138,177
2045 Passenger VMT without measures	599,858,891
Change from 2015 (w measure)	-12%
Change from 2019 (w measure)	-15%
Change from 2015 (w/o meas)	22%
Change from 2019 (w/o meas)	18%
2015 population	87,570
2019 population	90,030
2045 population	107,250
2015 VMT per capita	5,619
2019 VMT per capita	5,664
2045 VMT per capita (w meas)	4,039
2045 VMT per capita (w/o meas)	5,593
Change from 2015 (w measure)	-28%
Change from 2015 (w/o meas)	0%
Change from 2019 (w measure)	-29%
Change from 2019 (w/o meas)	-1%

Strategy	Measure Number	New/Existing	Sector	Measure	2030	2040	2045	Quantification approach
Electrification and Clean Alternatives	OT-1.1	New and Existing	Off-Road Vehicles and Equipment	Reduce landscaping-related emissions.	962	1,681	1,759	Assumes new lawn and garden equipment are zero-emissions starting in 2028. Assumes 60% and 100% replacement of existing fossil-fuel powered lawn and garden equipment by 2030 and 2040, respectively.
	OT-1.2	New and Existing	Off-Road Vehicles and Equipment	Reduce construction-related emissions.	2,361	3,746	5,176	Assumes 40% of construction equipment are converted to renewable diesel or other zero-carbon alternatives by 2030, 60% by 2040, and 80% by 2045.
			Total		3,324	5,427	6,935	

OT-1.1	2019	2023	2030	2040	2045
Reduce landscaping-related emissions.					
Zero-emission landscaping equipment starting in 2024					
Lawn and garden emissions (MTCO2e)	1,602	1,624	1,663	1,724	1,781
New land and garden emissions (MTCO2e)		22	61	121	178
GHG reductions from requiring zero-emission equipment in 2024 (MTCO2e)		39	99	156	
Replacing old landscaping equipment with zero-emission alternatives					
Existing lawn and garden emissions (MTCO2e)	1,602	1,602	1,602	1,602	1,602
Lawn and garden gasoline gallons	182,813	182,813	182,813	182,813	182,813
Lawn and garden diesel gallons	50,319	50,319	50,319	50,319	50,319
Replacement rate for existing equipment		60%	100%	100%	
GHG reductions from replacing old equipment (MTCO2e)		961	1,602	1,602	
Additional electricity use and emissions					
Gallons of gasoline offset from old equipment		109,688	182,813	182,813	
Gallons of diesel offset from old equipment		30,191	50,319	50,319	
kBTU of gasoline offset from old equipment (kBTU)		13,710,974	22,851,623	22,851,623	
kBTU of diesel offset from old equipment (kBTU)		4,169,392	6,948,986	6,948,986	
Assumed average efficiency of gasoline equipment [1]		30%	30%	30%	
Assumed average efficiency of diesel equipment [1]		30%	30%	30%	
Average efficiency of electric equipment [2]		90%	90%	90%	
Electricity needed to offset replaced gasoline equipment (kBTU)		4,570,325	7,617,208	7,617,208	
Electricity needed to offset replaced diesel equipment (kBTU)		1,389,797	2,316,329	2,316,329	
Total new electricity use (kBTU)		5,960,122	9,933,536	9,933,536	
Total new electricity use (MWh)		1,747	2,911	2,911	
Electricity emissions factor (MTCO2e/MWh)		0.021606	0.007202	0	
Additional GHG emissions from electricity use (MTCO2e)		38	21	-	
Summary					
GHG reductions from requiring zero-emission equipment in 2024 (MTCO2e)		39	99	156	
GHG reductions from replacing old equipment (MTCO2e)		961	1,602	1,602	
Additional GHG emissions from electricity use (MTCO2e)		(38)	(21)	-	
GHG Reductions from OT-1.1 (MTCO2e)		962	1,681	1,759	

Sources:

[1] average for 4 stroke engine

[2] <https://www.energy.gov/sites/prod/files/2014/04/f15/10097517.pdf>

OT-1.2	2019	2030	2040	2045
Reduce construction-related emissions.				
Renewable diesel or alternative fuels construction equipment				
Construction emissions (MTCO2e)	3,478	5,903	6,244	6,470
Percent conversion to renewable diesel or alternatives		40%	60%	80%
GHG reductions from renewable diesel or alternatives (MTCO2e)		2,361	3,746	5,176
GHG Reductions from OT-1.2 (MTCO2e)	2,361	3,746	5,176	

Strategy	Measure Number	New/Existing	Sector	Measure	2030	2040	2045	Quantification approach	Other Notes
Zero Waste	SW-1.1	New	Solid Waste	Eliminate the disposal of organic solid waste in landfills.	9,385	17,010	21,055	Quantified at the Strategy level, assuming a current diversion rate of 60% and targeting a 90% diversion rate by 2045. Current diversion rate in Milpitas is unknown; CalRecycle reports an 83% disposal rate and the City estimates a <40% diversion rate. Used Elk Grove Waste Reduction Measure (RC-1) as an example.	
	SW-1.2			Increase recycling and the diversion of other inorganic solid waste.					
	SW-1.3			Reduce the generation of waste from residents and businesses.					
	SW-1.4			Reduce the generation of construction and demolition waste.					
	SW-1.5			Facilitate repair and reuse of consumer products.					
Landfill Emissions	SW-2.1	New	Solid Waste	Dispose waste at innovative facilities.	NA	NA	NA	Not quantifiable.	
	SW-2.2	New	Solid Waste	Support waste-to-energy facilities.	NA	NA	NA	Not quantifiable.	
Waste Policy	SW-3.1	New	Solid Waste	Engage with waste-related policymaking.	NA	NA	NA	Not quantifiable.	
			Total		9,385	17,010	21,055		

SW-1	2019	2030	2040	2045
Zero Waste				
Achieve a zero waste diversion rate of 90% by 2045				
Legislative-adjusted forecasted emissions				
Emissions from landfilled solid waste	22,040	23,405	25,452	26,255
Emissions from alternative daily cover	973	1,033	1,124	1,159
Emissions from composted yard trimmings	553	588	639	659
Total forecasted emissions from solid waste	23,566	25,026	27,215	28,074
Measure reduction				
Estimated diversion rate* [1]	60%			
Targeted diversion rate		75%	85%	90%
Adjusted Forecasted Emissions from Solid Waste (MTCO2e)		15,641	10,206	7,018
GHG Reductions from SW-1 (MTCO2e)	9,385	17,010	21,055	

Source:

[1] <https://www.calrecycle.ca.gov/lgcentral/goalmeasure/disposalrate/graphs/estdiversion>

* The diversion rate for the City is unclear; the disposal rate provided by CalRecycle is 83%, while the diversion rate estimated by the City is ~40%. The disposal rate for nearby-city Fremont is 56%, and the average estimated statewide diversion rate between 2010 and 2017 is approximately 64% [1]. Based on this data, assuming a conservative diversion rate of 60%.

Strategy	Measure Number	New/Existing	Sector	Measure	2030	2040	2045	Quantification approach
Water Conservation	WA-1.1	New and Existing	Residential and Nonresidential	Reduce indoor water consumption in buildings.	85	39	0	Assumes a 25% reduction in water usage in new development by 2030, 30% by 2040, and 35% by 2045. Assumes a 20% reduction in water usage in existing development by 2030, 25% by 2040, and 30% by 2045.
	WA-1.2	New and Existing	Residential and Nonresidential	Reduce water consumption for irrigation and landscaping.	59	28	0	Assumes a 25% reduction in outdoor water consumption in existing development by 2030, 30% by 2040, and 35% by 2045. Assumes a 60% reduction in new development by 2030, 70% by 2040, and 75% by 2045.
Recycled Water	WA-2.1	New and Existing	Residential	Increase the use of recycled water.	NA	NA	NA	Not quantifiable.
Wastewater Treatment	WA-3.1	New and Existing	Residential and Nonresidential	Generate biogas at wastewater treatment plants.	NA	NA	NA	Not quantifiable.
			Total		144	67	-	

WA-1.1	2019	2030	2040	2045
Reduce indoor water consumption in buildings.				
Water reductions from ultra-low-flow appliances required in all new development				
<u>Electricity use for water supply in all development</u>				
SFPUC electricity usage (MWh)	9,663	10,261	11,159	11,511
SCVWD electricity usage (MWh)	6,607	7,016	7,630	7,870
SBWR electricity usage (MWh)	1,053	1,118	1,216	1,254
<u>Electricity use for water supply in new development</u>				
SFPUC electricity usage in new development (MWh)	598	1,496	1,848	
SCVWD electricity usage in new development (MWh)	409	1,023	1,264	
SBWR electricity usage in new development (MWh)	65	163	201	
Target percent reduction in water usage in new development under measure	25%	30%	35%	
Electricity reductions from reduced water use				
SFPUC reduced electricity usage (MWh)	150	449	647	
SCVWD reduced electricity usage (MWh)	102	307	442	
SBWR reduced electricity usage (MWh)	16	49	70	
SFPUC emissions factor (MTCO2e/MWh)	-	-	-	
SCVWD emissions factor (MTCO2e/MWh)	0.05178	0.01726	-	
SBWR emissions factor (MTCO2e/MWh)	0.05178	0.01726	-	
GHG reductions in new development (MTCO2e)	6	6	0	
Water reductions from ultra-low-flow appliances in existing development				
<u>Electricity use for water supply in existing development</u>				
SFPUC electricity usage (MWh)	9,663	9,663	9,663	
SCVWD electricity usage (MWh)	6,607	6,607	6,607	
SBWR electricity usage (MWh)	1,053	1,053	1,053	
Target percent reduction in water usage in existing development under measure	25%	30%	35%	
SFPUC reduced electricity usage (MWh)	1,933	2,416	2,899	
SCVWD reduced electricity usage (MWh)	1,321	1,652	1,982	
SBWR reduced electricity usage (MWh)	211	263	316	
SFPUC emissions factor (MTCO2e/MWh)	-	-	-	
SCVWD emissions factor (MTCO2e/MWh)	0.05178	0.01726	-	
SBWR emissions factor (MTCO2e/MWh)	0.05178	0.01726	-	
GHG reductions in existing development (MTCO2e)	79	33	0	
GHG Reductions from WA-1.1 (MTCO2e)	85	39	-	

WA-1.2

Reduce water consumption for irrigation and landscaping.	2019	2030	2040	2045
Landscaping irrigation water use per capita per day (gallons) [1]	54			
Annual landscaping irrigation water use per capita per year (gallons)	19,601			
Milpitas population	90,030	95,605	103,970	107,250
Estimated annual water demand for landscaping (MG)	1,765	1,874	2,038	2,102
In existing development		1,765	1,765	1,765
In new development		109	273	338
Percent reduction in outdoor landscaping water from Water Efficient Landscape and Water Conservation Ordinances, drought-tolerant and water-conserving native landscaping, and water-efficient irrigation equipment programs				
In existing development	25%	30%	35%	
In new development	60%	70%	75%	
Annual water reduction (MG)				
In existing development	441	529	618	
In new development	66	191	253	
Total annual water reduction (MG)	507	721	871	
Emissions factor for water supply (MTCO2e/MG)	0.11569	0.03856	-	
GHG reductions (MTCO2e)	59	28	-	

Source:

[1] <https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2018/Final/SupportingDocs/Water-Portfolios-and-Balances.pdf>

California Water Use (2011-2015) (millions of acre feet)

Water Year	2011	2012	2013	2014	2015
Residential Exterior	2.3	2.4	2.5	2.4	1.9
Populations (from the Department of Finance)	37,561,624	37,924,661	38,269,864	38,556,731	38,870,150

Strategy	Measure Number	New/Existing	Sector	Measure	2030	2040	2045	Quantification approach
Urban Forestry and Open Space	MI-1.1		Miscellaneous	Protect native trees and vegetation and enhance carbon sequestration.	2,632	6,601	8,586	iTree Canopy
Urban Heat Island Reduction	MI-2.1		Miscellaneous	Reduce the urban heat island effect to conserve energy.	NA	NA	NA	
Green Infrastructure	MI-3.1		Miscellaneous	Increase the use of green infrastructure.	NA	NA	NA	
Green Business and Jobs	MI-4.1		Miscellaneous	Incentivize and promote green business practices.	NA	NA	NA	
	MI-4.2		Miscellaneous	Support green jobs in the city.	NA	NA	NA	
Carbon Sequestration and Embodied Emissions	MI-5.1		Miscellaneous	Increase soil carbon content.	NA	NA	NA	
	MI-5.2		Miscellaneous	Use low-carbon and carbon sequestering construction materials in new development.	NA	NA	NA	
			Total		2,632	6,601	8,586	

MI-1.1	2019	2030	2040	2045
Protect native trees and vegetation and enhance carbon sequestration.				
Existing Conditions [1]				
Current Tree Carbon Storage (MTCO2e)	133,365			
Current Tree Carbon Sequestration (MTCO2e/year)	5,307			
Tree coverage (square miles)	1.8			
Carbon sequestration per area (MTCO2e/square mile/year)	2900.0			
Percent tree coverage (Existing [1] and targets)	13%	20%	30%	35%
Percent increase from 2019		50%	124%	162%
New Tree coverage (square miles) [1]	0.9	2.3	3.0	
Additional Sequestration from expanded trees (MTCO2e/year)	2,632	6,601	8,586	
GHG Reductions from MI-1.1 (MTCO2e)	2,632	6,601	8,586	

[1] Estimated in iTree Canopy based on a sample of 500 points.
<https://canopy.itreetools.org/>

--City of Toronto committed to 30%-40% urban forestry cover, up from 25%
<http://wx.toronto.ca/inter/it/newsrel.nsf/7017df2f20edbe2885256619004e428e/c3c788e736e7f0d0852584fe00734171?OpenDocument>

Assumptions and Conversion Factors
Milpitas Greenhouse Gas Inventory and Forecasts



Category	Value	Notes	Source
Conversion Factors			
g/MT	1000000		
g/lb	453.592		
g/kg	1000		
lb/MT	2204.622622		
kg/MT	1000		
MT/ton	0.907185		
g/ton	907185		
lb/kg	2.20462		
kWh/MWh	1000		
MWh/GWh	1000		
gal/cubic foot	7.480519481		
gal/Liter	0.264172052		
Liter/gallon	3.785411784		
gallon/acrefoot	325.851.43		
days/year	365		
million gal/acre-feet	0.325851432		
MMBTU/gallon (diesel)	0.1374		
MMBTU/scf (natural gas)	0.001037		
therms/scf	0.01037		
kBTU/gal (gasoline)	125		
kBTU/gal (diesel)	138.1		
kBTU/kWh	3.41		

GWP			
Source (Select)	IPCC Fifth Assessment Report (Avg) <--drop down selection		
	CO2 GWP	CH4 GWP	N2O GWP
CO2	1		
CH4	28		
N2O	265		
Source	CO2 GWP	CH4 GWP	N2O GWP
IPCC Fourth Assessment Report (w/o climate carbon feedback)	1	25	265
IPCC Fourth Assessment Report (with climate carbon feedback)	1	34	298
IPCC Fourth Assessment Report (Avg)	1	25	298
IPCC Fifth Assessment Report (Avg)	1	28	265
IPCC Third Assessment Report	1	23	296
IPCC Second Assessment Report	1	21	310

Electricity Emission Factors	2005	2015	2018	2019	2020	2030	2040	2045	Source
PG&E EF (lb CO2/MWh)	489	404.51	206.29	197.8123	189.3347	113.0356	37.6785		https://www.theclimateregistry.org/our-members/cris-public-0 reports/eGRID (https://www.epa.gov/energy/emissions-generation-0 resource-integrated-database-eGRID) eGRID (https://www.epa.gov/energy/emissions-generation-0 resource-integrated-database-eGRID) eGRID (https://www.epa.gov/energy/emissions-generation-0 resource-integrated-database-eGRID)
CAMX EF (lb CH4/MWh)	0.03024	0.033	0.034	0.0327	0.0315	0.0189	0.0063		
CAMX EF (lb N2O/MWh)	0.00808	0.004	0.004	0.00385	0.0037	0.0022	0.0007		
CAMX EF (lb CO2/MWh)	724.12	527.9	496.50	478.1111	459.7222	275.8333	91.9444		
RPS Requirements									
PG&E									
Percent Renewable			27%	30%	33%	60%	87%	100%	
Increase in Renewables (from 2018)				3%	6%	33%	60%		
SVCE EF (lb CO2/MWh)				2.34	2.2397	1.3371	0.4457	0.0000	SVCE Inventory
MTCO2e/MWh					0.021606	0.007202	0.0000		

Fuel Emission Factors			
Fuel	Emission Factor	Unit	Source
Diesel (backup generators)	10.21 kg CO2/gal		
	0.9 g CH4/MMBTU		Climate Registry
	0.4 g N2O/MMBTU		2020 Default
Natural Gas (backup generators)	0.05444 kg CO2/scf		Emission Factors
	0.9 g CH4/MMBTU		
	0.9 g N2O/MMBTU		

22.5091702 lb CO2/gal
0.000272586 lb CH4/gal
0.000121149 lb N2O/gal
11.57372351 lb CO2/therm
0.000198416 lb CH4/therm
0.000198416 lb N2O/therm

22.5489072 lb CO2e/gal
0.0102280123 MTCO2e/gal
11.63185946 lb CO2e/therm
0.005276123 MTCO2e/therm

Natural Gas (lb/therm)			
CO ₂	CH ₄	N ₂ O	MTCO2e/therm
11.7	0.000226742	0.000005	0.005310456

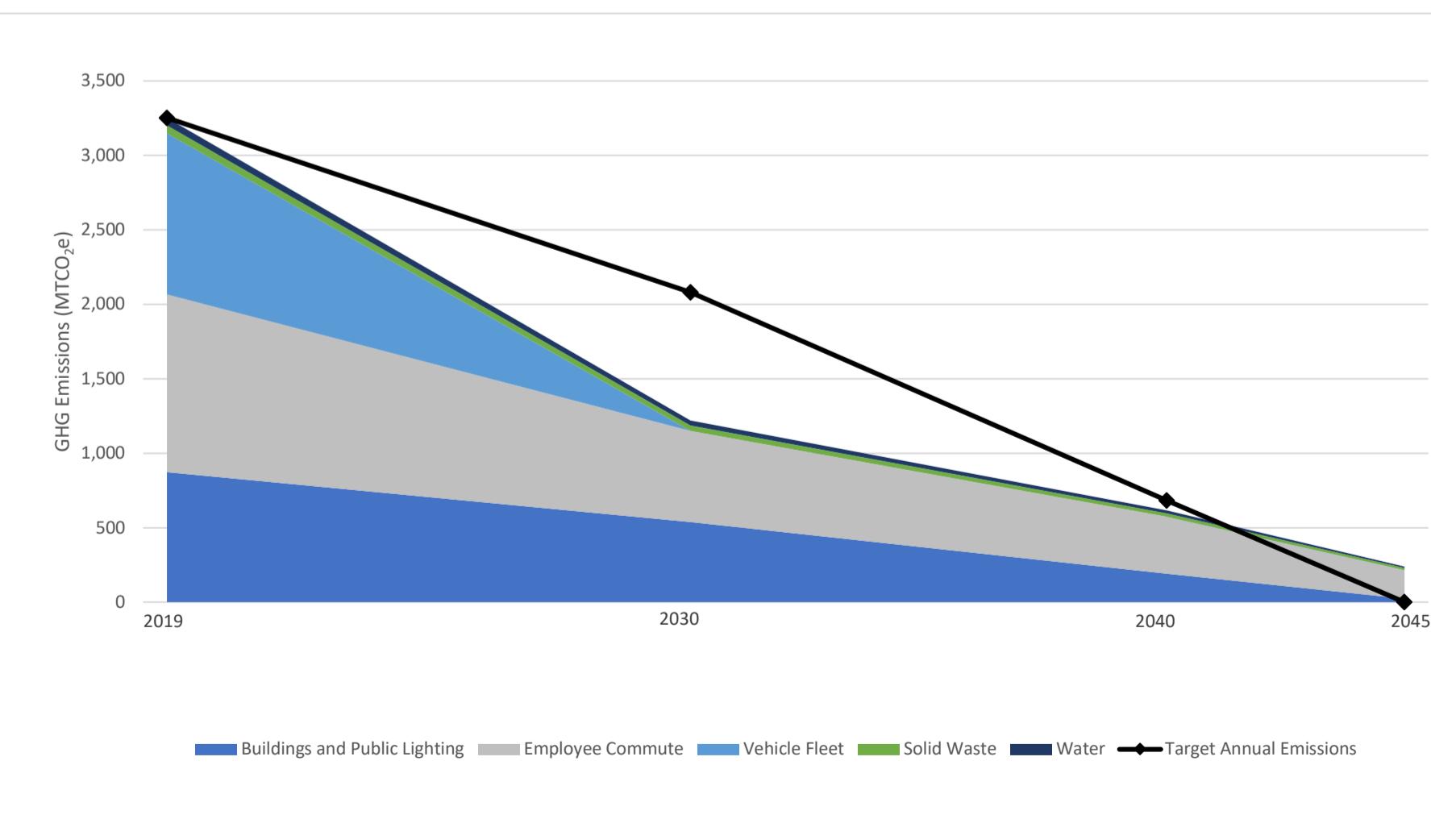
EMFAC2021 Emission Factors - Passenger	
Year	Emission Factor (MTCO2e/mile)
2019	
2030	0.000274487
2040	0.000252949
2045	0.000249778

EMFAC Emission Factors - Commercial	
Year	Emission Factor (MTCO2e/mile)
2019	
2030	0.001122798
2040	0.000870220
2045	0.000812973

*2005 PG&E emissions factor provided by previous 2005 inventory and confirmed here:
https://www.ca-ilg.org/sites/main/files/file-attachments/ghg_emission_factor_guidance.pdf

*2015 data is proxy data from 2016

Measure Number	Measure Title	2030	2040	2045
Buildings and Public Lighting				
ME-1.1	Reduce lighting-related energy consumption.	2	1	-
ME-1.2	Increase energy efficiency.	0	0	-
ME-1.3	Implement conservation best practices to reduce energy use.	NA	NA	NA
ME-2.1	Transition municipal buildings and facilities to be all-electric.	351	707	878
ME-3.1	Continue to use SVCE-supplied 100% carbon-free electricity.	NA	NA	NA
ME-3.2	Transition to 100% clean energy for municipal operations.	NA	NA	NA
Employee Commute				
MEC-1.1	Reduce employee commute VMT and support low-carbon alternatives.	406	576	769
Vehicle Fleet				
MVF-1.1	Convert the City's fleet vehicles and equipment to all-electric or alternative fuels, such as renewable diesel.	924	840	830
Solid Waste				
MSW-1.1	Increase waste diversion and achieve zero waste by 2030.	20	35	43
MSW-2.1	Implement an environmentally preferable purchasing policy.	NA	NA	NA
Water				
MWA-1.1	Reduce municipal water consumption.	1	0	0
Total Reductions from Measures				
	Reduction Needed for Target	1,703	2,158	2,520
	Gap Needed to Achieve Target*	841	2,090	2,759
		(862)	(68)	239
<i>*negative numbers mean target has been achieved; positive values means there is a gap</i>				
Legislative-Adjusted BAU Emissions				
Legislative-Adjusted BAU Emissions - Reductions from Measures				
Total Target Emissions				
Reduction Targets				
2019				
Emissions		3,252	2,923	2,773
Target %		-	36%	79%
Target		-	2,081	683
Reduction		-	841	2,090
2030				
Emissions with Measures Applied		873	538	190
	Buildings and Public Lighting	1,195	611	385
	Employee Commute	1,081	1	0
	Vehicle Fleet	53	36	22
	Solid Waste	50	33	17
	Water	3,252	1,219	615
Total		3,252	2,081	239
Target Annual Emissions		-	-	-
Axis		-	-	-
2040				
2045				



Measure Number	Measure Title	2030	2040	2045
ME-1.1	Reduce lighting-related energy consumption.	2	1	-
ME-1.2	Increase energy efficiency.	0	0	-
ME-1.3	Implement conservation best practices to reduce energy use.	NA	NA	NA
ME-2.1	Transition municipal buildings and facilities to be all-electric.	351	707	878
ME-3.1	Continue to use SVCE-supplied 100% carbon-free electricity.	NA	NA	NA
ME-3.2	Transition to 100% clean energy for municipal operations.	NA	NA	NA
MEC-1.1	Reduce employee commute VMT and support low-carbon alternatives.	406	576	769
MVF-1.1	Convert the City's fleet vehicles and equipment to all-electric or alternative fuels, such as renewable diesel.	924	840	830
MSW-1.1	Increase waste diversion and achieve zero waste by 2030.	20	35	43
MSW-2.1	Implement an environmentally preferable purchasing policy.	NA	NA	NA
MWA-1.1	Reduce municipal water consumption.	1	0	-

Total Reductions from Measures	1,703	2,158	2,520
Reduction Needed for Target	841	2,090	2,759
Gap Needed to Achieve Target*	(862)	(68)	239

**negative numbers mean target has been achieved; positive values means there is a gap*

	Reduction Targets	2019	2030	2040	2045
Emissions		3,252	2,923	2,773	2,759
Target %			36%	79%	100%
Target			2,081	683	-
Reduction			841	2,090	2,759

Sector	Strategy	Measure Number	New/Existing	Measure	2030	2040	2045	Quantification approach	Actions	Other Notes
Buildings and Public Lighting	Energy Efficiency and Conservation	ME-1.1		Reduce lighting-related energy consumption.	2	1		- ENGIE/ESCO data provided by City.		
		ME-1.2		Increase energy efficiency.	0	0		- ENGIE/ESCO data provided by City.		
		ME-1.3		Implement conservation best practices to reduce energy use.	NA	NA	NA	Not quantifiable.		
Buildings and Public Lighting	Electrification	ME-2.1		Transition municipal buildings and facilities to be all-electric.	351	707	878	All-electric new development starting in 2030, and all-electric existing buildings by 2045.		
Buildings and Public Lighting	Clean Energy	ME-3.1		Continue to use SVCE-supplied 100% carbon-free electricity.	NA	NA	NA	City currently using SVCE-supplied 100% carbon free energy.		
Buildings and Public Lighting		ME-3.2		Transition to 100% clean energy for municipal operations.	NA	NA	NA	Included in ME-2.1 and MVF-1.1.		
Employee Commute	Sustainable Employee Commutes	MEC-1.1		Reduce employee commute VMT and support low-carbon alternatives.	406	576	769	Assumes reductions in fossil-fuel powered employee commutes from EVs/alternative fuels, active transportation, transit, and telecommuting/flexible schedules of 40%, 60%, and 80% in 2030, 2040, and 2045, respectively.		
Vehicle Fleet	Low- and Zero-Emission Fleet Vehicles and Equipment	MVF-1.1		Convert the City's fleet vehicles and equipment to all-electric or alternative fuels, such as renewable diesel.	924	840	830	Inventory assumed all gasoline usage was on-road vehicles and all diesel usage was off-road vehicles and equipment. Quantification assumes all gasoline is converted to EV by 2030.		
Solid Waste	Zero Waste	MSW-1.1		Increase waste diversion and achieve zero waste by 2030.	20	35	43	Assumed 60% diversion rate currently, targeting 90% by 2030.		
	Responsible Consumption	MSW-2.1		Implement an environmentally preferable purchasing policy.	NA	NA	NA	Not quantifiable.		
Water	Water Efficiency and Conservation	MWA-1.1		Reduce municipal water consumption.	1	0		- ENGIE/ESCO data provided by City.		
Total					1,703	2,158	2,520			

ME-1.1	2019	2030	2040	2045
Reduce lighting-related energy consumption.				
Lighting upgrade annual electricity savings (kWh) [1]				
Interior and exterior lighting at facilities	1,137,349	1,137,349	1,137,349	1,137,349
Streetlights	1,771,359	1,771,359	1,771,359	1,771,359
Sports lighting	49,571	49,571	49,571	49,571
Park lighting	151,312	151,312	151,312	151,312
Total (kWh)	3,109,591	3,109,591	3,109,591	3,109,591
Total (MWh)	3,110	3,110	3,110	3,110
Total (MWh) scaled with municipal growth forecast	3,110	3,368	3,410	
SVCE electricity emissions factor (g CO2e/MWh)	607	202	-	
SVCE electricity emissions factor (MTCO2e/MWh)	0.00061	0.000202	0	
GHG reductions from lighting upgrades (MTCO2e)	2	1	-	
GHG Reductions from ME-1.1 (MTCO2e)	2	1	-	

Source:

[1] ESCO Explainer for CAP Measures.docx (document provided by the City)

ME-1.2	2019	2030	2040	2045
Increase energy efficiency.				
HVAC upgrades electricity savings (kWh) [1]	21,982	23,809	26,111	
High-Efficiency Transformers (kWh) [1]	112,956	112,956	112,956	
Total upgrades electricity savings (MWh)	135	137	139	
SVCE electricity emissions factor (g CO2e/MWh)	607	202	-	
SVCE electricity emissions factor (MTCO2e/MWh)	0.00061	0.000202	0	
GHG reductions from energy efficiency upgrades (MTCO2e)	0	0	-	
GHG Reductions from ME-1.2 (MTCO2e)	0	0	-	

Source:

[1] ESCO Explainer for CAP Measures.docx (document provided by the City)

ME-2.1	2019	2030	2040	2045
Transition municipal buildings and facilities to be all-electric.				
All-electric new development by 2030				
Natural gas usage (therms)	155,596	159,681	161,615	162,601
New natural gas usage (therms)		4,085	6,019	7,005
Natural gas savings from all-electric new development in 2030 (therms)			1,935	2,920
Natural gas emissions factor (MTCO2e/therm)			0.0053105	0.0053105
GHG reductions from natural gas savings in new development (MTCO2e)			10	16
Diesel backup generator usage (gallons)	3,456	3,547	3,590	3,612
New diesel backup generator usage (gallons)		91	134	156
Diesel savings from all-electric new development in 2030 (gallons)			43	65
Diesel backup generator emissions factor (MTCO2e/gallon)			0.0102280	0.0102280
GHG reductions from diesel savings in new development (MTCO2e)			0.4	0.7
GHG reductions from all-electric new development in 2030 (MTCO2e)			11	16
All-electric retrofits for existing buildings by 2045				
Existing natural gas usage (therms)	155,596	155,596	155,596	155,596
Percent of buildings retrofitted from natural gas	40%	80%	100%	100%
Existing diesel backup generator usage (gallons)	3,456	3,456	3,456	3,456
Percent of buildings retrofitted from diesel backup generators	60%	100%	100%	100%
Reduced natural gas (therms)	62,238	124,477	155,596	155,596
Reduced diesel backup generator usage (gallons)	2,074	3,456	3,456	3,456
Natural gas emissions factor (MTCO2e/therm)	0.0053105	0.0053105	0.0053105	0.0053105
Diesel backup generator emissions factor (MTCO2e/gallon)	0.0102280	0.0102280	0.0102280	0.0102280
GHG reductions from all-electric retrofits by 2045 (MTCO2e)	352	696	862	862
Additional electricity use and emissions				
Assumed average efficiency of natural gas heating (conservative) [1]	78%			
Assumed average efficiency of electric heating [2]	100%			
kWh per therm conversion	29.3001			
Total therms offset from natural gas heating use (therms)	62,238	126,411	158,516	158,516
Total electricity needed to offset natural gas heating (MWh)	1,422	2,889	3,623	3,623
SVCE electricity emissions factor (MTCO2e/MWh)	0.00061	0.000202	0	0
Additional GHG emissions from electricity use (MTCO2e)	1	1	-	-
GHG Reductions from ME-2.1 (MTCO2e)	351	707	878	878

Sources:

[1] Energy Solutions Center. 2021. Natural Gas Furnaces. Available: https://naturalgasefficiency.org/for-residential-customers/heating-gas_furnace/#:~:text>All%20furnaces%20built%20and%20sold,furnace%20with%20standing%20pilot%20E2%80%93%2050%25

[2] U.S. DOE. 2021. Electric Resistance Heating. Available: <https://www.energy.gov/energysaver/home-heating-systems/electric-resistance-heating#:~:text=Electric%20resistance%20heating%20is%20100,the%20fuel's%20energy%20into%20electricity>.

MEC-1.1	2019	2030	2040	2045
Reduce employee commute VMT and support low-carbon alternatives.				
Annual employee commute VMT	3,508,561	3,706,429	3,800,139	3,847,879
Annual GHG emissions from employee commutes (MTCO2e)	1195	1017	961	961
Percent reduction in employee commute emissions		40%	60%	80%
GHG reductions from employee commutes (MTCO2e)		407	577	769
Additional GHG emissions from EVs				
Annual employee commute VMT	3,508,561	3,706,429	3,800,139	3,847,879
Percent of reduction in employee commute VMT that comes from employee vehicle conversions to EVs		30%	50%	70%
Converted EV VMT for employee commutes		444,771	1,140,042	2,154,812
Average Efficiency of EV LDV (kWh/100-mi) [2]		34	34	34
Charged amount (MWh)		1,246	1,278	1,294
SVCE electricity emissions factor (MTCO2e/MWh)		0.00061	0.000202	0
Additional GHG emissions from EV on-road fleet (MTCO2e)		1	0	-
GHG Reductions from MEC-1.1 (MTCO2e)		406	576	769

Source:

[1] <http://www.fueleconomy.gov/feg/download.shtml> (Without EV efficiency forecasts, EV efficiency assumed to be the same for all future years)

< Includes reductions from EV/alternative fuels commutes, active transportation, transit, and telecommuting/flexible schedules

MVF-1.1

Convert the City's fleet vehicles and equipment to all-electric or alternative fuels, such as renewable diesel.

	2019	2030	2040	2045
Gasoline on-road vehicles				
Annual GHG emissions from on-road vehicle fleet (MTCO2e)	823	700	662	662
Additional GHG emissions from EVs				
Annual gasoline usage in on-road vehicles (gallons)	92,606	97,829	100,302	101,562
Average gasoline fleet vehicle fuel economy (miles/gallon)	25	25	25	25
Annual VMT from gasoline fleet vehicles	2,315,150	2,445,715	2,507,550	2,539,052
Average Efficiency of EV LDV (kWh/100-mi) [2]		34	34	34
Charged amount (MWh)		822	843	854
SVCE electricity emissions factor (MTCO2e/MWh)		0.00061	0.000202	0
Additional GHG emissions from EV on-road fleet (MTCO2e)		0	0	-
Diesel off-road vehicles and equipment				
Annual GHG emissions from off-road vehicles and equipment (MTCO2e)	258	224	178	169
Additional electricity use and emissions				
Gallons of diesel from converting off-road vehicles and equipment	26,383	27,051	27,390	
Zero-emission alternatives replacement rate	70%	85%	100%	
Gallons of diesel offset from converting off-road vehicles and equipment	18,468	22,993	27,390	
kBTU of diesel offset from old equipment (kBTU)	2,550,492	3,175,328	3,782,610	
Assumed average efficiency of diesel equipment [2]	30%	30%	30%	
Average efficiency of electric equipment [3]	90%	90%	90%	
Electricity needed to offset replaced diesel equipment (kBTU)	850,164	1,058,443	1,260,870	
Total new electricity use (MWh)	249	310	370	
SVCE electricity emissions factor (MTCO2e/MWh)	0.00061	0.000202	0	
Additional GHG emissions from electricity use (MTCO2e)	0	0	-	
GHG Reductions from MVF-1.1 (MTCO2e)	924	840	830	

Sources:

[1] <http://www.fueleconomy.gov/feg/download.shtml> (Without EV efficiency forecasts, EV efficiency assumed to be the same for all future years)

[2] average for 4 stroke engine

[3] <https://www.energy.gov/sites/prod/files/2014/04/f15/10097517.pdf>

MSW-1.1	2019	2030	2040	2045
Increase waste diversion and achieve zero waste by 2030.				
Landfilled solid waste (tons)	157	166	170	172
Emissions from landfilled solid waste	53	56	57	58
Estimated diversion rate*	60%			
Targeted diversion rate		75%	85%	90%
GHG reductions from zero waste (MTCO2e)		20	35	43
GHG Reductions from MSW-1.1 (MTCO2e)		20	35	43

*Assumed estimated diversion rate for municipal operations in 2019.

MWA-1.1	2019	2030	2040	2045
Reduce municipal water consumption.				
Total water usage (MG)	155			
Total water cost (\$)	\$ 1,044,941			
Cost per million gallons (\$/MG)	\$ 6,751			
ESCO anticipated cost savings from retrofit upgrades (\$) [1]	\$ 30,532			
Estimated water savings (MG)		5	5	5
Water emissions factor (MTCO2e/MG)		0.15116	0.050386	0
GHG reductions from water retrofit upgrades (MTCO2e)		1	0	-
GHG Reductions from MWA-1.1 (MTCO2e)		1	0	-

Source:

[1] ESCO Explainer for CAP Measures.docx (document provided by the City)

Assumptions and Conversion Factors
Milpitas Greenhouse Gas Inventory and Forecasts



Category	Value	Notes	Source
Conversion Factors			
g/MT	1000000		
g/lb	453.592		
g/kg	1000		
lb/MT	2204.622622		
kg/MT	1000		
MT/ton	0.907185		
g/ton	907185		
lb/kg	2.20462		
kWh/MWh	1000		
MWh/GWh	1000		
gal/cubic foot	7.480519481		
gal/Liter	0.264172052		
Liter/gallon	3.785411784		
gallon/acrefoot	325.851.43		
days/year	365		
million gal/acre-feet	0.325851432		
MMBTU/gallon (diesel)	0.1374		
MMBTU/scf (natural gas)	0.001037		
therms/scf	0.01037		
kBTU/gal (gasoline)	125		
kBTU/gal (diesel)	138.1		
kBTU/kWh	3.41		

GWP			
Source (Select)	IPCC Fifth Assessment Report (Avg) <--drop down selection		
	CO2 GWP	CH4 GWP	N2O GWP
CO2	1		
CH4	28		
N2O	265		
Source	CO2 GWP	CH4 GWP	N2O GWP
IPCC Fourth Assessment Report (w/o climate carbon feedback)	1	25	265
IPCC Fourth Assessment Report (with climate carbon feedback)	1	34	298
IPCC Fourth Assessment Report (Avg)	1	25	298
IPCC Fifth Assessment Report (Avg)	1	28	265
IPCC Third Assessment Report	1	23	296
IPCC Second Assessment Report	1	21	310

Electricity Emission Factors	2005	2015	2018	2019	2020	2030	2040	2045	Source
PG&E EF (lb CO2/MWh)	489	404.51	206.29	197.8123	189.3347	113.0356	37.6785		https://www.theclimateregistry.org/our-members/cris-public-0 reports/eGRID (https://www.epa.gov/energy/emissions-generation-0 resource-integrated-database-eGRID) eGRID (https://www.epa.gov/energy/emissions-generation-0 resource-integrated-database-eGRID) eGRID (https://www.epa.gov/energy/emissions-generation-0 resource-integrated-database-eGRID)
CAMX EF (lb CH4/MWh)	0.03024	0.033	0.034	0.0327	0.0315	0.0189	0.0063		
CAMX EF (lb N2O/MWh)	0.00808	0.004	0.004	0.00385	0.0037	0.0022	0.0007		
CAMX EF (lb CO2/MWh)	724.12	527.9	496.50	478.1111	459.7222	275.8333	91.9444		
RPS Requirements									
PG&E									
Percent Renewable			27%	30%	33%	60%	87%	100%	
Increase in Renewables (from 2018)				3%	6%	33%	60%		
SVCE EF (lb CO2/MWh)				2.34	2.2397	1.3371	0.4457	0.0000	SVCE Inventory
MTCO2e/MWh					0.021606	0.007202	0.0000		

*2005 PG&E emissions factor provided by previous 2005 inventory and confirmed here: https://www.ca-ilg.org/sites/main/files/file-attachments/ghg_emission_factor_guidance.pdf

*2015 data is proxy data from 2016

Fuel Emission Factors			
Fuel	Emission Factor	Unit	Source
Diesel (backup generators)	10.21 kg CO2/gal		
	0.9 g CH4/MMBTU		Climate Registry
	0.4 g N2O/MMBTU		2020 Default
Natural Gas (backup generators)	0.05444 kg CO2/scf		Emission Factors
	0.9 g CH4/MMBTU		
	0.9 g N2O/MMBTU		

22.5091702 lb CO2/gal
0.000272586 lb CH4/gal
0.000121149 lb N2O/gal
11.57372351 lb CO2/therm
0.000198416 lb CH4/therm
0.000198416 lb N2O/therm

Natural Gas (lb/therm)	CO ₂	CH ₄	N ₂ O	MTCO2e/therm
	11.7	0.000226742	0.000005	0.005310456

EMFAC2021 Emission Factors - Passenger	
Year	Emission Factor (MTCO2e/mile)
2019	
2030	0.000274487
2040	0.000252949
2045	0.000249778

EMFAC Emission Factors - Commercial	
Year	Emission Factor (MTCO2e/mile)
2019	
2030	0.001122798
2040	0.000870220
2045	0.000812973

Measure Number	Measure	Action Number	Action	Prioritization Score	GHG Emissions Reduction Potential	City Cost Effectiveness	Residential and Business Cost Effectiveness	Technological/Implementation Feasibility	Current Policies or Ordinances	Jurisdictional Control	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability	Resilience	Job Development	Resource Preservation
BUILDING ENERGY																			
STRATEGY 1. SHIFT TO CLEAN AND RELIABLE ENERGY																			
BE-1.1	Achieve 100 percent carbon-free electricity by 2030 in all existing and new development.	BE-1.1.1	Require new development to install on-site renewable energy and storage systems capable of meeting anticipated building energy consumption, or participate in a group-buy solar and storage program, or opt-in to SVCE.	22	8	2	2	2	1	2		0	0	1	1	1	1	1	0
		BE-1.1.2	Review zoning regulations for opportunities to simplify and encourage renewable energy systems.	20	8	0	2	2	1	2		0	2	0	0	1	1	1	0
		BE-1.1.3	Conduct outreach to residents and business owners to increase awareness of SVCE's carbon-free electricity supply.	18	8	0	2	2	1	2		1	2	0	0	0	0	0	0
		BE-1.1.5	Require new nonresidential development that cannot meet electricity demand through onsite renewable energy generation and storage to purchase 100% carbon-free electricity from SVCE. Work with SVCE to provide a cost-effective direct access program.	18	8	2	2	0	1	2		0	0	1	0	0	1	1	0
		BE-1.1.4	Require all newly built parking structures to have solar generation capabilities.	17	6	2	2	0	1	2		0	0	1	0	1	1	1	0
		BE-1.1.5	Collaborate with the Milpitas Chamber of Commerce and other partners to identify regional programs that could provide necessary financial arrangements to facilitate the use of PPAs for residential and nonresidential buildings.	16	8	2	0	2	1	1		0	2	0	0	0	0	0	0
		BE-1.1.6	Require the installation of solar heaters for all new swimming pools.	15	8	0	0	0	1	2		0	0	1	0	1	1	1	0
		BE-1.1.7	Work with utility partners (e.g., PG&E, SVCE, state regulators) to improve electric grid reliability.	15	4	2	0	0	0	2		0	2	1	1	1	1	1	0
BE-1.2	Facilitate innovative approaches to energy generation, distribution, and storage (e.g., microgrids).	BE-1.2.1	Consider opportunities for alternative energy generation, energy recapture (in-conduit hydro, co-generation), and distributed energy storage systems.	13	4	2	2	2	0	2		0	0	0	0	1	0	0	0
		BE-1.2.2	Collaborate with SVCE to encourage local schools and hospitals to develop microgrids, separate from utility-scale storage systems.	12	4	2	2	0	0	2		0	0	0	0	1	1	0	0
BE-1.3	Strengthen community awareness of energy efficiency, energy conservation, electrification, and clean energy.	BE-1.3.1	Work with regional partner agencies and utilities, such as BAAQMD, PG&E, and SVCE, to promote State rebates and other incentives and funding opportunities for renewable energy.	18	8	2	2	2	0	2		0	2	0	0	0	0	0	0
		BE-1.3.2	Develop and implement a comprehensive energy efficiency, energy conservation, electrification, and clean energy outreach and education campaign to support emissions reductions from building energy use.	18	6	0	2	2	1	2		1	2	0	1	0	0	1	0
STRATEGY 2. MAXIMIZE BUILDING DECARBONIZATION AND EFFICIENCY																			
BE-2.1	Adopt updated "reach" building codes with each building and energy code cycle to accelerate all-electric new development.	BE-2.1.1	Adopt an updated reach code for the 2022 code cycle that prohibits the installation of natural gas infrastructure in new development.	20	6	0	2	2	1	2		1	2	1	1	0	1	1	0
		BE-2.1.2	Adopt a ban on the installation of fossil fuel-powered backup energy sources in new development by 2030.	18	4	0	2	2	1	2		1	2	1	1	0	1	1	0
		BE-2.1.3	Partner with BayREN, SVCE, PG&E, other cities, and the private sector to develop effective strategies to facilitate electrification implementation.	13	4	2	2	0	0	2		1	2	0	0	0	0	0	0
		BE-2.1.4	Increase awareness and create incentives for developers to build all-electric buildings, such as reduced permit and/or impact fees.	10	4	0	2	2	0	1	1		0	0	0	0	0	0	0
BE-2.2	Facilitate all-electric development projects for industrial buildings.	BE-2.2.1	Build market demand for all-electric industrial buildings.	7	4	0	2	0	0	0		0	0	0	0	0	0	1	0
BE-2.3	Expand the City's Green Building Program.	BE-2.3.1	Develop additional incentives, above and beyond expedited building permit processing, for projects that incorporate sustainable design approaches and/or elements that exceed local, regional, and State requirements.	18	8	2	0	2	1	1		0	2	0	0	0	1	0	1
BE-2.4	Retrofit existing residential and nonresidential buildings and municipal facilities to improve energy efficiency and facilitate fuel switching.	BE-2.4.1	Develop a comprehensive energy retrofit program to transition existing residential buildings to all-electric by 2045. Begin program providing education and incentives then transition to point-of-sale and replace retrofit requirements.	23	8	0	2	2	2	1	1		1	2	1	1	0	1	1
		BE-2.4.2	Connect building owners to funding resources and financing options, such as Energy Upgrade California, for energy efficiency retrofits and improvement projects.	18	8	2	2	2	0	2		0	2	0	0	0	0	0	0
		BE-2.4.3	Develop a comprehensive energy retrofit program to transition existing nonresidential buildings to all-electric, aiming for a 60% conversion rate by 2045. Begin program providing incentives then transition to point-of-sale and replace retrofit requirements.	14	6	0	0	0	0	1	1		0	2	1	1	0	1	0
		BE-2.4.4	Eliminate the provision of fossil fuel-powered backup generator permits for existing nonresidential development by 2030.	11	6	0	0	2	0	1	0		0	0	1	1	0	0	0
BE-2.5	Facilitate energy audits for existing buildings to identify energy efficiency retrofit and electrification opportunities.	BE-2.5.1	Work with PG&E, SVCE, and other agencies to provide free energy audits of existing residential and nonresidential buildings.	17	4	0	2	2	2	1	2		1	2	0	0	0	1	0
		BE-2.5.2	Encourage ongoing energy benchmarking in existing nonresidential buildings, consistent with regulatory benchmarking programs and existing green building standards to help close the energy efficiency information gap.	13	4	2	2	2	0	2		0	0	0	0	0	1	0	
BE-2.6	Reduce plug loads in existing buildings.	BE-2.6.1	Use partnerships to promote appliance upgrades to energy-efficient technologies and products through campaigns targeted at residents and local businesses, ENERGY STAR® appliance change-out programs, and incentives (e.g., give-a-ways, federal/state/utility rebates, etc.).	15	4	2	2	2	0	2		1	2	0	0	0	0	0	0
		BE-2.6.2	Facilitate the adoption of smart grid and other peak load reduction technologies, such as building energy management systems and smart appliances, within existing buildings.	15	4	2	2	0	0	2		0	0	1	1	1	1	1	0

Measure Number	Measure	Action Number	Action	Prioritization Score	GHG Emissions Reduction Potential	City Cost Effectiveness	Residential and Business Cost Effectiveness	Technological/Implementation Feasibility	Current Policies or Ordinances	Jurisdictional Control	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability	Resilience	Job Development	Resource Preservation
TRANSPORTATION AND LAND USE																			
STRATEGY 1. FACILITATE SUSTAINABLE TRANSPORTATION AND LAND USE PLANNING																			
TR-1.1	Reduce VMT from new development in compliance with SB 743.	TR-1.1.1	Enforce the City's requirements for SB 743, which mandate a 15% reduction in new project-generated VMT.	18	6	0	2	2	1	2		0	0	1	1	1	1	0	1
		TR-1.1.2	Continuously update VMT policy and implementation tools to further reduce VMT.	18	6	0	2	2	1	2		0	0	1	1	1	1	0	1
TR-1.2	Reduce VMT from existing development.	TR-1.2.1	Work with local employers to provide subsidies to employees for using transit or active transportation to commute to work, and encourage flexible work schedules (e.g., 9/80s and 4/10s) as well as tele-commuting.	20	6	2	2	2	1	2		0	2	1	1	0	0	0	1
		TR-1.2.2	Partner with local businesses to provide discounts or rewards programs to incentivize using transit or active transportation to travel to businesses.	20	6	2	2	2	1	2		0	2	1	1	0	0	0	1
		TR-1.2.3	Require employers of 50 or more employees to implement vehicle trip reduction programs and limit car commutes to 40% of their workforce by 2030.	17	6	0	2	2	1	1		0	2	1	1	0	0	0	1
		TR-1.2.4	Adopt and phase a citywide TDM ordinance by 2023, building on recommendations of the Metro Specific Plan and incorporate TDM ordinance into the Zoning Ordinance Update (anticipated in 2025).	16	6	0	2	2	1	2		0	0	1	1	0	0	0	1
		TR-1.2.5	Implement existing TDM plans, such as The District at Milpitas Lot 3A TDM Plan.	15	6	0	2	2	1	1		0	0	1	1	0	0	0	1
		TR-1.3.1	Facilitate the development of complete streets and neighborhoods.	19	4	0	2	2	0	2		1	2	1	1	1	1	1	1
		TR-1.3.2	Maintain and continue to improve regional arterials within the City.	17	4	0	2	2	1	2		0	0	1	1	1	1	1	1
TR-1.3	Continue to implement and adopt policies that support high-density, mixed-use, transit oriented development, and housing near jobs	TR-1.3.3	Promote and facilitate the creation of an innovation district within Metro Specific Plan Area to provide more jobs near transit and housing.									0	0	0	0	0	0	0	0
		TR-1.3.4	Support high levels of ridership at the Milpitas BART station by encouraging higher density, mixed uses, and connectivity along transit corridors and at transit nodes.	14	6	2	2	2	0	2		0	0	0	0	0	0	0	0
		TR-1.3.5	Promote dense development in central locations and along transportation corridors.									0	0	0	0	0	0	0	0
		TR-1.3.6	Support Redevelopment of older commercial or gateway areas (Main Street and Calaveras) to intensify development and a mix of uses along major transit corridor.	14	6	2	2	2	0	2		0	0	0	0	0	0	0	0
		TR-1.3.6	Promote the increase of density and mixed uses in key opportunity areas.	12	4	2	2	2	0	2		0	0	0	0	0	0	0	0
		TR-1.3.7	Encourage development of urban plazas in new development in the Milpitas Metro Specific Plan, Midtown Specific Plan, and town center areas to encourage pedestrian activity and vibrant mixed-use centers that reduce vehicular activity.	12	4	2	2	2	0	2		0	0	0	0	0	0	0	0
TR-1.4	Explore car-free zones or shared streets in appropriate areas	TR-1.4.1	Explore car-free zones in commercial hubs such as those identified in the Midtown Specific Plan and Metro Specific Plan areas.	9	4	0	0	0	1	1		0	0	1	1	0	0	0	1
STRATEGY 2. DECARBONIZE VEHICLES																			
TR-2.1	Increase EV charging infrastructure.	TR-2.1.1	Work with SVCE and other partners to provide incentives and increase EV charging stations in visible, accessible, shared locations such as mixed-use development or accessible to multi-family renters.	21	8	0	2	2	0	1	1		0	2	1	1	1	1	0
		TR-2.1.2	With each Title 24 and CalGREEN code cycle, adopt updated EV charging station standards for all new development through the City's reach codes that go beyond State requirements. Require at least 50 percent of parking spaces in new development to be EV-ready/EVSE installed by 2030.	20	8	0	2	2	1	1		1	0	1	1	0	1	1	1
		TR-2.1.3	Provide rebates and other incentives to home and business owners to install EV chargers.	20	8	2	2	0	1	1		1	2	1	1	0	1	0	0
		TR-2.1.4	Ensure EV charging stations are encouraged and allowed through land use designations that currently permit gas fueling stations.	13	8	0	2	2	0	1	2		0	0	0	0	0	0	0
TR-2.2	Increase EV and low-carbon vehicle adoption.	TR-2.2.1	Improve awareness of local, regional, and State incentives for low- and zero-emission vehicles and increase EV purchases in Milpitas through events and resource promotion such as through Climate Action Milpitas Dashboard.	18	8	2	2	2	0	2		0	2	0	0	0	0	0	0
		TR-2.2.2	Partner with the BAAQMD, Joint Venture Silicon Valley, and the Silicon Valley Clean Cities Coalition to pursue funding for EV deployment projects in the city.	17	8	2	2	2	1	2		0	0	0	0	0	0	0	0
		TR-2.2.3	Include a provision in the next contract with the City's solid waste franchise hauler that they use alternative fuel vehicles for the fleet which services Milpitas.	16	8	0	2	0	1	1		0	2	1	1	0	0	0	0
		TR-2.2.4	Partner with Acterra and its GoEV Program to deploy a public outreach campaign that gives the public opportunities to drive EVs and provides EV education.	15	8	0	0	2	0	1	2		0	2	0	0	0	0	0
		TR-2.2.5	Adopt an ordinance that phases out development of new gasoline and diesel fuel stations as the market shifts to fossil fuel free vehicles.	14	8	0	0	0	1	1		0	2	1	1	0	0	0	0
		TR-2.2.6	Provide incentives to convert vehicle fleets (e.g., rental, private, school) in the city.	12	8	2	0	0	1	1		0	0	0	0	0	0	0	0
TR-2.3	Reduce vehicle idling.	TR-2.3.1	Adopt ordinances to limit idling at institutions and businesses to reduce the impacts of vehicle idling on adjacent uses, such as housing, schools, and health care facilities.	14	4	0	2	0	1	2		0	2	1	1	0	0	0	1
		TR-2.3.2	Discourage the construction of new drive-throughs in the Milpitas Metro Specific Plan.	12	4	0	2	0	1	2		0	0	1	1	0	0	0	1
		TR-2.3.3	Require all new nonresidential development with loading docks to supply sufficient electrical power for delivery trucks and associated equipment to reduce idling when making deliveries.	9	4	0	0	0	1	1		0	0	1	1	0	0	0	1

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TR-2.4	Reduce the amount of parking such that it meets the needs of residents, workers, and visitors in a way that is consistent with the City's sustainability goals.	TR-2.4.1	Revise development standards for multi-family and mixed-use developments to separate parking costs from the cost to rent, purchase, or lease residential and nonresidential buildings.	16	4	2	0	2	1	1	1	1	2	1	1	0	0	0	1
		TR-2.4.2	Revise development standards to eliminate or reduce the minimum parking requirements for new development and redevelopment of nonresidential buildings and mid- to higher-density residential development.	14	4	0	0	2	2	1	2	0	0	1	1	0	0	0	1
		TR-2.4.3	Develop and require parking maximums at new development.	9	4	0	0	0	0	1	1	0	0	1	1	0	0	0	1
STRATEGY 3. INCREASE ACTIVE AND PUBLIC TRANSPORTATION USE																			
TR-3.1	Enhance and expand transit facilities and infrastructure.	TR-3.1.1	Implement the Milpitas OnDemand "hub-and-spoke" micro-transit pilot program, including on-demand shuttle service for first- and last-mile connections to existing transit hubs such as the BART station and VTA light rail stops.	22	6	2	2	2	1	2	0	2	1	1	1	0	1	1	
		TR-3.1.2	Ensure a pedestrian-friendly environment around the BART and light rail transit stations.	19	6	2	2	0	1	2	0	2	1	1	1	1	0	0	1
TR-3.2	Increase transit ridership.	TR-3.2.1	Work with transit agencies to provide free or subsidized transit to low-income residents, expanding to all residents by 2030.	21	6	2	2	2	1	1	0	2	1	1	1	0	1	1	
		TR-3.2.2	Improve reliability and convenience of existing transit services through increased frequency, expanded service areas, extended service hours, and better facilities.	17	6	0	2	0	1	1	0	2	1	1	1	0	1	1	
TR-3.3	Improve active transportation options.	TR-3.3.1	Require all new development other than single family to provide short-term and long-term bicycle parking facilities to meet peak season maximum demand.	17	4	0	2	2	1	2	1	2	1	1	0	0	0	1	
		TR-3.3.2	Increase awareness of existing City initiatives to facilitate active transportation, including Bike Paths maps and Suggested Routes to School Program maps.	17	4	2	2	2	0	2	0	2	1	1	0	0	0	1	
		TR-3.3.3	Require new nonresidential developments projects to provide "end-of-trip" facilities for cyclists, including showers, secure bicycle lockers, and changing spaces.	14	4	0	2	0	1	2	0	2	1	1	0	0	0	1	
		TR-3.3.4	Require new nonresidential developments have adequate e-bike and e-scooter infrastructure and options.	13	4	0	2	0	1	1	0	2	1	1	0	0	0	1	
		TR-3.3.5	Implement the updated Trail, Pedestrian, and Bicycle Master Plan to enhance and expand bicycle and pedestrian infrastructure and networks.	19	4	2	2	2	1	1	0	2	1	1	1	0	0	1	
OFF-ROAD VEHICLES AND EQUIPMENT																			
STRATEGY 1. SHIFT TO CLEAN OFF-ROAD EQUIPMENT AND VEHICLES																			
OT-1.1	Reduce landscaping-related emissions.	OT-1.1.1	Promote regional and State incentive programs to encourage residents and business owners to convert or replace their fossil fuel-powered gardening equipment, such as lawn mowers, leaf blowers, and edge trimmers, with electric alternatives.	15	4	2	2	2	0	2	1	2	0	0	0	0	0	0	
		OT-1.1.2	Adopt an ordinance that prohibits the sale of fossil fuel-powered landscaping equipment by 2024 to transition to zero-emission landscaping equipment.	13	4	0	2	2	1	1	0	0	1	1	0	0	0	1	
		OT-1.1.3	Require all new development to install sufficient exterior electrical outlets to charge electric-powered landscaping equipment.	9	4	0	2	0	1	2	0	0	0	0	0	0	0	0	
OT-1.2	Reduce construction-related emissions.	OT-1.2.1	Reduce idling of construction vehicles and equipment.	15	4	2	2	0	1	1	0	2	1	1	0	0	0	1	
		OT-1.2.2	Prohibit the use of fossil fuel-powered generators at construction sites in all new discretionary projects.	10	4	0	0	0	1	0	0	2	1	1	0	0	0	1	
		OT-1.2.3	Require all construction projects to use renewable diesel in diesel-powered construction equipment.	10	4	0	0	0	1	1	0	2	1	1	0	0	0	0	
SOLID WASTE																			
STRATEGY 1. ACHIEVE ZERO WASTE																			
SW-1.1	Eliminate the disposal of organic solid waste in landfills.	SW-1.1.1	Require local restaurants to compost food waste, consistent with SB 1383.	13	6	0	2	2	1	1	0	0	0	0	0	0	0	1	
		SW-1.1.2	Expand existing organic waste collection routes and drop-off sites to improve composting services for interested residents and businesses.	13	6	0	2	2	1	2	0	0	0	0	0	0	0	0	
		SW-1.1.3	Implement and enforce the requirements of SB 1383 and eliminate disposal of compostable organic materials to landfills.	19	8	0	2	2	1	2	1	0	0	0	0	1	1	1	
SW-1.2	Increase recycling and the diversion of other inorganic solid waste.	SW-1.2.1	Partner with RecycleStuff.org to enhance awareness of local and regional recycling opportunities.	14	6	2	2	2	0	2	0	0	0	0	0	0	0	0	
		SW-1.2.2	Adopt an ordinance that requires recycling and composting services, the use of only recyclable and compostable materials by vendors, and adequate staff to ensure proper disposal and recycling at events that require a City-issued permit.	12	6	0	2	0	1	2	0	0	0	0	0	0	0	1	
		SW-1.2.3	Partner with waste haulers to expand the diversion of non-food, non-construction, and non-demolition solid waste.	11	6	0	0	2	1	1	0	0	0	0	0	0	0	1	
SW-1.3	Reduce the generation of waste from residents and businesses.	SW-1.3.1	Enforce the City's plastic bag and Styrofoam ban.	14	6	0	2	2	1	2	0	0	0	0	0	0	0	1	
		SW-1.3.2	Encourage local businesses to reduce the use of single-use, non-biodegradable products, and support the establishment of a regional ordinance that restricts and/or limits the use of these products by local businesses.	14	6	2	2	2	0	2	0	0	0	0	0	0	0	0	
		SW-1.3.3	Require organizations over 50 employees to implement organization-wide waste reduction initiatives.	12	6	0	2	0	1	2	0	0	0	0	0	0	0	1	
SW-1.4	Reduce the generation of construction and demolition waste.	SW-1.3.4	Promote responsible consumption of products and materials.	12	6	2	2	0	0	2	0	0	0	0	0	0	0	0	
		SW-1.3.5	Coordinate with other local jurisdictions and landfills to implement a divertible materials (e.g., recyclables) ban at landfills.	11	6	0	2	0	1	1	0	0	0	0	0	0	0	1	
		SW-1.4.1	Amend the building demolition permit requirements and adopt a comprehensive construction and demolition ordinance to reach a 75% diversion rate.	15	6	0	2	2	1	1	0	1	1	0	0	0	0	1	

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SW-1.5	Facilitate repair and reuse of consumer products.	SW-1.5.1	Develop a reuse facility that makes building materials available to customers, and acts as an outlet for reusable items otherwise destined for landfill.	17	6	0	2	2	0	1	1	0	2	0	0	0	1	1	1
		SW-1.5.2	Create and support "fix-it clinics" at Parks and Recreation facilities and other City buildings that can build skills among local businesses and residents in innovation, repair, and reuse.	17	6	0	2	2	0	1	1	0	2	0	0	0	1	1	1
		SW-1.5.3	Support Extended Producer Responsibility initiatives that drive end of product life management.	12	6	2		2	0	0	2	0	0	0	0	0	0	0	0
		SW-1.5.4	Promote redesign of products so that they do not require end of life disposal, but are incorporated back into useful products.	12	6	2		2	0	0	2	0	0	0	0	0	0	0	0
WATER AND WASTEWATER																			
STRATEGY 1. PROMOTE RESILIENT WATER SUPPLY, WATER USE, AND WATER RESOURCES																			
WA-1.1	Reduce indoor water consumption in buildings.	WA-1.1.1	Increase residential and nonresidential participation in the High Efficiency Clothes Washer Rebate Program and the High Efficiency Toilet Rebate Program by ensuring continued funding to the City's Water Conservation Program, operated in conjunction with resources provided by SCVWD and BAWSCA.	17	4	0	2	2	2	1	1	1	2	0	0	0	1	0	1
		WA-1.1.2	Collaborate with San Francisco Public Utilities Commission (SFPUC) and Santa Clara Valley Water District (SCVWD) to develop a retrofit program to encourage installation of water conservation measures in existing businesses and residences.	17	4	0	2	2	2	1	1	1	2	0	0	0	1	0	1
		WA-1.1.3	Regularly review and update the City's Water Conservation Ordinance and water conservation measures to be consistent with current best management practices and ensure effective and ongoing conservation efforts.	15	4	2		2	2	1	2	0	0	0	0	0	1	0	1
		WA-1.1.4	Continue water conservation efforts outlined in the 2021 Urban Water Management Plan (UWMP).	15	4	2		2	2	1	2	0	0	0	0	0	1	0	1
		WA-1.1.5	Require ultra-low-flow fixtures in new residential and nonresidential development.	13	4		2	2	0	1	2	0	0	0	0	0	1	0	1
		WA-1.1.6	Continue to assess and manage distribution system losses through efforts including replacing existing meters with smart meters, implementing a Supervisory Control and Data Acquisition (SCADA) system, replacing selected water pipe with upgraded design criteria to withstand seismic events, and maintaining an active cathodic protection system.	13	4	0		2	2	1	2	0	0	0	0	0	1	0	1
		WA-1.1.7	Coordinating with SFPUC and SCVWD, facilitate the development of a water auditing program for existing residential and nonresidential development.	11	4	0	0	2	0	0	2	1	2	0	0	0	0	0	0
WA-1.2	Reduce water consumption for irrigation and landscaping.	WA-1.2.1	Continue to fund and operate the City's Water Conservation Program in conjunction with resources provided by Valley Water and BAWSCA, including the Irrigation Equipment Upgrades Rebate Program, Landscape Conversion Rebate Program, Water Wise Survey Program, and Water Efficient Gardening workshops.	18	4	0	2	2	2	1	2	1	2	0	0	0	1	0	1
		WA-1.2.2	Increase residential and nonresidential participation in the Landscape Conversion Rebate and Irrigation Equipment Upgrades programs to convert lawns to a healthy habitat with native and drought-tolerant species that use water-efficient irrigation equipment.	17	4	0	2	2	2	1	1	1	2	0	0	0	1	0	1
		WA-1.2.3	Implement and enforce the Water Efficient Landscape Ordinance and the Water Conservation Ordinance.	13	4	0		2	2	1	2	0	0	0	0	0	1	0	1
		WA-1.2.4	Require drought tolerant, water conserving, and/or native landscaping in new development and redevelopment projects.	11	4	0	0	2	0	1	2	0	0	0	0	0	1	0	1
WA-1.3	Increase the use of recycled water and support efforts to drought proof our water supply.	WA-1.3.1	Increase residential and nonresidential participation in the Rainwater Catchment Rebate and Graywater Laundry to Landscape Rebate programs to utilize rainwater and graywater for landscaping and irrigation purposes.	15	4		2	2	0	1	1	1	2	0	0	0	1	0	1
		WA-1.3.2	Continue to require all commercial and industrial development south of the Hetch Hetchy right-of-way to install recycled water lines and require conversion of landscape irrigation to recycled water, as feasible.	15	4	2	0	2	2	1	2	0	0	0	0	0	1	0	1
		WA-1.3.3	Support use of recycled water as drought proof water supply including potential indirect potable recharge.	14	4			2	2	0	0	1	2	0	0	1	1	0	1
		WA-1.3.4	Encourage the use of recycled water for industrial uses and landscape irrigation where feasible, within the parameters of State and County Health Codes and standards and in compliance with regional agency requirements.	12	4	2		2	2	0	2	0	0	0	0	0	0	0	0
		WA-1.3.5	Encourage residents and businesses to install on-site recycled water systems (i.e., greywater systems) and rainwater harvesting systems, consistent with all State and County Health Codes and standards and in compliance with regional water agency requirements.	12	4	2		2	2	0	2	0	0	0	0	0	0	0	0
		WA-1.3.6	Require all new residential and nonresidential development to include a separate piping system for recycled water (i.e. "purple pipes") to be used for irrigation and other outdoor water uses, as feasible.	8	4	0	0	0	0	1	1	0	0	0	0	0	1	0	1

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CARBON SINKS																				
STRATEGY 1. RESILIENT INFRASTRUCTURE AND HEALTHY FOREST AND NATURAL SYSTEMS																				
CS-1.1	Protect native trees and vegetation and enhance carbon sequestration.	CS-1.1.1	Based on the recommendations from the City's Urban Forestry Management Plan, implement a tree planting program to expand the city's urban forest canopy.	18	4	0	2	2	2	1	0	2	1	1	0	1	1			
		CS-1.1.2	Develop and implement a street tree planting program for residential neighborhoods.	18	4	0	2	2	2	1	0	2	1	1	0	1	1			
		CS-1.1.3	Identify high priority areas for civic tree planting activities that provide the greatest benefits to the community and provides urban canopy coverage in areas of the city that are currently underserved by street trees and trees within public spaces.	16	4	2	2	2	2	2	0	2	0	0	0	0	0			
		CS-1.1.4	Make available a list of plants and trees native to the region that are suitable for use in landscaping, consistent with the requirements of Milpitas' Water Efficient Landscape Ordinance (WELO).	16	4	2	2	2	2	2	0	0	0	0	0	1	0			
		CS-1.1.5	Update Milpitas' Tree Protection Regulations as specified in the General Plan. - Establish additional criteria and findings that need to be met prior to removing a protected or heritage tree. - Provide more detailed tree replacement requirements to address the aesthetic loss, habitat value, and economic value of the tree being removed. - Enhance the penalties for unpermitted tree removals. - Consider adding additional tree species to the list of locally protected tree species (particularly native species). - Establish criteria for construction practices to protect existing high value trees to the greatest extent feasible.	16	4	0	2	2	1	1	0	2	1	1	0	1	0			
		CS-1.1.6	Identify thresholds for new development mitigation for the provision of parks or open space.	13	4	2	2	2	1	2	0	0	0	0	0	0	0			
		CS-1.1.7	Identify natural areas that could be obtained and preserved through land transfers and acquisitions of undeveloped/unprotected private and public lands.	11	4	2	2	0	2	1	0	0	0	0	0	0	0			
CS-1.2	Reduce the urban heat island effect to conserve energy.	CS-1.2.1	Amend the Zoning Code to create tree planting standards for new and renovated development; require the planting of two trees in single-family development in the front, side, or rear yard as feasible; and create lineal landscaping standards for commercial development that identify a minimum number of tree plantings based on lineal frontage length.	17	4	0	0	2	2	1	2	0	2	1	1	0	1			
		CS-1.2.2	Require all new development to install cool pavements, plant low-maintenance and drought-tolerant landscaping, and plant shade trees.	17	4	0	0	2	2	1	2	0	2	1	1	0	1			
		CS-1.2.3	Reduce heat gain from surface parking lots in new development for a minimum of 50% of the site's hardscape. Develop standards to provide shade from the existing tree canopy or from appropriately selected new trees that complement site characteristics and maximize drought tolerance.	16	4	0	2	2	1	1	0	2	1	1	0	1	0			
CS-1.3	Increase the use of green infrastructure.	CS-1.3.1	Develop and implement a green infrastructure program for the installation and maintenance of projects and existing public resources, such as the parks system and other open spaces.	18	4	0	2	2	2	1	0	2	1	1	0	1	1			
		CS-1.3.2	Review Capital Improvement Program projects to identify opportunities for green infrastructure.	16	4	2	2	2	2	2	0	0	0	0	0	1	0			
		CS-1.3.3	Develop guidelines for the inclusion of green infrastructure in the design of transportation improvements.	13	4	0	2	2	2	1	0	0	0	0	0	1	0			
		CS-1.3.4	Encourage the use of green roofs on existing and new development.	12	4	2	2	2	0	2	0	0	0	0	0	0	0			
CS-1.4	Increase soil carbon content.	CS-1.4.1	Develop a healthy soil strategy for the city to support urban agriculture, address carbon sequestration, and increase water capture.	11	4	0	2	0	2	1	0	0	0	0	0	1	0			
CS-1.5	Use low-carbon and carbon sequestering construction materials in new development.	CS-1.5.1	Adopt standards to require the use of pervious paving materials in plazas, in addition to the provision of mature landscaping and other strategies that will maximize carbon sequestration.	13	4	0	2	2	1	2	0	0	0	0	0	1	0			
		CS-1.5.2	Require building materials that store carbon (e.g., wood, calcium carbonate-based cementitious substances, synthetic limestone) in all nonresidential construction.	6	4	0	0	0	0	1	1	0	0	0	0	0	0			

Prioritization Framework

All actions are prioritized based on timeline (when they should be implemented - near, mid, long term)

Criteria	Description and Score		
GHG Emissions Reduction Potential	Small - The action has a small (between 0%-2%) greenhouse gas reduction potential. 4	Medium - The action has a medium (between 3%-5%) greenhouse gas reduction potential. 6	High - The action has a high (over 5%) greenhouse gas emissions reduction potential. 8
City Cost Effectiveness	Costs Outweigh Benefits - Implementation costs slightly outweigh the long-term financial benefits. -2	Benefits Match Costs - Long-term financial benefits match implementation costs OR don't know the overall cost effectiveness of the action. 0	Benefits Outweigh Costs - Long-term financial benefits outweigh implementation costs. 2
Residential and Business Cost Effectiveness	Cost Outweigh Benefits - Long-term financial benefits do not outweigh implementation costs. -2	Benefits Match Costs - Long-term financial benefits match implementation costs OR don't know the overall cost effectiveness of the action. 0	Benefits Outweigh Costs - Long-term financial benefits outweigh implementation costs. 2
Technological/ Implementation Feasibility	No - Technology is not readily available and is not on track to be deployed in the specified timeframe. -2	Maybe - Technology is on track to be deployed in the specified timeframe OR don't know about the status of the technology. 0	Yes - Technology needed currently exists. 2
Current Policies or Ordinances	No - Policies or ordinances currently exist that prohibit this action. -2	Maybe - Policies or ordinances would need to be developed to support this action OR don't know if policies or ordinances exist. 0	Yes - Policies or ordinances currently exist that support this action. 2
Jurisdictional Control	No - City is the influencer. 0	Maybe - City is the regulator. 1	Yes - City is the actor. 2
Implementation Timeframe	6+ Years - Action could be operational after 6+ years. 0	3-5 Years - Action can be operational in the next 3 to 5 years. 1	1-2 Years - Action can be operational in the next 1 to 2 years. 2
Co-Benefits			
Benefits to Renters	cost savings of energy efficiency upgrades, improvements in transit and fuel, and housing security. 0		home to see the cost savings of energy efficiency upgrades, improvements in transit and fuel, and housing security. 1
Equity	No - This action neither enhances nor decreases health and racial equity through improved quality of life, access to 0		Yes - This action enhances health and racial equity through improved quality of life and access to 2
Air Pollution Prevention	pollutant emissions OR don't know what impact this action has on local or regional criteria pollutant emissions at location of 0		Yes - This action minimizes local or regional criteria pollutant emissions at the location of implementation. 1
Health and Well-Being	No - This action does not influence public health OR don't know 0		Yes - This action enhances public health. 1
Reliability	transportation system, emergency response, etc. OR don't know the impact on reliability. 0		Yes - Action helps increase reliability of the electrical grid, transportation system, emergency response, etc. 1
Resilience	No - Action does not impact the resilience of the City, people, and ecosystems to climate-related disruptions OR don't know 0		Yes - Action increases the resilience of the City, people, and ecosystems to climate-related disruptions. 1
Job Development	No - Action does not influence job creation in Milpitas OR don't know 0		Yes - Action maximizes quality job creation in Milpitas. 1
Resource Preservation	No - Action does not impact greenspaces/prime habitat OR don't know 0		Yes - Action helps preserve greenspaces/prime 1

Maximum Potential Score

29

Implementing Agencies

County Administration Office	CAO
Innovation and Business Assistance Dep.	IBA
Office of Emergency Services	OES
Community Development Department	CDD
Air Pollution Control District	APCD
Health and Human Services	HHS
Fire Department	TCFD
Emergency Medical Services	EMS
Agricultural Commissioner	AC
Public Services Department	PSD

Climate Resilience Benefit	Measure Number	Measure	Action Number	Action	Prioritization Score	COBENEFITS															
						Climate Resilience Potential	City Cost Effectiveness	Residential and Business Cost Effectiveness	Technological/Implementation Feasibility	Current Policies or Ordinances	Jurisdictional Control	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability				
STRATEGY 1. Resilient Communities and Equity and Environmental Justice																					
1.1	Increase community resilience to impacts from air pollution.		1.1.1	Develop an outreach program to educate vulnerable communities and residents in general on strategies to protect themselves from air pollution exacerbated by climate change, including impacts from wildfire smoke.	15	6	0	0	2	0	2	2	0	2	0	1	0				
			1.1.2	Establish or support development of community centers and/or other locations indoors for individuals experiencing homelessness or other vulnerable populations to seek refuge during periods of high air pollution.	11	6	0	0	0	0	1	1	0	2	0	1	0				
			1.1.3	Coordinate with partner organizations to communicate measures to protect residents and workers during high ozone and high particulate matter days.	10	4	0	0	2	0	0	2	0	2	0	0	0	0			
1.2	Increase community resilience to respond to and recover from widespread health emergencies.		1.2.1	Consider the overall preparedness of the community to respond to and recover from widespread health emergencies and develop programs and activities designed to increase resilience and self-sufficiency.	15	8	2	0	2	0	2	1	0	0	0	0	0	0			
			1.2.2	Partner with the Milpitas Unified School District and other community organizations to develop programs and activities designed to help individuals, families, and community groups prepare for and respond effectively to widespread health emergencies.	8	4	0	0	2	0	0	1	0	0	0	1	0	0			
			1.2.3	Collaborate with federal, State, regional, and local partners to implement programs to help prevent vector and waterborne diseases.	6	4	0	0	0	0	0	1	0	0	0	1	0	0			
1.3	Protect populations vulnerable to extreme heat.		1.3.1	Work with City departments to identify specific locations in the city with populations vulnerable to heat-related illness (e.g., elderly populations, high rates of cardiovascular disease).	15	6	2	0	2	0	2	1	0	2	0	0	0	0			
			1.3.2	Develop a targeted outreach campaign with supporting materials to raise awareness about heat risks. Ensure that extreme heat preparedness and response information is available in the primary non-English languages spoken in the community.	17	8	0	0	2	0	2	2	0	2	0	1	0	0	0		
			1.4.1	Promote community awareness of climate-resilient actions that can be implemented by homeowners, such as water conservation, on-site water collection, passive solar designs, and alternative energy strategies.	11	6	0	0	0	2	1	1	0	0	0	0	1	0	0		
1.4	Increase community awareness of climate change.		1.4.2	Collaborate with federal, State, regional, and local partners to develop a community-wide outreach program to educate diverse communities on how to prepare and recover from the various impacts of climate change likely to affect the city.	13	8	0	0	2	0	2	1	0	0	0	0	0	0	0		
			1.5.1	Ensure that climate impacts and climate adaptation measures aimed at reducing climate risks do not lead to disproportionately adverse effects on vulnerable populations.	14	4	0	0	2	2	2	2	0	2	0	0	0	0	0		
			1.6.1	Consider the needs of vulnerable populations and individuals with limited mobility when planning for access to safe and comfortable shelter during extreme heat events or other severe weather events.	14	6	0	0	2	2	2	2	0	0	0	0	0	0	0		
1.6	Improve mobility among vulnerable populations and individuals.		1.6.2	Encourage and support local transit service providers to increase and expand services for people who are transit-dependent, including seniors, persons with mobility disabilities, and persons without regular access to automobiles by improving connections to regional medical facilities, senior centers, and other support systems that serve residents and businesses.	12	4	0	0	2	2	0	1	0	2	0	0	1	0	0		
			1.6.3	Support and encourage the expansion of paratransit and public transit service to neighborhood and regional medical facilities.	13	6	0	0	2	2	0	1	0	2	0	0	0	0	0	0	
			1.7.1	Explore opportunities to construct additional community facilities. The facilities should be geographically distributed to accommodate underserved areas of the city and include spaces that can be rented by residents and community groups.	14	4	0	0	2	2	2	0	1	2	0	1	0	0	0	0	
1.7	Ensure completeness and availability of emergency supplies and resources to all segments of the population, focusing especially on vulnerable populations and individuals.		1.7.2	Encourage services and programs that meet the unique needs of seniors within Milpitas, including the establishment of medical facilities, transportation options for seniors and people with mobility disabilities, senior centers, and programs that provide for in-home care and aging-in-place.	17	6	0	0	2	2	1	2	0	2	0	1	0	0	1	0	
			1.7.3	Support health care facilities and services that assist underserved populations, including minorities, disabled persons, and the homeless community.	18	8	0	0	2	2	0	2	0	2	0	1	0	0	1	0	0
			1.7.4	Recognize that not-for-profit health care providers, clinics, and permanent supportive housing provide a valuable resource and appropriate medical care for the community, including vulnerable populations.	16	4	2	0	2	2	2	2	0	2	0	0	0	0	0	0	0
			1.7.5	Continue to promote public safety through public education programs, and ensure programs are available and accessible to all segments of the community.	19	6	2	0	2	2	2	2	0	2	0	1	0	0	0	0	0
			1.7.6	Coordinate with local homeless services to ensure that emergency shelters are available during extreme heat events, poor air quality, severe weather events, and other highly hazardous conditions. Ensure that the local homeless population is made aware of these resources.	15	8	0	0	2	0	0	2	0	2	0	1	0	0	0	0	0

Climate Resilience Benefit	Measure Number	Measure	Action Number	Action	Prioritization Score	COBENEFITS													
						Climate Resilience Potential	City Cost Effectiveness	Residential and Business Cost Effectiveness	Technological/Implementation Feasibility	Current Policies or Ordinances	Jurisdictional Control	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability		
STRATEGY 2. Resilient Transportation Systems and Resilient Energy Resources																			
2.1	Integrate climate change considerations in all transportation agency planning and decision-making processes.	2.1.1	Update maintenance protocols to incorporate projected climate change effects and evaluate the potential for increased frequency or need to maintain transportation infrastructure, specifically from extreme heat and increased frequency of flooding events.							18	8	2	0	2	2	2	1		
		2.1.2	Use the best available science to update design standards for future development and maintenance of transportation infrastructure and capital improvement projects that incorporate future projections for more intense heat wave events.							16	8	2	0	2	0	2	1		
		2.1.3	Coordinate with regional transportation agencies to ensure redundancy of critical transportation routes to allow for continued access and movement in the event of an emergency.							10	8	0	0	0	0	0	1		
2.2	Reduce local flooding impacts to transportation infrastructure.	2.2.1	Develop guidelines for the inclusion of green infrastructure in the design of transportation improvements.							17	6	0	0	2	2	2	0		
		2.2.2	Update the City's Streetscape Master Plan to require drought-tolerant plantings consistent with the requirements of Milpitas's Water Efficient Landscape Ordinance (WELO) and Green Stormwater Infrastructure (GSI) elements such as pervious pavers, bioretention areas and stormwater tree filters should be included wherever possible, consistent with the City's GSI Plan.							17	6	0	0	2	2	2	0		
2.3	Increase the resilience of existing residential and commercial development through energy efficiency upgrades and onsite energy generation and storage.	2.3.1	Transition all City-owned buildings to use 100 percent renewable sources of electricity and install onsite carbon-free backup power supplies to make City operations grid-independent during PSPS events.							16	8	2	0	0	0	2	1		
		2.3.2	Promote decentralization of energy supplies and energy storage capacity for residents and businesses to improve energy independence (i.e., microgrids and battery storage).							14	8	0	0	0	0	1	0		
2.4	Minimize stress on the electrical grid.	2.4.1	Facilitate the adoption of smart grid and other peak load reduction technologies, such as building energy management systems and smart appliances, within new and existing buildings.							16	6	2	2	2	0	0	1		
		2.4.2	Encourage distributed energy resources including solar, fuel cells etc. to provide environmental benefits, as well as energy security, and the support of the grid during peak energy use periods.							15	6	0	0	2	2	1	1		
		2.4.3	Collaborate with utility providers to ensure that infrastructure and resource management plans account for anticipated climate change impacts.							13	8	0	0	0	2	0	1		
2.5	Protect critical energy and telecommunications infrastructure and systems from climate change.	2.5.1	Require that all new power and gas lines and transformers are installed underground where feasible and promote the undergrounding of existing overhead facilities.							11	6	0	0	2	0	1	0		
		2.5.2	Ensure adequate utility system redundancy and fuel is available to maintain critical facilities during emergency events.							17	8	0	0	2	0	1	0		
		2.5.3	Require that all new telecommunication lines are installed underground where feasible and promote the undergrounding of existing overhead facilities.							10	6	0	0	2	0	0	0		
STRATEGY 3. Reduced Flooding																			
3.1	Minimize risks to life and property resulting from flooding and flood induced hazards.	3.1.1	Invest in the use of pervious pavements and landscaping in developed areas to prevent localized flooding events during small and large storms.							12	6	0	0	2	2	1	0		
		3.1.2	Continue to maintain good standing and compliance under the National Flood Insurance Program (NFIP). This will be accomplished through the implementation of floodplain management programs that will, at a minimum, meet the requirements of NFIP: Enforcement of the Flood Damage Prevention ordinance. Participate in the floodplain identification and mapping updates. Provide public assistance/information on floodplain requirements and impacts.							20	8	2	0	2	2	1	0		
		3.1.3	Evaluate and consider increasing the design criteria for current and future flood protection projects from 100-year flood events to higher impact flood events.							19	8	0	0	2	2	1	1		
		3.1.4	Evaluate the need to increase pump station capacity and provide protection for pump stations.							18	8	2	0	2	2	2	1		
3.2	Evaluate proposed development in areas of the City subject to flooding impacts caused by rising sea levels.	3.2.1	Require evaluation of projected inundation for development projects near San Francisco Bay or at flooding risk from local waterways which discharge to San Francisco Bay. For projects affected by increased water levels in San Francisco Bay, the City shall require incorporation of mitigation measures prior to the approval of the project.							19	8	2	2	2	2	1	1		
		3.3.1	Monitor information from federal, State, and regional agencies on water level rises in San Francisco Bay on an on-going basis. Use this information to determine if additional adaptive management actions are needed and implement those actions to address flooding hazards from increasing sea levels for existing or new development and infrastructure.							12	6	0	0	2	2	0	2		
3.3	Maintain up-to-date flood risk and hazard data.	3.3.2	Continuously monitor local and regional efforts to track sea level rise and the associated flood risks. Consider constructing facilities, such as flood walls and additional pump stations, to protect the city from flooding associated with sea level rise.							13	6	0	0	2	2	0	2		

Climate Resilience Benefit	Measure Number	Measure	Action Number	Action	Prioritization Score	COBENEFITS											
						Climate Resilience Potential	City Cost Effectiveness	Residential and Business Cost Effectiveness	Technological/Implementation Feasibility	Current Policies or Ordinances	Jurisdictional Control	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability
STRATEGY 4: Robust Emergency Services and Improved Disaster Recovery																	
4.1	Ensure that emergency services have adequate capacity to address increased demand due to climate change-related impacts.	4.1.1	Identify community safety areas and evaluate existing locations that serve as temporary shelters or refuge during hazard events for resilience to future climate impacts.	14	8 2 0 0 0 1 0								1 2 0 0 0 0 0				
		4.1.2	Collaborate with federal, State, and regional partners to ensure coordinated evacuation planning and ensure compliance with Senate Bill 99 and Assembly Bill 747 regarding evacuation route capacity and adequate egress points for subdivisions in the city.	10	8 0 0 0 0 0 0								0 0 0 0 1 1 0				
		4.1.3	Establish resilience hub locations in neighborhoods throughout the community, equipped with backup power and disaster assistance and supplies.	18	8 2 0 2 0 1 1								0 2 0 1 1 0 0				
		4.1.4	Maintain up-to-date emergency preparedness and evacuation plans and procedures in coordination with appropriate State, regional, County, and local agencies and departments.	16	8 0 0 2 2 2 1								0 0 0 0 1 0 0				
		4.1.5	Continue to maintain the City's Emergency Operations Center and conduct regular staff training exercises to ensure that all City staff members, in addition to emergency responders, are adequately trained to fulfill their duties in the event of an emergency.	18	8 0 0 2 2 2 0								0 2 0 1 1 0 0				
		4.1.6	Conduct ongoing training for first responders and City personnel to ensure they have the necessary training and equipment to deal with climate-exacerbated hazards, including how to better serve vulnerable populations. Improve cultural competency of emergency services personnel in accordance with Senate Bill 160 in coordination with Santa Clara County Office of Emergency Management.	16	8 0 0 2 0 1 1								0 2 0 1 1 0 0				
		4.1.7	Clearly communicate to the public the City's plans, procedures, and responsibilities in the event of a disaster or emergency. Communications and information made available to the public shall be provided in multiple languages to ensure the greatest number of community members have access to this information.	19	8 0 0 2 2 2 1								0 2 0 1 1 0 0				
		4.1.8	Encourage residents to register with the Santa Clara County Emergency Alert System (AlertSCC) to ensure notification in the event of an emergency.	16	8 0 0 2 2 2 0								0 0 0 1 1 0 0				
		4.1.9	Develop Disaster Documentation Program to include tracking disasters affecting Milpitas, and tracking via photos damage incurred during and after disaster events. This data can be used for tracking and trending, and ultimately mitigation planning.	19	8 0 0 2 2 2 1								0 2 0 1 1 0 0				
		4.1.10	Develop a debris management plan to aid in post-disaster recovery.	13	6 0 0 2 2 2 0								0 0 0 0 1 0 0				
4.2	Provide effective, efficient, and immediately available Community Emergency preparedness programs response in the event of a natural or human-made disaster.	4.2.1	Encourage residents and community leaders to participate in disaster training programs, such as the "Strategic Actions For Emergencies" (S.A.F.E) emergency preparedness program and the Community Emergency Response Team (CERT) program. Where feasible, assist in neighborhood drills and safety exercises to increase participation and build community support.	16	8 0 0 2 2 2 1								0 0 0 0 1 0 0				
		STRATEGY 5: Reduced Urban Heat Island Effect and Resilient Water Resources															
5.1	Reduce urban heat island effect through cool roofs, parking lot shading, landscaping, and urban greening in new and existing private and public development.	5.1.1	Amend the Zoning Code to create tree planting standards for new and renovated development, to require the planting of two trees in single-family development in the front, side, or rear yard as feasible, and to create linear landscaping standards for commercial development that identify a minimum number of tree plantings based on linear frontage length.	18	6 0 0 2 2 1 0								1 2 1 1 0 1 0				
		5.1.2	Encourage the inclusion of additional shade trees, vegetated stormwater treatment and landscaping to reduce the "heat island effect" in development projects.	20	8 0 0 2 2 1 0								1 2 1 1 0 1 0				
		5.1.3	Encourage the installation or use of cool roof technologies, green roofs, and rooftop gardens in new and existing private and public development.	13	6 0 0 2 0 1 0								0 2 0 1 0 1 0				
		5.1.4	Support outreach and education describing benefits of cooling strategies, including promotion of the Cool California website and resources on the City website and at City Hall.	9	6 0 0 2 0 1 0								0 0 0 0 0 0 0				
		5.1.5	Reduce heat gain from surface parking lots in new development for a minimum of 50% of the site's hardscape. Develop standards to provide shade from the existing tree canopy or from appropriately selected new trees that complement site characteristics and maximize drought tolerance. Where feasible, use open-grid pavement systems (at least 50% pervious, which would also satisfy the stormwater Low Impact Development requirement).	18	8 0 0 2 2 1 0								0 2 0 1 0 1 0				
		5.1.6	Update City design standards to use heat-mitigating and heat resistant materials on pedestrian walkways and transit stops.	17	8 0 0 2 0 2 1								0 2 0 1 0 1 0				
		5.1.7	Collaborate with the regional transit providers to install cooling technologies/structures/design features at transit stops.	12	6 0 0 2 0 0 1								0 2 0 1 0 0 0				

Climate Resilience Benefit	Measure Number	Measure	Action Number	Action	Prioritization Score	COBENEFITS														
						Climate Resilience Potential	City Cost Effectiveness	Residential and Business Cost Effectiveness	Technological/Implementation Feasibility	Current Policies or Ordinances	Jurisdictional Control	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability			
5.2	Advocate for Drought-Proof Water Supplies including recycled water system or indirect potable recharge		5.2.1	Work with water utilities to evaluate vulnerabilities of water supply systems and develop strategies to improve resilience.	14	8	0	0	2	0	0	2	0	0	0	0	1	0	0	1
			5.2.2	Collaborate with federal, State, and local agencies and organizations to identify future water supplies, explore alternative supply sources, and improve capacity.	14	8	0	0	2	0	0	2	0	0	0	0	1	0	0	1
			5.2.3	When updating master plans for infrastructure, including water supply, flood control and drainage, and critical facilities, review relevant climate change scenarios and ensure that the plans consider the potential effects of climate change and include measures that provide for resilience to climate impacts.	16	8	0	0	2	2	2	1	0	0	0	0	1	0	0	0
			5.2.4	Develop, implement and manage a new city-wide water rationing and conservation plan, including community outreach and education. This project will begin the conversion of City and private-owned irrigation facilities from potable to recycled water where they are adjacent to recycled water pipelines.	16	8	0	0	2	2	2	1	0	0	0	0	1	0	0	0
			5.2.5	Continue to require all commercial and industrial development south of the Hatch Hatchy right-of-way to install recycled water lines, and require conversion of landscape irrigation to recycled water as soon as available.	16	8	0	0	2	2	1	1	0	0	0	0	1	1	0	0
			5.2.6	Aggressively pursue expansions to the treatment and distribution capacity of recycled water supplies and coordinate with the City of San Jose South Bay Water Recycling Program to increase recycled water supplies available to Milpitas.	16	8	0	0	2	2	0	2	0	0	0	0	1	1	0	0
STRATEGY 6. Integrated Resilience Planning and Improved Biodiversity and Habitat																				
6.1	Embed climate resiliency and adaptation across planning efforts.		6.1.1	Integrate climate resiliency throughout long-term planning and current development projects.	21	8	2	0	2	2	2	1	0	2	0	1	1	0	0	0
			6.1.2	Participate in regional climate adaptation planning efforts.	20	8	2	0	2	2	2	0	0	2	0	1	1	0	0	0
			6.1.3	Encourage and support private sector investment in climate adaptation through climate-resilient infrastructure such as onsite renewable energy, integrated stormwater management and water conservation.	15	6	0	0	2	2	1	1	0	0	0	0	1	1	1	0
6.2	Integrate findings of climate vulnerability into all phases of emergency planning.		6.2.1	Ensure that emergency response plans and training programs continue to evolve and are modified to incorporate future climate projections in order to protect residents, infrastructure, and facilities during emergencies and extreme weather events.	20	8	2	0	2	2	2	0	0	2	0	1	1	0	0	0
			6.3.1	Continue the City's Tree Maintenance Program.	20	8	0	0	2	2	1	0	1	2	1	1	0	1	0	1
6.3	Prioritize nature-based solutions to improve resilience while promoting biodiversity.		6.3.2	Promote tree health, removal of dead branches and trees that may become a hazard in severe weather, earthquake or a result of drought.	17	6	0	0	2	2	0	0	1	2	1	1	0	1	0	1
			6.3.3	Prepare and adopt an Urban Forest Management Plan (UFMP) for Milpitas. Conserve existing native trees and vegetation where possible and integrate regionally native trees and plant species into development and infrastructure projects where appropriate.	18	8	0	0	2	2	1	0	0	2	0	1	0	1	0	1
			6.3.4		20	8	0	0	2	2	1	0	1	2	1	1	0	1	0	1
			6.3.5	Work with the Santa Clara Valley Water District to restrict future fencing, piping and channelization of creeks when flood control and public safety can be achieved through measures that preserve the natural environmental and habitat of riparian corridors; in addition, evaluate opportunities to revert some existing concrete-lined channels to more natural alternatives such as levees.	18	8	0	0	2	2	0	0	0	2	0	1	1	1	0	1
			6.3.6	Collaborate with the Santa Clara Valley Water District to support the priorities and projects of the Safe, Clean Water and Natural Flood Protection Program. Pursue grant funding opportunities from the District to provide funding for water conservation, habitat restoration, and open space projects that increase community resiliency, while improving water quality and increasing flood safety throughout the community.	19	8	0	0	2	2	0	1	0	2	0	1	1	1	0	1
			6.3.7	Continue to collaborate with the Santa Clara Valley Water District, and pursue grant funding from the district to support the priorities and projects of the Safe, Clean Water and Natural Flood Protection Program.	19	8	0	0	2	2	0	1	0	2	0	1	1	1	0	1
			6.3.8	Encourage and accommodate multipurpose flood control projects that incorporate recreation, education, resource conservation, preservation of natural riparian habitat, and the scenic value of drainages, creeks, and detention ponds.	18	8	0	0	2	2	0	0	0	2	0	1	1	1	0	0

Prioritization Framework

All actions are prioritized based on timeline (when they should be implemented - near, mid, long term)

Criteria	Description and Score			
Climate Resilience Potential	Small - The action has a small effect on reducing risk of climate impacts. 4	Medium - The action has a medium effect on reducing risk of climate impacts. 6	High - The action has a high effect on reducing risk of climate impacts. 8	
City Cost Effectiveness		Costs Outweigh Benefits - Implementation costs slightly outweigh the long-term financial benefits. -2	Benefits Match Costs - Long-term financial benefits match implementation costs OR don't know the overall cost effectiveness of the action. 0	Benefits Outweigh Costs - Long-term financial benefits outweigh implementation costs. 2
Residential and Business Cost Effectiveness	Cost Outweigh Benefits - Long-term financial benefits do not outweigh implementation costs. -2		Benefits Match Costs - Long-term financial benefits match implementation costs OR don't know the overall cost effectiveness of the action. 0	Benefits Outweigh Costs - Long-term financial benefits outweigh implementation costs. 2
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Current Policies or Ordinances	No - Policies or ordinances currently exist that prohibit this action. -2		Maybe - Policies or ordinances would need to be developed to support this action OR don't know if policies or ordinances currently exist. 0	Yes - Policies or ordinances currently exist that support this action. 2
Jurisdictional Control	No - City is the influencer. 0		Maybe - City is the regulator. 1	Yes - City is the actor. 2
Implementation Timeframe	6+ Years - Action could be operational after 6+ years. 0		3-5 Years - Action can be operational in the next 3 to 5 years. 1	1-2 Years - Action can be operational in the next 1 to 2 years. 2
Co-Benefits				
Benefits to Renters	No - This action does not benefit who rent their home to see the cost savings of energy efficiency upgrades, improvements in transit and fuel, and housing security. 0		Yes - This action benefits residents who rent their home to see the cost savings of energy efficiency upgrades, improvements in transit and fuel, and housing security. 1	
Equity	No - This action neither enhances nor decreases health and racial equity through improved quality of life, access to resources and opportunities, or health OR don't know what impact this action has on equity. 0		Yes - This action enhances health and racial equity through improved quality of life and access to resources and opportunities. 2	
Air Pollution Prevention	No - This action does not impact local or regional criteria pollutant emissions OR don't know what impact this action has on local or regional criteria pollutant emissions at location of implementation. 0		Yes - This action minimizes local or regional criteria pollutant emissions at the location of implementation. 1	
Health and Well-Being	No - This action does not influence public health OR don't know what impact this action has on public health. 0		Yes - This action enhances public health. 1	
Reliability	No - Action does not impact the reliability of the electrical grid, transportation system, emergency response, etc. OR don't know the impact on reliability. 0		Yes - Action helps increase reliability of the electrical grid, transportation system, emergency response, etc. 1	
GHG Mitigation	No - Action does not result in GHG reductions in the City OR don't know what impact action has on GHG reductions. 0		Yes - Action will reduce GHG emissions in the City. 1	
Job Development	No - Action does not influence job creation in Milpitas OR don't know what impact action will have on job creation in Milpitas. 0		Yes - Action maximizes quality job creation in Milpitas. 1	
Resource Preservation	No - Action does not impact greenspaces/prime habitat OR don't know what impact action will have on these resources/biodiversity. 0		Yes - Action helps preserve greenspaces/prime habitat/biodiversity. 1	

Maximum Potential Score

27

Thresholds

Score 15 - 25	Include in CAP
Score 12-14	Medium priority
Score under 12	Last priority

Notes

Climate Resilience Potential
City Cost Effectiveness
Residential and Business Cost Effectiveness

Technological/ Implementation Feasibility Could this be changed to something like Technological or Resource Feasibility? This would help to be more applicable to actions that don't have a technological component, like those that require funding, which may or not be available.

Current Policies or Ordinances

Jurisdictional Control

Implementation Timeframe

Benefits to Renters

Equity

Air Pollution Prevention

Health and Well-Being

Reliability

Resilience

Job Development

Resource Preservation

Implementing Agencies

County Administration Office	CAO
Innovation and Business Assistance	IBA
Office of Emergency Services	OES
Community Development Department	CDD
Air Pollution Control District	APCD
Health and Human Services	HHS
Fire Department	TCFD
Emergency Medical Services	EMS
Agricultural Commissioner	AC
Public Services Department	PSD

Appendix C

Resilience Plan

Memo



455 Capitol Mall, Suite 300
Sacramento, CA 95814
916.444.7301

Date: October 1, 2021

To: Elaine Marshall (City of Milpitas)

From: Honey Walters, Hannah Kornfeld, Kai Lord-Farmer, and Julia Wilson (Ascent)

Subject: City of Milpitas Climate Action Plan Update, Final Community Preparedness and Resiliency Plan – Technical Memorandum

1 INTRODUCTION

Global climate change is projected to exacerbate the impacts of certain hazards that the City of Milpitas (hereafter referred to as "city") is already exposed to under current conditions. These hazards include indirect impacts from wildfires and effects on air quality, extreme heat, heat wave events, long-term drought, and flooding. Climate change is also projected to create a new set of hazards that the city has not experienced historically (e.g., sea-level rise). While many of these hazards have existed historically for the city, the frequency and intensity of these hazards will increase as a result of global climate change. The City of Milpitas government (hereafter referred to as "City") has prepared this Community Preparedness and Resiliency Plan (Resiliency Plan) to identify the primary and secondary physical impacts of climate change that will most directly affect the city and includes a set of adaptation strategies to improve resiliency. The first portion of the Resiliency Plan includes a climate change vulnerability assessment and serves to inform development of adaptation strategies by analyzing the city's exposure to existing hazards, sensitivity to these hazards, potential climate-related impacts from these hazards, and the City's existing capacity to prepare and adapt for these impacts, known as adaptive capacity. The second portion of the Resiliency Plan includes a set of adaptation strategies to reduce the impacts from climate-related hazards and increase the city's overall resilience to climate change.

1.1 CLIMATE CHANGE MITIGATION AND ADAPTATION

The effects of climate change are already being experienced today. The combustion of fossil fuels, among other human activities, since the Industrial Revolution in the 19th century has introduced greenhouse gases (GHGs) into the atmosphere at an increasingly accelerated pace, intensifying the greenhouse effect and leading to a trend of unnatural warming of the Earth's climate, known as global climate change or global warming. Climate change has more recently become a priority issue on an international, national, and local scale as recent climate data reveal more extreme weather patterns, increased average global temperatures, and the rapid melting of the Earth's Arctic and Antarctic poles and glaciers.

The Intergovernmental Panel on Climate Change (IPCC), the international body charged with compiling and interpreting the data surrounding climate change, estimates that global average temperatures will increase by 3.7 degrees Celsius (°C) (6.7 to 8.6 degrees Fahrenheit [°F]) by the end of the century unless additional efforts to reduce GHG emissions are made (IPCC 2014). A more recent IPCC report indicates that average global temperatures will likely increase by 1.5 °C (2.7 °F) between 2030 and 2052 if global GHG emissions continue their current rate (IPCC 2018). There is consensus among the scientific community that a 1.5 °C (2.7 °F) rise in global temperatures will likely

cause catastrophic environmental disasters in certain locations including extreme heat, sea-level rise, and more severe and damaging precipitation events (IPCC 2018).

In August 2021, IPCC released the Six Assessment Report, which highlights key new insights into the importance of global climate tipping points, thresholds in the global climate (e.g., global temperatures) that, when exceeded, can lead to large changes in the state of the climate system with one impact rapidly leading to a series of cascading events with vast repercussions. The Six Assessment Report also notes that under the best-case scenario, in which global emissions peak in the 2020s and decline to net zero around 2050 followed by varying levels of net negative emissions thereafter, global temperatures are still more likely than not to exceed 1.5 °C between 2021 and 2040 (IPCC 2021). The Six Assessment Report contains the IPCC's strongest warnings to date on the causes and impacts of climate change. Importantly, the report notes that, in terms of solutions, "We need transformational change operating on processes and behaviors at all levels: individual, communities, business, institutions and governments. We must redefine our way of life and consumption" (IPCC 2021).

According to California Natural Resources Agency's (CNRA's) *Safeguarding California Plan: 2018 Update*, California experienced the driest 4-year statewide precipitation on record from 2012 through 2015; the warmest years on average in 2014, 2015, and 2016; and the smallest and second smallest Sierra snowpack on record in 2014 and 2015 (CNRA 2018). According to the National Oceanic and Atmospheric Administration and the National Aeronautics and Space Administration, 2016, 2017, and 2018 were the hottest recorded years in history (NOAA 2019). In contrast, the northern Sierra Nevada experienced one of its wettest years on record during the 2016-2017 water year (CNRA 2018). While it remains imperative that global GHG emissions be reduced, it is equally important for communities to invest in climate change adaptation policy planning to improve resilience to extreme climate events. Current climate projections show that the impacts of climate are largely irreversible through the year 2050, regardless of whether global GHG emissions are reduced before this period (CalOES 2020).

Efforts that focus on reducing the sources of climate change are termed climate change mitigation, GHG mitigation, or climate action. Efforts to reduce harm from the effects of a changing climate, the focus of this report, are referred to as climate adaptation and resilience. Figure VA-1 illustrates the relationship between these two approaches. State law requires communities to address climate change mitigation in local planning and environmental review processes and climate adaptation in local long-range planning processes, such as general plans (CalOES 2020).



Source: CalOES 2020, adapted by Ascent Environmental in 2021

Figure VA-1 Relationship Between Climate Mitigation and Adaptation

1.2 GUIDANCE DOCUMENTS

This section provides a summary of the guidance documents and resources that were used to help develop the vulnerability assessment and adaptation strategies included in this Resiliency Plan.

California Adaptation Planning Guide

The most recent version of the California Adaptation Planning Guide (APG) was released in March 2020. This guidance builds upon the first iteration of the APG released in 2012. The APG was developed by the California Office of Emergency Services (CalOES) and CNRA. The APG provides guidance to local governments for adaptation and climate change resiliency planning. The APG includes a step-by-step process that communities may use to help plan for the impacts of climate change. The APG is designed to be flexible and guide communities through an adaptation planning process that is best suited for their needs. The APG served as the formal guidance document for preparation of this Resiliency Plan (CalOES 2020).

California's Fourth Climate Assessment

CNRA, the Governor's Office of Planning and Research (OPR), and the California Energy Commission (CEC) prepared *California's Fourth Climate Change Assessment* (Climate Assessment) in 2018. The Climate Assessment was designed to address critical information gaps that decisionmakers at the State, regional, and local levels need to close to protect and build the resilience of people, infrastructure, natural systems, working lands, and waterways from climate-related impacts. The Climate Assessment is referenced throughout this report to provide information regarding regional climate change impacts.

Safeguarding California Plan

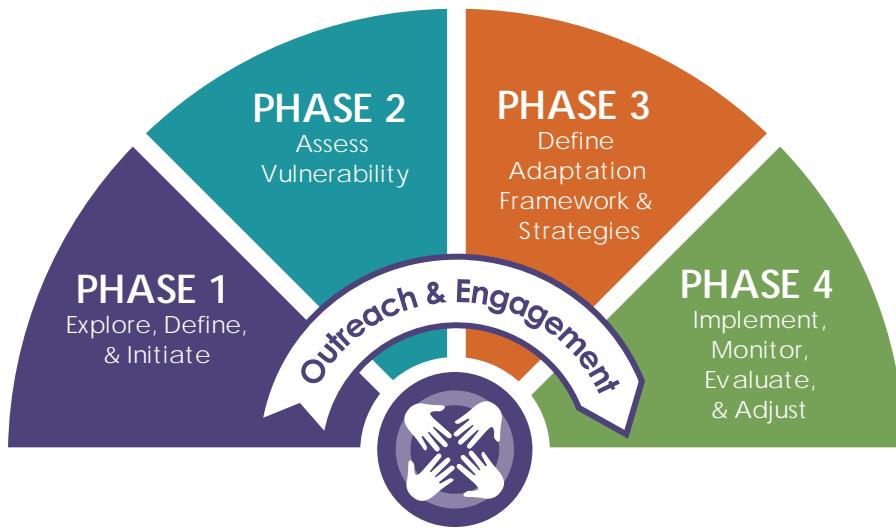
Alongside the update to the Climate Assessment, CNRA released the *Safeguarding California Plan* in 2018 which provides a roadmap for State government action to build climate resilience. The *Safeguarding California Plan* identifies actions the State government will take to protect communities, infrastructure, services, and the natural environment from climate change impacts and includes strategies for use as local examples for climate adaptation. The *Safeguarding California Plan* is referenced in this report to provide guidance on assessing the city's vulnerability to climate change and the development of adaptation strategies.

Santa Clara County and City of Milpitas Regional Planning Efforts

In addition to State adaptation efforts, the County of Santa Clara, the City, and other supporting agencies have developed planning documents focused on local and regional adaptation to climate-related hazards. These planning documents analyze existing hazards and include strategies or guidelines to mitigate the severity of climate impacts. The County of Santa Clara's *Operational Area Hazard Mitigation Plan* (OAHMP), the City's *General Plan 2040*, and the City's *2013 Climate Action Plan* (CAP) were used to support the development of this Resiliency Plan. Other agency documents considered and reviewed for the purpose of developing this Resiliency Plan include the *California's Fourth Climate Change Assessment Report: San Francisco Bay Area Region Report* (Climate Change Assessment Report San Francisco Region), the California Department of Transportation's (Caltrans') *Climate Change Vulnerability Assessment 2017 District 4 Technical Report* (District 4 Technical Report), the Metropolitan Transportation Commission/Association of Bay Area Governments (MTC/ABAG) *Plan Bay Area: 2040 Regional Transportation Plan/Sustainable Communities Strategy* (RTP/SCS), the City's *2015 Urban Water Management Plan* (UWMP), the Bay Area Climate Adaptation Network's (BayCAN's) *Equitable Adaptation Resource Guide*, the City's *Water Infrastructure Risk and Resilience Assessment*, and the Adapting to Rising Tides (ART) *Bay Area Sea Level Analysis and Mapping Project* data.

1.3 ADAPTATION PLANNING PROCESS

The APG provides guidance for communities throughout the state in planning for and adapting to the impacts of climate change. The APG includes a four-phase process, illustrated in Figure VA-2 which allows communities to assess their specific climate vulnerabilities and provides guidance on developing strategies to reduce climate change-related risks and prepare for current and future impacts of climate change.



Source: CalOES 2020, adapted by Ascent Environmental in 2021

Figure VA-2 Adaptation Planning Process

- ▶ **Phase 1, "Explore, Define, and Initiate,"** includes scoping and defining the adaptation planning effort. Phase 1 also involves identifying key roles and stakeholders in the local government and throughout the community to contribute to the planning process. Potential climate change effects and important physical, social, and natural assets in the community are identified for further analysis. Phase 1 is discussed in Section 1, "Introduction," of this report.
- ▶ **Phase 2, "Assess Vulnerability,"** includes an analysis of potential climate change impacts and adaptive capacity to determine the vulnerability of populations, natural resources, and community assets. The vulnerability assessment is composed of four steps: exposure, sensitivity and potential impacts, adaptive capacity, and vulnerability scoring. Phase 2 also integrates stakeholder and public input to provide a comprehensive assessment of the community's sensitivity to climate change and its ability to adapt. Phase 2 is addressed in Section 2, "Vulnerability Assessment" of this report.
- ▶ **Phase 3, "Define Adaptation Framework and Strategies,"** focuses on creating an adaptation framework and developing adaptation strategies based on the results of the vulnerability assessment. Adaptation strategies identify how the community will address the potential for harm based on the community's resources, goals, values, needs, and regional context. Community input is needed to prioritize adaptation strategies, identify co-benefits of strategies, and determine implementation steps. Phase 3 is discussed in Section 3, "Adaptation Framework," of this report.
- ▶ **Phase 4, "Implement, Monitor, Evaluate, and Adjust,"** the adaptation framework is implemented, consistently monitored, evaluated, and adjusted based on continual learning, feedback, or triggers. The adaptation planning process is intended to be cyclical in nature. Phase 4 is not included within this report, as it is not required for compliance with Senate Bill (SB) 379 and because the City already has processes in place to monitor and evaluate its planning efforts. Furthermore, the adaptation goals and strategies in this report will be included in the City's CAP Update which will contain a chapter that enumerates implementation planning policies. This section of the CAP Update will guide the implementation, monitoring, and evaluation of the adaptation policies.

The ultimate goal of the adaptation planning process is to improve community resilience in the face of a changing climate. A resilient community is one that is prepared for current and future hazardous conditions and experiences less harm when a disaster happens. Resilient communities can prepare for and recover from hazards with an understanding that the climate is going to continue to change in predictable and unforeseen ways. Ongoing learning and monitoring of strategy implementation allow for adjustments to be made in response to new information and opportunities.

1.4 PUBLIC OUTREACH AND STAKEHOLDER ENGAGEMENT

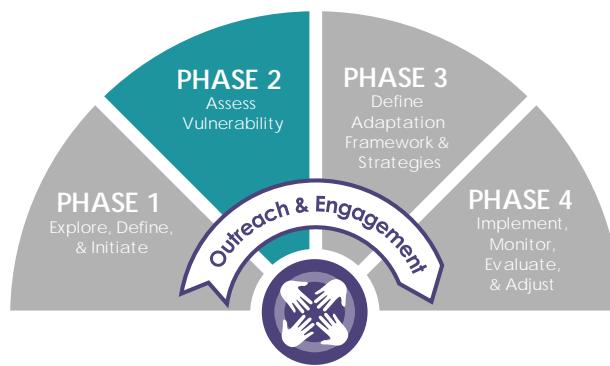
As part of the CAP planning process, several community outreach events were conducted to gain feedback on initial findings from the vulnerability assessment and input on adaptation strategy ideas and priorities that should be included in the final CAP. Listed below is the list of community outreach activities conducted, specific to climate vulnerabilities and adaptation.

- ▶ **CAP Steering Committee Meeting** – On March 1, 2021, a meeting was held with the City’s CAP Steering Committee to discuss initial findings from the vulnerability assessment, existing climate adaptation efforts the City, and preliminary adaptation strategies.
- ▶ **Energy and Environmental Sustainability Commission Meeting** – On May 19, 2021, a meeting was held with the City’s Energy and Environmental Sustainability Commission to discuss initial findings from the vulnerability assessment, climate adaptation priorities, and preliminary adaptation strategies.
- ▶ **Milpitas High School Workshop** – In May 2021, the City hosted a workshop with students from Milpitas High School to discuss climate concerns and potential strategies to be included in the CAP.
- ▶ **Farmer’s Market Booth** – On July 25, 2021, the City hosted a pop-up booth at the Milpitas Farmer’s Market to gauge public perception of preliminary CAP strategies and identify barriers to personal climate choices.
- ▶ **CAP Feedback Survey** – The City has published an online survey through the CAP Dashboard to gain feedback from the public about the CAP and priorities for addressing climate change.

2 VULNERABILITY ASSESSMENT

This section provides a comprehensive assessment of the city’s vulnerabilities to climate change. It identifies and characterizes the climate-related hazards and other climate effects that are anticipated to affect the city. The vulnerability assessment follows the process outlined in Phase 2 of the APG and is composed of the following four steps:

- ▶ **Exposure:** The purpose of this step is to understand existing hazards within the city and how changes in climate variables (e.g., average temperature, precipitation) are projected to affect these hazards. Existing hazards that can be worsened by the effects of climate change are identified and described, based on historical data from sources such as the OAHMP. Climate projection data are used to develop projections for how existing hazards are expected to change by mid-century (2035–2064) and late-century (2065–2099).



- ▶ **Sensitivity and Potential Impacts:** This step identifies a list of population groups and community assets that are sensitive to localized climate impacts. Climate-related hazards (e.g., flooding, wildfire) are generally projected to increase in severity, with the potential for climate change to generate new impacts that communities have not experienced historically. Using historical data, research from regional and State reports on climate impacts, and input from stakeholders, this step seeks to understand how sensitive populations and assets may be affected by climate impacts.
- ▶ **Adaptive Capacity:** The City, partner agencies, and regional organizations have already taken steps to build resilience and protect sensitive populations and assets from existing hazards. Thus, the purpose of this step is to identify the City's and partner agencies' current capacity to address future climate impacts, referred to as adaptive capacity. The ability of the City to adapt to each of the identified climate impacts is determined through a review of existing plans, policies, and programs, and through stakeholder engagement.
- ▶ **Vulnerability Scoring:** This step determines the city's priority climate vulnerabilities through a vulnerability scoring process. Vulnerability scores are based on several factors including the severity of projected climate impacts, how sensitive certain populations and assets are to anticipated climate impacts, and whether sufficient adaptive capacity exists to manage future climate impacts.

The vulnerability assessment helps the city understand which climate vulnerabilities are most urgent and should be prioritized during the adaptation strategy development phase, outlined in Section 3, "Adaptation Framework and Strategies", as well as during strategy implementation.

2.1 EXPOSURE

The city encompasses an area of approximately 18 square miles (35 kilometers [km]), extending between the south end of the San Francisco Bay and the Los Buellis Hills of the Mount Diablo Range in northern Santa Clara County. The city spans across a diverse topographic area with elevations ranging from sea level to about 2,600 feet near Monument Peak. The topography can be divided into two distinct sub-areas referred to as the Valley Floor and the Hillside, each characterized by landscapes that are prone to specific hazards.

The Hillside occupies the eastern half of the city's topography, is much steeper than the Valley Floor, and is characterized by open space with chaparral and native grasses with some scattered pockets of residences. The Valley Floor supports most of the development in the city and is characterized as low-lying and urban.

During winter, temperatures in the city range from 31 °F to 59 °F. Showers and cloudy days come and go during this season and produce most of the city's annual 15 inches (380 millimeters) of precipitation, with precipitation tapering off in the spring. The summer months are dry and warm but cooler than other parts of the Bay Area. Temperatures can reach over 100 °F with most days in the mid- to high-70s. From June to September, the city experiences little rain, and as autumn approaches, the temperature gradually cools down.

This section summarizes existing hazards in the city and describes the projected changes in climate variables that are anticipated to exacerbate these hazards.

Existing Hazards

The OAHMP provides a comprehensive summary of climate-related hazards that affect Santa Clara County, as well as geographic-specific hazards that affect the city. Unlike the majority of the Bay Area, the city is not at high risk from sea-level rise, wildfire, or days where temperatures exceed 100 °F. According to the OAHMP, the city's risk of wildfire has a risk rating score of zero. The city is not located within a Wildland-Urban Interface (WUI) zone according to the Santa Clara County Planning Office's *Santa Clara County Wildland Urban Interface Fire Area* map (Santa Clara County 2009). However, eastern portions of the city including the Milpitas Hillside and the eastern boundary of the city is located adjacent to the wildland urban interface and located in the "moderate" fire hazard severity zone as

designated by the California Department of Forestry and Fire Protection (CAL FIRE). Indirect impacts associated with degraded and harmful air pollution from regional fires have historically affected the livelihood and health of the city's citizens. Additionally, during the 2020 wildfires in east portions of the San Francisco Bay Area, the city was under evacuation warnings although an evacuation order was never implemented. About half of the city's Valley Floor lies within one of the Special Flood Hazard Areas; almost all land west of the Southern Pacific Railroad lies within the 100-year flood zone and all land west of Highway 680 is part of the 500-year flood zone.

Climate Change Effects

In Phase 1 of the adaptive planning process, climate change effects are described and projected for the mid- and late-century periods. Climate change effects are categorized as primary (direct) and secondary (indirect). Primary effects are those that are caused by the initial impacts of increased GHG emissions, from which secondary effects result. The primary climate change effects analyzed for the city include changes in average temperature and annual precipitation. The secondary effects, which can occur because of individual changes or a combination of changes in the primary effects, include human health hazards, drought, extreme heat events, extreme precipitation and flooding, landslides, wildfires, and sea-level rise.

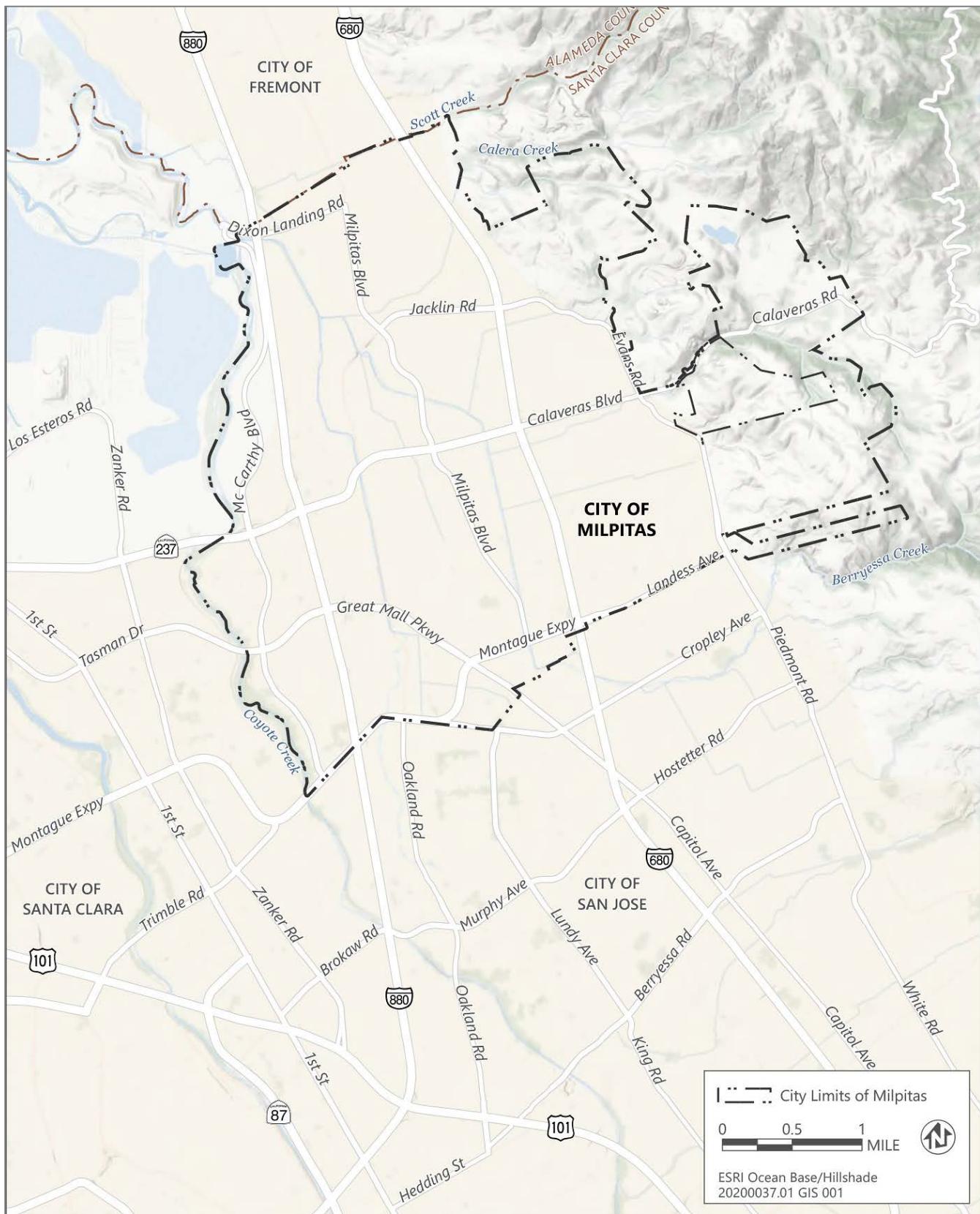
Though the precise extent of future climate change effects is uncertain, historical climate data and forecasted GHG emissions can be used to project climate change effects for the mid-century (2035-2064) and late-century (2065-2099) periods. To assess potential effects from climate change, the APG recommends using Cal-Adapt, a tool developed by CEC and the University of California, Berkeley's Geospatial Innovation Facility that uses global climate simulation model data to identify how climate change might affect various geographies in California.

Cal-Adapt addresses the uncertainty in future GHG emissions by using Representative Concentration Pathways (RCPs) developed by IPCC. The RCP scenarios used in the Cal-Adapt tool are the RCP 8.5 scenario, which represents a business-as-usual future emissions scenario that would result in atmospheric carbon dioxide (CO₂) concentrations exceeding 900 parts per million (ppm) by 2100, and the RCP 4.5 scenario, which represents a lower GHG emissions future and likely the best-case scenario for climate impacts, under which GHG emissions would peak in 2040 and then decline through the rest of the century, resulting in a CO₂ concentration of about 550 ppm by 2100. The emissions scenarios depend on global GHG emissions trends in the future and the efficacy of global GHG reduction strategies proposed by the international community. Because the efficacy of the GHG reduction strategies and the likelihood that a certain RCP scenario will occur are uncertain, a discussion of both emissions scenarios and their subsequent impacts are included in this analysis.

Cal-Adapt also includes 10 global climate models, downscaled to local and regional resolution using the Localized Constructed Analogs statistical technique. Four of these models have been selected by California's Climate Action Team Research Working Group as priority models for research contributing to California's Climate Assessment. Projected future climate from these four models can be described as producing:

- ▶ a warm/dry simulation (HadGEM2-ES),
- ▶ a cooler/wetter simulation (CNRM-CM5),
- ▶ an average simulation (CanESN2), and
- ▶ the model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5).

To analyze climate projections for the city, the average global climate model (CanESM2) was chosen, as it represents an average scenario. As noted previously, most of the data presented in Cal-Adapt have been downscaled to grid cells that are 6 km by 6 km in size. The city is approximately 35 kilometers squared (km²), which is nearly equal to the grid cell sizes provided by Cal-Adapt (i.e., 36 km²). Therefore, the Cal-Adapt option to evaluate climate change impacts for the incorporated census tract for the city will be used in this analysis. Figure VA-3 shows the study area (the city's boundaries) to assess climate change impacts.



Source: Data downloaded from Santa Clara County in 2020

Figure VA-3 Study Area

PRIMARY CLIMATE CHANGE EFFECTS

Increased Temperatures

According to Cal-Adapt, the historic (1961–1990) annual average maximum temperature for the study area was 68.3 °F, and the historic annual average minimum temperature was 48.2 °F. As shown in Table VA-1, both annual average maximum and minimum temperatures are projected to increase by mid-century and further increase by the end of the century under both emissions scenarios. The annual average maximum temperatures in the city are projected to be 72.8 °F by mid-century (2035–2064) and 73.7 °F by the late-century period (2065–2099) under the medium-emissions scenario. Under the high-emissions scenario, the annual average maximum temperature in the study area is projected to be 73.7 °F by mid-century (2035–2064) and 77.1 °F by the late-century period (2065–2099) (CEC 2021a). This equates to an increase in temperature of approximately 1.5 to 4.3 °F by the end of the century, depending on a medium- or high-emissions scenario (CEC 2021a).

Table VA-1 Changes in Annual Average Temperature in the City of Milpitas

Average Annual Temperature (°F)	Historic Average Annual Temperature (1961–1990)	Medium-Emissions Scenario (RCP 4.5)		High-Emissions Scenario (RCP 8.5)	
		Mid-Century (2035–2064)	End of Century (2065–2099)	Mid-Century (2035–2064)	End of Century (2065–2099)
Maximum Temperature	68.3	72.8	73.6	73.7	77.1
Minimum Temperature	48.2	52.4	53.3	53.5	56.9

Notes: °F = degrees Fahrenheit; RCP = Representative Concentration Pathway.

Source: CEC 2021a

Changes in Precipitation Patterns and Storm Events

According to the Climate Change Assessment San Francisco Region Report, precipitation patterns in California oscillate between extremely dry and wet periods (OPR, CEC, and CNRA 2018b). Climate models predict that precipitation volatility will intensify in future years in the Bay Area. Dry years are likely to become even drier, while wet years will become even wetter in the next several decades. Additionally, sea-level rise occurring in the region will result in saltwater intrusion into groundwater resources.

According to Cal-Adapt, the historic annual average (1961–1990) precipitation in the city has been 15.6 inches. As shown in Table VA-2, the total annual precipitation in the city is projected to be 17.6 inches by mid-century (2035–2064) and 17.7 inches by the late-century period (2065–2099) under the medium-emissions scenario. Under the high-emissions scenario, the annual average precipitation in the city is projected to be 17.8 inches by mid-century (2035–2064) and 19.4 inches by the late-century period (2065–2099) (CEC 2021a).

Alongside changes in total annual precipitation, the city is projected to experience increases in the size of large storm events under both the RCP 4.5 and RCP 8.5 scenarios. As shown in Table VA-2, the historic total 2-day rainfall during a 50-year storm event (i.e., a large storm that has a 2 percent chance of occurring in any given year) in the city is 10.7 inches. Under the medium-emissions scenario, this rainfall is projected to decrease slightly to 10.2 inches by mid-century (2035–2064) but increase to 11.3 inches by the late-century period (2065–2099). Under the high-emissions scenario, the rainfall during these events is projected to remain at 10.7 inches by mid-century (2035–2064) and increase significantly to 14.1 inches by the late-century period (2065–2099) (CEC 2021a). Notably, while annual precipitation is projected to increase, increases in annual rainfall will largely occur during larger storm events rather than gradual increases in rainfall throughout the year. In current practice, the stormwater management systems in urban areas are modeled to manage large storm events based on characteristics of rainfall specific to the region from observed historical data. If these historic rainfall intensities are exceeded, as is projected in the future, stormwater management systems can be compromised and affect the performance of the City's stormwater management and flood protection systems.

Table VA-2 Changes in Annual Average Precipitation in the City of Milpitas

Average Annual Precipitation	Historic Average Annual Temperature (1961-1990)	Medium-Emissions Scenario (RCP 4.5)		High-Emissions Scenario (RCP 8.5)	
		Mid-Century (2035-2064)	End of Century (2065-2099)	Mid-Century (2035-2064)	End of Century (2065-2099)
Average Annual Precipitation	15.6	17.6	17.7	17.8	19.4
50-Year Storm Event ¹	10.7	10.2	11.3	10.7	14.1

Notes: °F = degrees Fahrenheit; RCP = Representative Concentration Pathway.

1. 2-day rainfall in the Lower Coyote Creek-Frontal San Francisco Bay Estuaries Watershed.

Source: CEC 2021a

SECONDARY CLIMATE CHANGE EFFECTS

Human Health Hazards

Climate change is closely linked to human health and public safety. In addition to direct impacts on public health and safety from drought, extreme heat, flooding, landslides, wildfires, and sea-level rise, several indirect impacts threaten public health and safety. Some of the potential impacts on public health are listed below.

- ▶ Climate change could increase disparities in vulnerable communities, which are often already experiencing disproportionate pollution burden and environmental impacts.
- ▶ Extreme heat and wildfires can worsen air quality.
- ▶ Climate influences the spread of vector-borne infectious diseases.
- ▶ Climate-induced extreme weather events can affect mental health.

Environmental Justice Communities are generally understood as those that face disproportionate environmental impacts or pollution burdens due to socioeconomic factors or historic disadvantages (e.g., racism, income inequality) that have placed them at increased risk to environmental impacts. Environmental Justice Communities are more vulnerable to climate change, as they already face disproportionate environmental impacts and may have fewer resources to prepare for, respond to, and recover from hazard damage. Climate change is likely to increase disparities in Environmental Justice Communities. For example, low-income communities are often more likely to be located in floodplains, coastlines, or other at-risk locations susceptible to extreme weather (U.S. Global Change Research Program 2021). Environmental Justice Communities are discussed in further detail in Section 2.2, "Sensitivity and Potential Impacts."

While some populations will be more severely affected than others, all persons in the city will experience climate impacts. The San Francisco Bay Area Air Basin (SFBAAB), within which the city is located, faces challenges associated with high levels of vehicle movement resulting in emission of transportation-related air pollutants. Santa Clara County, among other southern counties located in the SFBAAB are in nonattainment for several of the national and State ambient air quality standards for ground-level ozone and particulate matter (EPA 2021). Higher temperatures, as a result of climate change, will facilitate the formation of ground-level ozone, a respiratory irritant that is a component of smog. Ground-level ozone is associated with various negative health outcomes, including reduced lung function, pneumonia, asthma, cardiovascular-related morbidity, and premature death (EPA 2013). Many of the same populations that are vulnerable to the effects of extreme heat, such as those with existing chronic health conditions and seniors and children, are also vulnerable to the effects of poor air quality.

Studies have shown climate influences the population size, geographic distribution, behavior, and reproduction of vectors (e.g., rodents, mosquitoes, ticks, fleas, and others) that transmit diseases to humans. The many factors that contribute to the incidence of vector-borne diseases, such as land use patterns and human behavior, present challenges in projecting their spread (Gubler et al. 2001). Additionally, cases of certain viruses are known to increase during warm weather. Models for North America predict increases in infectious diseases spread to humans, such as West Nile Virus carried by mosquitoes, caused by increases in temperature and decreases in precipitation (Harrigan et al. 2014). The California Department of Public Health (CDPH) estimates that several vector-borne infectious diseases will increase in prevalence in California, including malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, and West Nile Virus (CDPH 2019).

Climate change can impact mental health through various pathways, including but not limited to, increases in the frequency and severity of extreme weather events and increases in economic instability. Extreme weather events such as fires and floods can have acute mental health impacts and can be linked to increases in anxiety and depression in certain populations (Kar and Bastia 2006). Climate change can also precipitate chronic impacts including negative impacts on livelihoods (e.g., increased droughts reduce profitability for farmers), leading to mental health impacts such as chronic stress and depression (Hanigan et al. 2012).

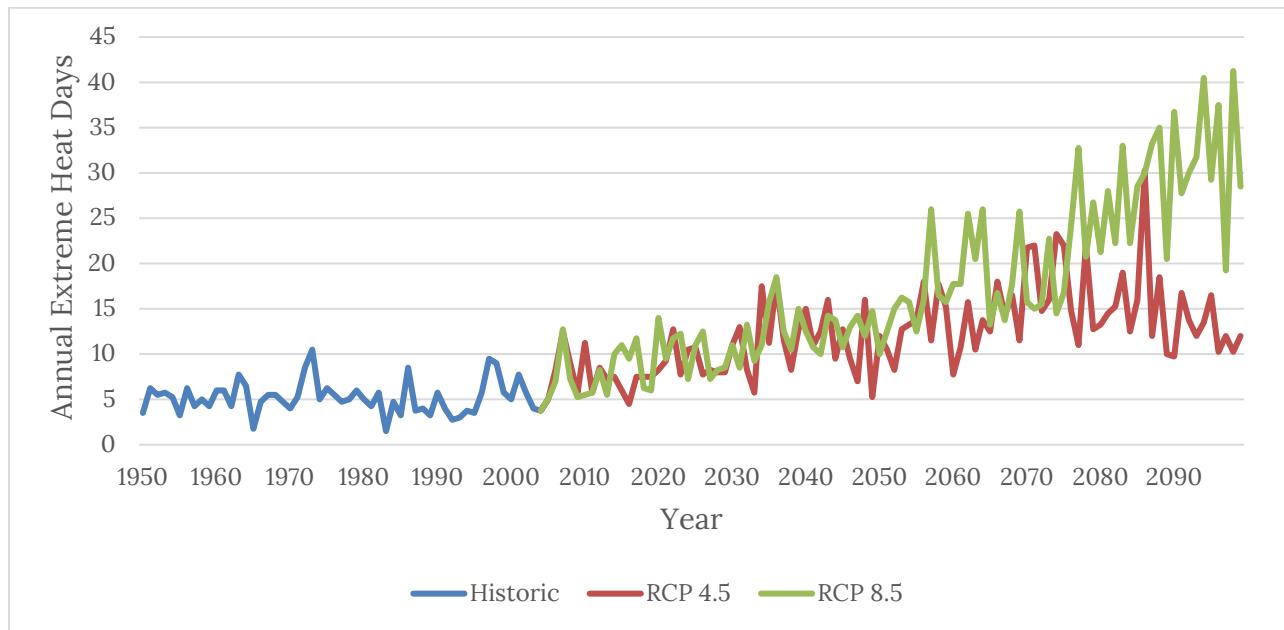
Climate change will likely increase socioeconomic disparities in communities that already experience disproportionate environmental burdens, worsen air quality, increase the spread of vector-borne diseases, and negatively affect mental health.

Extreme Heat Events

Due to its coastal location, the city is not at high risk of extreme heat events over 100 °F. However, heat is a relative effect that will impact populations differently for a number of factors. For instance, the homes of coastal communities or other locations that have historically supported moderate climates may not be equipped with heating, ventilation, and air conditioning (HVAC) systems to regulate internal temperatures during extreme heat events. The Climate Change Assessment San Francisco Region Report identifies this as a contributing factor to a high degree of risk for Bay Area residents (OPR, CEC, and CNRA 2018b:56).

The Cal-Adapt tool provides estimates of future instances of extreme heat events. Extreme heat events represent extreme heat days and heat waves. Extreme heat days occur when the daily maximum/minimum temperature exceeds the 98th historical percentile of the daily maximum/minimum temperatures between April and October. Heat waves are characterized as periods of sustained extreme heat over multiple days (i.e., four or more consecutive extreme heat days).

Based on historical data, the extreme heat day threshold in the city is defined as 91.6 °F. Historically, the city has experienced an average of four extreme heat days per year. As a result of rising annual average maximum temperatures from climate change, the study area is projected to experience up to 17 extreme heat days annually by mid-century and 20 extreme heat days by late-century under the medium-emissions scenario. Under the high-emissions scenario, the study area is projected to experience up to 15 extreme heat days annually by mid-century and 38 extreme heat days by late-century (CEC 2021b). As shown in Figure VA-4, the number of extreme heat days is projected to increase from historic averages and will continue to increase through the end of the century under both emissions scenarios.



Source: Data downloaded from Cal-Adapt, adapted by Ascent Environmental in 2021.

Figure VA-4 Projected Annual Extreme Heat Days

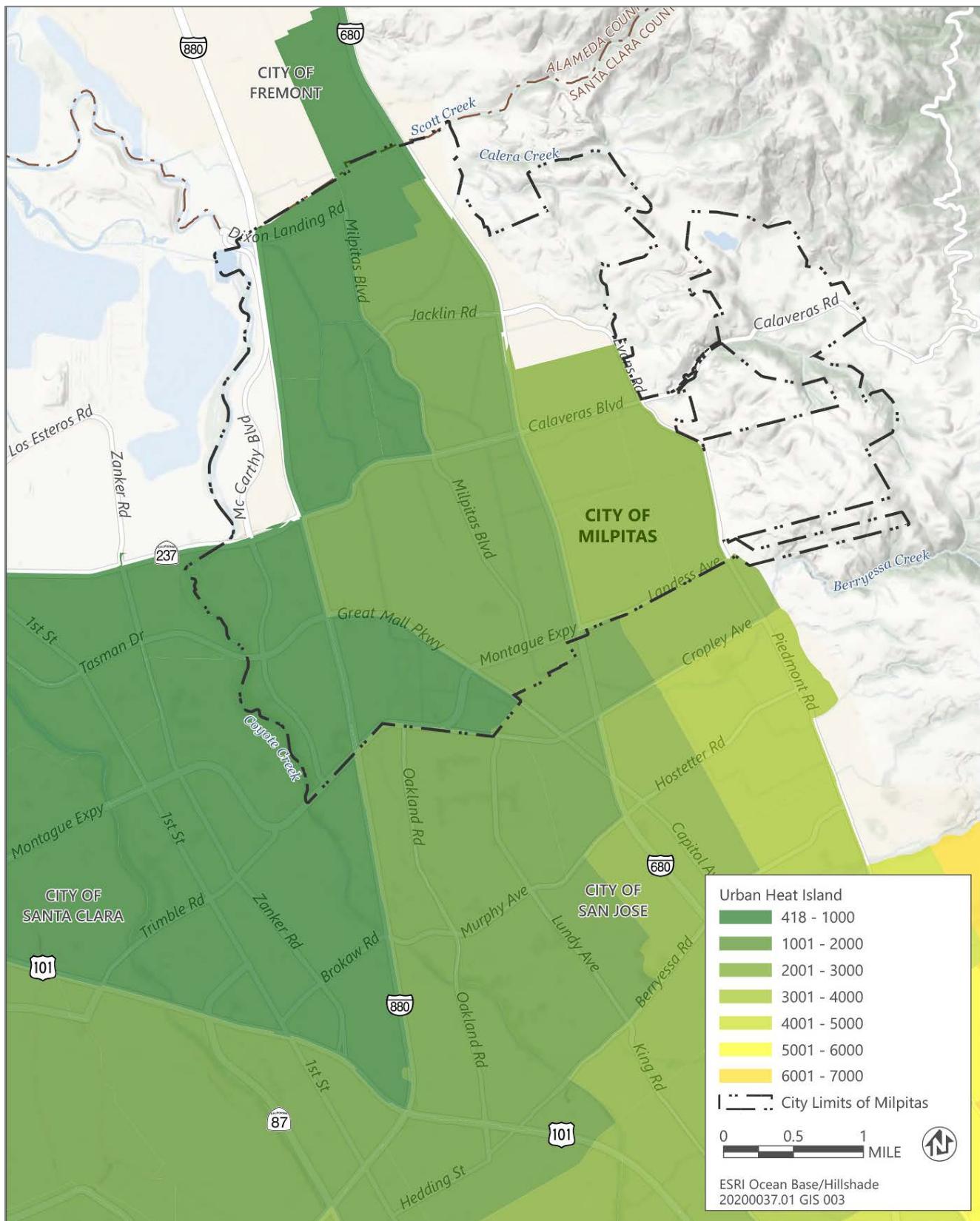
Heat wave events (i.e., four or more consecutive extreme heat days) have historically been infrequent in the study area, with fewer than one recorded per year. Based on Cal-Adapt projections, heat waves will likely continue be infrequent in the future. Under the medium-emissions scenario, the study area is projected to experience 1.3 heat waves per year by late century. Under the high emissions scenario, the study area is projected to experience 1.4 heat waves per year by mid-century and 3.2 heat waves per year by late-century (CEC 2021c).

The Urban Heat Island (UHI) effect is generally understood as the phenomenon of urban areas being significantly warmer than surrounding rural areas because of human activity and land use patterns in the built environment. Several factors contribute to the effect, with the primary cause being changes in land surfaces (EPA 2008). Urban heat islands are created by a combination of heat-absorptive surfaces (e.g., dark pavement and roofing), heat-generating activities (e.g., automobile engines and industrial generators), and the absence of "green spaces" (i.e., vegetative surfaces which provide evaporative cooling). During extreme heat days and heat waves, asphalt and darker surfaces can increase temperatures in the day and reduce nighttime cooling (as retained heat is released from heat-absorbing surfaces).

In 2015, the California Environmental Protection Agency (CalEPA) released a study that defines and examines the characteristics of the UHI and scientifically assigns a score based on atmospheric modeling for each census tract in and around most urban areas throughout the state, resulting in a UHI index for these areas. The UHI index is calculated as a temperature differential over time between an urban census tract and nearby upwind rural reference points at a height of two meters above the ground, where people experience heat. Due to coastal wind patterns and its location in the Bay Area, the city's score on the UHI index is lower than in other urban portions of the region.

Figure VA-5 shows CalEPA's UHI Map for the city. The color gradient in the map illustrates approximate average temperature difference between rural and urban areas in the region, with green representing the smallest temperature differential and red representing the greatest temperature differential. As shown in Figure VA-5, most of the city is characterized as green, which represents a low UHI index.

As temperatures continue to increase from climate change, extreme heat days and heat wave events are likely to occur more frequently. In addition, populations and assets in urban areas are more susceptible to higher temperatures due to the prevalence of paved surfaces and lack of evaporative cooling from vegetation. This increased exposure to higher temperatures is a public health risk and may increase stress on sensitive infrastructure.



Source: Data downloaded from Santa Clara County in 2020 and CalEPA in 2020

Figure VA-5 California Environmental Protection Agency's Urban Heat Island Map for the San Francisco Bay Area

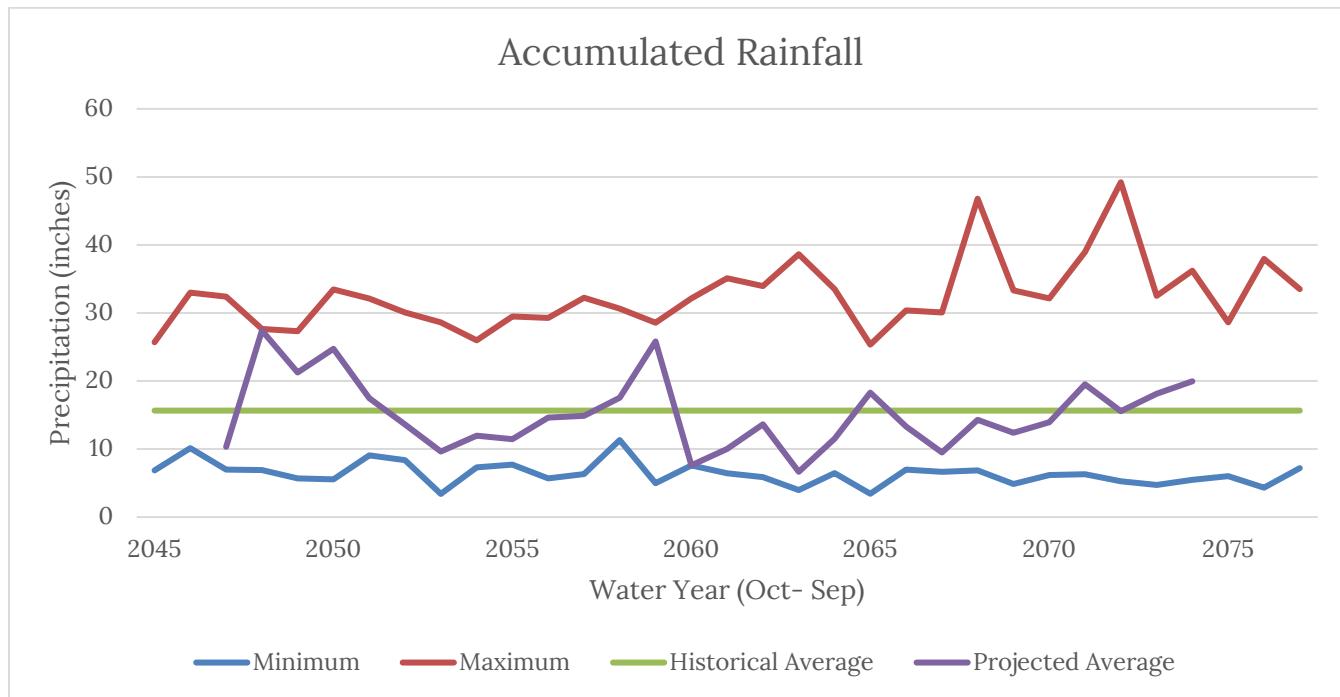
Drought and Water Supply

The city's water supply is generated from multiple locations and sources. The city is supplied by two potable water wholesalers, the San Francisco Public Utilities Commission (SFPUC) and the Santa Clara Valley Water District (SCVWD). SFPUC receives its water from an intricate water system sourced by waters of the Hetch Hetchy Reservoir in Yosemite National Park. The water flows through the San Joaquin Valley where it is distributed to the users of San Francisco, San Mateo, and Santa Clara counties, including the city. SCVWD provides water from a combination of surface and groundwater resources. A large percentage of SCVWD's water supply is supplied by the Sacramento River and its tributaries, which flow into the Sacramento-San Joaquin River Delta (Delta). Approximately 15 percent of SCVWD's water supply is sourced from groundwater with plans to increase groundwater extraction in the future. Additionally, a small, but growing portion of SCVWD's water supply is recycled water (SCVWD 2016). The city also receives some recycled water from South Bay Water Recycling (SBWR), which originates from the San Jose-Santa Clara Regional Wastewater Facility (RWF).

Snowpack in the Sierra Nevada Mountains of Northern California plays a critical role in water supply for the region, including the city, replenishing the watersheds and reservoirs used as water resources throughout the state. Due to increases in climate variability and rising temperatures, California has already seen signs of decreased snowmelt in Northern California: snowpack in the Sierra Nevada is expected to decline by as much as 33 percent by mid-century and 66 percent by end of century, relative to historic baseline snowpack (OPR, CEC, and CNRA 2018c). Warmer temperatures have also caused California snowpack to melt faster and earlier in the year. This change in California's snowpack disrupts the normal timing of groundwater and surface water recharge and makes it harder to store and use during hotter times of the year or during drought conditions. Reduced snowpack and earlier snowmelt will lead to more frequent water shortages and less water available in the Delta and other water supply systems. This lack of a reliable imported water supply may place stress on the city's water supply resources as these waters are equitably distributed throughout the state (City of Milpitas 2016).

In addition to the surface water derived from the Hetch Hetchy Reservoir and the Delta, the city relies on portion of its water supply from local sources such as groundwater. As stated above, of the SCVWD's water supply portfolio, groundwater makes up about 15 percent, and could be affected by projected changes in annual precipitation. The Sustainable Groundwater Management Act (SGMA) regulates groundwater and requires governments and water agencies of high- and medium-priority basins to develop groundwater sustainability plans. These plans are intended to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge by 2040 for critically over-drafted basins and by 2042 for the remaining high- and medium-priority basins. SCVWD, the district that supplies groundwater to the city, pumps its groundwater from the Santa Clara (medium-priority) and Llaga (high-priority) subbasins, which are both located entirely in Santa Clara County. Future periods of drought may result in greater overdraft of these basins.

As shown in Table VA-2 above, under both the medium- and high-emissions scenarios, the city is not expected to experience significant overall changes in average precipitation. However, the city will experience increased variability in precipitation. The city and state have a highly variable climate that is susceptible to prolonged periods of drought. Recent research suggests that extended drought occurrence (a "mega-drought") could become more pervasive in future decades (CEC 2021c). An extended drought scenario is predicted for all of California from 2051 to 2070 under the HadGEM2-ES simulation and high-emissions scenario. The extended drought scenario is based on the average annual precipitation over 20 years. This average value equates to 78 percent of the historic median annual precipitation averaged for the North Coast and Sierra regions. As shown in Figure VA-6, the city's observed historical average annual rainfall accumulation is 15.6 inches. Under the anticipated drought scenario between 2051 and 2070, the city's average annual rainfall accumulation would decrease to 13.4 inches (CEC 2021c). Predicted drought conditions due to climate change will result in stress on reliable water supply and will likely result in water shortages. During extended drought periods, alternative local water storage methods will increasingly be relied upon.



Source: Data downloaded from Cal-Adapt, adapted by Ascent Environmental in 2021

Figure VA-6 Projected Late Century Drought Conditions

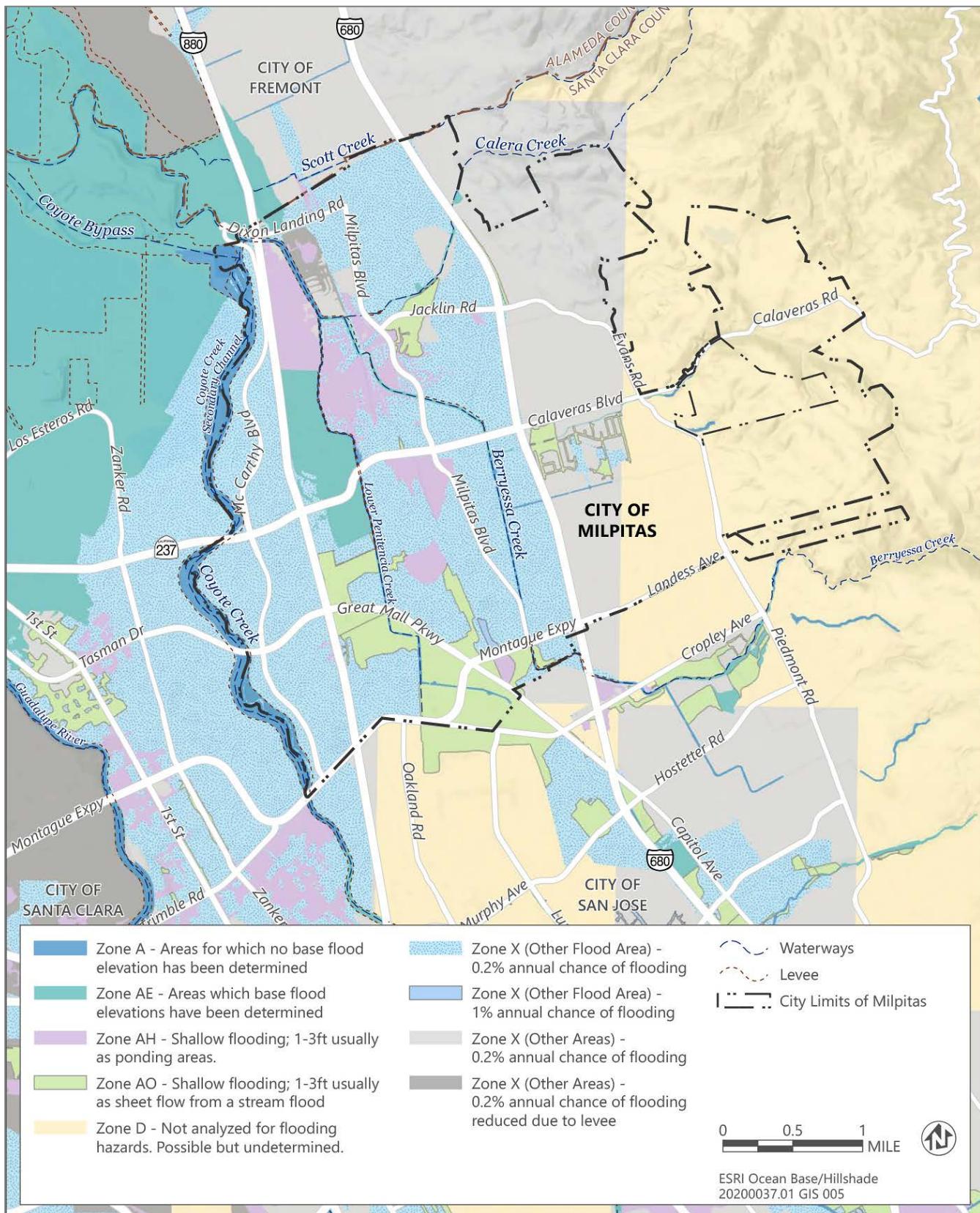
Extreme Precipitation and Flooding

Variability in the climate is likely to result in changes to the frequency, intensity, and duration of precipitation events causing heavy rainfall, thunderstorms, and hail. Like other California regions, the high year-to-year variability of precipitation in the city is severely affected by extreme precipitation events (i.e., days having precipitation at or exceeding the 95th percentile), which accounts for 80 percent of the year-to-year variability (Jennings et al. 2018). Most of the heaviest precipitation events occur during the winter months. It is predicted that the state will experience prolonged periods of drought followed by multi-year wet periods.

Historically, the city experienced an average of one extreme precipitation events per year. An extreme precipitation event is defined as the lowest value from an annual-maximum value over a 2-day period. For the city, this would be 1.05 inches of rainfall over a 2-day period. Under the medium-emissions scenario, the city is expected to experience two extreme precipitation events per year by mid-century and two extreme precipitation events per year by the late-century period. Under the high-emissions scenario, the city is expected to experience two extreme precipitation events per year by mid-century and three extreme precipitation events per year by the late-century period (CEC 2021d).

Extreme precipitation in the city typically occurs in the form of rainstorms driven by atmospheric rivers. An atmospheric river is a narrow band of the atmosphere that transports large amounts of water vapor and produces heavy precipitation across California during the winter months (NOAA 2015). Atmospheric rivers can last for several days, bringing heavy rains to lower elevations. Climate change is projected to result in longer and wider atmospheric rivers that carry larger amounts of water vapor compared to historic conditions (Espinoza et al. 2018). Larger atmospheric rivers would result in greater precipitation volumes and more frequent thunderstorms and hail, which can cause flooding and high winds, damaging infrastructure and endangering public safety.

As shown in Figure VA-7, portions of the city are located in Federal Emergency Management Agency (FEMA) flood zones for the 100- and 500-year storm events. As more intense precipitation events occur over short periods, the city is likely to experience an increase in flood events.



Source: Data downloaded from Santa Clara County in 2020 and from FEMA in 2021

Figure VA-7 Federal Emergency Management Agency Flood Zones in the City of Milpitas

Landslides

Landslides are events where a mass of earth or rock moves down a slope, which can be triggered by both geologic (e.g., earthquake) and climatologic (e.g., high-volume precipitation events) factors. The likelihood of landslides can be significantly higher when heavy rainfall events occur after wildfires, causing increased debris flow which can clog drainage systems and compound flooding impacts. The combination of increased temperatures, increased likelihood of wildfires, and increased occurrence of extreme precipitation events could result in more frequent and larger landslides in the western portion of the city that is characterized by hillsides.

Wildfire

Wildfire risk is determined by several factors: wind speeds, drought conditions, available wildfire fuel (i.e., dry vegetation), past wildfire suppression activity, and expanding wildland-urban interface, defined as areas of human development in or near high wildfire risk areas (Westerling 2018). Climate change is expected to worsen many of the factors that contribute to wildfire risk by increasing the intensity of drought events and creating hotter and drier landscapes more susceptible to burning.

As discussed above, climate change will result in changes in precipitation patterns, increased temperature, and drought conditions. Wetter months may lead to increased vegetative growth followed by periods of drought causing the vegetative growth to dry up, creating greater amounts of fuel for fires. Climate change will also worsen existing severe wind events, which fuel the spread and intensity of wildfires. The Diablos wind events occur during the autumn months resulting from air dropping from the Great Basin deserts of Nevada and Utah. Once the Diablos winds reach Northern California, they are hot, dry, and forceful. These winds have caused some of the region's most damaging wildfires occurring in Northern California including the Santa Clara Unit (SCU) Lightning Complex fire, which consumed approximately 400,000 acres of land in Santa Clara, Alameda, Contra Costa, San Joaquin, Merced, and Stanislaus Counties in August 2020 (CAL FIRE 2021). While future wind events are predicted to decrease, the intensity of a severe wind event over a shorter amount of time is predicted to increase (OPR, CEC, and CNRA 2018b).

Cal-Adapt provides projections for annual mean hectares burned within fire-prone areas within the state; the city is not located in an identified high-fire hazard area, thus, Cal-Adapt does not provide projections for future fire activity in the city (Santa Clara County 2009). Nevertheless, while wildfire risk may not directly occur within the city boundaries, wildfires occurring within Bay Area and beyond will have direct adverse impacts on city residents. Wildfire events not only cause direct physical damage to humans, structures, and biological and hydrological resources, but also contribute to global climate change and air quality degradation. The incomplete combustion of vegetation releases smoke composed of carbon monoxide (CO); particulate matter (PM); hydrocarbons; oxides of nitrogen (NO_x) and reactive organic gases, which combine to produce ground-level ozone); and thousands of other compounds. CO emissions are highest during the smoldering stages of a fire and NO_x emissions are produced primarily from oxidation of the nitrogen deposits in vegetation (Ahuja and Proctor 2018:439).

The composition of pollutants emitted during a wildfire depends on the interaction of several factors including the type, amount, and moisture content of fuels; meteorological conditions; emissions factors; typography; and others. In the treatable landscape, the likelihood of igniting a catastrophic wildfire will also depend on a confluence of prolonged climate trends. For example, the fire regime of 2018 was the result of prolonged drought followed by heavy precipitation coupled by elevated temperatures.

City residents will likely face future conditions where air quality is severely degraded due to wildfire activity within the state. For instance, during the 2020 fire season, air quality in the Bay Area was rated the worst globally due to three major wildfire complexes in the East Bay, North Bay, and southern Peninsula burning concurrently (ABC News 2020).

Air quality impacts related to wildfire smoke are disproportionately felt by low-income residents, and particularly, individuals experiencing homelessness. Low-income residents may not be equipped with sufficient filtration systems to provide respite from the smoke in their homes. Moreover, individuals experiencing homelessness face challenges in finding indoor areas that could shelter them from exposure to high concentrations of air pollution. Additionally, outdoor laborers may be required by their employers to continue working even during periods of dangerous levels of

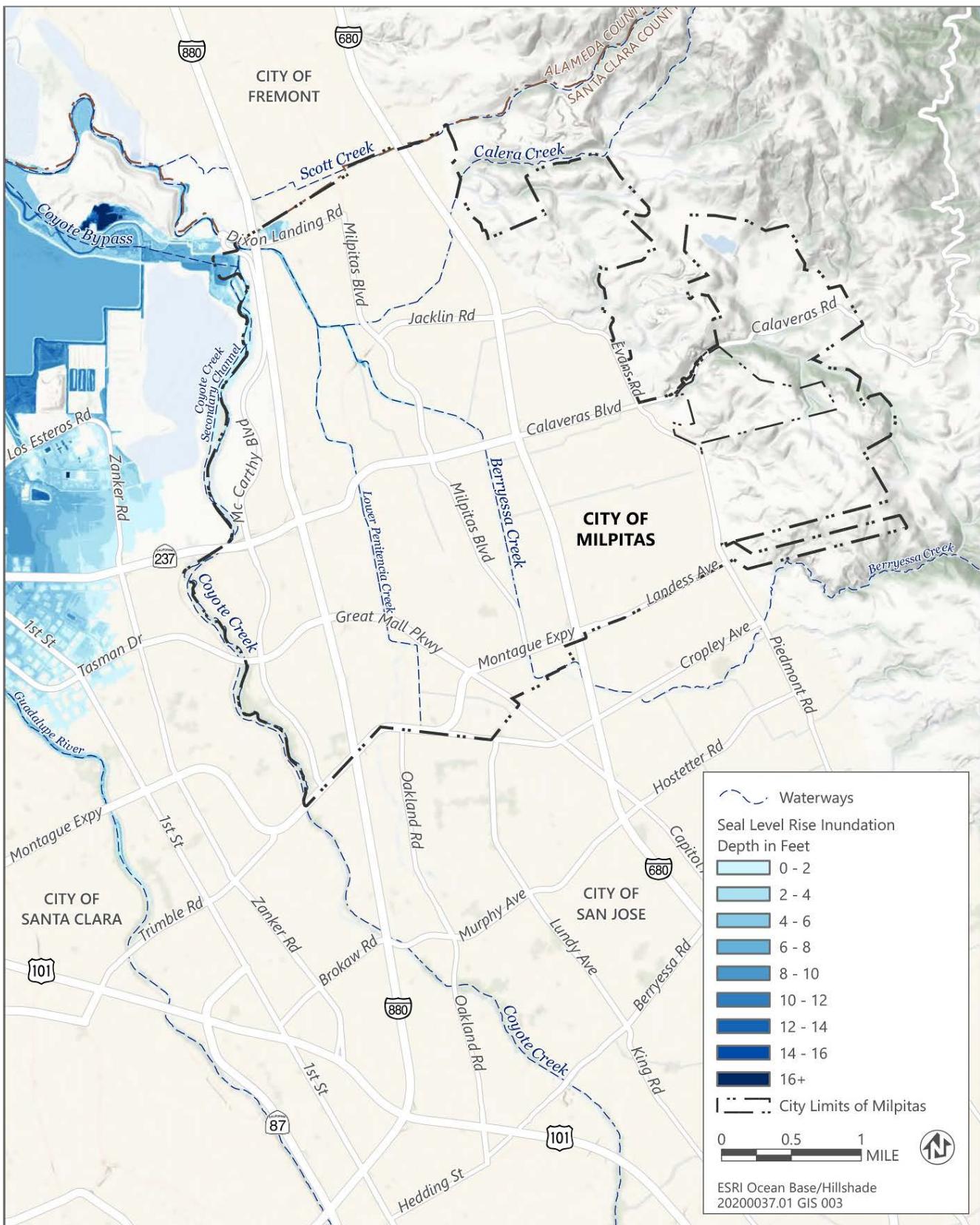
air pollution. While regulatory mechanisms implemented by the federal Occupational Safety and Health Administration and the Division of Occupational Safety and Health (better known as Cal/OSHA) exist, enforcement of these protocols is uncertain, particularly in industries that employ undocumented individuals, who are less likely to request compliance with such protocols.

Sea Level Rise

Rising sea levels are considered a secondary effect of climate change due to warming ocean temperatures and melting glacial ice sheets. The California coast has already seen a rise in sea level of 4 to 8 inches over the 20th century due to climate change (DWR 2021). Sea-level rise poses the greatest risk during coastal storms which increase tidal elevations. The large waves associated with storm surges can cause flooding in low-lying areas, loss of coastal wetlands, saltwater contamination of drinking water, impacts on roads and bridges, and increased stress on levees (DWR 2021). In addition, rising sea levels results in coastal erosion as shoreline sediment is re-deposited back into the ocean. A portion of the city's water supply is obtained from SCVWD, which sources its groundwater from the Santa Clara and Llaga groundwater subbasins. The Santa Clara subbasin, located in northern Santa Clara County, borders the San Francisco Bay. However, due to the Santa Clara subbasin's characteristic steep upward gradient, saltwater intrusion to the aquifer is minimized (SCVWD 2016).

The Bay Area will be particularly susceptible to sea-level rise in the 21st century. Cal-Adapt uses global models to indicate where California will see substantial sea-level rise, with the exact magnitude depending on a variety of factors including global GHG emissions, the rate at which oceans absorb heat, melting rates and movements of land-based ice sheets, and local coastal land subsidence or upshift. Cal-Adapt presents data in the form of a mapping tool which identifies where inundation may occur from varying degrees of sea-level rise ranging from 0 to 1.41 meters. While the region and neighboring communities to the city will directly experience sea-level rise and its impacts, the city is not located within an area that Cal-Adapt predicts inundation from up to 1.41 meters of sea-level rise combined with flooding from the 100-year storm event.

The ART Program also provides a mapping tool to evaluate potential sea-level rise impacts in the Bay Area. *ART Bay Area Sea Level Rise and Shoreline Analysis* maps are the most robust and accurate mapping tools for the Bay Area. Figure VA-8 shows projected sea-level rise in vicinity of the city. However, climate models are constantly evolving to accommodate new science and trends in the generation of global GHG emissions. It is foreseeable that if global GHG emissions continue to increase or new science pertaining to ocean dynamics and other carbon-related feedback loops arise, future climate change models may show sea-level rise within the boundaries of the city.



Source: Data downloaded from Santa Clara County in 2020 and AdaptingtoRisingTides.org in 2021

Figure VA-8 Sea-Level Rise in the Vicinity of Milpitas

2.2 SENSITIVITY AND POTENTIAL IMPACTS

This section provides a summary of the city's sensitivity to climate-related hazards and summarizes potential impacts from these hazards. Climate change effects will impact the city differently, such that some population groups and physical assets will be affected much more severely than others. Key populations and assets identified in the city are organized into the following overarching categories: populations, transportation, energy, water, and emergency services.

Figure VA-9 shows the locations of critical facilities identified in the city. In this context, critical facilities include childcare facilities, fire stations, police stations, city buildings, pump stations, and schools which have been identified as part of the OAHMP.

Populations

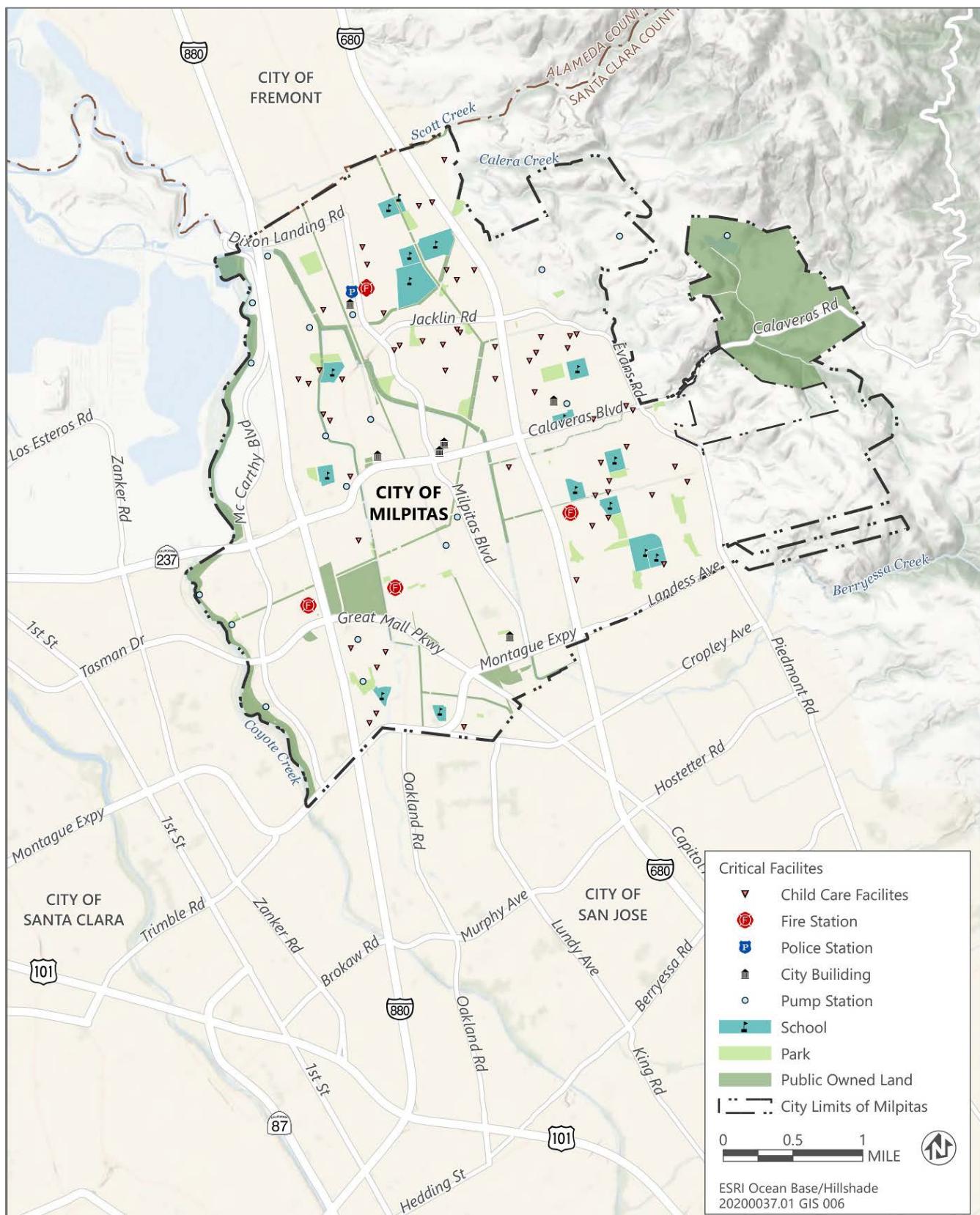
POLLUTION-BURDENED COMMUNITIES

In general, Environmental Justice Communities and communities of color are more susceptible to climate change-related hazards due to limited access to financial resources, health challenges or disabilities, living or working conditions, or historical and current marginalization. These factors, among others, can lead to increased susceptibility to, and disproportionate harm from climate impacts. Vulnerable populations in the city include Environmental Justice Communities, low-income persons, communities of color, linguistically isolated persons, senior citizens, persons with disabilities, and persons experiencing homelessness, among others.

Climate change affects human health through environmental changes, such as more frequent extreme heat event, more frequent and powerful wildfires, degradation of air quality, heightened growth and dispersal of allergens, and enhanced prevalence of infectious diseases. The resulting human health impacts include, but are not limited to, increases in the risk of asthma, allergies and other respiratory illnesses, cardiovascular diseases, vector-borne diseases, mental health impacts, civil conflicts and migrations, malnutrition, injuries, health-related illness, heatstroke, and death (Bell et al. 2016). While all persons in the city are anticipated to experience some level of health impacts from climate change, the populations most vulnerable to these health impacts are the same communities that experience health inequities or systemic differences in health status under current conditions (CDPH 2019). The vulnerable communities described below, particularly Environmental Justice Communities which have a disproportionate environmental burden, face climate change impacts that compound and exacerbate existing public health sensitivities and vulnerabilities.

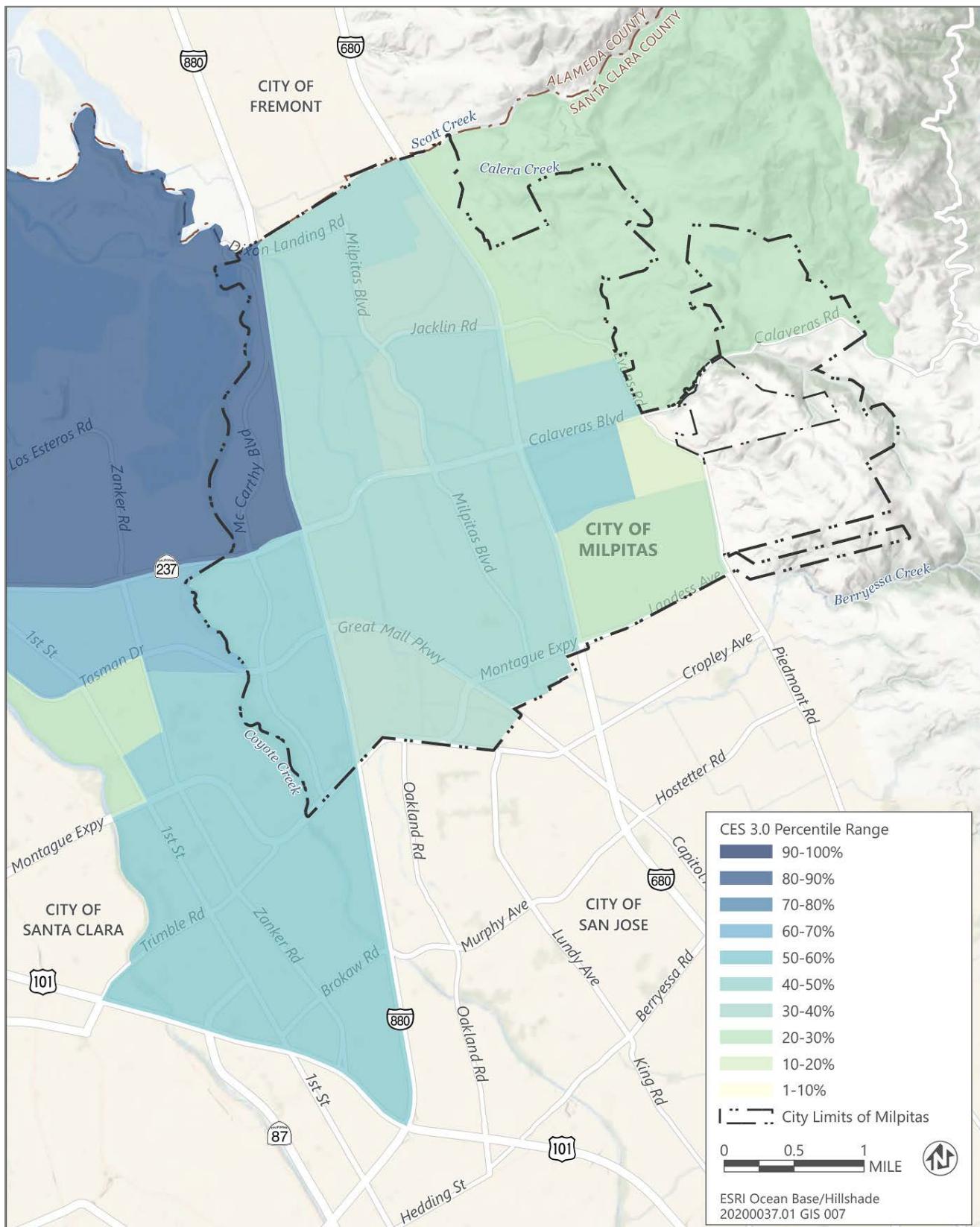
CalEPA's California Environmental Health Screening Tool 3.0 (CalEnviroScreen 3.0) is a mapping tool developed by the Office of Environmental Health Hazards Assessment to help identify low-income census tracts in California that are disproportionately burdened by and vulnerable to multiple sources of pollution. CalEnviroScreen 3.0 uses environmental, health, and socioeconomic information based on data sets available from State and federal government sources to produce scores for every census tract in the state. Figure VA-10 below shows the scoring of the city's residents organized by census tract using the CalEnviroScreen 3.0 mapping tool.

As shown above in Figure VA-10, the city is generally composed of census tracts that are within the 20-50 percentile, indicating Milpitas residents face a moderate level of pollution burden. Notably, the results of CalEnviroScreen 3.0 are a composite of several different factors including pollution exposure, existing hazardous sites, sensitivity of the population, and socioeconomic factors.



Source: Data downloaded from Santa Clara County in 2020 and received from City of Milpitas in 2021

Figure VA-9 Critical Facilities in the City of Milpitas



Source: Data downloaded from Santa Clara County in 2020 and California Office of Environmental Health Hazard Assessment in 2020

Figure VA-10 Disadvantaged Communities in the City of Milpitas

The Public Health Alliance of Southern California has also produced a mapping tool called the California Healthy Places Index (HPI). The HPI combines 25 community characteristics into a single indexed HPI Score. HPI scores for each census tract can be compared across the state to provide an overall picture of health and well-being in each neighborhood in California. The tool also allows multiple census tracts to be pooled together into a single score, allowing the comparison of zip codes, project areas, and other geographies. In addition to the overall score, the index also contains eight sub-scores for each of the Policy Action Areas (Economic; Education; Housing; Health Care Access; Neighborhood; Clean Environment; Transportation; and Social factors). The index was created using statistical modeling techniques that evaluated the relationship between these Policy Action Areas and life expectancy at birth. The statistics were designed to maximize the ability of the HPI to identify healthy communities and quantify the factors that shape health. Figure VA-11 below shows the HPI scoring for the city.

As shown in Figure VA-10 and Figure VA-11, there are several locations in the city which score disproportionately higher as part of the CalEnviroScreen 3.0 Tool and the HPI index. These include the neighborhood directly south of Calaveras Boulevard and east of Interstate 680 (Census Tract 5044.18) as well as the neighborhood directly south of Scott Creek Road and west of Interstate 680 (Census Tract 5044.22). Additionally, the residents in the northeastern and southwestern parts of the city are proportionally healthier, in general, than other California census tracts, whereas the residences of the central part of the city are comparatively less healthy.

Communities of Color

The city is an urbanized community and supports a dense population. The city's population in 2020 was approximately 84,000 residents composed of residents of primarily Asian (65.7 percent), Caucasian (15.5 percent) Hispanic or Latino (14.2 percent), and African American (3.5 percent) descent (U.S. Census 2021a). Across the U.S., including California and the city, communities of color are disproportionately vulnerable to and impacted by climate change. This vulnerability is often due to variables such as location, employment type, income level, and access to resources, which are often the result of historic inequitable planning processes (Lynn et al. 2011).

Low-Income Communities

Approximately 7.3 percent of the city's population were living below the federal poverty level in 2020 compared to the national average of 13.1 percent (U.S. Census Bureau 2021b). The largest demographics living in poverty are males and females between the ages of 18-24, and females between the ages of 35-44. The most common racial group living below the poverty line are of Asian descent, followed by those of Hispanic descent.

Linguistically Isolated Communities

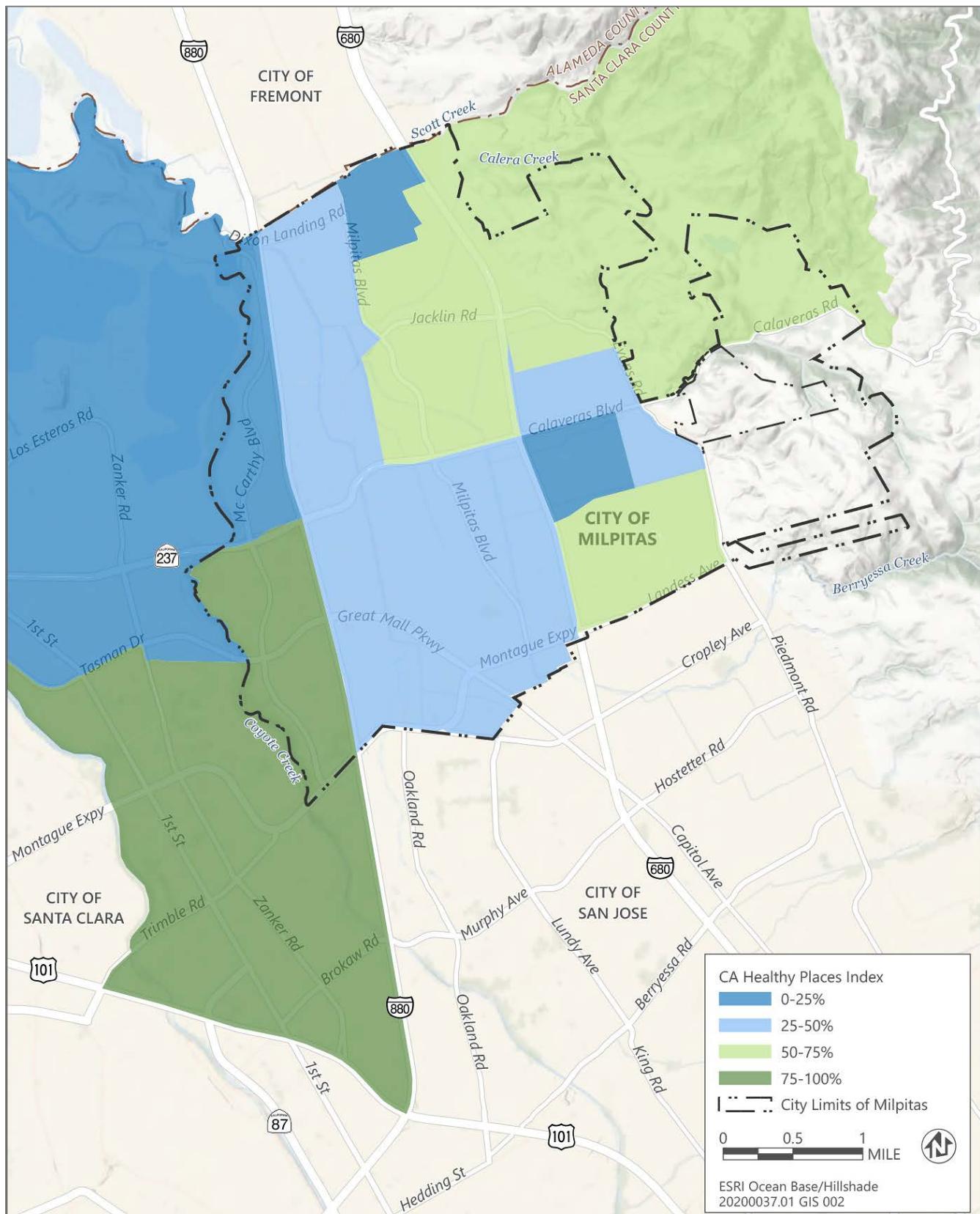
Communities of color can also face challenges due to limited English proficiency and may not be able to access important information regarding climate hazards. Communities of color are often left out of community planning and emergency planning processes. Approximately 67 percent of the city's population speaks a language other than English at home. Of this 67 percent, 26 percent speak English at a level characterized as less than "very well" (U.S. Census Bureau 2021a).

Senior Citizens

Vulnerable populations also include senior populations who are 65 years of age and older. The city's population in 2020 was approximately 8 percent seniors (U.S. Census Bureau 2021a).

Persons with Disabilities

During hazard events such as wildfires, flooding, or extreme storms, vulnerable populations such as persons with disabilities may require additional assistance to adequately respond to these hazard events. Challenges that these populations face include potential inability to access emergency supplies, evacuate, or receive and understand emergency information. Further, the effects of climate change hazards can result in infrastructure disruptions including electric power outages. Such events could result in additional health hazards for seniors or persons with disabilities who rely on electricity to sustain medical equipment/assistive technology use.



Source: Data downloaded from Santa Clara County in 2020 and California Healthy Places Index in 2021

Figure VA-11 Healthy Places Index for the City of Milpitas

Persons Experiencing Homelessness

Every 2 years, Santa Clara County conducts “point-in-time” counts of sheltered and unsheltered persons. In 2019, North Santa Clara County, which includes the city, had a total of 1,621 persons experiencing homelessness (193 sheltered and 1,428 unsheltered), an increase of 62 percent from 2017. Additionally, North Santa Clara County saw an increase in the number of unsheltered persons, rising from 69 percent of the unsheltered homeless population in 2017 (846 persons) to 88 percent (1,428 persons) in 2019. Individuals experiencing homelessness are especially vulnerable to climate change impacts including increased heat waves and extreme heat days, flooding, and impacts on human health. This vulnerability stems from lack of shelter, resources to respond to events, and sanitation. In addition to impacts from existing climate change risks, emergency events such as wildfires and flooding can disproportionately affect persons experiencing homelessness. Extreme weather events can result in the loss of housing stock and reduced regional housing affordability, resulting in increased occurrences of homelessness (Center for American Progress 2019).

Wildfires are another major public health concern for the Bay Area. Although Environmental Justice Communities in the city are not located in areas where wildfire risk is predicted to increase, unlike other climate-induced natural disasters that have more localized health impacts, a single wildfire can influence the health outcomes of multiple regions because wildfire smoke can travel long distances and worsen the air quality for weeks. Wildfires are a major source of PM, which is an air pollutant that increases one’s risk for respiratory illnesses, cardiovascular disease, negative birth outcomes, and premature death (Bell et al. 2016). As identified above, wildfire smoke also increases one’s exposure to CO, ground-level ozone, PM, and toxic chemicals (e.g., pesticides, plastics, and paints) released from burned vegetation, buildings, and other human-made materials. Even when sheltering indoors, individuals are at risk of exposure to hazardous air quality because wildfire smoke penetrates into homes, particularly older homes that are poorly insulated (Rudolph et al. 2018). While there is no exact definition for older homes, in 2014, the State implemented the first California Green Building Standards Code which required significant improvements in the building envelope and building energy use.

Approximately 83 percent of the residential units in the city were built before 2013, making these homes less energy efficient and more susceptible to impacts in air quality impacts (U.S. Census Bureau 2021a). Moreover, wildfires can also cause immediate health impacts through burns, injuries, and heat stress. Beyond these immediate health impacts, the stress, displacement, and loss of home and community from wildfires can cause significant mental health impacts, such as anxiety, depression, and post-traumatic stress disorder (Hanigan et al. 2012).

Table VA-3 provides a summary of impacts on the city’s population from the set of climate-related hazards discussed above.

Table VA-3 Climate Change Impacts to Populations

Climate Change Effects	Populations						
	Environmental Justice Communities	Low-Income Communities	Communities of Color	Linguistically Isolated	Seniors	Persons with Disabilities	Persons Experiencing Homelessness
Human Health Hazards	<ul style="list-style-type: none"> ▶ Increased exposure to poor air quality and infectious disease compared to non-Environmental Justice Communities ▶ Exacerbated economic insecurity resulting in mental health concerns 	<ul style="list-style-type: none"> ▶ Increased exposure to poor air quality and infectious disease compared to non-low-income population ▶ Exacerbated economic insecurity resulting in mental health concerns 	Increased exposure to poor air quality and infectious disease compared to non-communities of color	Increased exposure to poor air quality and infectious disease compared to non-linguistically isolated population	Increased risk from poor air quality and infectious disease compared to non-senior population	<ul style="list-style-type: none"> ▶ Increased exposure to poor air quality and infectious disease compared to abled population ▶ Exacerbated economic insecurity resulting in mental health concerns 	<ul style="list-style-type: none"> ▶ Increased exposure to poor air quality and infectious disease compared to housed population ▶ Exacerbated economic insecurity resulting in mental health concerns
Drought and Water Supply	Water shortages during droughts likely to disproportionately impact Environmental Justice Communities	Water shortage during droughts likely to disproportionately impact low-income households	Water shortages during droughts likely to disproportionately impact communities of color	Limited ability to interpret and react to drought and available water supply messaging	Increased hazards to human health from limited access to potable water	Increased hazards to human health from limited access to potable water	Increased hazards to human health from limited access to potable water
Extreme Heat Events	<ul style="list-style-type: none"> ▶ Increased exposure to heat at home from limited ability to afford air conditioning systems ▶ Increased exposure to UHI effect 	<ul style="list-style-type: none"> ▶ Increased exposure to heat at home from limited ability to afford air conditioning systems ▶ Increased exposure to UHI effect 	<ul style="list-style-type: none"> ▶ Increased likelihood of limited access to air conditioning and cooling facilities ▶ Increased exposure to UHI effect 	Potentially limited access to information and cooling centers	<ul style="list-style-type: none"> ▶ Increased vulnerability to heat-related health risks ▶ Increased exposure to UHI effect 	<ul style="list-style-type: none"> ▶ Increased exposure to outdoor heat without access to air conditioning or protection ▶ Increased exposure to UHI effect 	<ul style="list-style-type: none"> ▶ Increased exposure to outdoor heat without access to air conditioning or protection ▶ Increased exposure to UHI effect
Extreme Precipitation and Flooding	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures ▶ Environmental Justice Communities are located in flood-prone areas 	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures. ▶ Populations are more likely to be located in flood-prone areas and would be exposed to increased risk of flooding 	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures ▶ Populations are more likely to be located in flood-prone areas and would be exposed to increased risk of flooding 	Limited access to warning messages and city precautionary measures	<ul style="list-style-type: none"> ▶ Limited mobility and ability to react to flooding events ▶ Limited ability to prepare for extreme weather events and reliance on existing supplies and infrastructure 	<ul style="list-style-type: none"> ▶ Limited mobility and ability to react to flooding events ▶ Limited ability to receive warnings and access to shelter 	Limited ability to receive warnings and access to shelter due to limited mobility

Climate Change Effects	Populations						
	Environmental Justice Communities	Low-Income Communities	Communities of Color	Linguistically Isolated	Seniors	Persons with Disabilities	Persons Experiencing Homelessness
Landslides	Limited access to warning messages and limited ability to evacuate	Limited access to warning messages and limited ability to evacuate	Limited access to warning messages and limited ability to evacuate	Potential inability to receive and interpret warning messages and evacuation notices	Limited ability to evacuate due to lack of mobility or limited situational understanding from cognitive conditions	Limited ability to evacuate due to lack of mobility, limited situational understanding from cognitive conditions, or reliance on medication or devices	Limited ability to receive warnings and ability to evacuate due to lack of mobility
Wildfires	Limited access to warning messages and limited ability to evacuate	Limited access to warning messages and limited ability to evacuate	Limited access to warning messages and limited ability to evacuate	Potential inability to receive and interpret warning messages and evacuation notices	Limited ability to evacuate due to lack of mobility or limited situational understanding from cognitive conditions	Limited ability to evacuate due to lack of mobility, limited situational understanding from cognitive conditions, or reliance on medication or devices	Limited ability to receive warnings and ability to evacuate
Sea-Level Rise	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Extreme Precipitation and Flooding	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures ▶ Environmental Justice Communities are located in a flood-prone area 	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures ▶ Populations are more likely to be located in a flood-prone area and would be exposed to increased risk of flooding 	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures ▶ Populations are more likely to be located in a flood-prone area and would be exposed to increased risk of flooding 	<ul style="list-style-type: none"> ▶ Limited access to warning messages and city precautionary measures ▶ Populations are more likely to be located in a flood-prone area and would be exposed to increased risk of flooding 	<ul style="list-style-type: none"> ▶ Limited mobility and ability to react to flooding events ▶ Limited ability to prepare for extreme weather events and reliance on existing supplies and infrastructure 	<ul style="list-style-type: none"> ▶ Limited mobility and ability to react to flooding events ▶ Limited ability to receive warnings and access to shelter 	Limited ability to receive warnings and access to shelter due to lack of mobility
Landslides	Limited access to warning messages and limited ability to evacuate	Limited access to warning messages and limited ability to evacuate	Limited access to warning messages and limited ability to evacuate	Potential inability to receive and interpret warning messages and evacuation notices	Limited ability to evacuate due to lack of mobility or limited situational understanding from cognitive conditions	Limited ability to evacuate due to lack of mobility, limited situational understanding from cognitive conditions, or reliance on medication or devices	Limited ability to receive warnings and ability to evacuate

Notes: N/A = not applicable.

Source: Ascent Environmental 2021

Transportation

The public roadway system including bicycle and pedestrian facilities in the city are operated and maintained by the City's Public Works Department. One of the major effects of climate change on the city's roadway system is the reduction in the overall lifespan of transportation infrastructure (OPR, CEC, and CNRA 2018b). Increased average temperatures and extreme heat can result in the degradation of pavement and could impact roadway, trail, and bicycle facilities. Increases in flooding-related hazards along roadways can result in increased erosion of subbase materials underneath roadways and further roadway degradation. This impact can result in secondary impacts on roadway facilities, including disruptions to vehicular access and commerce between cities. Roadway degradation overtime can increase the risk to human safety by damaging or blocking evacuation routes and limiting access for emergency responders.

Transit services in the city are operated by the Santa Clara Valley Transportation Authority (VTA). The city is also serviced by Bay Area Rapid Transit (BART), which operates a station in the Milpitas Transit Center. The transit systems available in the city also include local bus services, light rail, and ride-sharing programs. Transit access, safety, and cost can be impaired by climate change impacts such as extreme heat. Transit stops without adequate sheltering (i.e., bus shelters or street trees) can lead to dangerous exposure to extreme heat with disproportionate impacts on low-income populations who, in general, use transit at higher rates. Additionally, bus and rail transit vehicles can undergo increased stress to maintain proper air conditioning and engine cooling during extreme heat events and risk failure during extreme heat days over 100 °F (Cambridge Systems 2015).

Climate impacts to the transportation system are presented in Table VA-4.

Table VA-4 Climate Change Impacts to Transportation

Climate Change Effects	Assets				
	Roadways	Emergency Access/ Evacuation Routes	Transit Facilities and Services	Railroads	Bicycle Paths and Trails
Human Health Hazards	Damage to roadways, if substantial, can disrupt access to regular medical care for people with chronic illnesses.	Damage to roadways, if substantial, can potentially reduce emergency response time but is unlikely to significantly reduce access.	Increased spread of infectious disease may lead to decreased transit ridership.	N/A	N/A
Drought and Water Supply	N/A	N/A	N/A	N/A	N/A
Extreme Heat Events	Increased likelihood of roadway damage from heat expansion	Damage to roadways, if substantial, can potentially reduce emergency response times but unlikely to significantly reduce access	<ul style="list-style-type: none"> ▶ Increased heat exposure for riders at stations without adequate shading ▶ Increased stress on transit vehicles 	N/A	Increased likelihood of damage from pavement degradation
Extreme Precipitation and Flooding	Increased likelihood of roadway damage from erosion of roadway subbase materials	<ul style="list-style-type: none"> ▶ Potential closure of evacuation routes due to damage or water coverage ▶ Reduced ability for emergency services access 	Risk of physical damage to transit facilities	Risk of physical damage	Risk of physical damage
Landslides	Risk of physical damage	<ul style="list-style-type: none"> ▶ Potential closure of evacuation routes due to damage or landslide coverage ▶ Reduced ability for emergency services access 	Risk of physical damage	Risk of physical damage	Risk of physical damage
Wildfires	Risk of physical damage	<ul style="list-style-type: none"> ▶ High risk for areas on single-access roads ▶ Potential closure of evacuation routes due to damage or ongoing wildfire ▶ Reduced ability for emergency services access 	Fixed routes limit effectiveness in evacuation and may experience physical damage	Fixed routes limit effectiveness in evacuation and may experience physical damage	Risk of physical damage
Sea-Level Rise	Increased likelihood of roadway damage from erosion of roadway subbase materials	<ul style="list-style-type: none"> ▶ Potential closure of evacuation routes due to damage or water coverage ▶ Potential removal of vehicle access to low-lying areas ▶ Reduced ability for emergency services access 	Risk of physical damage	N/A	Risk of physical damage

Notes: N/A = not applicable.

Source: Ascent Environmental 2021

Energy

Electrical and natural gas infrastructure within the city is owned and operated by Pacific Gas and Electric (PG&E). Electricity delivered to consumers in the city is generated from a mix of power sources from elsewhere in the region and state, as well as on-site generation of electricity from local public and private facilities. The City is a member of Silicon Valley Clean Energy (SVCE), a local community-choice aggregator, that partners with PG&E and supplies carbon-free electricity to its members. The city supports the development and maintenance of electricity generation and transmission facilities, and the maintenance and operation of facilities on City-owned sites (i.e., on-site solar panels at City facilities).

Impacts on electricity resources from climate hazards can include stress and physical damage to the electricity generation, transmission, and distribution system. Extended drought periods may reduce the available surface water supply to generate hydroelectric power. Transmission facilities face increasing climate-related risks as a result of the increased frequency of wildfires, severe wind, and extreme heat events. Extreme heat events result in increased energy demand for cooling in residential and commercial buildings and can add stress to transmission systems, resulting in brownouts and damage to electricity infrastructure. Wildfires, flooding, landslides, and severe wind can cause physical damage to or destruction of transmission facilities. Due to a number of recent large-scale wildfires caused by electricity infrastructure exposed to extreme heat and high-winds, utilities have begun to implement public safety power shutoff events (PSPS) to avoid wildfire risk. PSPS events can result in communities experiencing no electricity for multiple days and prevent individuals from using prescribed medications and treatments that rely on electricity or refrigeration. PSPS events can also result in impacts to commerce and economic losses, particularly for businesses that rely on refrigeration such as grocery stores. Hazards such as landslides, wildfires, and flooding can also affect underground natural gas pipelines, exposing and/or damaging these pipelines. The damage resulting from climate change-related hazards on electricity and natural gas infrastructure can have a greater impact on disadvantaged populations, particularly communities that are low-income or individuals who have limited mobility or lack the financial means to make repairs to their property.

Increases in extreme heat and heat waves will have implications for energy demand in residential and nonresidential buildings in the city with a higher energy demand for cooling and a decrease in energy demand for heating, in general. In general, for buildings in the city, increases in will result in increased electricity demand for cooling and place increased demand on the electricity grid, particularly during extreme heat days and heat wave events which is projected to increase peak electricity demand for utilities. Currently, during extreme heat days and heat wave events, electricity utilities and the State's grid operator, California Independent System Operator, initiate "Flex Alerts", requesting customers to conserve energy during certain times of the day to reduce stress on the electricity grid.

Some initial research that models future changes in peak load for utilities in California during extreme heat events has demonstrated that peak loads are substantially more sensitive to temperature anomalies, indicating warm-anomalous temperatures (e.g., extreme heat days and heat waves) will have a disproportionate impact on higher-intensity electricity consumption (Kumar et al. 2020). The research also indicates that disregarding the asymmetry in temperature response of electricity demand will lead to underestimating the climate-sensitive portion of the upper extremes of demand for electricity utilities in California, for short-term (2021-2040) and long-term (2081-2099) time periods included in the study. This will likely lead to an increase in the frequency of brownout and blackouts, in which portions of the electricity grid are disrupted and communities lose power due to an imbalance between power generation and power consumption.

Studies of PG&E electricity and natural gas infrastructure show that hazards from sea-level rise, flooding, and wildfire are the greatest threats from climate change. As flooding may occur from a storm event, power system infrastructure in the coastal regions may be damaged and could be impacted for several weeks (OPR, CEC, and CNRA 2018b). As flooding becomes more frequent, transmission lines will become more susceptible to corrosion. Though impacts on natural gas infrastructure would be less severe than impacts on electrical facilities because gas pipelines are generally located underground, natural gas infrastructure will require increased maintenance due to climate change-related impacts such as wildfire and flooding (Bruzgul et al. 2018). Climate impacts to energy resources are presented in Table VA-5.

Table VA-5 Climate Change Impacts to Energy

Climate Change Effects	Assets	
	Electricity Transmission Lines and Natural Gas Pipelines	Electricity Generation
Human Health Hazards	Public safety power shutoff events can prevent residents' use of prescribed medications and treatments that rely on electricity and refrigeration	N/A
Drought and Water Supply	Increased stress on system and potential failure	<ul style="list-style-type: none"> ▶ Increased stress on systems and potential failure ▶ Reduced effectiveness of hydroelectric generation facilities
Extreme Heat Events	Increased stress on system and potential failure	Increased electricity demand for building cooling and increased likelihood of brownouts or blackouts
Extreme Precipitation and Flooding	Risk of potential damage/failure	<ul style="list-style-type: none"> ▶ Reduced effectiveness of hydro-electric generation facilities ▶ Risk of potential damage/failure. ▶ Risk of physical damage and increased stress on generation facilities from turbulent weather
Landslides	Risk of potential damage/failure	Risk of potential damage/failure
Wildfires	Risk of potential damage/failure	<ul style="list-style-type: none"> ▶ Increased smoke cover reduces effectiveness of solar generation ▶ Risk of physical damage/failure
Sea-Level Rise	Risk of potential damage/failure	N/A

Notes: N/A = not applicable.

Source: Ascent Environmental 2021

Water

The city's water resources will be affected by climate change due changes in precipitation, and a slight increase in the occurrence of extreme precipitation events. Extreme precipitation events that occur with more intensity over a short period could cause flooding, limiting access to or damage to water facilities. As previously discussed, snowmelt in Northern California is also projected to occur earlier in the year, causing springtime recharge to occur before the warmer and drier summer months when it is most needed. Reduced snowpack also reduces water captured for storage in surface water bodies and aquifers for potable drinking water. As a result, the city and region could experience decreased water supply during the spring and summer months, which are also projected to become drier and warmer as a result of climate change.

Changes in rainfall and snowmelt timing can affect SFPUC and SCVWD's ability to provide adequate and safe drinking water on a reliable basis. While these agencies may be able to rely on groundwater to provide additional supply, which is currently the direction SCVWD is moving, drawing from these sources can substantially lower water tables, resulting in land subsidence. Precipitation variability will also affect the city's local surface and groundwater supply causing the city to rely on other sources such as recycled water resources, which is currently the intent of SCVWD moving into the future.

It is estimated that by 2040, the city's water demand will increase by approximately 28 percent from 2020 levels due to population and economic growth, further emphasizing the need for a sustainable water supply and water supply management (City of Milpitas 2020). Increased episodes of drought and increased water demand could result in water shortages for the region, endangering residents, and ecological systems (e.g., flood control or sensitive habitat, recreational areas).

SFPUC and SCVWD and their member agencies contribute to the region's local water supply, which is composed of surface water, groundwater, and recycled water. Throughout Northern California, and extending from the coast to the Sierra Nevada mountains, surface water reservoirs retain water resources for residents in the region. Currently groundwater does not supply customers located in the city; however, groundwater resources do supply water to SCVWD, the main water provider for the city. Recycled water in the region has increased over time and provides non-potable water to recreational areas in the city with plans to increase overall recycled water use in the future.

The city's stormwater infrastructure was developed to maintain flood control while directing water northwest to the San Francisco Bay. The system consists of conveyance pipelines known as municipal separate stormwater systems which discharge stormwater and non-stormwater. The city identifies the highest priority water quality conditions within each watershed and specific goals, strategies, and schedules to address those priorities, including numeric goals and activity levels, and requirements for water quality monitoring and assessment (City of Milpitas 2016).

Wastewater facilities are also threatened by climate change. Flooding during larger storm events increases the risk of sewage and hazardous and/or toxic materials being released into waterways if wastewater treatment plants are inundated, storage tanks are damaged, or pipelines are damaged. Wastewater treatment facilities in Santa Clara County have already been impacted during large storms that have caused sewage spills. During these flooding-induced spill events, there is an increased risk of contracting water-borne illnesses and fungal infections. While the City does not treat wastewater, it pumps its wastewater through two force mains to the San Jose/Santa Clara Water Pollution Control Plant, also known as the RWF, which is located approximately 0.25-miles directly west of the northwestern boundary of the city. Though the City may not have jurisdiction over operations of the RWF, flooding-related incidences may be widespread and could affect city residents. Anticipated climate impacts to water resources are presented in Table VA-6.

Table VA-6 Climate Change Impacts to Water and Wastewater Infrastructure

Climate Change Effects	Assets			
	Flood Control	Water Conveyance	Available Water Supply	Water and Wastewater Treatment
Human Health Hazards	N/A	N/A	Increased concentration of industrial chemicals, heavy metals, and agriculture runoff contaminants in groundwater drinking sources	Increased risk of contracting water-borne illnesses and fungal infections during sewage spill events
Drought and Water Supply	N/A	Reduced efficiency of water conveyance from limited supply and increased energy costs	Significant reduction in water available during droughts from reduced reserve supplies and changing water runoff patterns	N/A
Extreme Heat Events	Potential damage to channels and other engineered flood control facilities	Increased stress on water conveyance system	Increased demand for potable water and for industrial cooling	Potential damage to channels and other engineered flood control facilities
Extreme Precipitation and Flooding	<ul style="list-style-type: none"> ▶ Increased demand for flood control facilities and increased risk of damage from overflow or ground saturation surrounding facilities ▶ Increased demand for flood control and storm surge facilities and increased risk of physical damage 	<ul style="list-style-type: none"> ▶ Risk of physical damage ▶ Increased stress on conveyance system 	Increased risk of water contamination and reduction in available potable water	<ul style="list-style-type: none"> ▶ Increased demand for flood control facilities ▶ Increased risk of damage from overflow or ground saturation surrounding facilities
Landslides	Risk of physical damage	Risk of physical damage	Risk of physical damage	Risk of physical damage
Wildfires	Risk of physical damage	Risk of physical damage	Increased demand for water for persons displaced by wildfire, exposed individuals, and for fire suppression	Risk of physical damage
Sea-Level Rise	Increased demand for flood control facilities and increased risk of damage from overflow or ground saturation surrounding facilities	Potential physical damage to conveyance facilities	Increased risk of water contamination and reduction in available potable water	Increased demand for flood control facilities and increased risk of damage from overflow or ground saturation surrounding facilities

Notes: N/A = not applicable.

Source: Ascent Environmental 2021

Emergency Services

On August 5, 2021, the Milpitas City Council approved a full update to the City's Emergency Operations Plan (EOP). The EOP provides an overview of the City's approach to emergency operations. It identifies emergency response policies, describes the response and recovery organization, and assigns specific roles and responsibilities to City departments, agencies, and community partners. The EOP has the flexibility to be used for all emergencies, including climate change-related hazards, and will facilitate response and recovery activities in an efficient and effective way.

The EOP is reviewed, updated, republished, and redistributed on a 2-year review, 5-year revision cycle in accordance with the 2016 State Homeland Security Grant Program guidance. The EOP may be modified as a result of post-incident analyses and/or post-exercise reviews and assessments. City staff will coordinate future revisions to ensure that relevant or updated climate-related hazards or risk conditions are included.

Emergency operation facilities are locations that provide essential products and services to the public, particularly during emergency events. Emergency operation facilities can include hospitals or other health care facilities, police and fire stations, and communication facilities. An increase in climate-related hazard event emergencies will place more demand on emergency operation facilities, emergency personnel, related infrastructure, and equipment in the city. As discussed above, the city is anticipated to experience more frequent hazard events including coastal storms, erosion, floods, wildfire impacts, drought, and extreme weather. As temperatures increase and heat waves occur more frequently, the city is likely to experience potential public health impacts. Floods and landslides may threaten transportation routes, emergency services stations, and evacuation routes, which could hinder emergency response times during such events. PSPS events may place pressure on emergency generators, which are used during black-out periods to power police, fire, and the emergency operations center.

Additionally, physical damage to emergency services facilities could occur as a result of climate change-related hazards. Within the city, four fire stations and one police station are located in within either the 100- or 500-year flood zones. Schools often serve as community resource centers and evacuation centers during emergencies. Based on the GIS analysis in the OAHMP, 12 schools are located within FEMA floodplain designations. Notification of emergencies and evacuation instructions rely upon functioning communication facilities such as AM/FM antennas, broadband radio transmitter, and television transmitters. Communications facilities within the city may be affected by increases in frequency and severity of flooding events and extreme heat events. Climate impacts to emergency services are presented in Table VA-7.

Table VA-7 Climate Change Impacts to Emergency Services

Climate Change Effects	Assets		
	Emergency Response Personnel	Emergency Facilities	Telecommunications
Human Health Hazards	Increased exposure to infectious diseases and personal injuries	Increased stress on health care facilities in responding to health impacts from exposure to poor air quality, extreme heat, infectious diseases, and other climate-induced effects	Increased demand on telecom systems during climate-induced natural disasters and infectious disease outbreaks
Drought and Water Supply	Increased demand for emergency services and reduced water availability for fire suppression	Increased demand on facilities for emergency response and preparedness planning	Increased stress on telecom systems
Extreme Heat Events	Increased exposure to heat-related health impacts for emergency responders	Increased demand for cooling centers	Increased stress on telecom systems
Extreme Precipitation and Flooding	<ul style="list-style-type: none"> ▶ Increased exposure to flood conditions for emergency responders ▶ Potential increases in emergency response times ▶ Increased challenges in responding to emergencies, providing treatment, or performing search and rescue operations 	<ul style="list-style-type: none"> ▶ Increased stress on evacuation centers and risk of physical damage to emergency facilities ▶ Risk of physical damage 	<ul style="list-style-type: none"> ▶ Risk of physical damage ▶ Risk of disruption to communication abilities in the city and region
Landslides	Increased exposure to hazard areas for emergency responders	<ul style="list-style-type: none"> ▶ Risk of physical damage ▶ Increased demand on evacuation shelters 	Risk of physical damage
Wildfires	Increased exposure of emergency response personnel to extreme health risk including smoke inhalation and dangerous fire conditions	<ul style="list-style-type: none"> ▶ Risk of physical damage ▶ Increased demand on evacuation shelters 	Risk of physical damage
Sea Level Rise	Increased exposure to flood conditions from emergency response	<ul style="list-style-type: none"> ▶ Increased stress on evacuation centers ▶ Risk of physical damage to emergency facilities 	N/A
Human Health Hazards	Increased exposure to infectious diseases and personal injuries	Increased stress on health care facilities in responding to health impacts from exposure to poor air quality, extreme heat, infectious diseases, and other climate-induced effects	Increased demand on telecom systems during climate-induced natural disasters and infectious disease outbreaks

Notes: N/A = not applicable.

Source: Ascent Environmental 2021

2.3 ADAPTIVE CAPACITY

This section analyzes the City's current capacity to address and adapt projected increase in severity and frequency of climate-related hazards. The City and regional partners have established plans, policies, and programs that address climate change impacts. These efforts, however, do not comprehensively identify strategies that will be taken by local and regional governments to address the full scope and magnitude of potential climate impacts. Climate change will increase the frequency and severity of climate-related hazards in the future, requiring updates to emergency response, land use planning, and strategic partnerships. A summary of the City's existing efforts to adapt to climate change effects is presented below.

Existing Plans and Reports

CALIFORNIA'S FOURTH CLIMATE CHANGE ASSESSMENT SAN FRANCISCO BAY AREA SUMMARY REPORT

The Climate Change San Francisco Regional Report, prepared in 2018, is one in a series of 12 climate vulnerability assessments in California which provide an overview of climate science, specific strategies to adapt to climate impacts, and key research gaps needed to safeguard the region from climate change. The Summary Report breaks down regional vulnerability by land use, infrastructure and services, communities, and cross-border climate interactions while providing adaptation strategies applicable to the city.

The report can be found here: [Climate Change Assessment San Francisco Regional Report](#)

CALIFORNIA DEPARTMENT OF TRANSPORTATION CLIMATE CHANGE VULNERABILITY ASSESSMENT 2018 DISTRICT 4 TECHNICAL REPORT

Caltrans District 4 Technical Report, prepared in 2018, assesses the vulnerability of the State Highway System to the impacts of climate change in District 4. District 4 includes the nine Bay Area counties (i.e., Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma). The technical report was developed to better understand the vulnerabilities of the California State Highway System from greater intensity and frequency weather-related and longer-term climate change events including temperature, precipitation, wildfire, sea-level rise, storm surge, cliff retreat, and flooding. The report identifies the vulnerability of Caltrans assets to these climate change-related natural hazards. In addition, through a partnership with regional agencies, the report explains how State Highway System projects should be prioritized to adapt to climate change. Caltrans's approach to adaptation is to consider risk-based implications of damage and economic loss during the project design phase. This method for inherently considering climate change effects in project design was developed by the Federal Highway Administration and is known as the Adaptation Decision-Making Assessment Process.

The report can be found here: [California Department of Transportation Climate Change Vulnerability Assessment 2018 District 4 Technical Report](#)

PLAN BAY AREA 2040

Every four years, MTC/ABAG prepares and updates a regional plan that forecasts population and employment growth to inform transportation infrastructure decisions to provide greater mobility, strengthen the economy, promote a healthy environment, and support communities. The current regional plan is *Plan Bay Area 2040*, which includes strategies to increase sustainability and address climate change by focusing on housing and job growth in areas near transit, preserving open space and sensitive habitat, investing in transit options that lead to reductions in GHG emissions, and considering the potential impacts of climate change on transportation projects.

MTC/ABAG is currently preparing an update, titled *Plan Bay Area 2050*, with a focus on solutions to reduce GHG emissions from passenger vehicles and light trucks. Adoption of *Plan Bay Area 2050* is anticipated in late 2021.

Plan Bay Area 2040 can be found here: [Plan Bay Area 2040](#)

SANTA CLARA OPERATIONAL AREA HAZARD MITIGATION PLAN

The County of Santa Clara Office of Emergency Services updated its OAHMP in 2017. The OAHMP is intended to enhance public awareness and understanding, create a decision tool for management, promote compliance with State and federal program requirements, enhance local policies for hazard mitigation capability, provide inter-jurisdictional coordination of mitigation-related programming, and achieve regulatory compliance. The OEHMP update includes an assessment of risk and vulnerability associated with hazards including wildfire/structure fire, flood, coastal storms/erosion/tsunami, earthquake/liquefaction, rain-induced landslide, dam failure, drought, hazardous materials incidents, terrorism, and emerging risks from climate change. The OAHMP specifically targets climate change resiliency as a component of emergency preparedness. In addition to identifying risks, the OAHMP provides the following mitigation types used to categorize hazard mitigation planning (Santa Clara County 2017).

- ▶ Prevention—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.
- ▶ Property Protection—Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.
- ▶ Public Education and Awareness—Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.
- ▶ Natural Resource Protection—Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- ▶ Emergency Services—Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.
- ▶ Structural Projects—Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.
- ▶ Climate Resilient—Actions that minimize the impacts of climate change via an aquifer storage and recovery system to increase water supply for drought mitigation and a flood diversion and storage project to reduce flood risk.

The OAHMP can be found here: [Santa Clara County Operational Area Hazard Mitigation Plan](#)

CITY OF MILPITAS GENERAL PLAN

A comprehensive update of the City's General Plan is undergoing public review. The *General Plan 2040* was released for public comment in August 2020. The *General Plan 2040* provides the long-term vision and policy direction guidance for residents, city staff, decision-makers, and the broader community. The *General Plan 2040* serves as the foundation for most City regulatory documents and addresses land use, circulation, community design, economic development, conservation and sustainability, utilities and community services, safety, noise, parks and recreation, and community health and wellness. The updated Safety Element provides information pertaining to the natural hazards that have historically affected the city including earthquakes, flooding, and hillside wildfire and well as climate resiliency and adaptation policies consistent with SB 379. Goal SA-6 of the *General Plan 2040* serves to "minimize risk

to life, property, the economy, and the environment through climate adaptation strategies that enhance and promote Milpitas' community resilience."

The General Plan 2040 can be found here: [City of Milpitas General Plan 2040](#)

CITY OF MILPITAS 2020 URBAN WATER MANAGEMENT PLAN

Under the Urban Water Management Planning Act (California Water Code Division 6, Part 2.6, Sections 10610 through 10656), the City's Public Works Department developed the 2020 UWMP to ensure a reliable water supply for the region until 2040. The report includes annual water supply reports which include documentation of local and imported water supplies. The overall objective of the 2020 UWMP was to develop a mix of drought-resilient water resources available to the region to avoid periods of water shortages and adopt a Water Shortage Contingency Plan that aligns to the State's six standard shortage levels. The 2020 UWMP acknowledges that climate change will likely result in changes to precipitation patterns in California; however, the 2020 UWMP does not provide recommendations or policies to address these changes, nor does it predict what and how these changes may affect water resources for the city. Under the Urban Water Management Planning Act, an urban water supplier is required to submit an updated plan every five years. The City's Public Works Department is currently in the process of developing its 2025 UWMP.

The plan can be found here: https://www.ci.milpitas.ca.gov/2020_uwmp/

BAYCAN EQUITABLE ADAPTATION RESOURCE GUIDE

The *BayCAN Equitable Adaptation Resource Guide* (BayCAN Guide) provides guidance to the Bay Area communities for the equitable distribution of resources to improve the resilience of the region. The BayCAN Guide selects six of the most comprehensive resources on equitable adaptation and outlines the distinct phases of the adaptation process and identifies key strategies to embed equity within each phase. These phases are then supplemented with "how-to" tools to help with the equitable adaptation process. The BayCAN Guide also presents example plans, guidance, and case studies in the Bay Area to inform other adaptation projects.

The BayCAN Guide can be accessed here: [BayCAN Equitable Adaptation Resource Guide](#)

WATER INFRASTRUCTURE RISK AND RESILIENCE ASSESSMENT

The *Water Infrastructure Risk and Resilience Assessment* was prepared by the City pursuant to the American's Water Infrastructure Act of 2018. Section 2013 of the act requires community drinking water systems serving more than 3,300 people to develop or update their risk and resilience assessment and emergency response plans. As of December 2020, the City serves approximately 75,500 water customers. The assessment identifies, quantifies, and communicates the risk and resilience of these plans. Earthquake, cyberattack, landslide, liquefaction, and physical sabotage are identified as the more likely threats to the City's assets. The assessment concludes that the City's water supply has resilience to these threats and indicates that, if necessary, water could be supplied by the SFPUC's water supply. The assessment also notes that water supply resiliency has been fortified more recently as the city's wholesale water supplies have been implementing their own measures to account for changes to precipitation patterns associated with climate change (City of Milpitas 2020).

ADAPTING TO RISING TIDES BAY AREA SEA LEVEL RISE ANALYSIS AND MAPPING PROJECT

The ART program led by the San Francisco Bay Conservation and Development Commission provides support, guidance, tools, and information to help agencies and organizations understand, communicate, and begin to address complex climate change issues. The ART *Bay Area Sea Level Rise Analysis and Mapping Project* produces inundation

data associated with sea-level rise and flood events and mapping projects for all nine San Francisco Bay counties. The inundation scenarios capture permanent inundation and temporary flooding impacts for sea-level rise scenarios for 0 to 66 inches and extreme high tide events from the 1-year to the 100-year extreme tide. Additionally, the mapping identifies key structures that would be adverse impacted by sea-level rise (San Francisco Bay Conservation and Development Commission 2021).

The ART Bay Area Sea Level Analysis and Mapping Project and related GIS files are located here: [Adapting to Rising Tides Bay Area Sea Level Rise Analysis and Mapping Project](#)

Summary of Adaptive Capacity

Table VA-8 evaluates the specific climate change effects covered under each of the plans and reports discussed above. As shown in Table VA-9, multiple planning efforts have been made to address the climate change-related impacts that are expected to impact the city. Mitigation and adaptation measures for hazards including flooding, storms and extreme weather events, and wildfires and severe wind have been relatively well documented in assessments prepared previously. Other climate change hazards including impacts on human health, drought and available water supply, extreme heat and heat waves, landslides, and sea-level rise are noted in various regional planning efforts. However, these efforts do not analyze regional climate change effects consistently while developing adaptation strategies. Most of the policies provided in existing plans are broad-based strategies to reduce risk from climate change. Thus, it is important to note that specific and targeted policies should be developed to address the resilience of the most vulnerable populations and assets in the city.

Table VA-8 Adaptive Capacity in Existing Plans and Reports

Plan or Report	Climate Change Hazard						
	Human Health Hazards	Drought and Water Supply	Extreme Heat Events	Extreme Precipitation and Flooding	Landslides	Wildfires	Sea-Level Rise
Santa Clara County OAHMP	✓	✓	✓	✓	✓	✓	✓
City's General Plan 2040	✓	✓	✓	✓	✓	✓	✓
California's Fourth Climate Change Assessment SF Regional Report	✓	✓	✓	✓	✓	✓	✓
Caltrans Climate Change Vulnerability Assessment District 4				✓	✓	✓	✓
Plan Bay Area 2040	✓	✓	✓	✓	✓	✓	✓
2015 Urban Water Management Plan		✓					
BayCAN Equitable Adaptation Resource Guide	✓	✓	✓	✓		✓	✓
Water Infrastructure Risk and Resilience Assessment							
Adapting to Rising Tides Bay Area Sea-Level Rise				✓			✓

Notes: OAHMP = Operational Area Hazard Mitigation Plan, SF = San Francisco, BayCAN = Bay Area Climate Adaptation Network

Source: Data compiled by Ascent Environmental in 2021

2.4 VULNERABILITY SCORING

The city's vulnerability to each identified climate change impact is assessed based on the magnitude of risk posed to populations and assets, and any existing measures in place to mitigate these impacts. Potential impacts and adaptive capacity are rated on a qualitative scale from Low to High based on guidance from the APG. A description of each qualitative rating for both factors is provided in Table VA-9.

Table VA-9 Potential Impact and Adaptive Capacity Scoring

Score	Potential Impact	Adaptive Capacity
Low	Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern.	The population or asset lacks capability to manage climate impact; major changes would be required.
Medium	Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern.	The population or asset has some capacity to manage climate impact; some changes would be required.
High	Impact is highly likely based on projected exposure; would result in substantial consequences to public health, safety, and/or other metrics of concern.	The population or asset has high capacity to manage climate impact; minimal to no changes are required.

Source: CalOES 2020

After rating potential impacts and adaptive capacity, an overall vulnerability score is determined for each climate change impact. This scoring can help the City understand which effects pose the greatest threats and should be prioritized in future planning efforts. Table VA-10 presents the rubric used to determine the overall vulnerability scores based on the ratings for potential impacts and adaptive capacity.

Table VA-10 Vulnerability Scoring

		Vulnerability Score		
Potential Impacts	High	3	4	5
	Medium	2	3	4
	Low	1	2	3
		High	Medium	Low
		Adaptive Capacity		

Source: CalOES 2020

Vulnerability scoring for each climate-related impact identified in Tables VA-3 through VA-7 is included below and organized by the same overarching categories: populations, transportation, energy, water, and emergency services. Some similar impacts have been combined to reduce redundancy.

Impacts to Populations

Major climate change-related impacts to populations in the city include increased exposure of air pollutants hazardous to human health, potential increased exposure to infectious diseases, and exposure to wildfire smoke, flooding, and extreme heat. Based on climate projections, the city is expected to experience higher average temperatures, and more frequent droughts, extreme heat events, flooding, and wildfires.

The Santa Clara County Public Health Department provides resources for the prevention and treatment of infectious diseases, heat-related illnesses, and mental health concerns. SCVWD also provides flood management planning in its E2, Emergency Response Planning project, which allows SCVWD to coordinate with local municipalities, including the

City, to clearly identify roles and responsibilities for floodplain management and flood emergency management. The E2 program is a continually evolving project. The City's *Water Infrastructure Risk and Resilience Assessment* evaluates the risk of the city's water-related infrastructure and has concluded that the infrastructure is of high resiliency. SCVWD's *Water Supply Master Plan* also looks forward to a future affected by climate change and accounts for water planning in future extended drought conditions.

Santa Clara County provides residents with real-time information regarding flooding events, among other emergency events, through their AlertSCC notification system, which administers notifications through cell phone calls and SMS text messages. The Milpitas Fire Department Office of Emergency Services (Milpitas OES) keeps its Emergency Operations Center in a constant state of readiness to manage and respond to emergencies affecting residents and the business community of the city. The structure of command supports the state-mandated Standardized Emergency Management System and the federal-mandated National Incident Management System.

To address impacts to people during PSPS events, PG&E partners with the City to operate Community Resource Centers. Community resource centers provide information, resources, and necessities to customers in the city. Historically, the Milpitas Sports Center has been used as a Community Resource Center during PSPS events and will likely be used during future events. The following policies from the *General Plan 2040* Safety Element address climate-change related impacts to the city's vulnerable populations:

- ▶ **Policy SA 6-5:** Ensure that climate impacts and climate adaptation measures aimed at reducing climate risks do not lead to disproportionately adverse effects on vulnerable populations.
- ▶ **Policy SA 6-6:** Consider the needs of vulnerable populations and individuals with limited mobility when planning for access to safe and comfortable shelter during extreme heat events or other severe weather events.

Table VA-11 provides a summary of the vulnerability scores for the potential climate change impacts on vulnerable populations.

Table VA-11 Population Vulnerability Scoring

Vulnerability Description	Vulnerability Score		
	Potential Impact	Adaptive Capacity	Vulnerability
Increased human health risk (i.e., poor air quality, infectious diseases, mental health concerns, limited access to potable water, heat-related illnesses)	High	Medium	4
Lack of electricity during Public Safety Power Shutoffs implemented during times of high wildfire risk	Medium	Low	4
Reduced available water supply from extended drought periods	High	High	3
Increased exposure to flood risk from extreme precipitation and sea-level rise	Medium	Medium	3
Increased exposure of people to landslides	Medium	High	2
Limited ability to prepare for climate events and to respond and evacuate	Medium	High	2
Increased exposure of people to wildfires	Low	High	1

Source: Ascent Environmental 2021

Impacts to Transportation

Transportation facilities play an important role in the region's economic prosperity and emergency response to climate-related hazards and other hazards. These facilities not only provide access throughout the region for the movement of workers and goods, but also provide evacuation routes and access to emergency services during hazard events. Damage to transportation facilities such as highways and railways can have a negative impact on the region's economy. Furthermore, these disruptions could disproportionately affect low-income communities or individuals with disabilities from accessing necessary employment centers, health centers, or other services.

The primary impacts of climate change on transportation facilities are physical damage to roadways, railways, and transit facilities from extreme heat events, flooding, sea-level rise, landslides, and wildfires. Climate impacts including extreme heat days, heat waves, and heavy precipitation events can reduce the likelihood of individual use of alternative modes of transportation (i.e., public transit, biking, walking) due to various factors including exposure to extreme heat or heavy precipitation and flooding.

The roadway network in the city is maintained and operated by various State, regional, and local agencies. These agencies collaborate to effectively prepare and adapt to climate change impacts to the transportation system. MTC/ABAG and Caltrans have developed plans and programs to identify roadway network vulnerabilities as well as guidance for how to prioritize transportation projects. Project prioritization through Caltrans' Adaptation Decision-Making Assessment Process will help the city's transportation system increase resilience as climate impacts become more frequent and severe over time, for roadways under Caltrans' jurisdiction. MTC/ABAG's *Plan Bay Area 2040* provides strategies to incorporate climate adaptation in the design of new projects and improvements of existing infrastructure. The next iteration, *Plan Bay Area 2050*, will provide even more resiliency strategies to be implemented throughout the Bay Area.

The City's *General Plan 2040* Circulation Element contains goals and policies that address the safe and efficient operation, maintenance, and management of the transportation network. The following policies serve to bolster the efficacy of the city's transportation network:

- ▶ **Policy CIR 1-3:** Promote interconnectivity of the transportation network in existing and new developments and actively measure the quality of conditions in neighborhoods to better understand what barriers exist in order to support use of and access to the network.
- ▶ **Policy CIR 1-7:** Coordinate with neighboring jurisdictions regarding planned developments and transportation improvements that impact communities in both jurisdictions.
- ▶ **Policy CIR 6-9:** Maximize efficient maintenance of transportation infrastructure of all modes, such as coordinating roadway paving or striping projects to include maintenance of pedestrian and bicycle infrastructure.

The vulnerability scores for impacts on transportation facilities and infrastructure in the county are provided in Table VA-12.

Table VA-12 Transportation Vulnerability Scoring

Vulnerability Description	Vulnerability Score		
	Potential Impact	Adaptive Capacity	Vulnerability
Increased impacts to evacuation routes and emergency access during hazard events	Medium	High	4
Increased risk of damage to roadways from landslides	Medium	Medium	3
Increased risk of damage to roadways from extreme heat events	Low	Medium	2
Increased risk of damage to roadways from flooding or sea-level rise	Low	Medium	2
Increased risk of damage to roadways from wildfires	Low	Medium	2
Increased risk of damage to transit facilities	Low	Medium	2
Increased risk of damage to railways	Low	Medium	2
Increased risk of damage to bicycle paths and trails	Low	Medium	2
Increased stress on transit service and reduced ridership from increased extreme weather events and spread of infectious disease	Low	Medium	2

Source: Ascent Environmental 2021

Impacts to Energy

Energy systems include electricity transmission lines, natural gas pipelines, and energy generation facilities (e.g., solar photovoltaic systems) that are within or serve the city. Climate change impacts to these resources include increased demand on transmission systems and energy production during extreme heat events as well as risks of physical damage to infrastructure during flooding events and wildfire or grassland fire events in the surrounding region. Climate change impacts will make it increasingly difficult for utility providers to sustain energy generation rates, repair damaged energy transmission infrastructure, and meet the increased demand for energy during extreme heat events which are becoming more common and more severe.

The city relies on PG&E and SVCE for the generation and distribution of a majority of its electricity and natural gas supply. In the event of an emergency or a climate change-related hazard event, PG&E and the California Independent System Operator issue preventative measures that may reduce stress on energy systems and reduce energy demand. These measures include conservation notifications such as Flex Alerts and operational notifications such as restricted maintenance operations or PSPS events. PG&E has also invested in the implementation of wildfire safety measures, which are included in its *2021 Wildfire Mitigation Plan*, which provides updated details on PG&E's comprehensive Community Wildfire Safety Program, incorporates lessons learned from 2020, and outlines additional programs to continue to reduce wildfire risk ignited by electrical infrastructure (PG&E 2021). Based on the *2021 Wildfire Mitigation Plan*, PG&E operated over 300 Community Resource Centers in 2020 with plans to expand this number through partnerships with participating counties and cities (PG&E 2021). Additionally, SVCE has partnered with Bay Area-based solar installer Sunrun to install up to roughly 20 megawatts of emissions-free solar and battery backup power to 6,000 households vulnerable to emergency power shutoffs during wildfire seasons.

Additionally, the following policy from the *General Plan 2040* Safety Element addresses the city's energy resources:

- ▶ **Policy SA 6-3:** Encourage and support private sector investment in climate adaptation through climate-resilient infrastructure such as onsite renewable energy, integrated stormwater management and water conservation.
- ▶ **Policy SA 6-4:** Promote community awareness of climate-resilient actions that can be implemented by homeowners, such as water conservation, on-site water collection, passive solar designs, and alternative energy strategies.

The vulnerability scores for impacts to energy resources are shown in Table VA-13.

Table VA-13 Energy Vulnerability Scoring

Vulnerability Description	Vulnerability Score		
	Potential Impact	Adaptive Capacity	Vulnerability
Increased demand for electricity generation during extreme heat events	Medium	Low	4
Increased system stress during droughts and extreme heat events	Medium	Low	4
Reduced effectiveness of hydro-electric electricity generation facilities during drought and extreme precipitation events	Low	Low	3
Reduced effectiveness of solar electricity generation facilities due to increased smoke from wildfires	Low	Low	3
Increased system stress and physical damage from flooding, sea-level rise, and landslides	Medium	Medium	3
Risk of physical damage from wildfires	Low	High	1

Source: Ascent Environmental 2021

Impacts to Water

Limited water supply and damage to the city's flood control system are the main climate vulnerabilities of the city's water resources. Extreme precipitation events and flooding have the potential to damage existing flood control and water conveyance facilities. Failure of flood control facilities could result in damage to other structures within the city and risks to public safety.

The majority of the city's water supply is imported from areas outside of the city. SFPUC imports water from the Hetch Hetchy Reservoir located in Yosemite National Park; SCVWD imports water from the Delta. The City's 2020 UWMP, prepared in coordination with SFPUC and SCVWD, demonstrates a goal of meeting future demand through a combination of implementing water conservation and demand management strategies, and increasing recycled water usage. Additionally, the City's *Water Supply Augmentation Study* recommends that the City add groundwater as a water resource to meet future demand. The City has also amended its water conservation ordinance that addresses extended periods of drought. In 2015, the city was able to conserve 30 percent more water than the previous year in response to the state's 4-year period drought period from 2012-2016, demonstrating the city's adaptive capacity to reduce water consumption when necessary. The vulnerability scores for impacts on water resources are shown in Table VA-14.

Table VA-14 Water Vulnerability Scoring

Vulnerability Description	Vulnerability Score		
	Potential Impact	Adaptive Capacity	Vulnerability
Reduction in available water supply	Medium	Medium	3
Increased risk of physical damage to flood control and water conveyance facilities	Medium	High	2
Increased demand for flood control and water conveyance facilities	Medium	High	2
Increased water demand	Medium	High	2
Increased risk of contamination of potable water supply from sea-level rise	Low	Medium	2

Source: Ascent Environmental 2021

Impacts to Emergency Services

The primary climate vulnerabilities in the city regarding emergency services are the exposure of emergency responders to increased frequency of hazards, the demand for emergency facilities to provide shelter and safety for residents impacted by hazardous events, and reliance on telecommunication services to alert residents and emergency responders.

Milpitas OES is responsible for emergency response in disaster situations. Milpitas OES provides alerts and notifications to residents through various communication channels in the event of an emergency and is also responsible for ensuring resources are available and for implementing emergency response and recovery procedures. The City contributed to the development of the OAHMP, which identifies goals, objectives, and potential actions to reduce hazard risks and enhance emergency response capabilities. The City also retains and updates a city-specific Multi-Hazard Mitigation Plan and manages the Community Emergency Response Team program to train residents to protect themselves, family, and neighborhood in the event of an emergency. Additionally, the City keeps the Emergency Operation Center active at all times and provides residents with emergency preparedness resources on its website. Also, Policy SA-62 of the *General Plan 2040* directs the city to "ensure that emergency response plans and training programs continue to evolve and are modified to protect residents, infrastructure, and facilities during emergencies and extreme weather events." The vulnerability scores for impacts to emergency services are shown in Table VA-15.

Table VA-15 Emergency Services Vulnerability Scoring

Vulnerability Description	Vulnerability Score		
	Potential Impact	Adaptive Capacity	Vulnerability
Increased exposure of emergency responders to heat-related sickness, smoke inhalation, and infectious disease	High	Medium	4
Increased risk of damage to emergency facilities (e.g., hospitals, cooling centers, telecommunication systems, and evacuation centers)	Medium	Medium	3
Increased demand for emergency response services	Medium	High	2
Increased demand for emergency facilities (e.g., hospitals, cooling centers, telecommunication systems, and evacuation centers)	Medium	High	2

Source: Ascent Environmental 2021

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