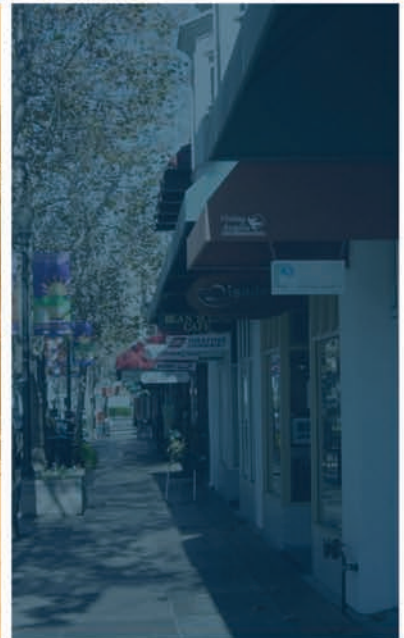
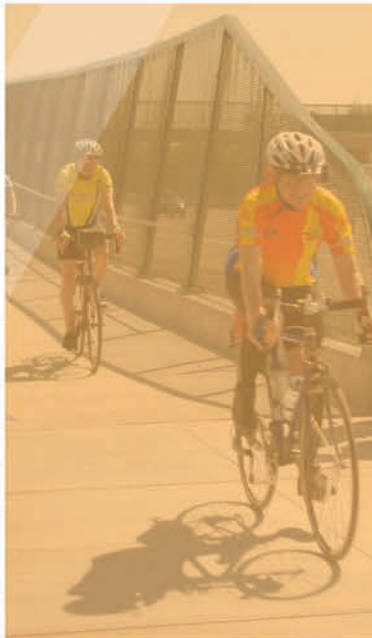


# CITY OF SUNNYVALE

## CLIMATE ACTION PLAN





---

# CITY OF SUNNYVALE

## CLIMATE ACTION PLAN

Adopted May 20, 2014

**Prepared for:**



City of Sunnyvale  
Community Development Department

**Prepared by:**



500 12<sup>th</sup> Street Oakland, Suite 250  
Oakland, CA 94607  
[www.pmcworld.com](http://www.pmcworld.com)



# ACKNOWLEDGEMENTS

## U. S. Department of Energy

This material is based upon work supported by the Department of Energy under Award Number DE-SC0002478.



This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.



# TABLE OF CONTENTS

## ES. EXECUTIVE SUMMARY

Executive Summary .....	ES-1
Framework for Environmental Sustainability .....	ES-1
Planning Process .....	ES-2
GHG Emissions Inventory .....	ES-2
GHG Emissions Projections .....	ES-3
GHG Emissions Reduction Target .....	ES-5
GHG Reduction Measures .....	ES-5
Adaptation .....	ES-8
Implementation .....	ES-8
Environmental Review .....	ES-8

## 1. INTRODUCTION

Introduction .....	1-1
Purpose and Scope .....	1-1
Local Context .....	1-2
Local Climate Protection Efforts to Date .....	1-3
Framework for Environmental Sustainability .....	1-3
Sunnyvale's Green Building Program .....	1-4
Sustainable Silicon Valley .....	1-4
Energy Efficiency and Conservation Block Grant Projects .....	1-4
Additional Existing Climate Protection Efforts .....	1-5
Relationship of the CAP to the General Plan .....	1-5
Planning Process .....	1-5
Sustainability Commission .....	1-6
Horizon 2035 Advisory Committee .....	1-6
Climate Change Science .....	1-6
The Greenhouse Effect .....	1-7
Climate Change Impacts .....	1-8
Global Climate Change Impacts .....	1-8
Climate Change Impacts to California .....	1-9
Regulatory Context .....	1-11
Federal Framework .....	1-12
Clean Air Act .....	1-12
Federal GHG Reduction Initiatives .....	1-12
California Legislative Framework .....	1-13
Governor's Executive Order S-3-05 .....	1-14
AB 32 – California Global Warming Solutions Act of 2006 .....	1-14
SB 375 – Sustainable Communities & Climate Protection Act of 2008 .....	1-14
SB 97 – CEQA Guideline Amendments of 2007 .....	1-15
BAAQMD Guidance and CEQA Tiering .....	1-15

## 2. GHG INVENTORY & FORECAST

Greenhouse Gas Inventory.....	2-1
Inventory Background and Methodology .....	2-1
2008 Baseline Inventory Results .....	2-2
Greenhouse Gas Emissions Forecast .....	2-4
Business-As-Usual GHG Emissions Forecast .....	2-4
Adjusted Forecast to Incorporate Existing State and Regional Programs .....	2-6
California Building Code, Title 24 .....	2-6
Clean Car Fuel Standards (AB 1493, Pavley) .....	2-7
Renewables Portfolio Standard .....	2-7
Caltrain Electrification .....	2-8
GHG Reduction Targets .....	2-9

## 3. GHG EMISSIONS REDUCTION STRATEGIES

Reduction Strategy Structure.....	3-1
Reduction Measure Criteria .....	3-4
Reduction Measures.....	3-6
Open Space and Urban Forestry (OS) .....	3-6
Open Space and Urban Forestry Measures .....	3-6
Decrease Energy Consumption (EC) .....	3-8
Decrease Energy Consumption Measures .....	3-9
Provide a Sustainable Energy Portfolio (EP) .....	3-12
Sustainable Energy Portfolio Measures.....	3-12
Decrease Water Consumption (WC) .....	3-14
Decrease Water Consumption Measures.....	3-14
Reduce Landfilled Waste (LW).....	3-16
Reduce Landfilled Waste Measures.....	3-16
Off-Road Equipment (OR) .....	3-18
Off-Road Equipment Measures.....	3-18
Increase and Retain Awareness of Sustainability Issues (CA).....	3-20
Awareness of Sustainability Issues Measures.....	3-20
Improve Mobility through Land Use Planning (LUP) .....	3-22
Land Use Planning Measures .....	3-23
Expand Sustainable Circulation and Transportation Options (CTO) .....	3-26
Expand Sustainable Circulation and Transportation Options Measures .....	3-26
Optimize Vehicular Travel (OVT).....	3-31
Optimize Vehicular Travel Measures.....	3-31
GHG Reduction Summary.....	3-34

## 4. ADAPTATION

Climate Change Impacts in Sunnyvale .....	4-1
Increased Rate of Wildfires .....	4-1
Negative Impacts on Wildlife .....	4-2
Deteriorating Public Health.....	4-3
Sea Level Rise.....	4-3
Existing Adaptation Efforts.....	4-4
California Climate Adaptation Strategy.....	4-4



Cal-Adapt .....	4-5
San Francisco Planning & Urban Research, Climate Change Hits Home .....	4-5
Differentiating Reduction and Adaptation Measures .....	4-7
Adaptation Strategies.....	4-8

## 5. IMPLEMENTATION PROGRAM

Implementation Program.....	5-1
Implementation Information.....	5-1
Implementation Measures.....	5-3
Monitoring and Updating This Plan .....	5-4
Implementation Matrix.....	5-4

## 6. GLOSSARY

## APPENDICES

- A. GHG Inventory Methodology
- B. GHG Technical Appendix
- C. BAAQMD Compliance
- D. Works Cited

## TABLES

Table ES-1 – 2008 Community-Wide Baseline Emissions by Sector.....	ES-2
Table ES-2 – Sunnyvale Community Growth Indicators .....	ES-3
Table ES-3 – State Reductions Summary .....	ES-4
Table ES-4 – GHG Reduction Summary by Topic.....	ES-6
Table 1 – Sunnyvale 2005 Employment by Industry.....	1-2
Table 2 – 2008 Baseline Greenhouse Gas Emissions by Sector.....	2-3
Table 3 – Sunnyvale General Plan Horizon 2035 Proposed Growth Scenario .....	2-4
Table 4 – Sunnyvale Business-as-Usual GHG Emissions Forecast (MTCO <sub>2</sub> e).....	2-5
Table 5 – Impact Summary of State and Regional Reduction Efforts (MTCO <sub>2</sub> e).....	2-8
Table 6 – Example Measure Quantification.....	3-3
Table 7 – Costs and Savings to the Community Ranges.....	3-4
Table 8 – 2020 GHG Reductions by Goal .....	3-34
Table 9 - Plan of Action for Local Governments .....	4-6
Table 10 – Costs and Savings to the Community Ranges.....	5-2
Table 11 – CAP Implementation Matrix.....	5-5

## FIGURES

Figure ES-1 – Framework for Environmental Sustainability.....	ES-1
Figure ES-2 – 2008 Baseline GHG Emissions by Sector .....	ES-3
Figure ES-3 – Business-As-Usual GHG Forecast, 2008–2035* .....	ES-4
Figure ES-4 – GHG Forecasts and State Reduction Targets .....	ES-5
Figure ES-5 – 2020 Emissions Reductions by Goal (Mtco <sub>2</sub> e).....	ES-7
Figure ES-6 – GHG Emissions Per Service Population (Mtco <sub>2</sub> e) .....	ES-7
Figure 1 – Sunnyvale’s Framework for Environmental Sustainability.....	1-3
Figure 2 – The Greenhouse Effect .....	1-7
Figure 3 – Potential Global Climate Change Impacts .....	1-8
Figure 4 – California Climate Change Impacts, 2070–2099 .....	1-9

Figure 5 – California Regulatory Framework Summary .....	1-13
Figure 6 – Sunnyvale’s GHG Emissions by Sector .....	2-2
Figure 7 – 2008 Baseline Greenhouse Gas Emissions by Sector .....	2-3
Figure 8 – Sunnyvale Business-as-Usual GHG Emissions Forecast (MTCO <sub>2</sub> e) .....	2-5
Figure 9 – 2008-2035 Sunnyvale BAU and ABAU forecast (MTCO <sub>2</sub> e) .....	2-9
Figure 10 – Greenhouse Gas Emissions Forecasts and State Reduction Targets .....	2-10
Figure 11 – GHG Reduction Goals .....	3-1
Figure 12 – GHG Reduction Measure Development Process .....	3-2
Figure 13 – GHG Quantification Sources and Tools .....	3-2
Figure 14 – 2020 GHG Reductions by Goal .....	3-35
Figure 15 – 2035 GHG Reductions by Goal .....	3-35
Figure 16 – 2020 GHG Reduction Target Achievement .....	3-36
Figure 17 – 2008–2035 Annual MTCO <sub>2</sub> e per Service Population .....	3-36
Figure 18 - California 2085 Wildfire Risks, Low Emissions Scenario .....	4-2
Figure 19 – South Bay Region at risk of 55 inch sea level rise .....	4-4
Figure 20 - Cal-Adapt Temperature Map and Projections .....	4-5
Figure 21 - Assessing Adaptation and GHG Reduction Actions .....	4-8



## EXECUTIVE SUMMARY

This Climate Action Plan is Sunnyvale's path toward creating a more sustainable, healthy, and livable Sunnyvale. The strategies outlined in this Plan will not only reduce GHG emissions but will also provide energy, fuel, water, and monetary savings while improving the quality of life in Sunnyvale. This Climate Action Plan is intended to streamline future environmental review of development projects in Sunnyvale by following the California Environmental Quality Act (CEQA) Guidelines for a Qualified GHG Reduction Strategy.



## EXECUTIVE SUMMARY

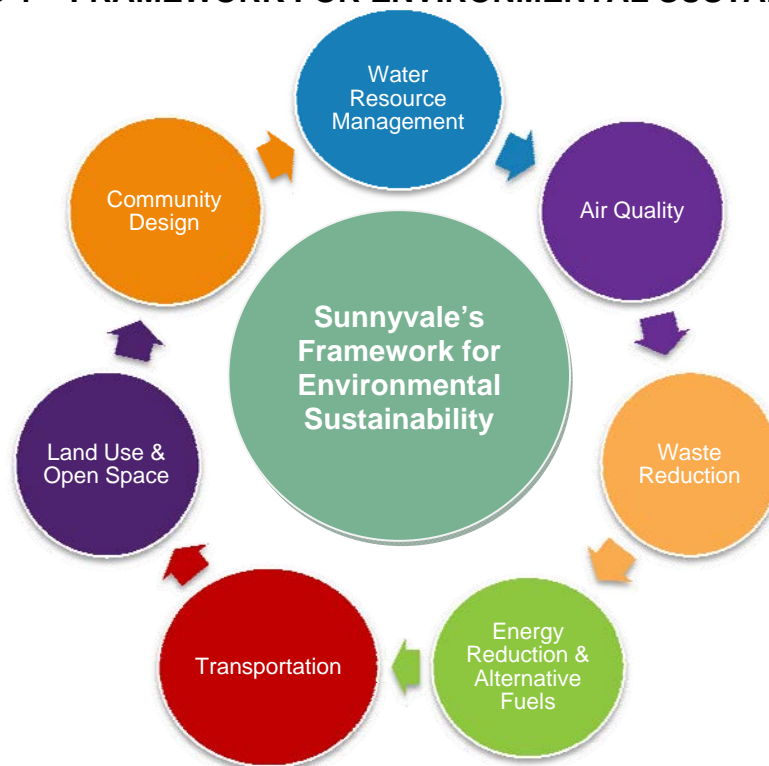
This Climate Action Plan (CAP; Plan) is Sunnyvale's path toward creating a more sustainable, healthy, and livable Sunnyvale. The strategies outlined in this Plan will not only reduce GHG emissions but will also provide energy, fuel, water, and monetary savings while improving the quality of life in Sunnyvale.

This Climate Action Plan is intended to streamline future environmental review of development projects in Sunnyvale by following the California Environmental Quality Act (CEQA) Guidelines and meeting the Bay Area Air Quality Management District's (BAAQMD) expectations for a Qualified GHG Reduction Strategy. The CAP will also identify how the City will achieve the state-recommended GHG emission reduction target of 15% below 2008 levels by the year 2020 (equivalent to 1990 emissions). The CAP provides goals and associated measures, also referred to as reduction measures, in the sectors of energy use, transportation, land use, water, solid waste, and off-road equipment. The City has a long-standing commitment to implementing environmental programs and proactively working to reduce GHG emissions. The adoption and implementation of this Plan will reinforce and build upon these policies and programs.

### Framework for Environmental Sustainability

In 2007, the City developed a framework for environmental sustainability to guide the implementation of policies and programs related to air quality, community design, energy reduction, land use, transportation, waste reduction, and water resource management. **Figure ES-1** below defines the organizational structure of the City's framework.

**FIGURE ES-1 – FRAMEWORK FOR ENVIRONMENTAL SUSTAINABILITY**



## Planning Process

The development process for this Plan relied on a comprehensive public participation strategy to engage residents, business owners, and stakeholders in the identification and refinement of goals, programs, activities, and projects to reduce emissions. The public participation process included significant involvement from the Horizon 2035 Advisory Committee, City-sponsored community workshops, stakeholder focus group meetings, development of a project website, and interagency coordination.

The project website provides access to all workshop and meeting notices and materials, links to resources, and a forum to submit comments and questions to staff. In addition, the City created a Facebook account to provide status updates on the Plan and alerts for workshops.

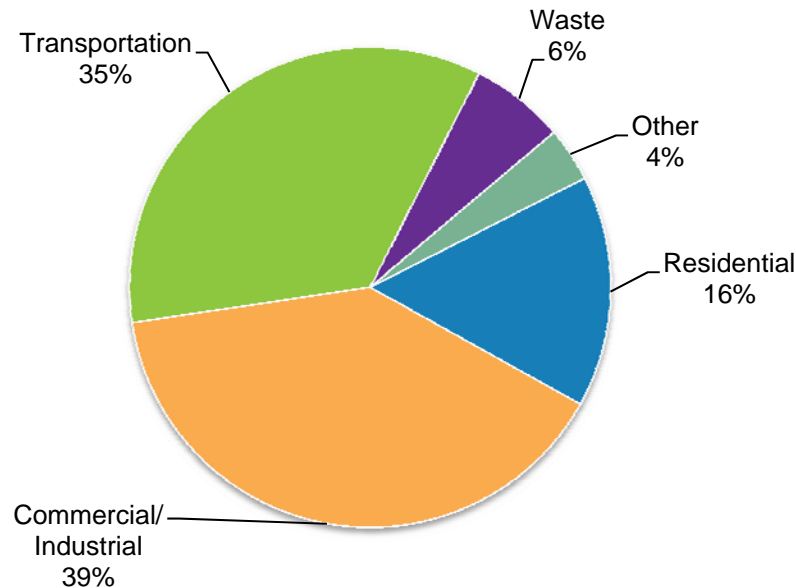
## GHG Emissions Inventory

The first component of a Qualified GHG Reduction Strategy is to conduct an inventory of GHG emissions within a specified geographic boundary. The City of Sunnyvale's GHG inventory utilizes a baseline year of 2008 to inventory carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>) generated from activities by the Sunnyvale community.

The emissions sources calculated in the baseline GHG inventory include commercial, residential, and industrial electricity and natural gas use, on-road transportation, solid waste disposal, energy use and direct process emissions related to water and wastewater, and off-road equipment use for construction and lawn and garden activities. GHG emissions from these activities were calculated from activity data such as kilowatt hours of electricity, therms of natural gas, tons of waste disposed, and vehicle miles traveled (VMT) from trips with an origin or destination in Sunnyvale. In 2008, the community emitted approximately 1,270,170 metric tons of carbon dioxide equivalents (MTCO<sub>2</sub>e) (see **Table ES-1** and **Figure ES-2**).

**TABLE ES-1 – 2008 COMMUNITY-WIDE BASELINE EMISSIONS BY SECTOR**

2008 Baseline Greenhouse Gas Emissions	MTCO <sub>2</sub> e	Percentage of Total
Residential	198,140	16%
Commercial/Industrial	502,210	39%
Transportation	442,610	35%
Community Waste	76,970	6%
Landfill Gas	3,600	<1%
Water	6,870	1%
Off-Road	37,830	3%
Caltrain	1,940	<1%
<b>Total</b>	<b>1,270,170</b>	<b>100%</b>

**FIGURE ES-2 – 2008 BASELINE GHG EMISSIONS BY SECTOR**

## GHG EMISSIONS PROJECTIONS

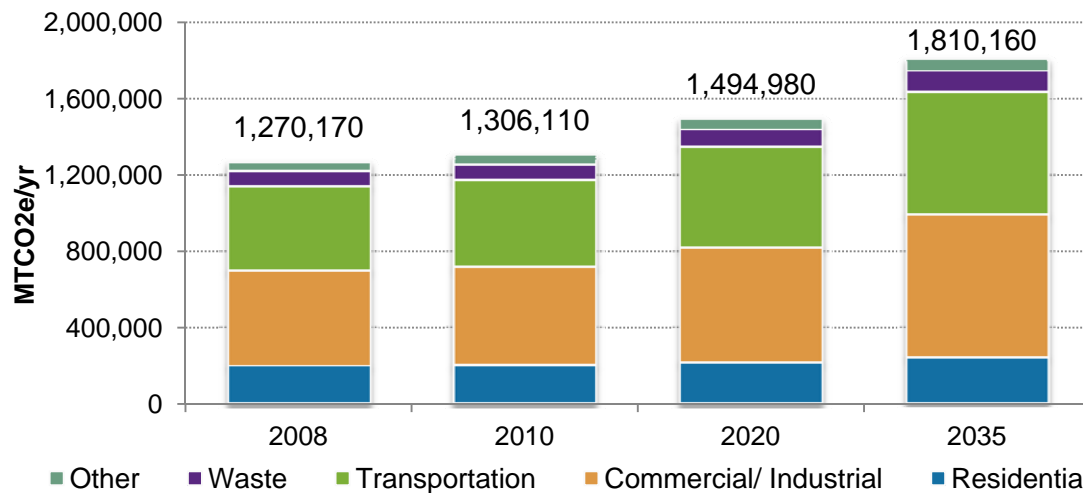
The basis for all growth scenarios is a business-as-usual (BAU) projection. The BAU projection forecasts emissions to reflect the City's growth projections without regulatory or technical intervention to reduce GHG emissions. The BAU projection is based on population, housing, employment, and vehicle miles traveled projections for 2020 and 2035, as shown in **Table ES-2**. The population, housing, and employment forecasts come from the City's General Plan, most recently updated in 2011.

**TABLE ES-2 – SUNNYVALE COMMUNITY GROWTH INDICATORS**

	2008	2010	2020	2035	2008 – 2035 Percentage Change
Population	133,110	135,100	145,020	159,910	20%
Households	54,130	55,050	59,660	66,570	23%
Jobs	73,630	76,320	89,750	109,900	49%
Service Population	206,740	211,420	234,770	269,810	31%

These indicators are then applied to the 2008 GHG emissions inventory to determine a BAU growth scenario. Under the BAU scenario, community-wide emissions will grow by approximately 18% by the year 2020 to 1,494,980 MTCO<sub>2</sub>e and by 43% by 2035 to 1,810,160 MTCO<sub>2</sub>e, as shown in **Figure ES-3**.



**FIGURE ES-3 – BUSINESS-AS-USUAL GHG FORECAST, 2008–2035\***

\* Other sources include water, wastewater, landfill gas, and off-road making less than 5% of the inventory.

In addition to AB 32, California has adopted and initiated implementation of several state-level programs that will impact local GHG emissions. In order to effectively determine the local emissions reductions that will need to be implemented to meet the City's emissions reduction target, the impact of state-level programs has been incorporated into an adjusted business-as-usual forecast. The state-level programs included in this adjusted forecast include the Renewable Portfolio Standard (RPS), updates to Title 24 Energy Efficiency Standards, California Solar Initiative Rebates, and the implementation of the Clean Car Fuel Standard, commonly referred to as the Pavley Standard. The impact of these state programs (shown in **Table ES-3**) will play a critical role in helping Sunnyvale to achieve the emissions reduction target.

**TABLE ES-3 – STATE REDUCTIONS SUMMARY**

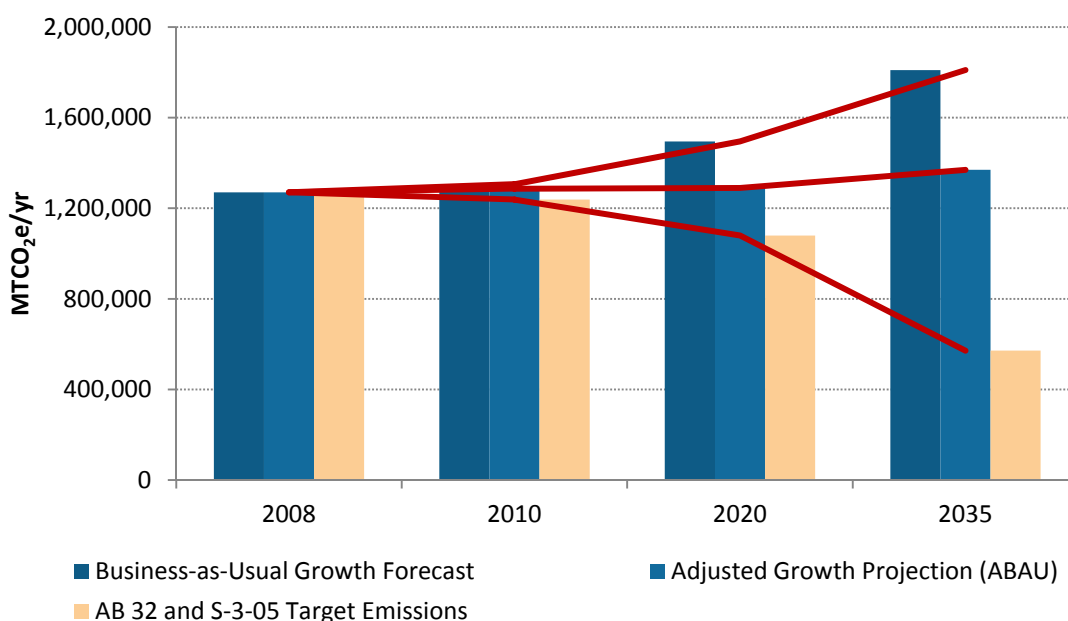
	2008	2010	2020	2035
BAU Forecast	1,270,170	1,306,110	1,494,980	1,810,160
BAU Forecast Growth Percentage		3%	18%	43%
Pavley I – Clean Car Fuel Standard	–	0	-81,150	-159,460
Renewable Portfolio Standard	–	-19,700	-90,800	-173,690
CALGreen & 2008 Title 24 Standards	–	0	-31,210	-105,400
Caltrain Electrification	–	0	-1,900	-2,100
Total State/Regional Reductions	–	-19,700	-205,060	-440,650
Adjusted BAU Forecast	1,270,170	1,286,410	1,289,920	1,369,510
ABAU Forecast Growth Percentage	0%	1%	2%	8%



## GHG EMISSIONS REDUCTION TARGET

After state and regional efforts are factored into Sunnyvale's growth forecast, the City's challenge to meet the GHG reduction targets of 15% below baseline levels by 2020 and progress toward the 80% below 1990 levels by 2050 will be fulfilled by the Climate Action Plan. **Figure ES-4** below identifies the gap between the City's GHG emissions forecast and the reduction targets if policies and programs are not developed to reduce GHG emissions.

**FIGURE ES-4 – GHG FORECASTS AND STATE REDUCTION TARGETS**



## GHG REDUCTION MEASURES

It is important to identify how the City will meet or exceed the minimum GHG reduction target of 15% below baseline levels by 2020 to ensure the City can utilize the Climate Action Plan as a Qualified GHG Reduction Strategy for use in environmental review of projects. This Plan identifies a clear path to allow the City to exceed the community-wide GHG reduction target of 15% below baseline levels by 2020.

The GHG reduction measures included in this Climate Action Plan demonstrate the City's ability to reach and exceed the GHG reduction target of 15% below baseline levels by 2020. Emissions reductions were quantified for three different years: 2010, 2020, and 2035. Emissions reductions for 2010 have been quantified to demonstrate the actual emissions reduction progress that the City has already made in implementing measures within the CAP. The 2020 and 2035 emissions reductions are the potential reductions that will be achieved through the implementation of these measures over the next several years.

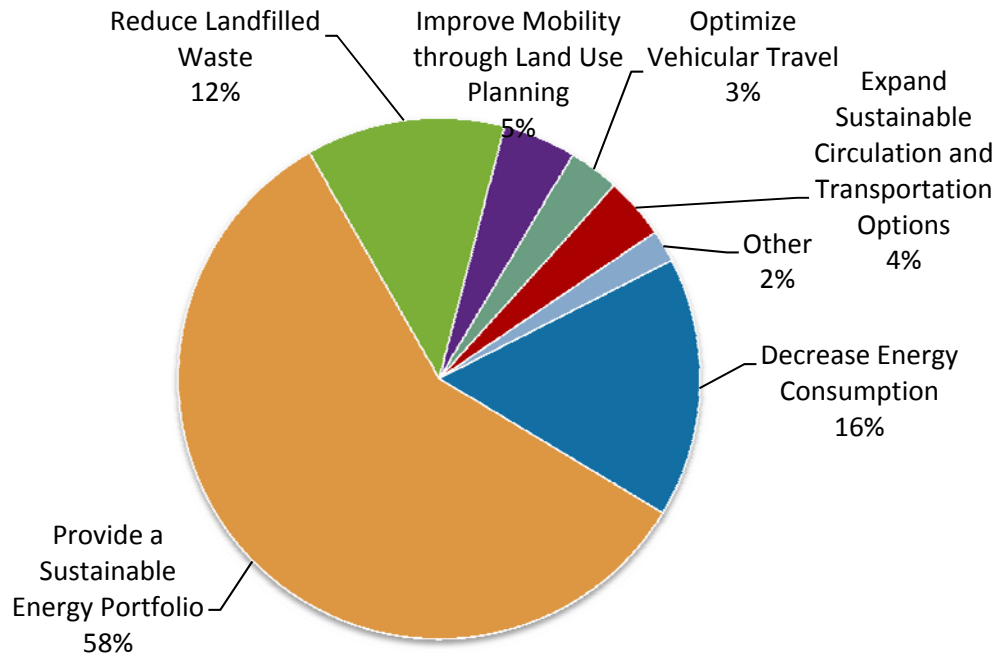
The reduction measures included in this Plan are a diverse mix of regulatory and incentive-based programs. The reduction measures aim to reduce GHG emissions from each source to avoid reliance on any one strategy or sector to achieve the target. In total, existing actions, state programs, and GHG reduction measures in this Plan will reduce GHG emissions in the City of Sunnyvale in 2020 by 434,890 MTCO<sub>2</sub>e (see **Table ES-4**), more than double the required GHG reductions necessary to meet AB 32 targets. **Figure ES-5** identifies the GHG reductions to be achieved by 2020 by goal.

The GHG reduction strategies are separated by goal or topic area to correspond with the sectors and sources of GHG emissions as follows:

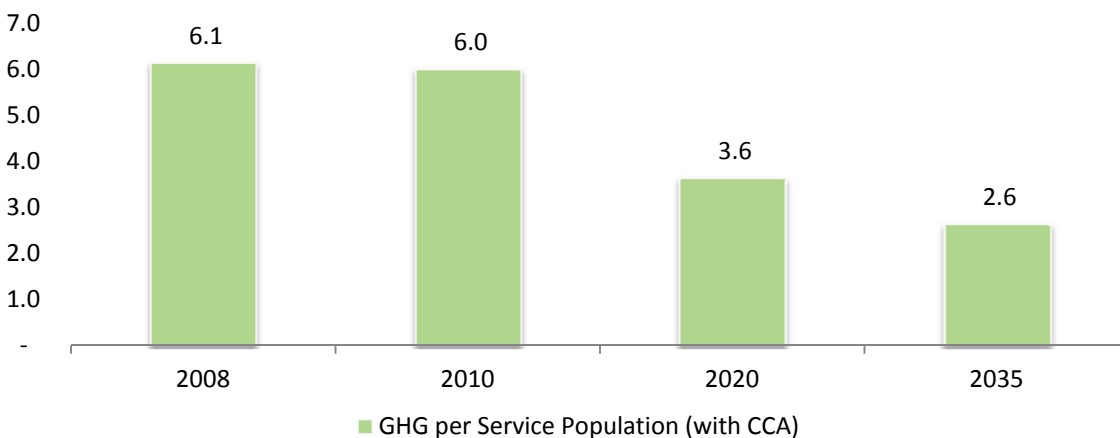


**TABLE ES-4 – GHG REDUCTION SUMMARY BY TOPIC**

Sector	2020 GHG Reductions (MTCO <sub>2</sub> e/yr)	2035 GHG Reductions (MTCO <sub>2</sub> e/yr)
Open Space and Urban Forestry	-310	-780
Decrease Energy Consumption	-67,520	-93,820
Provide a Sustainable Energy Portfolio	-254,380	-363,090
Decrease Water Consumption	-980	-1,520
Reduce Landfilled Waste	-53,960	-96,190
Reduce Off-Road Equipment Emissions	-7,430	-13,820
Increase and Retain Awareness of Sustainability Issues	0	0
Improve Mobility through Land Use Planning	-19,880	-21,410
Expand Sustainable Circulation and Transportation Options	-16,660	-32,380
Optimize Vehicular Travel	-13,770	-26,110
<b>Total Reductions</b>	<b>-434,890</b>	<b>-649,120</b>

**FIGURE ES-5 – 2020 EMISSIONS REDUCTIONS BY GOAL (MTCO<sub>2</sub>E)**

Implementation of the CAP by 2020 will exceed state recommendations and BAAQMD threshold requirements for developing a Qualified GHG Reduction Strategy by approximately 15%. As shown in **Figure ES-6**, through the implementation of this Plan, the City's GHG emissions will decrease from 6.1 MTCO<sub>2</sub>e per person per year in 2008 to 2.6 MTCO<sub>2</sub>e per person per year in 2035.

**FIGURE ES-6 – GHG EMISSIONS PER SERVICE POPULATION (MTCO<sub>2</sub>E)**

## ADAPTATION

Even with significant efforts to mitigate GHG emissions today, future climate projections anticipate that climate change may have significant effects on California's and Sunnyvale's precipitation, temperature, and weather patterns. Sunnyvale is located in Santa Clara County in close proximity to the San Francisco Bay. The potential consequences of climate change for the State of California and the City of Sunnyvale include those described below. The anticipated effects climate change may have on the Northern California region include:

- Increased wildfire risk;
- Negative impacts to wildlife;
- Deteriorating public health;
- Decreased supply of fresh water;
- Increased sea level rise.

To ensure climate change adaptation is adequately incorporated into future planning efforts, preliminary measures have been provided to guide City staff involvement in coordinating, preparing for, and educating the public on the potential impacts that climate change may have on the community.

## IMPLEMENTATION

To ensure the success of this Climate Action Plan, the City will integrate the goals and strategies of this Plan into other local and regional plans, programs, and activities. As the City moves forward with the Land Use and Transportation Element update as well as Zoning Code updates, Specific Plans, Housing Element updates, and other documents, staff will make sure that these documents support and are consistent with the CAP.

CAP implementation will also require City leadership to execute strategies and report on the progress of implementation. The City's sustainability coordinator will be responsible for coordinating GHG reduction efforts between departments and will designate staff to monitor and report on the progress of the CAP. This Plan identifies the responsible department for each measure and offers time frames and plan-level cost estimates for implementing each strategy. Lastly, successful implementation requires regular monitoring and reporting. Staff should monitor the CAP's implementation progress on an annual basis and report to the City Council on the Plan's progress each year.

## ENVIRONMENTAL REVIEW

To comply with the California Environmental Quality Act, the CEQA Guidelines recommend that the CAP undergo environmental review and demonstrate that it will have a less than significant environmental impact for all impacts analyzed. An Initial Study and Negative Declaration have been prepared to analyze the potential environmental effects of the CAP.

# CHAPTER 1

## INTRODUCTION

Local governments play an essential role in reducing greenhouse gas emissions and mitigating the potential impacts of climate change. This Climate Action Plan is Sunnyvale's path toward creating a more sustainable, healthy, and livable Sunnyvale. The strategies outlined in this Climate Action Plan will not only reduce GHG emissions but will also provide energy, fuel, water, and monetary savings while improving the quality of life in Sunnyvale.





## INTRODUCTION

Local governments play an essential role in reducing greenhouse gas (GHG) emissions and mitigating the potential impacts of climate change. This Climate Action Plan (CAP; Plan) is Sunnyvale's path toward creating a more sustainable, healthy, and livable Sunnyvale. The strategies outlined in this Plan will not only reduce GHG emissions but will also provide energy, fuel, water, and monetary savings while improving the quality of life in Sunnyvale. This Plan recognizes the necessity to act and demonstrates the City's commitment to reducing GHG emissions. The CAP is broken into the following chapters:

- An introduction to the regulatory and scientific framework under which this Plan was created (Introduction – **Chapter 1**);
- 2008 greenhouse gas emissions inventory and 2020 and 2035 forecasts (Greenhouse Gas Inventory & Forecast – **Chapter 2**);
- Sunnyvale's strategy to reduce greenhouse gas emissions (GHG Emissions Reduction Strategies – **Chapter 3**);
- Opportunities to adapt to climate change (Adaptation – **Chapter 4**); and
- The path necessary to successfully implement this CAP (Implementation Program – **Chapter 5**).

To streamline the main document, multiple technical appendices have been prepared to provide additional detail and information regarding GHG reductions, costs, and sources. This Plan includes the following four appendices:

- Technical memo on GHG emissions inventory results and methodologies (Baseline GHG Inventory – **Appendix A**);
- Summary of methodology and assumptions for GHG quantification and costs (GHG Methodology – **Appendix B**);
- Detailed discussion of how this Plan will satisfy BAAQMD requirements for a Qualified GHG Reduction Strategy (BAAQMD Compliance – **Appendix C**); and
- A list of all referenced materials included within this document (Works Cited – **Appendix D**).

## Purpose and Scope

This Climate Action Plan is intended to streamline future environmental review of development projects in Sunnyvale by following the California Environmental Quality Act (CEQA) Guidelines and meeting the Bay Area Air Quality Management District's (BAAQMD) expectations for a Qualified GHG Reduction Strategy. The CAP will also identify how the City will achieve the state-recommended GHG emission reduction target of 15% below 2008 levels by the year 2020. The CAP provides goals and associated measures, also referred to as reduction measures, in the sectors of energy use, transportation, land use, water, solid waste, and off-road equipment. The City of Sunnyvale has a long-standing commitment to implementing environmental programs and proactively working to reduce GHG emissions. The adoption and implementation of this Plan will reinforce and build upon these policies and programs.

## Local Context

Sunnyvale is located in the heart of the Silicon Valley in the San Francisco Bay Area. Sunnyvale is the 7th largest city in the nine-county Bay Area in terms of population and jobs. Sunnyvale started as a small fruit orchard farming community that expanded to include canneries with the extension of the railroad to the community in 1864. The city's industrial base began with the relocation of Hendy Iron Works from San Francisco in 1906 following the San Francisco earthquake. Sunnyvale was incorporated as a city in 1912, with a population of 1,800. Between 1930 and 1950, the development of Moffett Naval Air Station and World War II brought several aeronautical and defense-related industries to Sunnyvale including Westinghouse (now known as Northrop Grumman) and Lockheed Martin, which continue to be among Sunnyvale's largest employers. The city relies on information services and manufacturing industries, as shown in **Table 1**, as the economic and employment drivers of the community. Today, Sunnyvale is home to some of the nation's most successful research, manufacturing, and development businesses including NetApp, Yahoo, Advanced Micro Devices, Lockheed Martin, Nokia, and Juniper Networks.

**TABLE 1 – SUNNYVALE 2005 EMPLOYMENT BY INDUSTRY**

Employment by Industry	Percentage
Information Services	25
Manufacturing	24
Misc./Undefined	13.2
Retail Trade	10
Services	8.2
Recreation/Hospitality	3.5
Construction	2.2
Public Administration	1
Wholesale Trade	.9

*Note: Figures based on December 2005 Employment Development Data  
([www.labormarketinfo.edd.ca.gov](http://www.labormarketinfo.edd.ca.gov))*

Since the 1960s, the city has grown to over 140,000 residents and prides itself on high-quality city services including a unified public safety department, prize-winning parks, and significant promotion of cultural arts and activities in the community.

The Council Policy Manual (CPM) is a collection of policies established by the City Council through resolution or motion to guide City action and achieve General Plan goals. Policies included in the CPM align with the City's General Plan elements and provide direction in the areas of land use and transportation, community development, environmental management, public safety, socioeconomics, cultural, and planning and management.



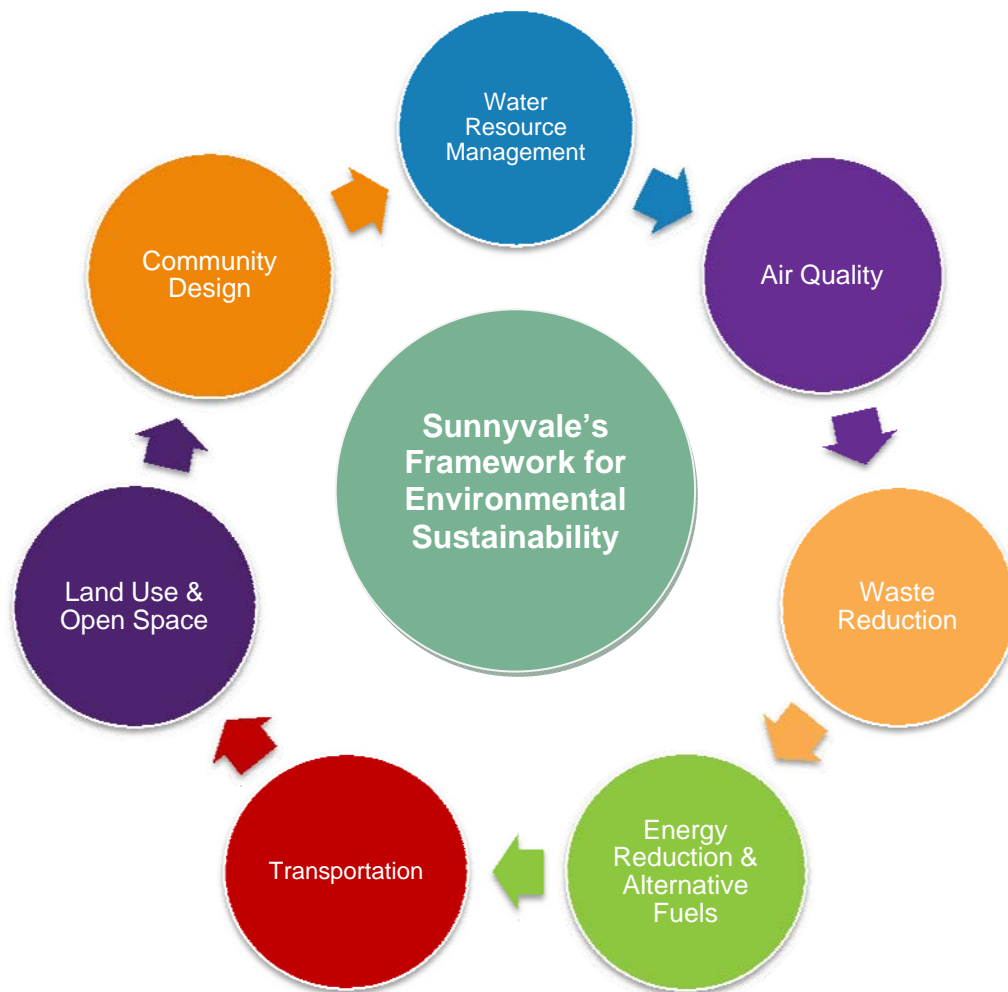
## Local Climate Protection Efforts to Date

Although climate change is a global issue, the City of Sunnyvale recognizes that many strategies at the local level can help prevent its progression. The City has a long history of integrating and implementing sustainability practices through public-private partnerships, General Plan implementation, and effective community engagement.

## Framework for Environmental Sustainability

In 2007, the City developed a framework for environmental sustainability to guide the implementation of policies and programs related to air quality, community design, energy reduction, land use, transportation, waste reduction, and water resource management. **Figure 1** below defines the organizational structure of the City's framework.

**FIGURE 1 – SUNNYVALE'S FRAMEWORK FOR ENVIRONMENTAL SUSTAINABILITY**



## Sunnyvale's Green Building Program

In 2010, the City Council adopted a Green Building Program to build energy-efficient buildings that conserve natural resources and improve indoor air quality based on the CALGreen minimum requirements and Build It Green's GreenPoint Rated program. The Green Building Program includes incentives, determined by the City Council, for buildings that exceed minimum green building standards.

## Sustainable Silicon Valley

The City is also a partner in Sustainable Silicon Valley, a collaborative effort among local government, regional agency, and private sector stakeholders. Sustainable Silicon Valley was created in 2000 by the California Environmental Protection Agency, Santa Clara Valley Water District (SCVWD), Silicon Valley Leadership Group (SVLG), and Silicon Valley Environmental Partnership (SVEP) to conserve resources and improve the environment in the Silicon Valley through comprehensive environmental management with a focus on the following six environmental pressures:

- 1) Use of energy from nonrenewable sources measured by CO<sub>2</sub> emissions
- 2) Use of fresh water
- 3) Urban sprawl
- 4) Habitat development and fragmentation
- 5) Use of nonrenewable raw materials
- 6) Discharges of toxic chemicals to the air

## Energy Efficiency and Conservation Block Grant Projects

The 2009 American Reinvestment and Recovery Act (ARRA) package has supported state and local government investment in greenhouse gas reduction activities through Energy Efficiency and Conservation Block Grant (EECBG) funding. The EECBG program, managed under the US Department of Energy, has provided a total of \$3.2 billion to cities, counties, states, and private entities across the United States. The goals of the EECBG program are to make strategic investments to meet the nation's long-term goals for energy independence and leadership in climate change by reducing fossil fuel emissions; reducing the total energy use of eligible entities; improving energy efficiency in transportation, building, and other appropriate sectors; and creating and retaining jobs.



In September 2009, the DOE awarded the City \$1.2 million in EECBG funds to develop a program that would demonstrate reductions in greenhouse gases, improve energy efficiency and stimulate job growth. The City's projects funded through the EECBG program include a streetlight retrofit project, this Climate Action Plan, and Acterra's Green@Home energy audit program.

## Additional Existing Climate Protection Efforts

Sunnyvale is also participating in or coordinating several other programs and activities that will directly or indirectly reduce GHG emissions and further the community's sustainability goals. The following is a brief list of additional City efforts to reduce GHG emissions:

- U.S. Mayor's Climate Protection Agreement
- ICLEI Member
- 2007 Municipal Climate Action Plan
- Bicycle Friendly Community – Bronze Level
- Tree City USA – 22 consecutive years



*Sunnyvale has been designated as a bicycle-friendly community by the League of American Bicyclists.*

## Relationship of the CAP to the General Plan

The Climate Action Plan incorporates the City's existing efforts and activities to reduce GHG emissions and builds upon components of the General Plan that, when implemented, will reduce GHG emissions from energy use, transportation, water use, waste disposal, and other activities.

The CAP will include chapters for energy use and renewable energy policies, waste reduction policies, and water conservation policies, in addition to transportation and land use policies, and will also include a quantitative analysis of the GHG reduction benefit of each policy to serve as a Qualified GHG Reduction Strategy in accordance with the CEQA Guidelines and BAAQMD guidance.

## Planning Process

The development process for this Plan relied on a comprehensive public participation strategy to engage residents, business owners, and stakeholders in the identification and refinement of goals, programs, activities, and projects to reduce emissions. The public participation process included significant involvement from the Horizon 2035 Advisory Committee, City-sponsored community workshops, stakeholder focus group meetings, development of a project website, and interagency coordination.

The project website provides access to all workshop and meeting notices and materials, links to resources, and a forum to submit comments and questions to staff. In addition, the City created a Facebook account to provide plan updates and alerts for workshops.

## Sustainability Commission

The Sustainability Commission is a seven-member advisory body to the City Council charged with providing expertise on environmental and sustainability policy issues related to the City's General Plan and this Climate Action Plan. The commission's advisory capacity to the City Council includes the following specific duties:

- Advise Council on policy issues addressing sustainability goals.
- Advise Council on how to strategically accelerate Sunnyvale's progress toward sustainability and recommend priorities in order to promote continued regional leadership in sustainability.
- Periodically review policies governing specific practices, such as greenhouse gas (GHG) emissions reduction, water conservation, renewable energy, energy efficiency, waste reduction, and urban forestry. Illustrative examples include creation of infrastructure for low emission vehicles, habitat restoration and conservation, biodiversity preservation, and reduction of toxics in the waste stream.
- Advise Council on ways to drive community awareness, education, and participation in best practices.
- Review and make recommendations to Council on federal, state, and regional policies related to sustainability which impact the Council's goals and policies.

## Horizon 2035 Advisory Committee



A subcommittee of the City Council created the Horizon 2035 Advisory Committee to serve in an advisory capacity during the development of the Land Use and Transportation Element update and Climate Action Plan. The committee will also assist with community outreach and education during LUTE and CAP development and implementation. The committee meets on a monthly basis and is made up of 15 members representing a broad cross-section of the Sunnyvale community.

The vision, goals, policies, and actions in this CAP have been developed in collaboration with the Horizon 2035 committee, and the committee has assisted staff in prioritizing the implementation of CAP measures.

## CLIMATE CHANGE SCIENCE

In order to make meaningful and effective decisions regarding greenhouse gas reductions, it is important to understand the scientific and regulatory framework under which this Plan has been developed. This section provides a brief introduction to the scientific research efforts to understand how climate change occurs and its global implications and describes the federal, state, regional, and local regulations that provide guidance and inform the development of this Plan.

Since the early 1990s, scientific consensus holds that the world's population is releasing greenhouse gases faster than the earth's natural systems can absorb them. These gases are released as byproducts of fossil fuel combustion, waste disposal, energy use, land-use changes, and other human activities. While often used interchangeably, there is a difference between the terms "climate change" and "global warming." According to the National Academy of Sciences, climate change refers to any significant, measurable change of climate lasting for an extended period of time that can be caused by both natural factors and human activities. Global warming, on the other hand, is an average increase in the temperature of the atmosphere caused by increased greenhouse gas emissions. The use of the term "climate change" is becoming more prevalent because it encompasses all changes to climate, not just temperature.

### The Greenhouse Effect

Without the natural greenhouse effect, the average global temperature would be zero degrees Fahrenheit, and life on earth would not be possible.

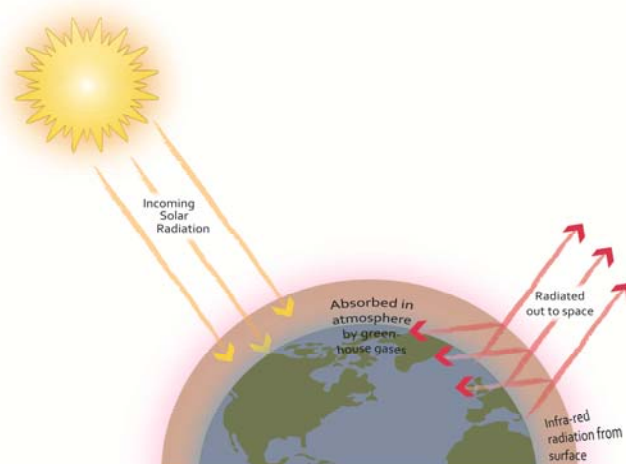
Source: National Oceanic and Atmospheric Administration, National Climatic Data Center 2008.

## The Greenhouse Effect

The release of gases, such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), creates a blanket around the earth that allows light to pass through but traps heat at the surface preventing its escape into space (**Figure 2**). While this is a naturally occurring process known as the greenhouse effect, human activities have accelerated the generation of greenhouse gases beyond natural levels. The overabundance of greenhouse gases in the atmosphere has led to an unexpected warming of the earth and has the potential to severely impact the earth's climate system.

Our planet is reliant on the greenhouse effect, which results when the atmosphere captures the heat that radiates away from the earth toward space. Several gases in the atmosphere function as barriers and trap heat within the planet's atmosphere, including water vapor, carbon dioxide, methane, nitrous oxides, and chlorofluorocarbons. These gases function similar to glass on a greenhouse; the glass panes of a greenhouse allow sunlight to pass into the building but trap heat within it, preventing heat from escaping.

**FIGURE 2 – THE GREENHOUSE EFFECT**



Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. 2008. NOAA Satellite and Information Service.



## Climate Change Impacts

The continued release of greenhouse gases at or above the current rate will continue to increase average temperatures around the globe. These increases in global temperatures are likely to change our planet's climate in ways that will have significant global, regional, and local long-term effects.

### Global Climate Change Impacts

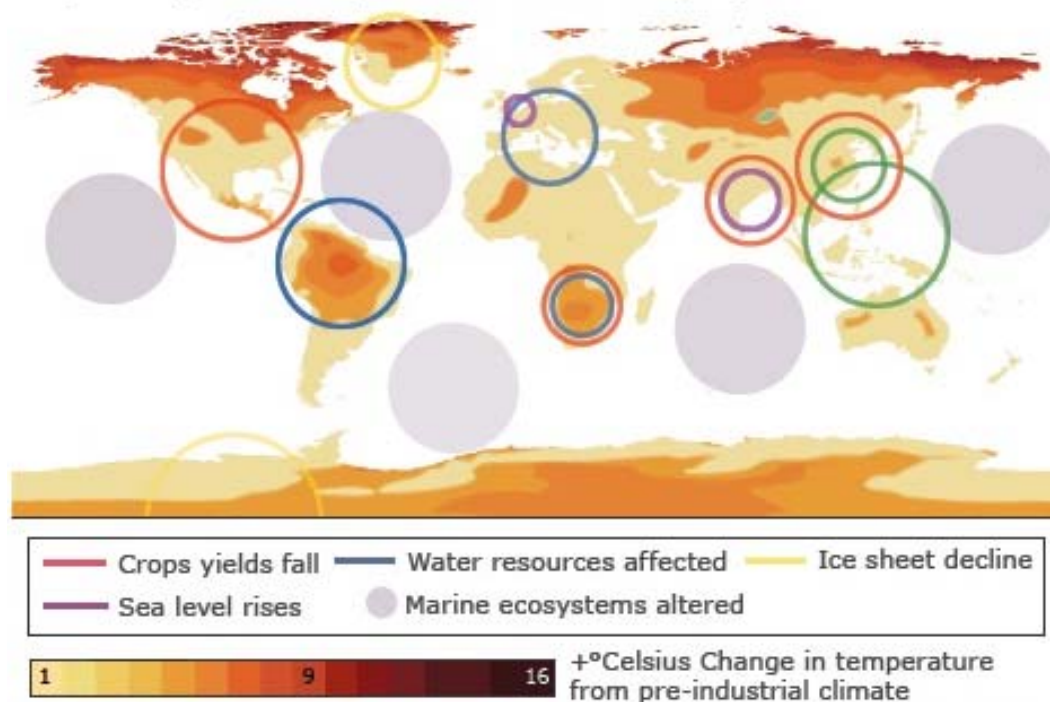
The Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report's Working Group I Summary for Policymakers summarizes current scientific understanding of global climate change and projects future climate change using the most comprehensive set of recognized global climate models. The report incorporates the current effects of global climate change and includes an increase in tropical cyclone intensity, a loss in seasonally frozen ground, and an increase in drought intensity.

As asserted in the IPCC Fourth Assessment Report, if trends remain unchanged, continued GHG emissions above current rates will induce further warming changes in the global climate system and pose even greater risks than those currently witnessed. The impact of additional warming on the global climate is shown in **Figure 3**. Given the scientific basis of climate change and expected trends, the challenge remains to prepare for and mitigate climate change through deliberate global and local action.

#### What is the IPCC?

The Intergovernmental Panel on Climate Change (IPCC) is an organization created by the United Nations Environmental Programme and the World Meteorological Organization to provide a global scientific view on the current state of climate change and its potential environmental and socioeconomic impacts.

**FIGURE 3 – POTENTIAL GLOBAL CLIMATE CHANGE IMPACTS**  
Impact of global temperature rise of 4C (7F)

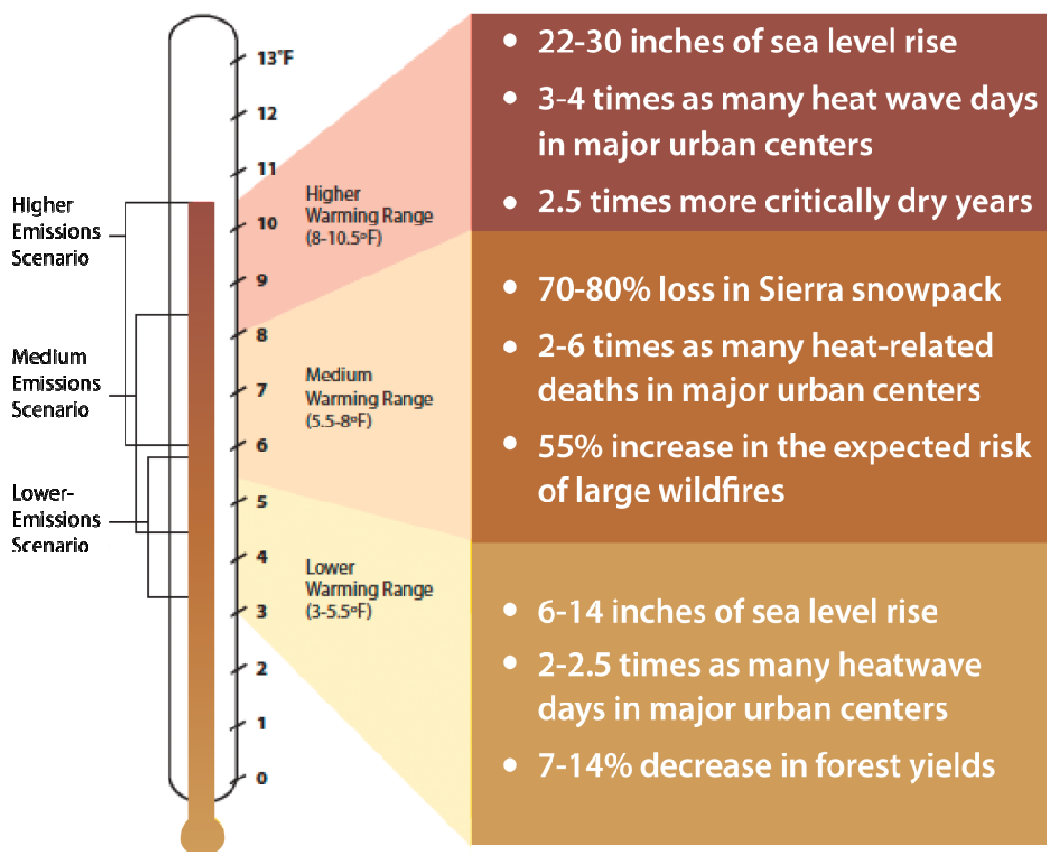


Source: Met Office, Hadley Centre 2009

## Climate Change Impacts to California

Research suggests that California will experience hotter and drier conditions, reductions in winter snow and increases in winter rains, sea level rise, significant changes to the water cycle, and an increased occurrence of extreme weather events. Such compounded impacts will affect economic systems throughout the state. To refrain from action is costly and risky; the California Climate Adaptation Strategy estimates that no action to address the potential impacts of climate change will lead to economic losses of “tens of billions of dollars per year in direct costs” and “expose trillions of dollars of assets to collateral risk.” Potential impacts in California due to climate change are summarized in **Figure 4**.

**FIGURE 4 – CALIFORNIA CLIMATE CHANGE IMPACTS, 2070–2099**



Source: California Energy Commission. 2006. *Our Changing Climate: Assessing the Risks to California*. Web Document. Sacramento: California Energy Commission.

### Increased Rate of Wildfires

Wildfire risk is based on a combination of factors including rainfall, winds, temperature, and vegetation. Wildfires are likely to grow in number and size throughout the state as a result of increased temperatures induced by climate change. Even under the “medium” warming scenario predicted by the Intergovernmental Panel on Climate Change, wildfire

risk will likely increase by 55% in California. Further, as wildfires increase in frequency and size, they will also increase in intensity.

### Negative Impacts on Wildlife

As temperatures rise, species are moving north in California or to higher elevations. This migrational change disrupts the food chain and prevents some plant species from being pollinated. Water and food supplies are expected to be more variable and to shift as the seasons change. Those species that are unable to migrate face the danger of extinction: “The amount of future warming expected in California may likely exceed the tolerance of endemic species (i.e., those that are native to a specific location and that only occur there) given their limited distribution and microclimate” (California Natural Resources Agency 2009).

Reduction in soil moisture will result in early dieback of many plants, potentially leading to conflicts with animal breeding seasons and other natural processes. Many of the potential effects on wildlife are still being studied, but with a limited ability to adapt to new climates, the potential for severe species loss is present.

Several potential hydrological changes associated with global climate change could also specifically influence the ecology of aquatic life in California and have several negative effects on cold-water fish. For example, if a rise in air temperature by just a few degrees Fahrenheit occurs, this change could be enough to raise the water temperatures above the tolerance of salmon and trout in many streams, favoring instead non-native fishes such as sunfish and carp. Unsuitable summer temperatures would be particularly problematic for many of the threatened and endangered fish that spend summers in cold-water streams, either as adults or juveniles or both.

### Deteriorating Public Health

Heat waves are expected to have a major impact on public health, as well as decreasing air quality and increasing mosquito breeding and mosquito-borne diseases. Further, climate change is expected to alter the spread and prevalence of disease carrying insects, organisms, or people, referred to as vectors, in addition to leading to a possible decrease in food quality and security. Vector control districts throughout the state are already evaluating how they will address the expected changes to California’s climate.

According to a new report from the California Air Resources Board (CARB), the warming climate will increase ozone levels in California’s major air basins, leading to upwards of 6 to 30 more days per year with ozone concentrations that exceed federal clean-air standards.

Cost-effective measures to reduce greenhouse gas emissions and protect public health are important for local governments. The new CARB study provides evidence of what is becoming known as the “climate penalty,” where rising temperatures increase ground-level ozone and airborne health-damaging particles, despite the reductions achieved by programs targeting smog-forming emissions from cars, trucks, and industrial sources. The elderly, young, and sensitive populations most likely to be impacted by climate change are also those that often lack sufficient resources to adapt. Such vulnerable demographics are likely to need assistance to respond to climate change. Social equity issues related to the unequal distribution of resources and increased costs to address



community-wide health risks will need to be addressed proactively to reduce the potential for financial strain on local governments.

### Decreased Supply of Fresh Water

The state's water supply is already under stress and is anticipated to shrink under even the most conservative climate change scenario. Warmer average global temperatures cause more rainfall than snowfall, making the winter snowfall season shorter and accelerating the rate at which the snowpack melts in the spring. The Sierra snowpack is estimated to experience a 25% to 40% reduction from its average by 2050. With rain and snow events becoming less predictable and more variable, the rate of flooding could increase and California's ability to store and transport fresh water for consumption could decrease. Further, warmer weather will lead to longer growing seasons and increased agricultural demand for water.

### Increased Severity and Frequency of Flood Events

Forecasts indicate more intense rainfall events, generating more frequent or extensive runoff, and flooding may result from a changing climate. Localized flood events may increase in periods of heavy rain. As explained by the Climate Adaptation Strategy, California's water system is structured and operated to balance between water storage for dry months and flood protection during rainy seasons. Although climate change is likely to lead to a drier climate overall, risks from regular, more intense rainfall events can generate more frequent and/or more severe flooding that upsets this managed balance between storage and protection. Additionally, erosion may increase and water quality may decrease as a result of increased rainfall amounts.

### Rising Sea Levels

Sea level rise is attributed to the increase of average ocean temperatures and the resulting thermal expansion and the melting of snow and ice contributing to the volume of water held in the oceans. While many effects of climate change will impact Sunnyvale, sea level rise is one specific impact that has been extensively studied and quantified, and its effects mapped. The San Francisco Bay Conservation and Development Commission (BCDC) has led research efforts on sea level rise in the Bay Area and issued a report on sea level rise in April 2009, which states that sea levels in the Bay Area will rise 16 inches by mid-century and 55 inches by the end of the century. Approximately 180,000 acres of the Bay Area could be inundated by mid-century, and 213,000 acres could be flooded by the end of the century, including 93 percent of both the Oakland and the San Francisco airports.

The speed and amount of sea level rise will be influenced by the increase in average temperatures and rate of melting of glacial ice. While there is a degree of uncertainty in projections, the actual rate of sea level rise is occurring more quickly than many previous projections had estimated.

## REGULATORY CONTEXT

Sunnyvale's climate action efforts will be implemented within a robust federal, state, regional, and local framework. Although the federal government has yet to enact legislative targets for reducing greenhouse gas emissions, California was the first state

in the nation to adopt GHG emissions reduction targets in 2006 under Assembly Bill 32 (AB 32). This section highlights the federal and state legislative framework guiding the preparation and implementation of this Plan.

## Federal Framework

While current federal government regulations lack strict emissions reduction targets, the federal government is supporting emissions reduction efforts of state and local governments in a variety of ways. Numerous proposals are currently under way at the federal level to limit emissions from power plants, impose pricing on carbon emissions, and provide federal energy efficiency legislation.

Federal agencies have undertaken a concerted effort to assist state and local governments, businesses, and residents with efforts related to energy, climate action planning, and smart growth. The Environmental Protection Agency (EPA) also provides educational resources and tools in support of GHG analysis and climate action planning.

### Clean Air Act

The Clean Air Act, the nation's landmark legislation to protect air quality and public health, was signed by President Richard Nixon in 1970. The law defines the EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. Implementation of programs and enforcement of the Clean Air Act is a collaborative effort between the EPA, states, regional agencies, and local governments. The EPA's analysis of the economic impact of implementing the Clean Air Act estimates that the costs to comply with the Clean Air Act are outweighed by the public health benefits by a ratio of more than 30 to 1.

In December 2009, the US EPA Administrator signed two findings related to greenhouse gas emissions under the Clean Air Act. The endangerment finding recognized that greenhouse gases such as carbon dioxide, methane, and nitrous oxide in the atmosphere threaten the public health and welfare of current and future generations. The cause or contribute finding recognized that fuel combustion from motor vehicles contributes to the greenhouse gas emissions that endanger public health and welfare. These two findings did not impose any direct requirements on industry or any other entities. This action, however, was a prerequisite for implementing greenhouse gas emissions standards for vehicles in collaboration with the National Highway Traffic Safety Administration.

### Federal GHG Reduction Initiatives

The federal government is currently employing voluntary and incentive-based programs to curb greenhouse gas emissions through energy efficiency improvements, renewable

#### The Clean Air Act saves lives

Between 1990 and 2010, it is estimated that the Clean Air Act has resulted in the avoidance of following public health issues:

- Adult Mortality – 160,000
- Infant Mortality – 230
- Mortality Ozone – 4,300
- Chronic Bronchitis – 54,000
- Heart Disease – 130,000
- Asthma Exacerbation – 1,700,000
- Emergency Room Visits – 86,000
- Lost School Days – 3,200,000
- Lost Work Days – 13,000,000

Source: EPA 2011. The Benefits and Costs of the Clean Air Act from 1990–2020.

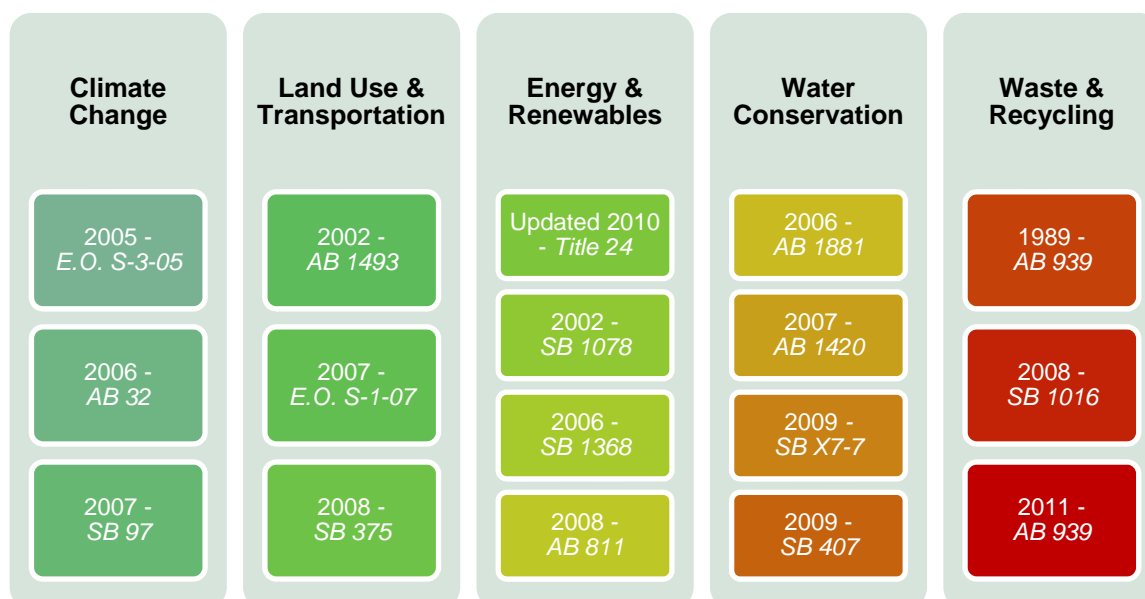
energy development, methane capture, and improved agricultural practices. In addition to the significant research efforts related to climate change and GHG reductions, programs such as ENERGY STAR, Climate Leaders, and the Smart Way program encourage emission reductions from large corporations, consumers, industrial and commercial buildings, and many major industrial sectors.

## California Legislative Framework

The State of California is the 15th largest emitter of greenhouse gases in the world, ultimately accounting for 2% of global greenhouse gas emissions. However, the State has been proactive in working to reduce emissions and has a long history of proven leadership in addressing energy and climate issues spanning the last 40 years. In 1988, Assembly Bill (AB) 4420 (Sher, Chapter 1506, Statutes of 1988) designated the California Energy Commission (CEC) as the lead agency for climate change issues in California. Since that time, there have been numerous initiatives in California to address climate change and energy efficiency, with the majority of legislation passed between 2000 and now. These initiatives have strengthened the ability of entities in California to engage in accurate data collection and have created ambitious targets and regulations that will directly lead to reductions in greenhouse gas emissions. Not only have California's efforts earned it a role as the leader in the United States for climate planning strategies, but the State has received world attention and accolades for its efforts.

California legislation related to climate change includes Executive Order S-3-05, Assembly Bill 32, and Senate Bill (SB) 375, which direct the State and other local agencies to reduce GHG emissions. These orders and laws are summarized below. In addition to Executive Order S-3-05, AB 32, and SB 375, the State has enacted legislation and policy initiatives related to climate change, transportation and vehicle efficiencies, energy, water, and solid waste. A summary of recent state efforts by topic is provided in **Figure 5**, with a more detailed discussion of recent climate change legislation provided below.

**FIGURE 5 – CALIFORNIA REGULATORY FRAMEWORK SUMMARY**



## Governor's Executive Order S-3-05

Executive Order S-3-05 establishes the California Environmental Protection Agency (CalEPA) as the agency responsible for coordinating the State's effort to achieve the (nonbinding) progressive greenhouse gas emissions reduction targets outlined in the executive order for the state:

- By 2010, reduce greenhouse gas emissions to 2000 levels;
- By 2020, reduce greenhouse gas emissions to 1990 levels;
- By 2050, reduce greenhouse gas emissions to 80% below 1990 levels.

## AB 32 – California Global Warming Solutions Act of 2006

Assembly Bill 32, known as the California Global Warming Solutions Act, was approved by the legislature and signed by Governor Schwarzenegger in 2006. The landmark legislation requires the California Air Resources Board (CARB) to develop regulatory and market mechanisms that will reduce greenhouse gas emissions to 1990 levels by 2020. Mandatory actions under the legislation to be completed by CARB include:

- Identification of early action items that can be quickly implemented to achieve greenhouse gas reductions. These early action items were adopted by CARB in 2007 and include regulations affecting landfill operations, motor vehicle fuels, car refrigerants, and port operations, among other regulations.
- Development of a scoping plan to identify the most technologically feasible and cost-effective measures to achieve the necessary emissions reductions to reach 1990 levels by 2020. The scoping plan employs a variety of GHG reduction measures that include direct regulations, alternative compliance mechanisms, incentives, voluntary actions, and market-based approaches like a cap-and-trade program. The plan identifies local governments as strategic partners to achieving the state goal and translates the reduction goal to a 15% reduction of current emissions by 2020.
- Creation and adoption of regulations to require the state's largest industrial emitters of greenhouse gases to report and verify their greenhouse gas emissions on an annual basis.

## SB 375 – Sustainable Communities & Climate Protection Act of 2008

Senate Bill 375 builds off of AB 32 and aims to reduce GHG emissions by linking transportation funding to land use planning. It requires metropolitan planning organizations (MPOs) to create a Sustainable Communities Strategy (SCS) in their regional transportation plans (RTPs) for the purpose of reducing urban sprawl. The SCS adopted by ABAG in 2013 demonstrates how the region will achieve the greenhouse gas emissions reduction target set by CARB for 2020 and 2035.

## SB 97 – CEQA Guideline Amendments of 2007

Senate Bill 97 was adopted in 2007 by the State of California and directed the Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to address greenhouse gas emissions. The CEQA Guidelines prepared by OPR were adopted in December 2009 and went into effect March 18, 2010. Local governments may use adopted plans consistent with the CEQA Guidelines to assess the cumulative impacts of projects on climate change, if the adopted plan includes a certified environmental impact report (EIR) or adoption of an environmental document. In order to benefit from the streamlining provisions of the CEQA Guidelines, a plan for the reduction of greenhouse gas emissions must accomplish the following:

- Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;
- Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;
- Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;
- Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;
- Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels;
- Be adopted in a public process following environmental review.

In response to the updated CEQA Guidelines, the Bay Area Air Quality Management District (BAAQMD) has adopted thresholds of significance for greenhouse gas emissions. These thresholds are used in the environmental review process for plans and projects by local governments and may streamline the environmental review process.

## BAAQMD Guidance and CEQA Tiering

The BAAQMD CEQA Air Quality Guidelines were developed to assist lead agencies in evaluating air quality impacts for projects and plans in the San Francisco Bay Area Air Basin. The guidelines were updated in 2010 to include guidance on assessing greenhouse gas and climate change impacts as required under CEQA Guidelines Section 15183.5(b) and to establish thresholds of significance for impacts related to GHG emissions. These thresholds can be used to assess plan-level and project-level impacts and allow a lead agency to determine that a project's impact on GHG emissions is less than significant if it is in compliance with a Qualified GHG Reduction Strategy.

This CAP follows both the CEQA Guidelines and the BAAQMD guidelines by incorporating the standard elements of a Qualified GHG Reduction Strategy. Appendix C describes in detail how the CAP satisfies the BAAQMD's requirements for a Qualified GHG Reduction Strategy and will allow future projects to determine that a project has a less than significant impact on GHG emissions if it complies with the City's CAP.





## CHAPTER 2



### GHG INVENTORY & FORECAST

The baseline greenhouse gas (GHG) emissions inventory identifies the major sources of GHG emissions within the City of Sunnyvale and provides a baseline against which future progress can be measured.





## GREENHOUSE GAS INVENTORY

The baseline greenhouse gas (GHG) emissions inventory identifies the major sources of GHG emissions within the City of Sunnyvale and provides a baseline against which future progress can be measured.

Specifically, this inventory does the following:

- Calculates GHGs from community-wide activities in the calendar year 2008.
- Converts activity data into GHG emissions by activity sector to easily compare the GHG impact between sectors.
- Provides City decision-makers and the community with adequate information to inform policy decisions.
- Forecasts how emissions will grow in the community if no behavioral changes are made.

### How is an inventory different from a carbon footprint?

A GHG emissions inventory incorporates GHG emissions that occur within the boundaries of a city based on adopted protocols and industry standards. The consistency allows GHG inventories to be compared and used in policy decisions. On the other hand, a carbon footprint includes GHG emissions from the region, and it is difficult to accurately estimate the community's contribution to the carbon footprint. Accordingly, a carbon footprint has limited value as a basis for policy decisions.

## Inventory Background and Methodology

The starting point of the Climate Action Plan is to measure or inventory Sunnyvale's current or baseline levels of GHG emissions. The City's GHG inventory is guided by the Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act (CEQA) Air Quality Guidelines, adopted in June 2010 and updated in October 2011. The guidelines include an appendix entitled "Recommended Plan-Level GHG Quantification Guidance." The guidance is recommended for any plan or program that will be used as a programmatic tiering document under CEQA according to BAAQMD's definition of a Qualified GHG Reduction Strategy. The guidelines indicate that the following sources are to be included in any inventory that will be used in a Qualified GHG Reduction Strategy:

- Residential energy (natural gas and electricity)
- Commercial and industrial energy (natural gas and electricity, including direct access)
- On-road transportation (diesel and gasoline use from on-road vehicles)
- Waste (direct landfill emissions, emissions from community waste)
- Water (wastewater treatment, energy for filtration and movement)
- Off-road equipment and vehicles (lawn and garden equipment, construction vehicles and equipment)
- Caltrain transit (GHG emissions from the use of Caltrain to and from Sunnyvale)

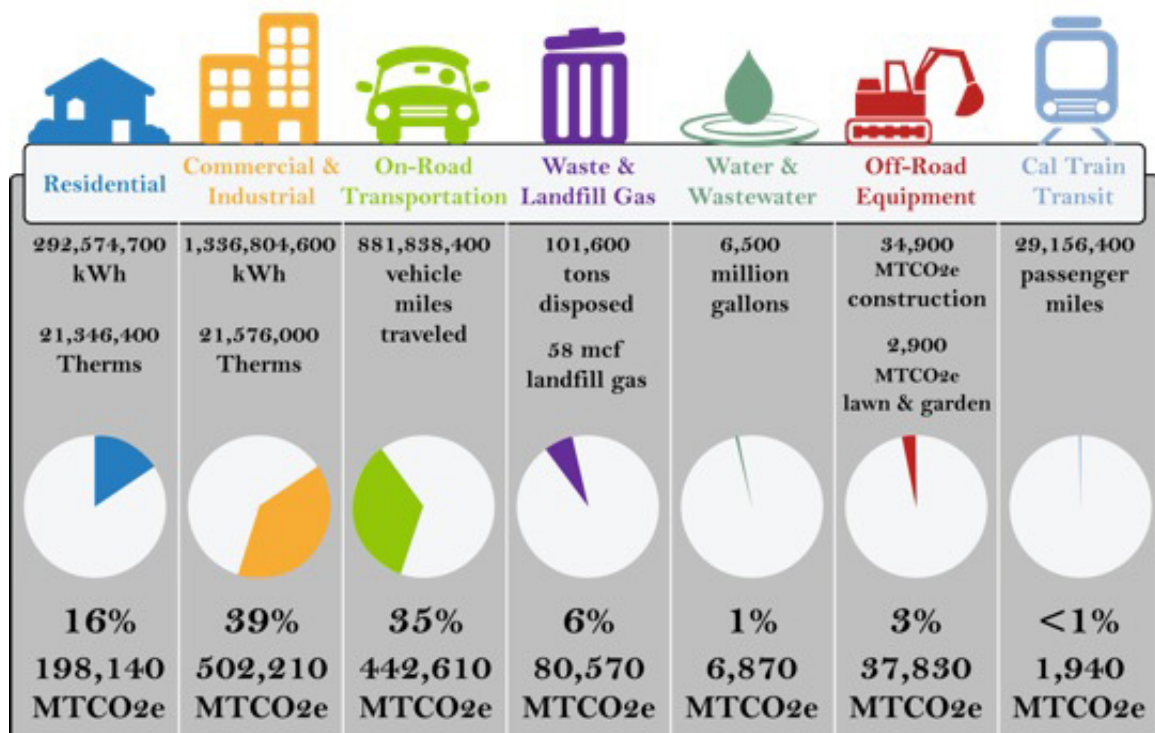
The GHG emissions inventory starts with collecting activity data for each sector listed above, such as the kilowatt-hours (kWh) of electricity used or therms of natural gas used for the residential, commercial, and industrial energy sectors, the vehicle miles traveled (VMT) for the transportation sector, or million gallons (MG) of water used by the community in a single calendar year. These activities are converted into GHG emissions using an emissions factor or coefficient. These emissions factors are supplied by the energy provider or emissions modeling software and indicate the GHGs that are emitted for every kWh produced, mile traveled, or ton of waste disposed.

The inventory measures three primary GHG emissions—carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). These GHGs are then converted to carbon dioxide equivalents (CO<sub>2</sub>e), enabling the City to consider different GHGs in comparable terms. The conversion of GHGs is done by comparing the global warming potential (GWP) of each gas to CO<sub>2</sub>. For example, methane is 21 times more powerful than CO<sub>2</sub> on a per weight basis in its capacity to trap heat, and therefore one metric ton of CH<sub>4</sub> would be calculated as 21 metric tons of CO<sub>2</sub>e, while nitrous oxide (N<sub>2</sub>O) is 310 times more powerful than CO<sub>2</sub> and would be calculated as 310 metric tons of CO<sub>2</sub>e.

## 2008 Baseline Inventory Results

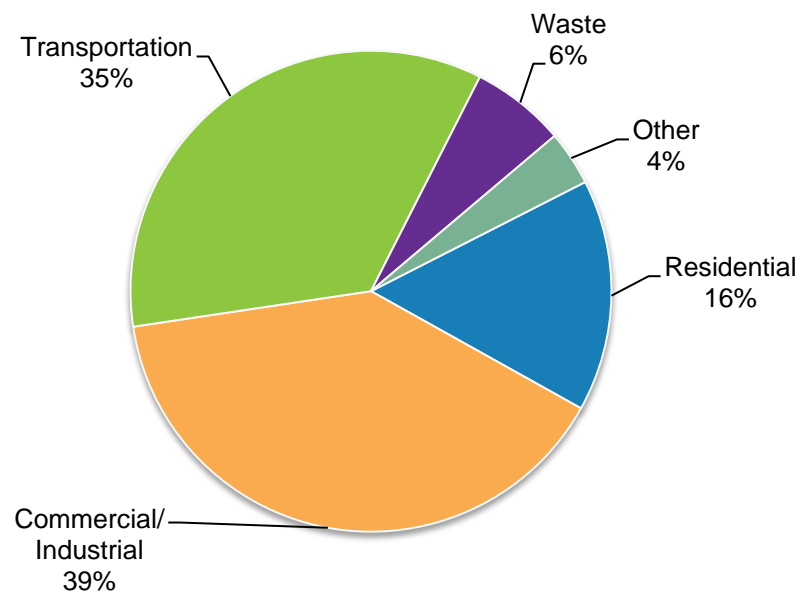
A baseline GHG emissions inventory and forecast are the basis of any climate action plan analysis. This section provides a brief overview of Sunnyvale's 2008 baseline emissions. The community of Sunnyvale emitted approximately 1,270,170 metric tons of carbon dioxide equivalents (MTCO<sub>2</sub>e) in the baseline year 2008. **Figure 6** summarizes the activity data, GHG emissions, and each sector's contribution to Sunnyvale's GHG emissions.

**FIGURE 6 – SUNNYVALE'S GHG EMISSIONS BY SECTOR**



**Figure 7** and **Table 2** compare each sector's contribution to the community's overall GHG emissions in 2008. The commercial/industrial energy sector is the largest contributor at 39%, producing approximately 502,210 MTCO<sub>2</sub>e in 2008. Emissions from the transportation sector were the next largest contributor, accounting for 35% of the total emissions, or approximately 442,610 MTCO<sub>2</sub>e. The residential sector accounted for 16% of the total emissions (198,140 MTCO<sub>2</sub>e), and emissions from solid waste comprised 6% of the total (76,970 MTCO<sub>2</sub>e). Emissions were also inventoried for landfill gas emitted from Sunnyvale's closed landfill, off-road equipment, water consumption, and Caltrain trips to and from Sunnyvale. Together, these sources contribute approximately 4% of total community-wide emissions and are shown in **Figure 7** as other emissions sources.

**FIGURE 7 – 2008 BASELINE GREENHOUSE GAS EMISSIONS BY SECTOR**



**TABLE 2 – 2008 BASELINE GREENHOUSE GAS EMISSIONS BY SECTOR**

2008 Baseline Greenhouse Gas Emissions	MTCO <sub>2</sub> e	Percentage of Total
Residential	198,140	16%
Commercial/Industrial	502,210	39%
Transportation	442,610	35%
Community Waste	76,970	6%
Landfill Gas	3,600	<1%
Water	6,870	1%
Off-Road	37,830	3%
Caltrain	1,940	< 1%
<b>Total</b>	<b>1,270,170</b>	<b>100%</b>

## GREENHOUSE GAS EMISSIONS FORECAST

A GHG emissions forecast is an estimate of how emissions will grow based on the City's household, jobs, and population growth projections. To estimate the GHG reductions that will be needed to reach the Assembly Bill (AB) 32 target, Sunnyvale's GHG emissions must be forecast based on anticipated growth in households, jobs, and population.

### Business-As-Usual GHG Emissions Forecast

A business-as-usual (BAU) forecast analyzes how emissions will grow if per capita consumption trends and efficiencies remain at their 2008 level, yet the number of jobs, households, and people in Sunnyvale continues to grow. In other words, the BAU is the status quo scenario before state, regional, and local reduction efforts are taken into consideration. The BAU projection utilizes the demographic projections included in the adopted General Plan for population, households, and jobs in Sunnyvale by 2035. **Table 3** identifies the population, jobs, households, and service population numbers utilized to forecast Sunnyvale's GHG emissions.

**TABLE 3 – SUNNYVALE ADOPTED GENERAL PLAN GROWTH SCENARIO**

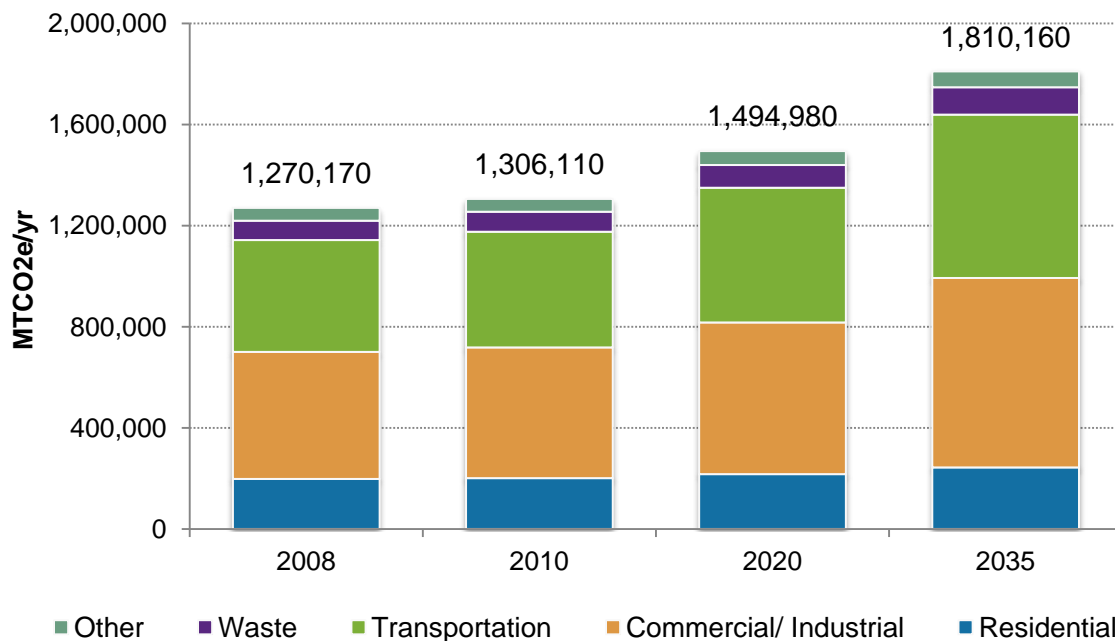
	2008	2010	2020	2035	Percentage Change
Population	133,110	135,100	145,020	159,910	20%
Households	54,130	55,050	59,660	66,570	23%
Jobs	73,630	76,320	89,750	109,900	49%
Service Population	206,740	211,420	234,770	269,810	31%

The growth scenario in the adopted General Plan provides the basis for the City's BAU forecast of GHG emissions. This inventory and forecast includes a 2010 GHG emissions estimate and a BAU forecast for the years 2020 and 2035 based on the land use and growth assumptions included in the General Plan. The 2010 estimate of GHG emissions is provided for context and allows the City to take credit for the actions of the City and the community to reduce GHG emissions prior to the development of the Climate Action Plan. **Table 4** and **Figure 8** summarize the growth forecast of GHG emissions by activity sector without any actions or policies in place to reduce GHG emissions. Under the growth scenario, emissions would grow by 18% in 2020 to 1,494,980 MTCO<sub>2</sub>e and by 43% from baseline to 1,810,160 MTCO<sub>2</sub>e in 2035.

**TABLE 4 – SUNNYVALE BUSINESS-AS-USUAL GHG EMISSIONS  
FORECAST (MTCO<sub>2</sub>E)**

Sector	Source	2008 Baseline	2010 Estimate	2020 Forecast	2035 Forecast
Residential	Electricity	84,850	86,160	93,020	104,350
	Natural Gas	113,290	115,040	124,200	139,320
Commercial/ Industrial	Electricity	387,700	399,380	463,240	578,680
	Natural Gas	114,510	117,950	136,820	170,910
Transportation	VMT	442,610	457,680	533,070	646,150
Landfilled Waste	Commercial	51,570	53,120	61,620	76,970
	Residential	25,400	25,790	27,850	31,240
Landfill Gas	Landfill Gas	3,600	3,460	2,830	2,100
Water	Gallons	6,870	7,000	7,730	8,960
Off-Road	Construction	34,930	35,620	39,310	45,580
	Lawn & Garden	2,900	2,940	3,180	3,560
Caltrain	Trips	1,940	1,970	2,110	2,340
<b>TOTAL</b>		<b>1,270,170</b>	<b>1,306,110</b>	<b>1,494,980</b>	<b>1,810,160</b>
Percentage Change Since Baseline			<b>3%</b>	<b>18%</b>	<b>43%</b>

\* The 2010 and 2020 business-as-usual growth forecasts are linear interpolations of the growth between 2008 and 2035 under the adopted General Plan growth scenario.

**FIGURE 8 – SUNNYVALE BUSINESS-AS-USUAL GHG EMISSIONS  
FORECAST (MTCO<sub>2</sub>E)**

BAU emissions related to energy, water, wastewater, waste, off-road equipment, and Caltrain ridership are anticipated to grow linearly with residential, commercial, and population growth. On-road VMT in the BAU scenario for 2035 were modeled using the Sunnyvale Travel Demand Forecasting Model and include regional transportation improvements identified in the Valley Transportation Plan 2030 published by the Santa Clara Valley Transportation Authority. 2010 and 2020 VMT forecasts were determined by linearly interpolating between the 2008 baseline year results and the 2035 results using the interim-year projections.

## Adjusted Forecast to Incorporate Existing State and Regional Programs

Select state and regional sustainability efforts will have a substantial impact on local GHG emissions. The state and regional efforts described below are incorporated into an adjusted business-as-usual forecast (ABAU) to clearly identify how those policies will reduce Sunnyvale's GHG emissions. The state and regional programs evaluated in this adjusted forecast include those discussed below.

### California Building Code, Title 24

The calculation of CALGreen energy reductions assumes that all development between 2010 and 2035 will meet Title 24 2008 minimum efficiency standards. It also assumes that all growth in the natural gas and electricity sectors is from new construction. Title 24 of the California Code of Regulations (CCR) mandates how each new home and business is built in California. It includes requirements for the structural, plumbing, electrical, and mechanical systems of buildings and for fire and life safety, energy conservation, green design, and accessibility in and around buildings. The 2010 triennial edition of Title 24 pertains to all occupancies that applied for a building permit on or after January 1, 2011, and remains in effect until the effective date of the 2013 triennial edition. This Climate Action Plan focuses on two sections of Title 24, Part 6, the California Energy Code, and Part 11, the California Green Building Standards Code or CALGreen Code. These two sections require direct electricity, natural gas, and water savings for every new home or business built in California. Title 24 is a statewide standard applied at the local level by local agencies through project review.

#### Part 6, 2008 Building Energy Efficiency Standards

The most recent update to Title 24, Part 6, the California Energy Code, went into effect on January 1, 2010, for both residential and nonresidential new construction. Part 6 also includes requirements for lighting and insulation upgrades to nonresidential buildings undergoing a major retrofit.

#### Part 11, 2010 California Green Building Code

California is the first state in the nation to adopt a mandatory green building code, the California Green Building Standards Code, or CALGreen. The CALGreen Code was updated in 2010 and became a mandatory code beginning January 1, 2011. The code takes a holistic approach to green building by including minimum requirements in the areas of planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. All local governments must adopt the minimum requirements of the CALGreen Code and may elect to adopt one of the two additional tiers.



Mandatory CALGreen standards do not require explicit reductions in energy consumption beyond the minimum Title 24, Part 6 standards. However, if a local government elects to adopt either tier of CALGreen, additional prerequisites and electives must be implemented by new development projects subject to CALGreen. For the voluntary energy efficiency prerequisites, Tier 1 includes a 15% improvement and Tier 2 includes a 30% improvement over minimum Title 24, Part 6 requirements. The City of Sunnyvale has adopted the Tier 1 standards of CALGreen.

The GHG forecast in this Plan incorporates the net energy benefit of new Title 24 requirements that did not exist in the baseline year. These estimates are based on California Energy Commission studies that compare each new update of Title 24 to its former version. The AB 32 Scoping Plan calls for ongoing triennial updates to Title 24 that will yield regular increases in the mandatory energy and water savings for new construction. As such, the GHG forecast also includes a conservative estimate of the energy and water reductions due to future updates of Title 24 based on historic growth rates. The energy reductions quantified in the forecast from Part 6 Energy Code updates are based on the assumption that the triennial updates to the code will yield regular decreases in the maximum allowable amount of energy used from new construction.

### Clean Car Fuel Standards (AB 1493, Pavley)

Signed into law in 2002, AB 1493 requires automobile makers to reduce GHG emissions from new passenger cars and light trucks beginning in 2011. Regulations were adopted by the California Air Resources Board (CARB) in 2004 and took effect in 2009 when the US Environmental Protection Agency (EPA) issued a waiver confirming California's right to implement the bill. CARB anticipates that the Pavley standards will reduce GHG emissions from new California passenger vehicles by about 22% in 2012 and about 30% in 2016, while simultaneously improving fuel efficiency and reducing motorists' costs.

### Renewables Portfolio Standard

California's Renewables Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country, mandating that 33% of electricity delivered in California is generated by renewable sources like solar, wind, and geothermal by 2020. The California RPS was first codified in 2002 by Senate Bill (SB) 1078 (requiring 20% renewable electricity mix by 2010) and further strengthened in April 2011 with the adoption of SB X 1-2 (requiring 33% renewable electricity mix by 2020). The RPS intends to boost the economy and establish California as a center for the development and use of renewable energy. Only Hawaii's electricity standard of 40% renewable by 2030 surpasses California renewable energy standards.

Despite the 2020 goal of California's RPS, technological and political challenges may prevent some investor-owned utilities from meeting the 33% target by 2020. In 2010, the California Public Utilities Commission reported that 18% of California's electricity came from renewable sources, missing the 20% goal by 2%. California utilities have more than enough renewable electricity under consideration to meet the 33% target by 2020. However, due to contract and transmission limitations, not all of this new electricity will be available in time to meet the goals. Taking these issues into account, this document assumes a more conservative forecast of a 28% renewable mix by 2020.



## Caltrain Electrification

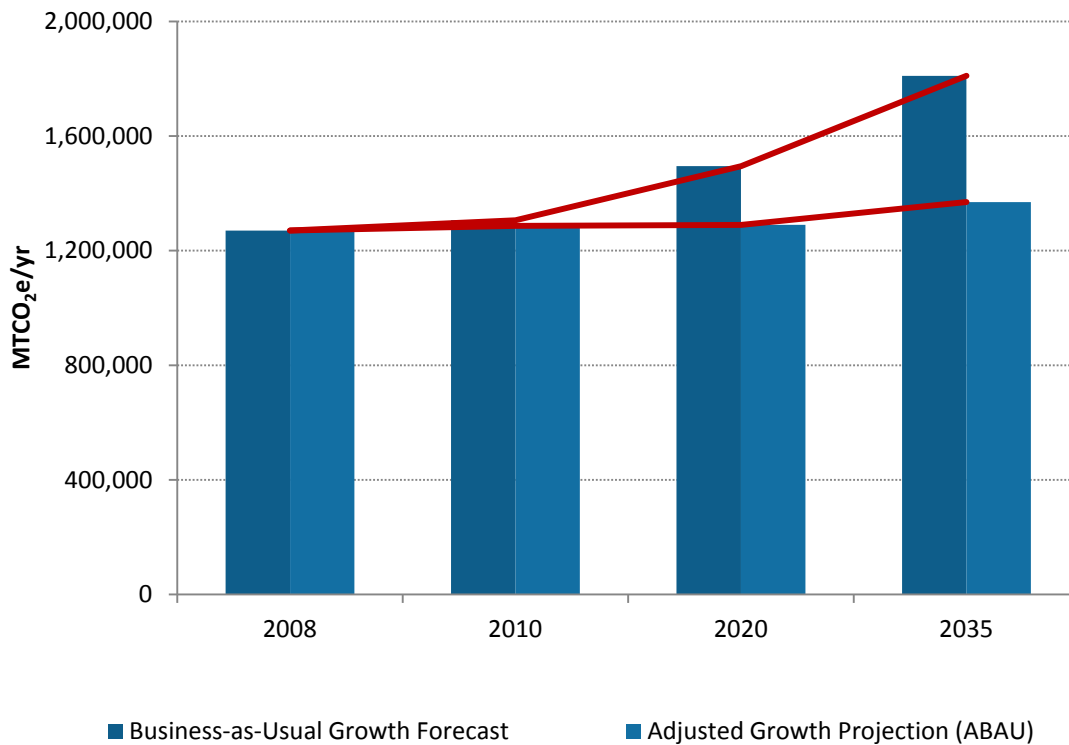
The Peninsula Corridor Joint Powers Authority is well on its way to modernizing the Caltrain system, which includes an electrification project in operation by 2018. This improvement is anticipated to reduce emissions by as much as 90% over the current diesel-run locomotives.

The GHG impact of state and regional efforts is shown in **Table 5**. As outlined in the table, state efforts reduce BAU emissions by 205,060 MTCO<sub>2</sub>e in 2020 and by 440,650 MTCO<sub>2</sub>e in 2035

**TABLE 5 –SUMMARY OF STATE AND REGIONAL EFFORTS (MTCO<sub>2</sub>E)**

	2008	2010	2020	2035
BAU Forecast	1,270,170	1,306,110	1,494,980	1,810,160
BAU Forecast Growth Percentage		3%	18%	43%
Pavley I – Clean Car Fuel Standard	–	0	-81,150	-159,460
Renewables Portfolio Standard	–	-19,700	-90,800	-173,690
CALGreen & 2008 Title 24 Standards	–	0	-31,210	-105,400
Caltrain Electrification	–	0	-1,900	-2,100
Total State/Regional Reductions	–	-19,700	-205,060	-440,650
Adjusted BAU Forecast	1,270,170	1,286,410	1,289,920	1,369,510
ABAU Forecast Growth Percentage	0%	1%	2%	8%

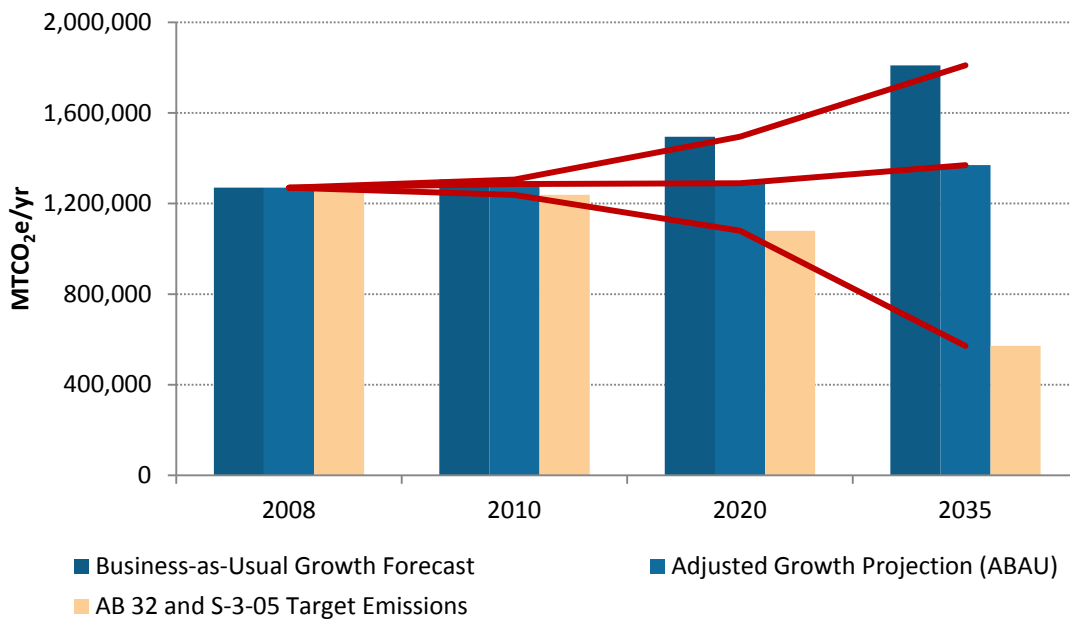
**Figure 9** identifies how the ABAU projection will influence the City's emissions when compared to the BAU forecast. Implementation of the state and regional policies and programs listed above will lessen the City's projected growth in GHG emissions from 18% to 2% by 2020 and from 43% to 8% by 2035.

**FIGURE 9 – 2008–2035 SUNNYVALE BAU AND ABAU FORECAST (MTCO<sub>2</sub>E)**

## GHG REDUCTION TARGETS

While these reductions represent a significant reduction, AB 32 recommends that local governments adopt a GHG reduction target of 15% below present (2005–2008) levels by 2020. Furthermore, former Governor Schwarzenegger signed Executive Order S 3-05 in 2005 to establish a statewide goal of achieving an 80% reduction below 1990 GHG emissions levels by 2050. The Executive Order S-3-05 reduction goal would be equivalent to a 95% reduction below 2008 emissions in Sunnyvale by 2050.

After state and regional efforts are factored into Sunnyvale's growth forecast, the City's challenge to meet the GHG reduction targets of 15% below baseline levels by 2020 and progress toward the 80% below 1990 levels by 2050 will be fulfilled by the Climate Action Plan. **Figure 10** identifies the gap between the City's GHG emissions forecast and the GHG reduction targets if there are not policies and programs developed to reduce GHG emissions.

**FIGURE 10 – GREENHOUSE GAS EMISSIONS FORECASTS AND STATE REDUCTION TARGETS**

This Climate Action Plan identifies GHG reduction strategies to close the gap between the ABAU forecast and the target emissions, as depicted in **Figure 10**. This Climate Action Plan identifies GHG reduction strategies to reduce emissions by a minimum of 237,960 MTCO<sub>2</sub>e, or 17% of total baseline emissions, to reach the GHG reduction target by 2020.

## CHAPTER 3

### GHG EMISSIONS REDUCTION STRATEGIES

The reduction measures included in this Plan are a diverse mix of regulatory and incentive-based programs for both new and existing development. The reduction measures also aim to reduce GHG emissions from each source to avoid reliance on any one strategy or sector to achieve the target.



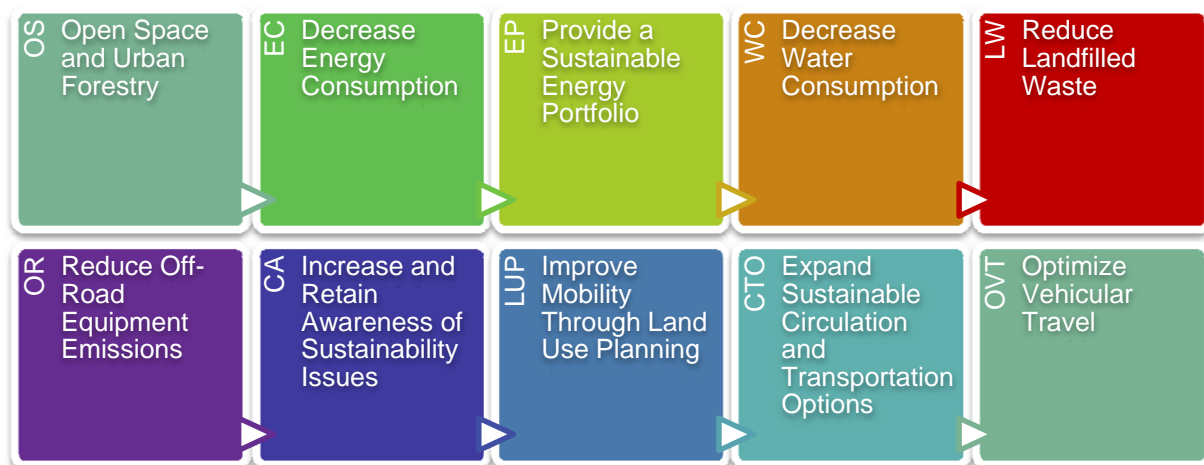


The reduction measures included in this Plan are a diverse mix of regulatory and incentive-based programs for both new and existing development. The reduction measures also aim to reduce GHG emissions from each source to avoid reliance on any one strategy or sector to achieve the target. The following chapter describes the process for developing, refining, and quantifying the GHG reduction goals, strategies, and actions identified to achieve the City's GHG reduction targets.

## REDUCTION STRATEGY STRUCTURE

In order to achieve the state-recommended reduction target of 15% below 2008 emissions levels by 2020, the City of Sunnyvale will need to achieve the goals and implement the policies and actions set forth in this chapter. The City's strategy is structured around the ten topic areas identified in **Figure 11**.

**FIGURE 11 – GHG REDUCTION GOALS**

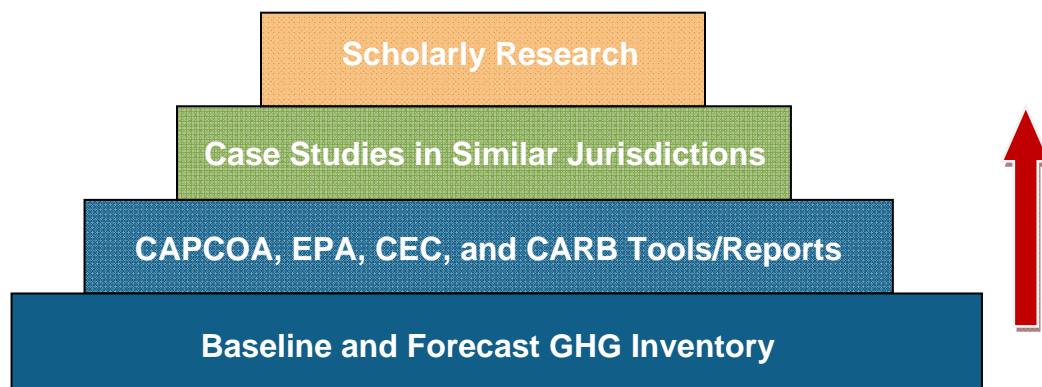


Each topic area has a corresponding goal, reduction measures, and supporting actions necessary for implementation. The process for developing GHG reduction measures included a review of existing policies, activities, and programs; identification of topic areas or goals based on the City's emissions inventory and sustainability vision; and preparation of preliminary reduction measure language with performance targets and indicators. The preliminary measures were refined through the staff and community engagement process and evaluated for political, technical, and financial feasibility (see **Figure 12**). The final step to developing each GHG reduction measure is to identify how each policy will be successfully implemented by determining the GHG reduction benefit, the time frame for implementation, the estimated costs and savings to the community and the City, potential sources of funding, the department responsible for implementation, and the additional benefits, or co-benefits, that may occur from implementation of each measure.

**FIGURE 12 – GHG REDUCTION MEASURE DEVELOPMENT PROCESS**

The GHG reduction benefit of each measure is determined by a change in operation, activity, or efficiency. In general, there are three types of reductions in climate action plans: (1) avoided emissions, (2) greater efficiency, and (3) sequestration. GHG reduction estimates are identified for 2015, 2020, and 2035.

The information used to estimate GHG emissions reductions is summarized in **Figure 13**. The baseline GHG inventory and forecast serve as the foundation for quantifying the City's GHG reduction measures. Activity data from the inventory, e.g., vehicle miles traveled (VMT) and kilowatt-hours (kWh) of electricity, is combined with the performance targets and indicators identified in this Plan to calculate the GHG reduction benefit of each measure. This approach ensures that the City's GHG reductions are tied to the baseline and future activities that are actually occurring in Sunnyvale.

**FIGURE 13 – GHG QUANTIFICATION SOURCES AND TOOLS**



Whenever possible, emissions reduction estimates are based on tools and reports provided by government agencies such as the US Environmental Protection Agency (EPA), California EPA, California Energy Commission (CEC), California Air Resources Board (CARB), California Air Pollution Control Officers Association (CAPCOA), and local air districts. If accurate reduction estimates are not available through these tools, a case study may be used if the case study is comparable to the conditions in the city. Finally, for more long-range reduction measures that lack actual on-the-ground testing or analysis, current scholarly and peer-reviewed research is combined with knowledge of existing city practices to create a defensible estimate of future emissions reductions.

To demonstrate the types of information and performance indicators that go into quantifying each measure, a detailed example calculation is provided in **Table 6**.

**TABLE 6 – EXAMPLE MEASURE QUANTIFICATION**

Example Measure: Implement residential energy efficiency program.			
	Quantification Data	Year: 2020	Data Source
A	Total residential electricity use (kWh)	600,000,000	Example GHG Inventory Forecast
B	Total households	100,000	US Census Data
C	Average electricity use per household	6,000	Calculation = A/B
D	Percentage of households participating in program	5%	Measure goal
E	Total households participating in program	5,000	Calculation = B*D
F	Average electricity savings per participant	5%	Case studies from cities A and B
G	Total electricity savings	1,500,000	Calculation = C*E*F
H	Metric ton of CO <sub>2</sub> e per kWh	0.0002	Example City GHG Inventory
I	Emissions reduction (MTCO <sub>2</sub> e)	300	Calculation = G*H

The methodology for determining the GHG reduction benefit from each measure is detailed in the GHG technical **Appendix B**, which summarizes the sources and assumptions used to estimate the GHG reductions from each measure.

## REDUCTION MEASURE CRITERIA

In order to ensure successful implementation and evaluation of the GHG reduction measures included in this Climate Action Plan, the following criteria have been identified in this Plan or the associated implementation matrix:

- Implementation Time Frame
- Estimated Cost to the City
- Cost and Savings Estimates to the Community
- Implementing Department
- Supporting Agencies
- Community Co-Benefits

**Implementation Time Frame:** The phase in which this measure should begin implementation. Time frames include:

- Near-Term – before 2016
- Mid-Term – before 2020
- Long-Term – after 2020

**Costs and Savings to the City and Community:** Plan-level cost estimates are provided to allow for comparison between measures and to assess savings and costs. These costs are based on the best available information at the time this Plan was developed and are represented in total annual costs or savings by 2020. For simplicity, these costs and savings are presented in the following ranges provided in **Table 7**.

**TABLE 7 – COSTS AND SAVINGS TO THE COMMUNITY RANGES**

Numeric Value (\$)	Range
0	Minimal
1–25,000	Low
25–100,000	Low-Medium
100,000–200,000	Medium
200,000–500,000	Medium-High
500,000–1,000,000	High
Over 1 million	Very High

**Implementing Department and Supporting Agencies:** City department or division that will take the lead on implementing and reporting process on the selected measure. Other departments and divisions will likely play a major supporting role; however, this department/division is the leader.

**Applicability:** Designates the type of development to which the measure applies. There are four options:

- Municipal – applies to municipal operations
- New Development – applies to new development applications only
- Existing Development – applies to existing development
- New & Existing Development – applies to new and existing development.

**Community Co-Benefits:** An additional benefit occurring from the implementation of a GHG reduction measure that is not directly related to reducing greenhouse gas emissions. In this document, the co-benefits are defined as follows:



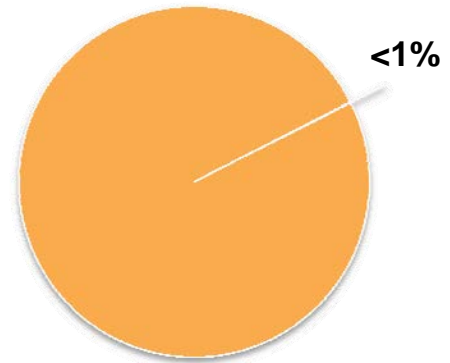
**Performance Indicator:** Performance indicators and targets are readily available statistics that signify a reduction in GHG. These indicators allow the City to measure progress and track implementation of each measure.

## REDUCTION MEASURES

### Open Space and Urban Forestry (OS)

**Goal:** Provide local open space resources that support natural processes and provide rest, relaxation, and recreation opportunities.

Open space refers to natural and built environments within and surrounding the city that provide the community with opportunities for recreation, socialization, and public enjoyment. This goal aims to expand opportunities and access to open spaces such as neighborhood parks, outdoor spaces in commercial or residential areas, and meeting spaces. By providing additional access to these spaces and creating more inviting public environments through urban tree planting, the Sunnyvale community can reduce energy use, sequester carbon, and foster a stronger sense of community. The Horizon 2035 vision is to create a community that has at least 80% of paved areas shaded by tree canopy by 2035.



OS contribution to total GHG reductions

### Open Space and Urban Forestry Measures

#### OS-1 Open Space

Maintain and increase the amount of open space in Sunnyvale consistent with the Council policy and the Consolidated General Plan so that there is a minimum of 5.34 acres per 1,000 population.

*Action Items:*

- OS-1.1. Achieve and maintain an open space to population ratio of 5.5 acres per 1,000 residents.

#### OS-1 Key Information

##### GHG Reductions

2020: 20 MTCO<sub>2</sub>e  
2035: 50 MTCO<sub>2</sub>e

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Departments

Community Services &  
Community Development

## OS-2 Outdoor Meeting Space

Provide availability and access to outdoor space for recreation or social purposes, including access to public open spaces on privately owned property such as retail shopping centers.

### OS-2 Key Information

#### GHG Reductions

2020: Supportive Measure

2035: Supportive Measure

#### Co-Benefits



#### Implementation Time Frame

Near-Term

#### Responsible Department

Community Development

## OS-3 Urban Forestry

Increase the number of shade trees planted in the community, and protect the existing tree stock.

### *Action Items:*

- OS-3.1. Continue to implement the City's Tree Preservation requirements.
- OS-3.2. Develop and implement canopy coverage requirements for City-owned parking lots, with exceptions for solar installations.
- OS-3.3. Promote tree planting on private property through incentive and support programs.
- OS-3.4. Expand existing park, open space, and boulevard tree inventory through the replacement of trees with a greater number of trees when trees are removed due to disease, park development, or other reasons.
- OS-3.5. Clarify codes and policies to maximize the preservation of the largest longest-living trees, and ensure the expansion of the urban forest over time as appropriate for the site.

### OS-3 Key Information

#### GHG Reductions

2020: 290 MTCO<sub>2</sub>e

2035: 730 MTCO<sub>2</sub>e

#### Co-Benefits



#### Implementation Time Frame

Mid-Term

#### Responsible Department

Public Works

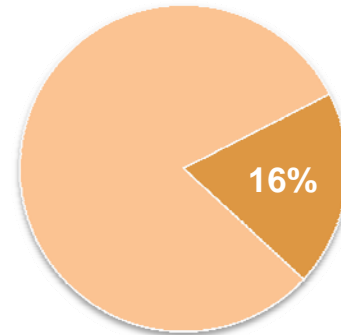
## Decrease Energy Consumption (EC)

**Goal:** Improve energy efficiency and conservation in the community and City operations.

The intent of this goal is to improve the energy efficiency of buildings. Implementation of energy conservation measures will not only reduce GHG emissions but will also reduce household and business costs associated with energy consumption.

Greenhouse gas emissions are created by the consumption of electricity and natural gas. Electricity and natural gas consumption supports businesses, industrial facilities, and homes. Electricity powers appliances that are the cornerstones of daily life, from personal appliances to local infrastructure such as traffic signals. Natural gas is used to heat water, to power natural gas cooking ranges, and in on-site fuel combustion that supports manufacturing and industrial processes.

Greater efficiencies in existing levels of energy consumption can be realized while still supporting the needs of our existing and future community. These measures target efficiencies in electricity and natural gas use in homes and businesses to reduce emissions. In Sunnyvale, where the majority of future GHG emissions will come from existing buildings, it is critical that this Plan include energy conservation measures that focus on improving the efficiency of existing buildings and ensuring that new construction projects utilize electricity and natural gas as efficiently as possible.



*EC contribution to total GHG reductions*

## Decrease Energy Consumption Measures

### EC-1 Lighting Efficiency

Increase the use of efficient indoor and outdoor lighting technologies.

#### Action Items:

- EC-1.1. Replace City-owned streetlights and park and parking lot lighting with energy-efficient lighting such as light-emitting diode (LED) or induction lights as technology becomes more affordable and when return on investment is less than five years.
- EC-1.2. Participate in an illumination bank that provides loans for upfront cost of energy-efficient lighting technologies to be paid back over three to seven years.
- EC-1.3. Require new private parking lot lighting to use energy-efficient lighting technologies.

#### EC-1 Key Information

##### GHG Reductions

2020:	220	MTCO <sub>2</sub> e
2035:	210	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Departments

Public Works & Community Development

### EC-2 New Construction and Remodels

Require green building practices in new residential and commercial development and remodels.

#### Action Items:

- EC-2.1. Evaluate and update the 2009 Zoning Code for Green Buildings for single-family, multi-family, and nonresidential building construction and major remodels every three to five years consistent with upgrades to the California Green Building Standards Code (CALGreen).
- EC-2.2. Continue to require energy-efficient siting of buildings. Buildings should be oriented and landscape material should be selected to provide maximum energy efficiency for the buildings.
- EC-2.3. Continue to provide incentives for new construction and remodels to adhere to a higher green building standard than required by the City.

#### EC-2 Key Information

##### GHG Reductions

2020:	4,440	MTCO <sub>2</sub> e
2035:	10,570	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Department

Community Development



### EC-3 Residential Energy Efficiency

Reduce residential energy use, with emphasis on existing homes built before 1990.

#### Action Items:

- EC-3.1. Participate in a Property Assessed Clean Energy (PACE) or similar financing program to offer low-interest loans to residents for energy-efficiency upgrades.
- EC-3.2. Prioritize non-general funds to assist low-income homeowners achieve energy-efficient improvements. Program annual Community Development Block Grant (CDBG) funds to fund weatherization programs.

### EC-4 Commercial Energy Efficiency

Establish a regulatory and incentive-based structure that facilitates commercial and industrial energy efficiency and conservation.

#### Action Items:

- EC-4.1. Consistent with California AB 1103, require all nonresidential building owners to disclose building energy consumption and building energy ratings upon sale or lease of the building.
- EC-4.2. Participate in a Property Assessed Clean Energy (PACE) or similar financing program to offer low-interest loans to businesses for energy efficiency upgrades.
- EC-4.3. Create an ordinance to facilitate energy efficiency improvements in nonresidential buildings through incentives and regulations that may include energy performance reports, time of sale upgrades, and/or innovative partnerships to reduce energy use.
- EC-4.4. Identify businesses that are likely to be the largest consumers of energy within the city and target City outreach to these businesses.

#### EC-3 Key Information

##### GHG Reductions

2020: 4,160 MTCO<sub>2</sub>e

2035: 9,090 MTCO<sub>2</sub>e

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Department

Community Development

#### EC-4 Key Information

##### GHG Reductions

2020: 47,900 MTCO<sub>2</sub>e

2035: 60,520 MTCO<sub>2</sub>e

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Department

Community Development

## EC-5 Smart Grid

Increase awareness and utilization of real-time energy consumption data and pricing available through PG&E's Smart Meter program.

### Action Items:

- EC-5.1. Require new construction and major remodels to install interior real-time energy monitors.
- EC-5.2. Connect businesses and residents with rebate programs that give priority to appliances with smart grid technology.
- EC-5.3. Inform the community of metering options, such as online applications and in-home monitors.

## EC-6 "Cool" Roofs and Pavements

Reduce the amount of dark, non-reflective roofing and paving material in order to mitigate the urban heat island effect and reduce energy associated with heating and cooling.

### Action Items:

- EC-6.1. Require all new and resurfaced parking lots, sidewalks, and crosswalks to be made of materials with high reflectivity, such as concrete or reflective aggregate in paving materials.
- EC-6.2. Require new multi-family buildings and re-roofing projects to install "cool" roofs consistent with the current California Green Building Code (CALGreen) standards for commercial and industrial buildings.
- EC-6.3. Commit to using a warm aggregate mix for all asphalt patching, overlay, and reconstruction.
- EC-6.4. Consider the lifespan and embedded GHG content of pavement materials for public projects.

### EC-5 Key Information

#### GHG Reductions

2020: 10,300 MTCO<sub>2</sub>e  
2035: 12,050 MTCO<sub>2</sub>e

#### Co-Benefits



#### Implementation Time Frame

Mid-Term

#### Responsible Department

Community Development

### EC-6 Key Information

#### GHG Reductions

2020: 470 MTCO<sub>2</sub>e  
2035: 1,200 MTCO<sub>2</sub>e

#### Co-Benefits



#### Implementation Time Frame

Long-Term

#### Responsible Department

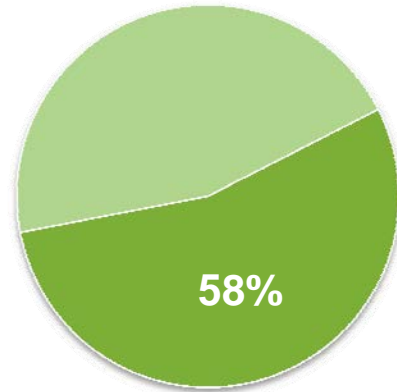
Community Development  
& Public Works

## Provide a Sustainable Energy Portfolio (EP)

**Goal:** Increase the amount of renewable energy produced in the city and facilitate a higher renewable mix for energy delivered to the city.

Conserving energy and improving energy efficiency in the built environment is the first step to reducing energy consumption; however, a minimum level of energy is necessary to support a functioning built environment and economy. The intent of this goal is to shift energy consumption that cannot be reduced through energy efficiency away from traditional electricity and natural gas to renewable energy sources. Both natural gas and electricity can be offset with renewable sources of energy that are profitable, yield cost savings to users, and spur local energy independence.

Through this goal, Sunnyvale will reduce greenhouse gas emissions from traditional electricity production and natural gas by significantly increasing the production of on-site renewable energy or the procurement of energy from additional renewable sources beyond what is currently provided.



*EP contribution to total GHG reductions*

### Sustainable Energy Portfolio Measures

#### EP-1 Renewable Energy Portfolio

Increase the renewable energy portfolio of electricity delivered to Sunnyvale so that more than 50% of delivered energy comes from renewable sources by 2035.

*Action Items:*

- EP-1.1. Create or join a community choice aggregation (CCA) program to take control of power generation for city residents and businesses.

#### EP-1 Key Information

##### GHG Reductions

2020:	233,400	MTCO <sub>2</sub> e
2035:	338,420	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Department

Environmental Services

## EP-2 Local Renewable Energy

Increase the number of renewable energy installations in and available to the community.

### *Action Items:*

- EP-2.1. Require new homes and businesses and major remodels to be “solar ready” by pre-wiring for solar water heating and solar electricity.
- EP-2.2. Participate in a Property Assessed Clean Energy (PACE) or similar financing program to offer low-interest loans to residents and businesses for renewable energy installations.
- EP-2.3. Prevent buildings and additions from shading more than 10% of roofs of other structures.
- EP-2.4. Continue to allow and encourage solar facilities above paved parking areas.
- EP-2.5. Maintain incentives for alternative energy installations in new and existing development, including solar and small-scale wind turbines.
- EP-2.6. Advocate for the development of a regional or statewide feed-in tariff that further encourages the development of mid-sized renewable energy installations.

### EP-2 Key Information

#### GHG Reductions

2020: 20,980 MTCO<sub>2</sub>e

2035: 24,670 MTCO<sub>2</sub>e

#### Co-Benefits



#### Implementation Time Frame

Mid-Term

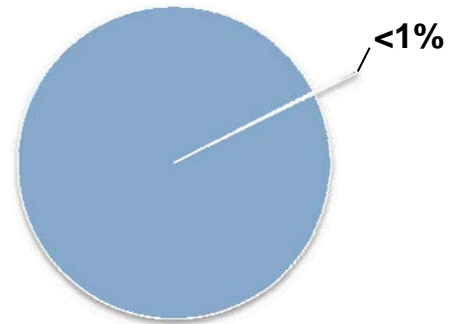
#### Responsible Department

Community Development

## Decrease Water Consumption (WC)

**Goal:** Reduce water-related greenhouse gas emissions through reclamation, conservation, and improvements to the water and wastewater processes.

Water consumption requires energy to pump, treat, distribute, collect, and discharge water as it is used by the community which results in greenhouse gas emissions. Greenhouse gas emissions also occur as a direct process from wastewater treatment. Conservation and more efficient use of water are both important strategies to reducing GHG emissions from water use and adapting to reduced water availability that may occur due to a changing climate.



WC contribution to total GHG reductions

This goal identifies opportunities to reduce energy-intensive water consumption from both new construction projects and existing development. Through the implementation of water efficiency measures and increased use of recycled water, the need to procure additional water sources in the future will be reduced.

### Decrease Water Consumption Measures

#### WC-1 Water Sources and Efficiency

Decrease the amount of energy needed to filter, transport, and treat water used within Sunnyvale.

##### *Action Items:*

- WC-1.1. Prepare a feasibility study to expand the City's current recycled water program citywide and improve the quality of recycled water to expand potential uses to industrial facilities or other applications.
- WC-1.2. Promote "purple pipe" (reclaimed water) infrastructure in new construction or major renovation in preparation for a growing, usable network.
- WC-1.3. Create a purple pipe network for citywide use of recycled water for irrigation and other outdoor purposes.
- WC-1.4. Create flexible provisions and encourage residents and businesses to collect rainwater to use for irrigation purposes.

#### WC-1 Key Information

##### GHG Reductions

2020: 230 MTCO<sub>2</sub>e

2035: 530 MTCO<sub>2</sub>e

##### Co-Benefits



##### Implementation Time Frame

Long-Term

##### Responsible Departments

Environmental Services &  
Public Works

## WC-2 Water Conservation

Reduce indoor and outdoor potable water use in residences, businesses, and industry.

### Action Items:

- WC-2.1. Require new development to reduce potable indoor water consumption by 30% (Tier 1 CALGreen) and outdoor landscaping water use by 40%.
- WC-2.2. Revise development standards to ensure the use of greywater, recycled water, and rainwater catchment systems is allowed in all zones.
- WC-2.3. Require new open space and street trees to be drought-tolerant.
- WC-2.4. Implement the City's Urban Water Management Plan to facilitate a 20% reduction in per capita water use by 2020.

### WC-2 Key Information

#### GHG Reductions

2020:	750	MTCO <sub>2</sub> e
2035:	990	MTCO <sub>2</sub> e

#### Co-Benefits



#### Implementation Time Frame

Near-Term

#### Responsible Department

Community Development  
& Public Works

### Water Conservation in Action

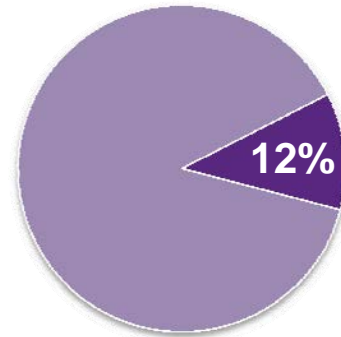
The Santa Clara Valley Water District (SCVWD) offers numerous rebates to residents and businesses in Santa Clara County. Through the water district's Landscape Rebate Program, Lockheed Martin converted a total of 24,532 square feet of irrigated turf to qualifying low-water-using landscape and overhead spray irrigation to drip irrigation at two of its Bay Area campuses. The company also upgraded 31 irrigation controllers to weather-based irrigation controllers. These changes will save an estimated 2.7 million gallons of water a year.

Lockheed Martin also participated in SCVWD's High-Efficiency Toilet Program, which provides the toilets and installation free of charge, allowing the company to replace 325 toilets and 180 urinal flush valves at no cost. The water district also provided 55 faucet aerators; the company then purchased and installed an additional 445 aerators. The total estimated amount of water conserved is nearly 8 million gallons per year, with an estimated savings of \$64,000 per year in ongoing water and sewer costs.

## Reduce Landfilled Waste (LW)

**Goal:** Decrease the amount of waste sent to landfill through increased recycling, composting, and materials management.

In 2008, the City Council adopted a Zero Waste Policy and directed staff to prepare a long-range plan to achieve zero waste in Sunnyvale. The policies in this Climate Action Plan related to waste build upon the City's 2010 waste characterization study by identifying opportunities to decrease waste sent to local or regional landfills through reduction in materials at the source and in day-to-day activities, an increase in recycling, and re-using as appropriate to move toward a Zero Waste community.



*LW contribution to total GHG reductions*

Both the consumption and disposal of resources require energy and emit greenhouse gases. As waste is sent to the landfill, it decomposes and emits methane gas. By providing additional opportunities to reduce waste generated and recycle or compost waste that cannot be eliminated, waste disposal trends within the community can be reduced. This decreased waste will in turn reduce GHG emissions associated with waste disposal.

## Reduce Landfilled Waste Measures

### LW-1 Materials Management

Reduce the availability or use of common materials that are not recyclable or that are cost-ineffective to recycle.

#### *Action Items:*

- LW-1.1. Reduce the use of plastic bags at grocery stores and convenience stores in the community through incentives or requirements.
- LW-1.2. Ban the sale or dispersal of disposable, single-use plastic water bottles at public events permitted by the City.
- LW-1.3. Ban the use of expanded polystyrene (EPS) take-out containers at restaurants and fast-food facilities.

### LW-1 Key Information

#### GHG Reductions

2020: Supportive Measure

2035: Supportive Measure

#### Co-Benefits



#### Implementation Time Frame

Long-Term

#### Responsible Department

Community Development  
& Environmental Services



## LW-2 Recycling and Composting

Increase the amount of waste recycled and composted by 1% per year according to the City's Zero Waste Strategic Plan.

### *Action Items:*

- LW-2.1. Require multi-family homes to participate in the City's Multi-family Recycling Program.
- LW-2.2. Select materials to be targeted for diversion and diversion methods, services, or technologies based on the results of the Zero Waste Strategic Plan.

### LW-2 Key Information

#### GHG Reductions

2020:	53,960	MTCO <sub>2</sub> e
2035:	96,190	MTCO <sub>2</sub> e

#### Co-Benefits



#### Implementation Time Frame

Near-Term

#### Responsible Department

Public Works &  
Environmental Services

### Sunnyvale's Zero Waste Goal

In 2008, the Sunnyvale City Council adopted a Zero Waste Policy and directed staff to prepare a long-range Zero Waste Strategic Plan. To achieve zero waste, the first step is to characterize the types of waste that are being disposed and then identify opportunities to reduce, reuse, or recycle that waste.

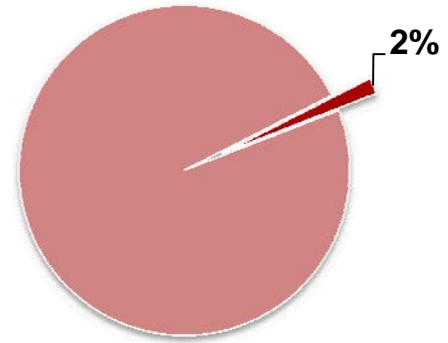
In 2010, the cities of Sunnyvale and Mountain View completed a waste characterization study to provide a detailed look at what types of waste the communities throw away at the Sunnyvale Materials and Recovery Transfer (SMaRt) Station. By determining the types of waste that are currently disposed of at the SMaRt facility, the cities can identify additional opportunities for recycling or collecting food waste and diverting that waste from landfills.

The study found that approximately 76% (53,476 tons) of waste (excluding construction and demolition waste), prior to sorting at the SMaRt facility, fall into the recoverability categories of recyclable paper, other recyclables, and compostable/potentially compostable (Cascadia Consulting Group 2010).

## Off-Road Equipment (OR)

**Goal:** Minimize emissions from off-road lawn and garden and construction equipment.

Construction and lawn and garden equipment combust gasoline and diesel fuel, producing greenhouse gas emissions and releasing other air contaminants such as particulate matter on-site. These two categories of equipment have significant opportunities to be used more efficiently and save users money without impeding business and development opportunities in Sunnyvale.



OR contribution to total GHG reductions

This goal aims to provide alternatives and cost-effective options for using more efficient equipment. Alternatives include electric equipment, alternative fuels, or even solar-powered equipment.

### Off-Road Equipment Measures

#### OR-1 Lawn and Garden Equipment

Encourage residents and businesses to use efficient lawn and garden maintenance equipment or to reduce the need for landscape maintenance through native planting.

##### Action Items:

- OR-1.1. Partner with the Bay Area Air Quality Management District to re-establish a voluntary exchange program for residential electric lawnmowers and backpack-style leaf blowers.
- OR-1.2. Require new buildings to provide electrical outlets on the exterior in an accessible location to charge electric-powered lawn and garden equipment.
- OR-1.3. In project review, encourage the replacement of high-maintenance landscapes (like grass turf) with native vegetation to reduce the need for gas-powered lawn and garden equipment.

#### OR-1 Key Information

##### GHG Reductions

2020:	30	MTCO <sub>2</sub> e
2035:	100	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Long-Term

##### Responsible Department

Community Development

## OR-2 Construction Equipment

Reduce emissions from heavy-duty construction equipment by limiting idling and utilizing cleaner fuels, equipment, and vehicles.

### Action Items:

- OR-2.1. Idling times will be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]), or less. Clear signage will be provided at all access points to remind construction workers of idling restrictions.
- OR-2.2. Construction equipment must be maintained per manufacturer's specifications.
- OR-2.3. Planning and Building staff will work with project applicants to limit GHG emissions from construction equipment by selecting one of the following measures, at a minimum, as appropriate to the construction project:
  - a. Substitute electrified or hybrid equipment for diesel- and gasoline-powered equipment where practical.
  - b. Use alternatively fueled construction equipment on-site, where feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel.
  - c. Avoid the use of on-site generators by connecting to grid electricity or utilizing solar-powered equipment.
  - d. Limit heavy-duty equipment idling time to a period of three minutes or less, exceeding CARB regulation minimum requirements of five minutes.

### OR-2 Key Information

#### GHG Reductions

2020:	7,400	MTCO <sub>2</sub> e
2035:	13,720	MTCO <sub>2</sub> e

#### Co-Benefits



#### Implementation Time Frame

Long-Term

#### Responsible Department

Community Development

## Increase and Retain Awareness of Sustainability Issues (CA)

**Goal:** Community members are knowledgeable about GHG emissions and are all taking actions to reduce them.

### Awareness of Sustainability Issues Measures

#### CA-1 Community Outreach and Involvement

Educate and involve the community regarding actions they can do at home to reduce energy, water, waste, and fuel consumption.

##### *Action Items:*

- CA-1.1. Create a structure or partner with other groups of volunteers, residents, and other organizations to help achieve Sunnyvale's sustainability goals.
- CA-1.2. Provide regular communication with schools, businesses, faith groups, community members, and neighborhood groups to increase participation in the city's progress toward sustainability.
- CA-1.3. Develop and encourage a mechanism for neighborhoods to share equipment and resources to improve sustainability.
- CA-1.4. Provide a toolkit of resources, including web-based efficiency calculators, for residents and businesses to analyze their greenhouse gas emissions in comparison to their neighborhood, the city, and the region.
- CA-1.5. Develop and implement a competitive greenhouse gas reduction program with an award component between groups of citizens in the city.
- CA-1.6. Use sustainability initiatives within City operations to educate the community on ways to achieve sustainability by example.
- CA-1.7. Actively promote the use of alternative modes of transportation as safe modes of travel. When applicable, promote viable programs sponsored by 511.org, the BAAQMD, and other recognized agencies on the City's website and publications.
- CA-1.8. Through selected projects and efforts to improve City operations, demonstrate how sustainability efforts are possible and successful.

#### CA-1 Key Information

##### GHG Reductions

2020: Supportive Measure

2035: Supportive Measure

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Departments

Community Development,  
Sunnyvale Public Library, &  
Environmental Services

- CA-1.9. Make comparison an intrinsic part of consumption. Bring awareness of how our consumption compares to other communities, regions, and others in our neighborhood.
- CA-1.10. Use the City's Sustainability Commission and coordinator as a structure to coordinate with other groups of volunteers, residents, and other organizations to help achieve Sunnyvale's sustainability goals.
- CA-1.11. Actively engage with Sunnyvale businesses to identify areas for GHG reduction and financial savings.

## CA-2 School Education and Involvement

Educate local schoolchildren about climate change and ways that they and their families can reduce greenhouse gas emissions.

### *Action Items:*

- CA-2.1. Recommend and advocate for schools to use Bay Area Air Quality Management District curriculum or other programs for local schoolteachers to teach children about climate change, greenhouse gas emissions, and local actions.
- CA-2.2. Continue to provide and improve the bicycle driver education program for elementary, middle, and high school students.

### CA-2 Key Information

#### GHG Reductions

2020: Supportive Measure

2035: Supportive Measure

#### Co-Benefits



#### Implementation Time Frame

Near-Term

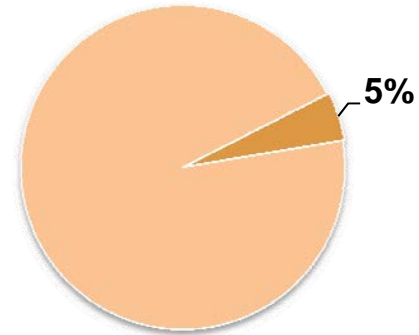
#### Responsible Departments

Environmental Services  
& Public Works

## Improve Mobility through Land Use Planning (LUP)

**Goal:** Utilize land use and planning tools to reduce or eliminate vehicle trips while still completing the activities of our everyday lives.

The distribution of land uses throughout the city shapes community transportation choices. In order to take part in the tasks of daily living, each day people must make choices about transportation that have a direct impact on GHG emissions. Transportation is the second largest contributor of GHGs within the city and one of the most complex sectors to address. Economic considerations, neighborhood boundaries, and other factors can complicate actions to optimize land use and transportation options.



*LUP contribution to total GHG reductions*

The goal to improve community mobility through land use planning and reduce emissions from transportation requires a multifaceted approach that includes an improved mixture of land uses, improved connectivity and circulation in existing neighborhoods, parking reduction strategies, provision of affordable housing, and an improved jobs/housing balance.

The measures in this section further support the City's implementation of the Sustainable Communities Strategy (SCS), although the GHG reduction impact of the SCS is not quantified separately. The City's designated Priority Development Areas (PDA) are identified in the Santa Clara Valley Transit Authority's (VTA) Core, Corridors, and Station Area Plan. Within Sunnyvale, the areas designated as PDAs include:

- Downtown & Caltrain Station
- East Sunnyvale
- El Camino Real Corridor
- Lawrence Station transit Village
- Tasman Crossing

## Land Use Planning Measures

### LUP-1 Parking

Reduce the amount of free or unrestricted parking available within the city to promote alternative modes of transportation and avoid unnecessary vehicle circulation.

#### *Action Items:*

- LUP-1.1. Build and maintain an electronic parking management system for City-owned parking structures in the downtown and consider expanding to other City lots in the downtown and in proximity to other commercial areas.
- LUP-1.2. Create maximum parking requirements and reduce minimum parking requirements for mixed-use development. Require parking lot sharing for mixed-use or commercial development with complementary hours of operation.
- LUP-1.3. Implement parking management tools for residential uses such as decreased or flexible standards, unbundled parking, and shared parking plans.
- LUP-1.4. Establish parking meters throughout downtown Sunnyvale to optimize parking availability and reduce unnecessary vehicle circulation.
- LUP-1.5. Retain a residential parking permit program for residential areas adjacent to commercial areas of the city where parking is in higher demand.
- LUP-1.6. Designate street parking stalls in the vicinity of key commercial and multi-family residential locations for efficient or alternatively fueled vehicles.

#### LUP-1 Key Information

##### GHG Reductions

2020:	4,970	MTCO <sub>2</sub> e
2035:	5,350	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Department

Public Works



## LUP-2 Transit-Oriented, Higher Density, Mixed-Use Development

Facilitate development in designated core and corridor areas that is transit-oriented, higher density, and mixed-use.

### *Action Items:*

- LUP-2.1. Continue to plan for most new residential, commercial, and industrial developments in specific plan areas, near transit, and close to employment and activity centers.
- LUP-2.2. Continue to identify underutilized areas that can support higher-density housing and mixed-use development.
- LUP-2.3. Facilitate the development of affordable housing near transit.
- LUP-2.4. Expand the zoning opportunities for the construction of accessory dwelling units in existing residential neighborhoods near transit as a means to increase affordable housing near transit.
- LUP-2.5. Continue to allow for the development of live/work spaces in commercial zoning districts and mixed-use residential zoning districts.

### LUP-2 Key Information

#### GHG Reductions

2020: 14,010 MTCO<sub>2</sub>e  
2035: 15,090 MTCO<sub>2</sub>e

#### Co-Benefits



#### Implementation Time Frame

Near-Term

#### Responsible Department

Community Development

## LUP-3 Local Commerce and Food

Increase the amount of locally generated and consumed goods in order to decrease the need for travel and promote healthier communities.

### *Action Items:*

- LUP-3.1. Amend the Zoning Code to allow small-scale, commercial urban farms to operate in residential areas.
- LUP-3.2. Ensure that every residential portion of mixed-use development has opportunities for growing produce locally.
- LUP-3.3. Establish community gardens for public use.
- LUP-3.4. Develop and implement a purchasing policy that requires food and other appropriate

### LUP-3 Key Information

#### GHG Reductions

2020: Supportive Measure  
2035: Supportive Measure

#### Co-Benefits



#### Implementation Time Frame

Long-Term

#### Responsible Departments

Community Development &  
Department of Finance

materials purchased by the City to be purchased from as local a supply as possible.

#### LUP-4 Jobs/Housing Balance

Plan for an improved jobs/housing balance in order to reduce the need for long-distance travel between residences and places of work.

##### *Action Items:*

- LUP-4.1. Support the retention and expansion of local anchor and growth industries.
- LUP-4.2. Review land use plans and regulations and revise as needed to support additional live/work opportunities and home occupations, provided they are compatible with the existing neighborhood.

#### LUP-4 Key Information

##### GHG Reductions

2020:	900	MTCO <sub>2</sub> e
2035:	970	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Departments

NOVA Workforce Services & Community Development

#### LUP-5 Distributed Services

Encourage the wider distribution of commonly used facilities and services in order to reduce the need for or length of vehicular trips to and from places of work and residence.

##### *Action Items:*

- LUP-5.1. Encourage the establishment and even distribution of neighborhood-serving facilities such as day-care providers, banking/ATM locations, markets, and drugstores in existing residential, commercial, and industrial areas in order to reduce the need for vehicle trips.
- LUP-5.2. Require new development to reduce the need for external trips by providing useful services/facilities on-site such as an ATM, vehicle refueling, and shopping.

#### LUP-5 Key Information

##### GHG Reductions

2020:	See LUP-4
2035:	See LUP-4

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Department

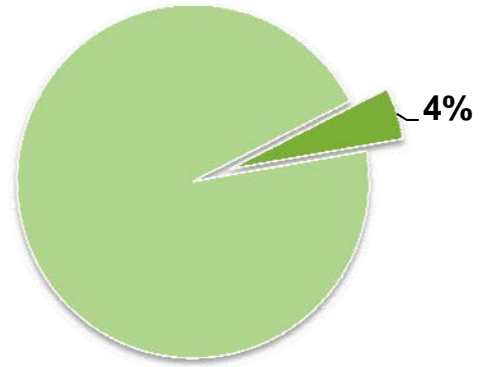
Community Development

## Expand Sustainable Circulation and Transportation Options (CTO)

**Goal:** Modify the transportation infrastructure such that bicycling, walking, and transit are viable options regularly used by all Sunnyvale residents and employees.

Expansion of mode choices within the community, in combination with an expanded diversity of land uses, can replace single-driver trips with low- or zero-emissions modes like walking, biking, transit, and carpooling.

The policies to expand sustainable circulation and transportation options include continued investment of the city's bicycle and pedestrian infrastructure, continued participation in transportation demand management programs for both employees and school-age children, and expanded transit opportunities.



CTO contribution to total GHG reductions

## Expand Sustainable Circulation and Transportation Options Measures

### CTO-1 Bicycle, Pedestrian, and Transportation Design Elements

Create streets and connections that facilitate bicycling, walking, and transit use throughout the city.

#### Action Items:

- CTO-1.1. Incorporate the provisions of AB 1358, the California Complete Streets Act of 2008, into roadway design, construction, and maintenance activities.
- CTO-1.2. Implement the street space allocation policy (RTC 8-085, April 28, 2009) in coordination with road reconstruction or resurfacing projects to provide road configurations that accommodate all travel modes.
- CTO-1.3. Require new development to provide cross-parcel access and linkages from the development entrance to the public sidewalk system, transit stops, nearby

#### CTO-1 Key Information

##### GHG Reductions

2020:	4,070	MTCO <sub>2</sub> e
2035:	4,380	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Departments

Public Works & Community Development

employment and shopping centers, schools, parks, and other parcels for ease of pedestrian and cyclist access.

- CTO-1.4. Improve pedestrian safety and comfort through design elements such as landscaped medians, pedestrian-level amenities, sidewalk improvements, and compliance with Americans with Disabilities Act (ADA) design standards, particularly for areas serving high volumes of traffic.
- CTO-1.5. Improve bicycle facilities and perceptions of comfort through pavement marking/coloring, physical separation, specialized signs and markings, and other design elements.
- CTO-1.6. Require sidewalks to be a minimum of 6 feet wide in order to allow side-by-side walking at identified locations that currently serve high pedestrian traffic volumes or locations planned to serve high volumes of pedestrian traffic.
- CTO-1.7. Actively promote intermodal linkages to and from regional transit options by establishing or improving well-defined, convenient intermodal hubs in downtown and specific plan areas. Work with the Valley Transportation Authority, Peninsula Corridor Joint Powers Board, Advisory Committee on Accessibility, and others to establish the best places for these locations.

## CTO-2 Bicycle, Pedestrian, and Transportation Travel Operations

Prioritize safe, efficient, and convenient access for non-automotive travel to destinations in and outside of Sunnyvale.

### Action Items:

- CTO-2.1. Require public areas and new development to provide bicycle parking consistent with the Valley Transportation Authority Bicycle Technical Guidelines, as amended.
- CTO-2.2. Require secure bicycle parking at public and large private events.
- CTO-2.3. Increase awareness of the city's bicycle facilities by updating the city bicycle map to show locations of public and private bicycle parking, creating a web-based application for members of the public to identify locations of private parking, and establishing information kiosks at key city locations to provide maps and highlight alternative modes of transportation.

### CTO-2 Key Information

#### GHG Reductions

2020: Supportive Measure

2035: Supportive Measure

#### Co-Benefits



#### Implementation Time Frame

Mid-Term

#### Responsible Departments

Public Works, Community Development, & Public Safety

- CTO-2.4. Fully fund the City's bicycle and pedestrian improvement plans for completion by 2035.
- CTO-2.5. Implement projects and programs to improve the safety of cyclists and pedestrians through increased enforcement of pedestrian right-of-way laws, removing crossing impediments, improving crossing time at signalized intersections for pedestrians and cyclists, requiring drive-through food establishments to serve bicyclists, and providing center refuge areas for pedestrians and bicyclists to pause when crossing arterials.
- CTO-2.6. Create at least one day a year when a portion of streets and plazas is designated for pedestrian and/or bicycle access only.
- CTO-2.7. Support business efforts to plan and implement a bike-sharing program for major commercial and industrial areas.

### CTO-3 Transit

Facilitate the use of public and private transit such as buses, Caltrain, Amtrak, and shuttles to and from Sunnyvale and within the city.

#### Action Items:

- CTO-3.1. Continue sponsoring projects to provide transit rider amenities at bus stops and rail stations.
- CTO-3.2. Work with the Valley Transportation Authority (VTA) and neighboring jurisdictions to provide transit priority signal timing in order to decrease travel time.
- CTO-3.3. Work with other agencies to provide High Occupancy Toll (HOT) lanes, and support expenditure of HOT lane revenue on projects that reduce vehicle miles traveled in Sunnyvale. Support regional congestion pricing measures.
- CTO-3.4. Advocate for transit service improvements by area transit providers consistent with established performance standards, with an emphasis on coordinating public transit schedules and connections and for subsidies for a higher level of transit service and/or more transit passes for residents and/or employees.
- CTO-3.5. Partner with GreenTRIP and other local or regional organizations to implement trip reduction programs in new residential, commercial, and mixed-use developments.

#### CTO-3 Key Information

##### GHG Reductions

2020:	5,920	MTCO <sub>2</sub> e
2035:	19,940	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Near-Term

##### Responsible Department

Community Development & Public Works

### CTO-4 Commute Programs

Reduce single-occupant vehicle trips to major employers (100 employees or more) located in Sunnyvale.

#### Action Items:

- CTO-4.1. Require existing and future major employers to utilize a variety of transportation demand management (TDM) measures such as flexible work schedules, telecommuting, guaranteed rides home, low- or no-cost transit passes, parking "cash-out" incentives, and other programs that provide employees with alternatives to single-occupant commutes.
- CTO-4.2. Create a TDM program for City staff to promote alternative transportation modes and carpooling to the greatest extent possible.
- CTO-4.3. Continue to provide density and other zoning incentives or procedural or financial incentives to developments for establishment of alternative transportation infrastructure within the private as well as adjacent public right-of-way, such as increased bicycle parking, separated sidewalks, bike lanes and signage, and change and shower facilities.
- CTO-4.4. Explore programs to encourage large employers to hire Sunnyvale residents.

#### CTO-4 Key Information

##### GHG Reductions

2020:	5,420	MTCO <sub>2</sub> e
2035:	5,840	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Department

Community Development & Public Works

#### Moffett Park Business & Transportation Association – A TDM Model

The Moffett Park Business & Transportation Association (MPBTA) is a nonprofit organization serving the nearly 14,000 employees and businesses in the 1,200-acre Moffett Park area of Sunnyvale. The MPBTA was formed through a public/private partnership in 2001 as the City and businesses recognized the benefits of pooled resources to implement successful transportation demand management (TDM) programs.

The MPBTA is responsible for organizing an annual employee commute survey, and provides services to employees in Moffett Park including: emergency ride home, shuttle programs to regional transit, free or reduced fare transit passes, educational and informational events on alternative transportation options, and coordination/support for business transportation coordinators at participating companies.

### CTO-5 School Commutes

Encourage carpooling, bicycling, walking, and transit access to elementary, middle, and high schools so that the number of car trips is no more than 50% of the number of students at any school.

#### *Action Items:*

- CTO-5.1. Support the creation of walking school bus programs in coordination with schools and parent organizations.
- CTO-5.2. Encourage schools to link employees and guardians of students with an online system such as 511.org that provides carpool matching.
- CTO-5.3. Continue to implement a Safe Routes to School program for increased bicycle and pedestrian safety to and from schools.

### CTO-5 Key Information

#### GHG Reductions

2020: 1,250 MTCO<sub>2</sub>e

2035: 2,220 MTCO<sub>2</sub>e

#### Co-Benefits



#### Implementation Time Frame

Mid-Term

#### Responsible Department

Public Works & Public Safety

### Safe Routes to School in Santa Clara County

Between 2008 and 2011, the City of Sunnyvale secured more than \$1.8 million in funding for capital improvements that support Safe Routes to School. This funding has been used to construct pedestrian and bicycle improvements on key school routes citywide.

Additionally, the Santa Clara County Department of Public Health received nearly \$1 million, in 2011, to create Safe Routes to School programs at local schools in the county. The program aims to increase safety at local schools primarily through educational programs such as bike rodeos, walking school buses, student safety traffic education, and family fun bike nights.

There are numerous benefits to Safe Routes To School programs including:

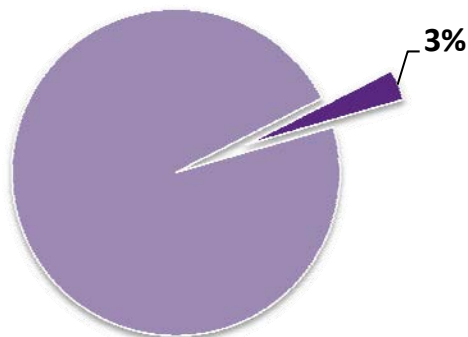
- Reduced traffic congestion surrounding schools.
- Increased physical activity for students.
- Improved air quality and reduced fuel consumption from idling vehicles.
- Increased community involvement.



## Optimize Vehicular Travel (OVT)

**Goal:** Minimize the environmental impact of vehicular travel.

While more efficient land use planning and increased circulation and transportation options will reduce vehicle trips in Sunnyvale, they cannot eliminate all vehicle trips. GHG emissions reductions will rely on increases in vehicle fuel efficiency and expansion of alternative fuel uses in Sunnyvale by providing the necessary infrastructure to support alternative fuel and zero emissions vehicles.



*OVT contribution to total GHG reductions*

Although the state and federal governments hold the primary responsibility to increase fuel efficiency standards of new vehicles and support the development of cost-competitive alternative fuels, there are several actions the City of Sunnyvale and the community can take to further support and spur the use of more efficient vehicles.

### Optimize Vehicular Travel Measures

#### OVT-1 Clean Alternative Motor Vehicles and Fuels

Promote the use of clean alternative motor vehicles and fuels to reduce emissions from vehicular travel.

##### *Action Items:*

- OVT-1.1. Designate preferred parking stalls for electric, hybrid, and other alternative fuel vehicles in all public and private parking lots consistent with the California Green Building Code.
- OVT-1.2. Secure funding to install electric vehicle recharging stations or other alternative fuel vehicle support infrastructure in existing public and private parking lots.
- OVT-1.3. Require sufficient electrical service in the garages/parking facilities of new residential development to support electric vehicle charging.
- OVT-1.4. Increase the number of efficient or alternatively fueled vehicles in the City fleet as vehicles are turned over.

#### OVT-1 Key Information

##### GHG Reductions

2020:	7,860	MTCO <sub>2</sub> e
2035:	19,980	MTCO <sub>2</sub> e

##### Co-Benefits



##### Implementation Time Frame

Long-Term

##### Responsible Department

Public Works &  
Environmental Services

- OVT-1.5. Collaborate with taxi franchises to use low-emissions vehicles such as hybrids, compressed natural gas vehicles, biodiesel vehicles, or electric vehicles.
- OVT-1.6. Explore zoning or other incentives to encourage alternative fuel stations like biodiesel and compressed or liquefied natural gas in place of or in combination with traditional gasoline and diesel fueling stations.
- OVT-1.7. Facilitate new fueling stations that offer alternative fuels.
- OVT-1.8. Accommodate neighborhood electric vehicles (NEVs) by enacting regulations consistent with the California Vehicle Code and the Manual of Uniform Traffic Control Devices.

### OVT-2 Car Sharing

Promote the use of car sharing in Sunnyvale in order to establish and maintain at least one viable car-share operation within the city by 2020.

#### *Action Items:*

- OVT-2.1. Work with car-sharing companies such as Zipcar and City Car Share to increase the availability of car-share programs in Sunnyvale.
- OVT-2.2. Identify appropriate locations, and require facilities for car-share vehicles in new parking garages, job centers, commercial cores, neighborhoods, and transit hubs.

### OVT-2 Key Information

#### GHG Reductions

2020:	1,810	MTCO <sub>2</sub> e
2035:	1,950	MTCO <sub>2</sub> e

#### Co-Benefits



#### Implementation Time Frame

Long-Term

#### Responsible Departments

City Manager & Community Development

### OVT-3 Circulation Efficiency

Improve the flow and efficiency of vehicular traffic throughout the city to avoid idling and reduce fuel consumption.

#### *Action Items:*

- OVT-3.1. Increase signal coordination as warranted to facilitate traffic flow along arterials and major collectors.
- OVT-3.2. Educate and enforce idling restrictions associated with delivery trucks and school pickups and drop-offs.

#### OVT-3 Key Information

##### GHG Reductions

2020: 4,110 MTCO<sub>2</sub>e  
2035: 4,180 MTCO<sub>2</sub>e

##### Co-Benefits



##### Implementation Time Frame

Mid-Term

##### Responsible Departments

Community Development &  
Public Works

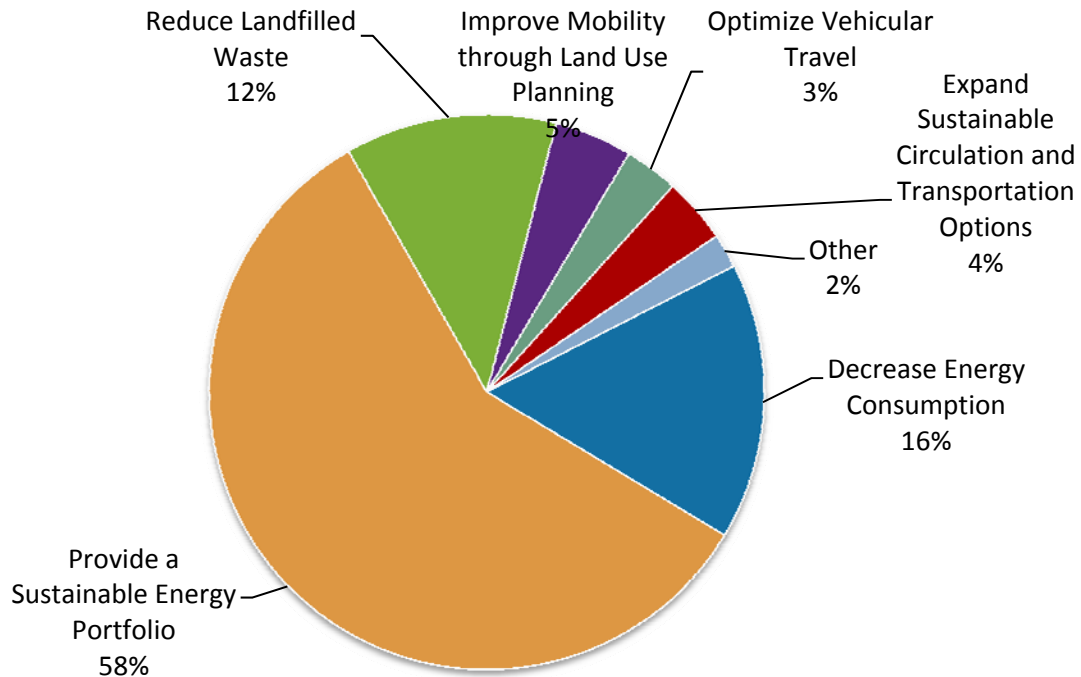
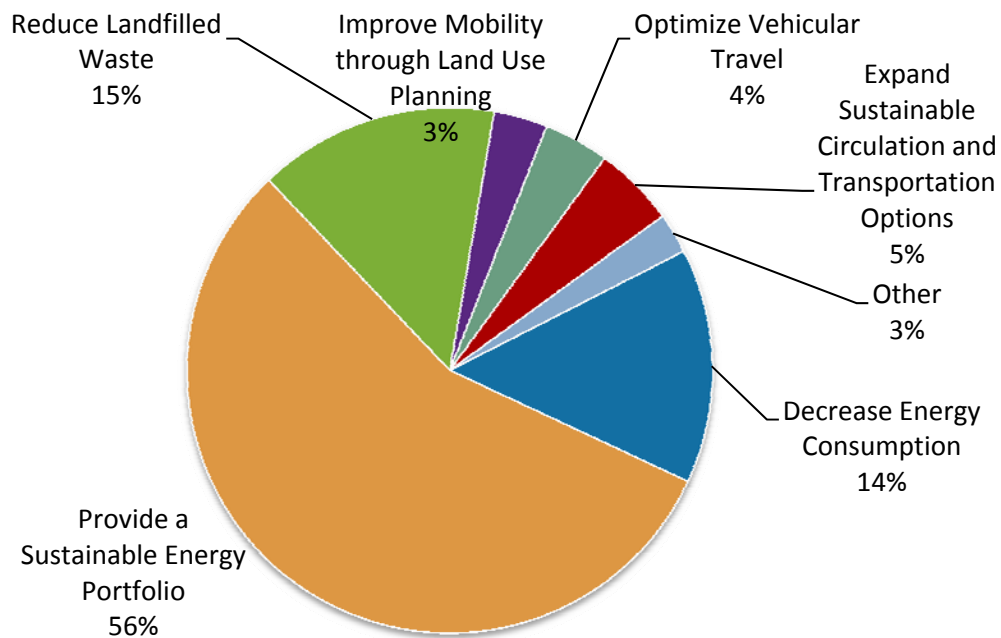
## GHG REDUCTION SUMMARY

This Plan identifies a clear path to allow the City to reach the minimum state and BAAQMD requirements. It is important to identify how the City will meet or exceed the minimum GHG reduction target of 15% below baseline levels by 2020 to ensure the City can utilize the Climate Action Plan as a Qualified GHG Reduction Strategy for use in environmental review of projects for new development.

The reduction measures included in this Plan are a diverse mix of regulatory and incentive-based programs for both new and existing development. The reduction measures also aim to reduce GHG emissions from each source to avoid reliance on any one strategy or sector to achieve the target. In total, existing actions, state programs, and GHG reduction measures in this Plan will reduce GHG emissions in Sunnyvale in 2020 by 434,890 MTCO<sub>2</sub>e (see **Table 8**). **Figure 14** and **Figure 15** demonstrate the GHG reductions achieved by goal for 2020 and 2035, respectively.

**TABLE 8 – 2020 GHG REDUCTIONS BY GOAL**

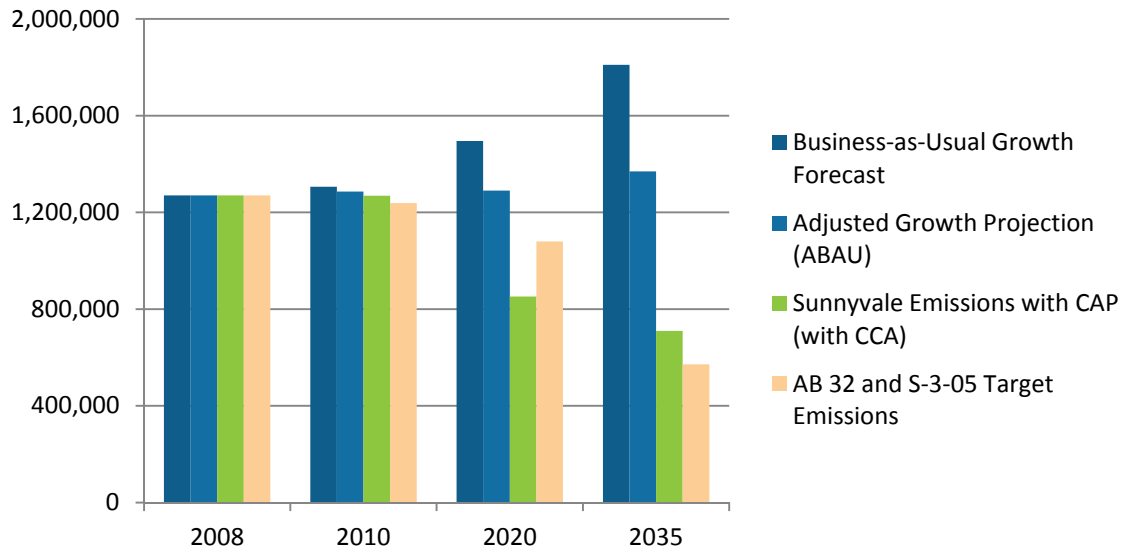
Sector	2020 GHG Reductions (MTCO <sub>2</sub> e/yr)	2035 GHG Reductions (MTCO <sub>2</sub> e/yr)
Open Space and Urban Forestry	-310	-780
Decrease Energy Consumption	-67,520	-93,820
Provide a Sustainable Energy Portfolio	-254,380	-363,090
Decrease Water Consumption	-980	-1,520
Reduce Landfilled Waste	-53,960	-96,190
Reduce Off-Road Equipment Emissions	-7,430	-13,820
Increase and Retain Awareness of Sustainability Issues	N/A	N/A
Improve Mobility through Land Use Planning	-19,880	-21,410
Expand Sustainable Circulation and Transportation Options	-16,660	-32,380
Optimize Vehicular Travel	-13,770	-26,110
<b>Total Reductions</b>	<b>-434,890</b>	<b>-649,210</b>

**FIGURE 14 – 2020 GHG REDUCTIONS BY GOAL****FIGURE 15 – 2035 GHG REDUCTIONS BY GOAL**

Complete implementation of this Plan will allow the City to achieve the reduction target of 15% below baseline levels by 2020 and will set the City on a trajectory to achieve the state GHG reduction target set by Executive Order S-3-05 of reducing GHG emissions

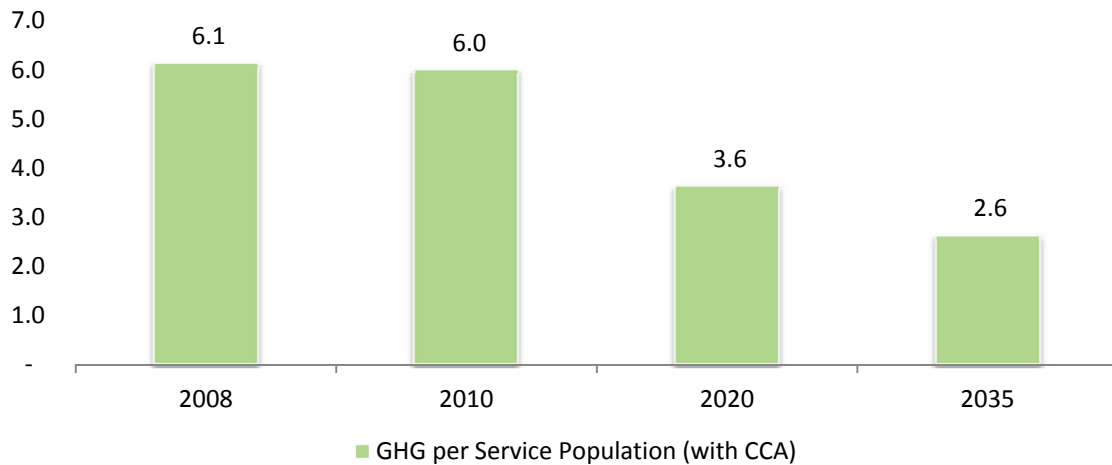
80% below 1990 levels by 2050. **Figure 16** shows the City's anticipated progress toward achieving the GHG reduction target through the implementation of this Plan.

**FIGURE 16 – 2020 GHG REDUCTION TARGET ACHIEVEMENT**



Achievement of the target by 2020 will exceed state recommendations and BAAQMD threshold requirements for developing a Qualified GHG Reduction Strategy by approximately 15%. As shown in **Figure 17**, through the implementation of this Plan, the City's GHG emissions will decrease from 6.1 MTCO<sub>2</sub>e per person per year in 2008 to 2.6 MTCO<sub>2</sub>e per person per year in 2035.


**FIGURE 17 – 2008–2035 ANNUAL MTCO<sub>2</sub>E PER SERVICE POPULATION**



A large, stylized sun graphic in shades of blue, featuring a circular face and radiating rays, positioned in the upper left quadrant of the page.

## CHAPTER 4

### ADAPTATION

A close-up photograph of a water droplet falling into a pool of water, creating concentric ripples. The image is in blue and white tones.

Even with significant efforts to mitigate GHG emissions today, future climate projections anticipate that climate change may have significant effects on California's and Sunnyvale's precipitation, temperature, and weather patterns. Sunnyvale is located in Santa Clara County in close proximity to the San Francisco Bay. The potential consequences of climate change for the State of California and the City of Sunnyvale include those described below.





Even with significant efforts to mitigate GHG emissions today, future climate projections anticipate that climate change may have significant effects on California's and Sunnyvale's precipitation, temperature, and weather patterns. Sunnyvale is located in Santa Clara County in close proximity to the San Francisco Bay. The potential consequences of climate change for the State of California and the City of Sunnyvale include those described below. This chapter summarizes the anticipated effects climate change may have on the Northern California region, which may include:

- Increased wildfire risk;
- Negative impacts to wildlife;
- Deteriorating public health;
- Decreased supply of fresh water;
- Increased sea level rise.

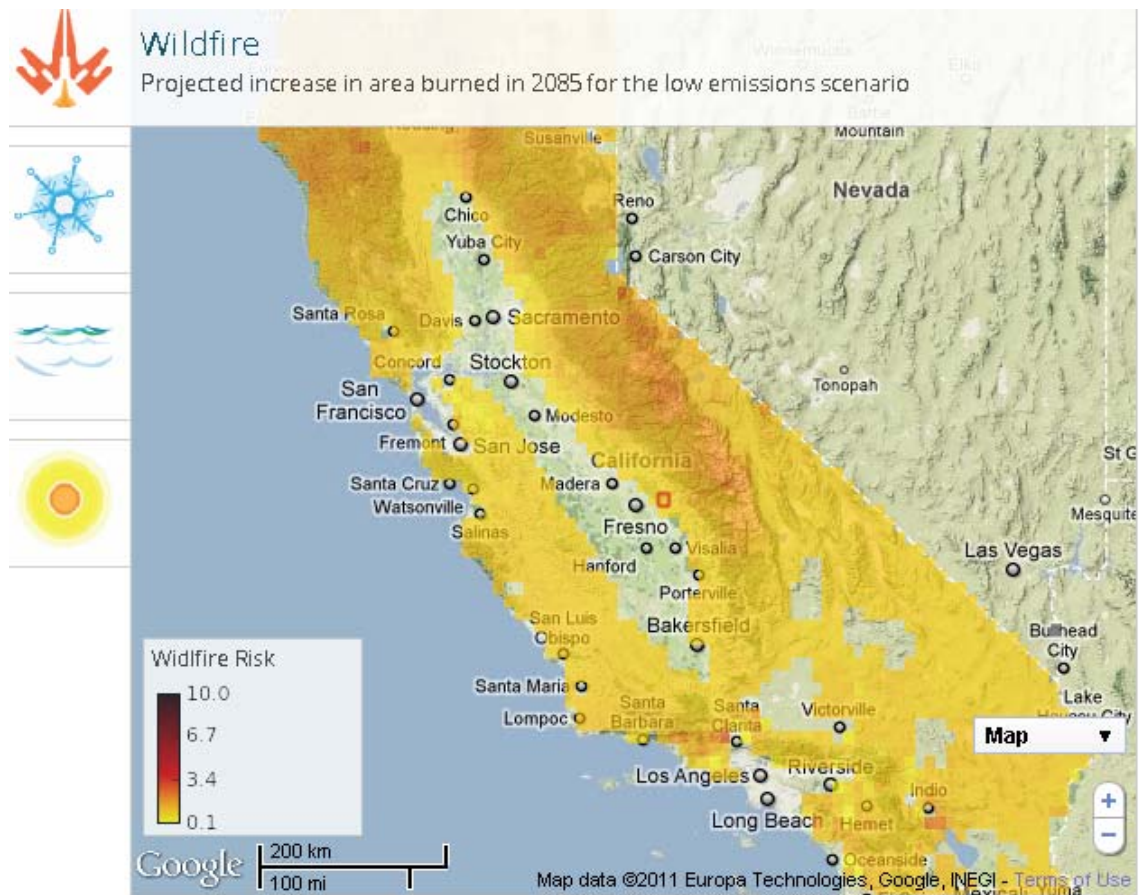
## CLIMATE CHANGE IMPACTS IN SUNNYVALE

Research suggests that California may experience hotter and drier conditions, reductions in winter snow and increases in winter rains, sea level rise, and an increased occurrence of extreme weather events. Such compounded impacts will affect economic systems throughout the state. To refrain from action is costly and risky; the California Climate Adaptation Strategy estimates that no action to address the potential impacts of climate change will lead to sector-wide losses of “tens of billions of dollars per year in direct costs” and “expose trillions of dollars of assets to collateral risk.”

### Increased Rate of Wildfires

Wildfire risk is based on a combination of factors including precipitation, winds, temperature, and vegetation. Wildfires are likely to grow in number and size throughout the state as a result of increased temperatures induced by climate change. Even under the “medium” warming scenario predicted by the Intergovernmental Panel on Climate Change, wildfire risk will likely increase by 55% in California (see **Figure 18**). Further, as wildfires increase in frequency and size, they will also increase in intensity.

**FIGURE 18 - CALIFORNIA 2085 WILDFIRE RISKS, LOW EMISSIONS SCENARIO**



Source: California Energy Commission 2011. Cal-Adapt Local Climate Snapshots.

## Negative Impacts on Wildlife

As temperatures rise, species move north in California or to higher elevations. This change in migration disrupts the food chain and prevents some plant species from being pollinated. With vegetation, reduction in soil moisture will result in early dieback of many plants, potentially leading to conflicts with animal breeding seasons and other natural processes. Several potential hydrological changes associated with global climate change could also specifically influence the ecology of aquatic life in California and have several negative effects on cold-water fish. For example, if a rise in air temperature by just a few degrees Celsius occurs, this change could be enough to raise the water temperatures above the tolerance of salmon and trout in many streams, favoring instead non-native fishes such as sunfish and carp. Many of the potential effects on wildlife are still being studied, but due to an inability to quickly adapt to new climates, the potential for severe species loss is present.

## Deteriorating Public Health

Heat waves are expected to have a major impact on public health, as well as decreasing air quality and increasing mosquito breeding and mosquito-borne diseases. Further, climate change is expected to alter the spread and prevalence of disease vectors and lead to a possible decrease in food quality and security. Vector control districts throughout the state are already evaluating how they will address the expected changes to California's climate.

According to a new report from the California Air Resources Board, the warming climate will increase ozone levels in California's major air basins, leading to upwards of 6 to 30 more days per year with ozone concentrations that exceed federal clean air standards. The elderly, young, and vulnerable populations most likely to be impacted by climate change are also those that often lack sufficient resources to adapt. Such vulnerable demographics are likely to need assistance to respond to climate change, which leads to social equity issues related to the unequal distribution of resources and increased costs to address community-wide health risks.

## Sea Level Rise

Sea level rise is attributed to the increase of average ocean temperatures and the resulting thermal expansion and the melting of ice-sheets contributing to the volume of water held in the oceans. While many effects of climate change will impact Sunnyvale, sea level rise is one specific impact that has been extensively studied and quantified, and its effects mapped. The San Francisco Bay Conservation and Development Commission (BCDC) issued a report on sea level rise in April 2009, which states that sea levels in the Bay Area will rise 16 inches by mid-century and 55 inches by the end of the century. By mid-century, approximately 180,000 acres of the Bay Area could be inundated and 213,000 acres could be flooded by the end of the century, including 93 percent of both the Oakland and the San Francisco airports.

The City of Sunnyvale will be directly impacted by sea level rise, as shown in the BCDC image on the next page. The area vulnerable to 16 inches of sea level rise covers the Sunnyvale Baylands Park, the City's Water Pollution Control Plant, the SMaRT station, and parts of the Lockheed property, see **Figure 19**. In addition, the movement of goods and people in and around the Bay Area that would be disrupted by flooding of ports, airports, highways, and rail lines will be significant for Sunnyvale.

The speed and amount of sea level rise will be determined by the increase in average temperatures and rate of melting of glacial ice. While there is a degree of uncertainty in projections, many original projections have been in reality more conservative than the actual impacts of climate change once they occurred.

**FIGURE 19 – SOUTH BAY REGION AT RISK OF 55 INCH SEA LEVEL RISE**

Source: Bay Conservation and Development Commission and San Francisco Planning and Urban Research, 2009.

## EXISTING ADAPTATION EFFORTS

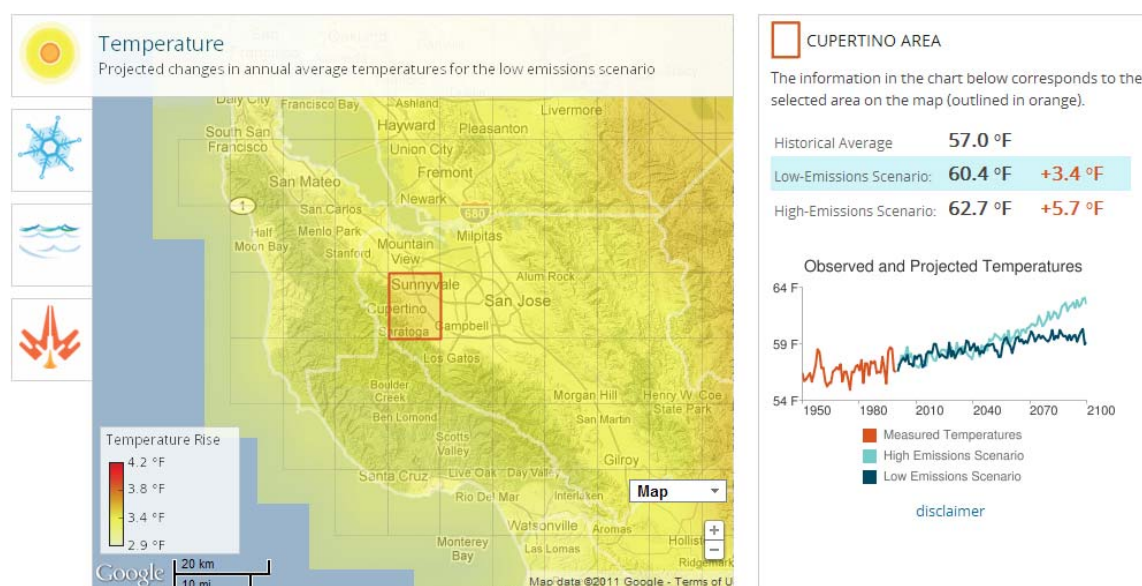
### California Climate Adaptation Strategy

In 2009, the California Natural Resources Agency released the California Climate Adaptation Strategy as a guide to both state and local agencies on appropriate strategies to adapt to climate change impacts. The guide includes adaptation strategies for public health, biodiversity, ocean and coastal resources, water management, agriculture, forestry, transportation, and energy infrastructure sectors.

## Cal-Adapt

Cal-Adapt is a multifaceted web portal, focusing on climate change effects and adaptation, that presents global climate change data from both historic observations and international computer models in an easy-to-use format. The tool allows users to interactively view historic and future temperature, snowpack, wildfire risk, and rainfall for their neighborhood, city, or all of California in a Google map, as shown in **Figure 20** below. To supplement the maps and projections, nearly 2,000 scholarly journal papers and abstracts are available for study in the portal's publications section, and all of the historic and future data used to create the models is also available.

**FIGURE 20 - CAL-ADAPT TEMPERATURE MAP AND PROJECTIONS**



Source: California Energy Commission 2011. Cal-Adapt Local Climate Snapshots.

## San Francisco Planning & Urban Research, Climate Change Hits Home

San Francisco Planning and Urban Research Association's (SPUR) adaptation report, "Climate Change Hits Home," was published in May 2011. The report recommends 30 adaptation strategies and tools to implement at a local and regional scale to minimize the impact that climate change may have on public safety and health, transportation, ecosystems and bio-diversity, energy, water management, and sea level rise. The report includes a Plan of Action identifying where local governments can act as the primary implementer of the strategies listed in **Table 9**.

San Francisco Bay Conservation and Development Commission (BCDC): BCDC is taking a lead in studying sea level rise and preparing a coordinated strategy. Their efforts include:

- BCDC Bay Plan Amendment: Climate Change Policies - The Commission updated the San Francisco Bay Plan Findings and Policies to include likely impacts of sea level rise in 2010.

- Adaptation Assistance Program (AAP) – The goal of the AAP is to build capacity within local governments to assess climate change issues and to plan for and implement adaptation strategies. The program will facilitate coordination among local governments and provide guidance for local and regional agencies on how to achieve consistency in adaptation policy.
- Regional Sediment Management (RSM) – BCDC is developing a RSM for the San Francisco Bay. The project has received initial funding.
- Rising Tides Design Competition – BCDC held an international design competition in 2009 to gather ideas for sea level rise resiliency.

**TABLE 9 - PLAN OF ACTION FOR LOCAL GOVERNMENTS**

Responsible Agency	Action
Public Works Department	Reduce urban heat island effect through three principal “no-regrets” strategies: expanding the urban forest, promoting white roofs, and using light-colored pavement materials.
Public Works/Building Departments	Evaluate alternatives and phase in the use of light-colored concrete, paving, and roofing materials on municipal properties.
Building Departments	Cities should begin to require lighter materials or white roofs in private development by amending existing building codes for new buildings and major retrofits.
PG&E Local Governments	Evaluate existing energy-efficiency and demand response programs for their effectiveness at shaving peak electricity demand in more frequent and prolonged hot weather.
Building Departments	Replace or retrofit the building stock over time with resource-efficient, climate-adaptive buildings.
Water Utilities	Develop water-supply scenarios for mid-century and beyond that include assumptions about changes (especially decreases) in precipitation amounts and timing.
Water Utilities	Evaluate alternative water-supply opportunities and demand-management strategies such as water conservation, water recycling and desalination, and prioritize investment in these strategies according to cost, reliability, and environmental benefits.
Water/Stormwater Utilities	Expand investments in “green infrastructure” or low-impact development.
Wastewater Utilities	Evaluate the vulnerability of wastewater collection and treatment systems to severe storms, sea level rise, and storm surge.



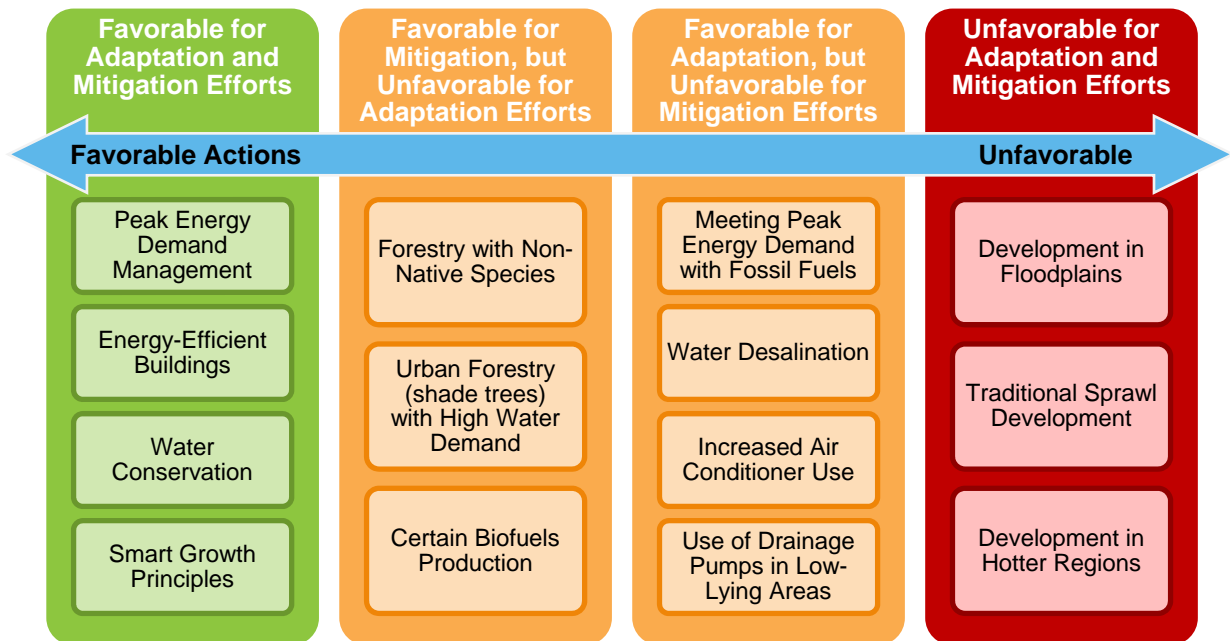
## Differentiating Reduction and Adaptation Measures

The City of Sunnyvale is already implementing several of the strategies listed above and has included many of these strategies in this Plan that serve as both adaptation and reduction measures. Adaptation and reduction measures are closely tied, but differ in that adaptation measures address the effects of climate change, whereas reduction measures address the cause. The adaptation measures in this chapter are presented in a different format than the reduction measures, as the adaptation measures have not been quantified for their greenhouse gas (GHG), energy, or economic benefits.

There are two types of adaptation measures: operational changes and increases to adaptive capacity. Operational measures assess climate change vulnerabilities and sensitive populations on a regular basis. They also address climate change adaptation in planning and public safety documents. Adaptive capacity measures are strategies that help prepare for and adjust to the impacts of climate change. Examples include the establishment of cooling centers during heat waves, promotion of energy efficiency and renewable energy to reduce peak load demand, and implementation of low impact development standards to reduce stormwater runoff and increase groundwater recharge. It should be noted that this adaptation chapter is meant to serve as a starting point for the City by including measures that will direct operational changes to identify potential climate change impacts and vulnerabilities but does not include adaptive capacity measures to address specific climate change impacts.

While adaptation measures and reduction measures may differ significantly in their goals, there can be significant common ground between them. For instance, a reduction measure to plant native trees reduces GHG by sequestering carbon and can lower energy consumption for air conditioning. Native tree planting also helps to adapt to climate change impacts by reducing the urban heat island effect and increasing storm water infiltration. **Figure 21** presents a spectrum of complementary and conflicting adaptation and GHG reduction actions.

It should be noted that not all adaptation measures are reduction measures, and vice versa. This Plan incorporates adaptation measures that are not harmful to or in conflict with proposed GHG reduction efforts at this time.

**FIGURE 21 - ASSESSING ADAPTATION AND GHG REDUCTION ACTIONS**

Source: Bedsworth and Hanak, 2008.

## ADAPTATION STRATEGIES

To ensure climate change adaptation is adequately incorporated into future planning efforts, the following measures have been provided to guide City staff involvement in coordinating, preparing for, and educating the public on the potential impacts that climate change may have on the community.

### A-1: Regional Coordination

Participate in regional efforts such as that of the San Francisco Bay Area Conservation and Development Commission (BCDC) and the Joint Policy Committee (JPC) to analyze and prepare for the impacts of climate change in the Bay Area.

#### Action Items:

- Action A-1.1. Appoint a staff liaison to attend and participate in regional meetings focusing on adaptation and resilience and to report back to staff on a regular basis.

## A-2: Preparedness

Ensure that Sunnyvale is prepared for potential environmental risks and hazards related to climate change, with a special emphasis on vulnerable populations such as seniors.

### Action Items:

- Action A-2.1. Regularly train and inform the Department of Public Safety Office of Emergency Services (OES) on potential climate change risks and hazards.
- Action A-2.2. Update the City Emergency Plan and Emergency Preparedness Workbook to address climate change impacts.

## A-3: Adaptive Planning

Integrate potential climate change impacts into local planning documents and processes.

- Action A-3.1. Analyze and disclose possible impacts of climate change on the project or plan area with an emphasis on sea level rise.
- Action A-3.2. Integrate climate change adaptation into future updates of the Zoning Code, Building Code, General Plan, and other related documents.

## A-4: Monitoring

Monitor climate change science and policy and regularly inform stakeholders of new information.

- Action A-4.1. Dedicate a page of the City's website to climate change and climate change adaptation.
- Action A-4.2. On a regular basis, assess adaptation efforts of the City, region, and state and identify goals or gaps to be addressed.



## CHAPTER 5



### IMPLEMENTATION PROGRAM

Reducing GHG emissions 15% below baseline 2008 levels will be a significant task. CAP implementation will require City leadership to execute strategies and report on the progress of implementation. This implementation program outlines a path for the City to monitor progress and summarizes the GHG reductions that will occur through the implementation of this Plan.



## IMPLEMENTATION PROGRAM

Reducing GHG emissions 15% below baseline 2008 levels will be a significant task. This implementation program outlines a path for the City to monitor progress and summarizes the GHG reductions that will occur through the implementation of this Plan.

### Implementation Information

To ensure the success of this Climate Action Plan, the City will integrate the goals and strategies of this plan into other local and regional plans, programs, and activities. As the City moves forward with the Land Use and Transportation Element update as well as Zoning Code updates, Specific Plans, Housing Element updates, and other planning documents, staff will ensure these documents support and are consistent with the CAP.

CAP implementation will also require City leadership to execute strategies and report on the progress of implementation. The City's Sustainability coordinator will be responsible for coordinating GHG reduction efforts between departments and will designate staff to monitor and report on the progress of the CAP. This Plan identifies the responsible department for each measure and offers time frames and plan-level cost estimates for implementing each strategy. Lastly, successful implementation requires regular monitoring and reporting. Staff should monitor the CAP's implementation progress on an annual basis and report to the City Council on the CAP's progress each year.

Crucial to the implementation of this Plan will be the City's implementation matrix. This matrix contains the GHG reduction, cost, savings, and co-benefit information presented in Chapter 3 for the year 2020, as well as more detail for City staff to effectively integrate these actions into their work plans. Additional information includes:

- **Costs and Savings to the City and Community:** These plan-level cost estimates are provided to allow for comparison between measures and to easily determine whether the savings outweigh the costs. These costs are based on the best available information at the time this Plan was developed and are represented in total annual costs or savings by 2020. For simplicity, these costs and savings are presented in the following ranges provided in Table 10.



TABLE 10 – COSTS AND SAVINGS TO THE COMMUNITY RANGES

Numeric Value (\$)	Range
0	Minimal
1–25,000	Low
25–100,000	Low-Med
100,000–200,000	Medium
200,000–500,000	Medium-High
500,000–1,000,000	High
Over 1 million	Very High

- **Implementation Time Frame:** The phase in which this measure should begin implementation. Time frames include:
  - Near-Term – before 2016
  - Mid-Term – before 2020
  - Long-Term – after 2020
- **Responsible Agency:** City department or division that will take the lead on implementing and reporting process on the selected measure. Other departments and divisions will likely play a major supporting role; however, this department/division is the leader.
- **Applicability:** Designates the type of development to which the measure applies. There are four options:
  - Municipal – applies to municipal operations
  - New Development – applies to new development applications only
  - Existing Development – applies to existing development
  - New & Existing Development – applies to new and existing development.
- **Community Benefits:** An additional benefit occurring from the implementation of a GHG reduction measure that is not directly related to reducing greenhouse gas emissions. In this document, the co-benefits are defined as follows:



- **Performance Indicator:** Performance indicators and targets are readily available statistics that signify a reduction in GHG. These indicators allow the City to measure progress and track implementation of each measure.

The City will use the implementation matrix and will develop a corresponding implementation tool to track, monitor, and update the Plan's implementation progress. As the City reports on progress in implementing the CAP, staff will evaluate the effectiveness of each measure to ensure that the anticipated GHG reductions are occurring. In the event that GHG reductions do not occur as expected, the City has the ability to modify and add additional policies to the CAP to ensure the City meets the 2020 reduction target.

## Implementation Measures

### IMPLEMENTATION MEASURE 1: MONITORING

Annually monitor and report the City's progress toward achieving the reduction target.

#### *Action Items:*

- **Action 1.1.** Provide support to City staff to facilitate implementation of measures and actions.
- **Action 1.2.** Prepare an annual progress report for review and consideration by the City Council, Planning Commission, or other applicable advisory bodies.
- **Action 1.3.** Develop and utilize a monitoring and reporting tool to assist with annual reports.
- **Action 1.4.** Identify key staff responsible for annual reporting and monitoring.
- **Action 1.5.** Integrate the results of the annual monitoring and reporting into the community conditions indicator report that is presented annually with the City budget.

### IMPLEMENTATION MEASURE 2: UPDATE GHG INVENTORY AND PLAN

Update the baseline greenhouse gas emissions inventory and Climate Action Plan at a minimum of every five years.

#### *Action Items:*

- **Action 2.1.** Inventory 2013 GHG emissions no later than 2015.
- **Action 2.2.** Update the Climate Action Plan to incorporate new technology, programs, and policies to reduce GHG emissions.
- **Action 2.3.** Consider updating and amending the Plan, as necessary, should the City find that specific reduction measures are not meeting intended GHG reductions.

### IMPLEMENTATION MEASURE 3: COLLABORATIVE PARTNERSHIPS

Continue to develop partnerships that support implementation of the Climate Action Plan.

*Action Items:*

- **Action 3.1.** Continue formal memberships and participation in local and regional organizations that provide tools and support for energy efficiency, energy conservation, greenhouse gas emissions reductions, adaptation, education, and implementation of this Plan.

### IMPLEMENTATION MEASURE 4: FUNDING SOURCES

Secure necessary funding to implement the Climate Action Plan.

*Action Items:*

- **Action 4.1.** Identify potential funding sources for reduction measures as part of annual reporting.
- **Action 4.2.** Ensure implementation through the inclusion of emissions reduction and adaptation measures in department budgets, the capital improvement program, and other plans as appropriate.
- **Action 4.3.** Pursue local, regional, state, and federal grants to assist with potential costs to the City and the community and support successful implementation of the CAP.

## Monitoring and Updating This Plan

The City will use the implementation matrix, as well as the implementation and monitoring tool, to track, monitor, and update the Climate Action Plan. As the City reports on progress in implementing the CAP, staff will evaluate the effectiveness of each measure to ensure that the anticipated GHG reductions are occurring. In the event that GHG reductions do not occur as expected, the City will be able to modify and add further policies to the CAP to ensure the City meets the 2020 reduction target.

## Implementation Matrix

This matrix, **Table 11**, contains the GHG reduction, performance target, implementation time frame, and the responsible and supporting agencies information presented in **Chapter 3** for the year 2020, as well as more detail for City staff to effectively integrate these actions into budgets, capital improvement programs, and programs.

TABLE 11 – CAP IMPLEMENTATION MATRIX

#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics
			2020	2035		Costs	Savings								
Open Space and Urban Forestry (OS) Provide local open space resources that support natural processes and provide rest, relaxation, and recreation opportunities.															
OS-1	Open Space	Maintain and increase the amount of open space in Sunnyvale consistent with the Parks of the Future Plan and the Open Space Element of the General Plan.	-20	-50	Very High	Minimal	Minimal	Near-Term	Community Services & Community Development	New & Existing Development	Voluntary	Improves Public Health	Provides Educational Opportunities	Improves Mobility	New acres of parkland
OS-2	Outdoor Meeting Space	Provide availability and access to outdoor space for recreation or social purposes, including access to public open spaces on privately owned property such as retail shopping centers.	Supportive Measure	Supportive Measure	Minimal	Minimal	Minimal	Mid-Term	Community Development	New Development	Voluntary	Improves Public Health	Provides Educational Opportunities	–	n/a
OS-3	Urban Forestry	Increase the number of shade trees planted in the community, and protect the existing tree stock.	-290	-730	Medium	Low	Medium	Mid-Term	Public Works	New & Existing Development	Mandatory for New, Voluntary for Existing	Improves Public Health	Reduces Energy Demand	Adaptation Measure	Number of new street trees planted
Decrease Energy Consumption (EC) Improve energy efficiency and conservation in the community and City operations.															
EC-1	Lighting Efficiency	Increase the use of efficient indoor and outdoor lighting technologies.	-220	-210	Very High	Minimal	Minimal	Mid-Term	Public Works & Community Development	Municipal	Voluntary	Reduces Energy Demand	–	–	Percentage of City streetlights replaced with LED
EC-2	New Construction and Remodels	Require green building practices in new residential and commercial development and remodels.	-4,440	-10,570	Low	High	High	Near-Term	Community Development	New Development	Mandatory	Reduces Energy Demand	Supports Local Economy	Reduces Water Consumption	Compliance with Green Building Ordinance and CALGreen
EC-3	Residential Energy Efficiency	Reduce residential energy use, with emphasis on existing homes built before 1990.	-4,160	-9,090	Medium-High	Very High	Very High	Mid-Term	Community Development	Existing Development	Mandatory	Reduces Energy Demand	Supports Local Economy	Provides Community Savings	Percentage of homes and businesses that respond to energy audits and percentage that participate in a

#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics
			2020	2035		Costs	Savings								
															PACE program New units receiving building permits
EC-4	Commercial Energy Efficiency	Establish a regulatory and incentive-based structure that facilitates commercial and industrial energy efficiency and conservation.	-47,900	-60,520	High	Very High	Very High	Near-Term	Community Development	New & Existing Development	Mandatory	Reduces Energy Demand	Adaptation Measure	Provides Community Savings	Percentage of commercial properties retrofitted upon sale and percentage of businesses that participate in PACE
EC-5	Smart Grid	Increase awareness and utilization of real-time energy consumption data and pricing available through PG&E's Smart Meter program.	-10,300	-12,050	Low	Low-Med	Very High	Mid-Term	Community Development	New & Existing Development	Mandatory for New, Voluntary for Existing	Reduces Energy Demand	Provides Community Savings	–	Percentage of new and existing homes and businesses that participate in monitoring program
EC-6	"Cool" Roofs and Pavements	Reduce the amount of dark, non-reflective roofing and paving material in order to mitigate the urban heat island effect and reduce energy associated with heating and cooling.	-470	-1,200	Low	Minimal	Medium-High	Long-Term	Community Development & Public Works	New Development	Mandatory	Reduces Energy Demand	Improves Public Health	Provides Community Savings	All new parking lots, crosswalks, and sidewalks are made of high albedo content  New office, industrial, retail, and services floor area permitted (SunGIS)
Provide a Sustainable Energy Portfolio (EP) Increase the amount of renewable energy produced in the city and facilitate a higher renewable mix for energy delivered to the city.															
EP-1	Renewable Energy Portfolio	Increase the renewable energy portfolio of electricity delivered to Sunnyvale so that more than 50% of delivered energy comes from renewable sources by 2035.	-233,400	-338,420	Low-Med	Minimal	Minimal	Near-Term	Environmental Services	New & Existing Development	Voluntary	Adaptation Measure	–	–	Percentage of "light" and "dark green" participants and renewable mix for "light" and "dark green"

#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics
			2020	2035		Costs	Savings								
EP-2	Local Renewable Energy	Increase the number of renewable energy installations in and available to the community.	-20,980	-24,670	Low	Very High	Very High	Mid-Term	Community Development	New & Existing Development	Voluntary	Reduces Energy Demand	Provides Community Savings	Adaptation Measure	Residential and nonresidential participation rates Permitted new square footage of commercial offices, retail and service space, and industry  New residential units receiving building permits (SunGIS)
Decrease Water Consumption (WC) Reduce water-related greenhouse gas emissions through reclamation, conservation, and improvements to the water and wastewater processes.															
WC-1	Water Sources and Efficiency	Decrease the amount of energy needed to filter, transport, and treat water used within Sunnyvale.	-230	-530	Very High	Minimal	Low-Med	Long-Term	Environmental Services & Public Works	New & Existing Development	Mandatory for New, Voluntary for Existing	Reduces Energy Demand	Reduces Water Consumption	Adaptation Measure	Annual reclaimed water use Average daily water consumption per capita
WC-2	Water Conservation	Reduce indoor and outdoor potable water use in residences, businesses, and industry.	-750	-990	Low	Medium	Very High	Near-Term	Community Development & Public Works	New Development	Mandatory	Adaptation Measure	Reduces Water Consumption	–	Gallons per capita per day (gpcpd) water consumption Square footage of permitted new construction (SunGIS)
Reduce Landfilled Waste (LW) Decrease the amount of waste sent to landfill through increased recycling, composting, and materials management.															
LW-1	Materials Management	Reduce the availability or use of common materials that are not recyclable or that are cost ineffective to recycle.	Supportive Measure	Supportive Measure	Low-Med	Minimal	Minimal	Long-Term	Community Development & Environmental Services	New & Existing Development	Mandatory	Adaptation Measure	–	–	n/a
LW-2	Recycling and Composting	Increase the amount of waste recycled and composted by 1% per year according to the City's Zero Waste Strategic Plan.	-53,960	-96,190	Medium	Minimal	Minimal	Near-Term	Public Works & Environmental Services	New & Existing Development	Mandatory	Provides Community Savings	Reduces Energy Demand	–	Per capita disposal rates or overall diversion rate



#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics	
			2020	2035		Costs	Savings									
Off-Road Equipment (OR) Minimize emissions from off-road lawn and garden and construction equipment.																
OR-1	Lawn and Garden Equipment	Encourage residents and businesses to use efficient lawn and garden maintenance equipment or to reduce the need for landscape maintenance through native planting.	-30	-100	Low	Medium	Minimal	Long-Term	Community Development	New & Existing Development	Voluntary	Provides Community Savings	Improves Public Health	–		Percentage of lawnmowers and leaf blowers exchanged
OR-2	Construction Equipment	Reduce emissions from heavy-duty construction equipment by limiting idling and utilizing cleaner fuels, equipment, and vehicles.	-7,400	-13,720	Minimal	Minimal	Minimal	Long-Term	Community Development	New Development	Mandatory	Improves Public Health	–	–		Percentage of equipment that is fuel efficient and/or alternatively fueled Idling restrictions
Increase and Retain Awareness of Sustainability Issues (CA) Community members are knowledgeable about GHG Emissions and are all taking actions to reduce them.																
CA-1	Community Outreach and Involvement	Educate and involve the community regarding actions they can do at home to reduce energy, water, waste, and fuel consumption.	Supportive Measure	Supportive Measure	Medium-High	Minimal	Minimal	Near-Term	Community Development, Sunnyvale Public Library, & Environmental Services	Other	Voluntary	Provides Community Savings	Provides Educational Opportunities	–		Number of community events related to sustainability
CA-2	School Education and Involvement	Educate local schoolchildren about climate change and ways that they and their families can reduce greenhouse gas emissions.	Supportive Measure	Supportive Measure	Medium	Minimal	Minimal	Near-Term	Environmental Services & Public Works	Other	Voluntary	Provides Educational Opportunities	–	–		Number of school outreach events conducted
Improve Mobility Through Land Use Planning (LUP) Utilize land use and planning tools to reduce or eliminate vehicle trips while still completing the activities of our everyday lives.																
LUP-1	Parking	Reduce the amount of free or unrestricted parking available within the city to promote alternative modes of transportation and avoid unnecessary vehicle circulation.	-4,970	-5,350	Medium	Unknown	Unknown	Mid-Term	Public Works	New Development	Mandatory	Improves Mobility	Reduces Energy Demand	–		Reduction in parking provision compared to a parking generation rate \$10 monthly parking cost



#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics
			2020	2035		Costs	Savings								
LUP-2	Transit-Oriented, Higher Density, Mixed-Use Development	Facilitate development in designated core and corridor areas that is transit oriented, higher density, and mixed use.	-14,010	-15,090	Unknown	Minimal	Minimal	Near-Term	Community Development	New Development	Mandatory	Improves Public Health	Improves Mobility	Supports Local Economy	Percentage of new housing units are deed-restricted below market rate
LUP-3	Local Commerce and Food	Increase the amount of locally generated and consumed goods in order to decrease the need for travel and promote healthier communities.	Supportive Measure	Supportive Measure	Low	Minimal	Minimal	Long-Term	Community Development & Department of Finance	New & Existing Development	Voluntary	Improves Public Health	Provides Community Savings	–	N/A
LUP-4	Jobs/Housing Balance	Plan for an improved jobs/housing balance in order to reduce the need for long-distance travel between residences and places of work.	-900	-970	Unknown	Unknown	High	Mid-Term	NOVA Workforce Services & Community Development	New & Existing Development	Voluntary	Supports Local Economy	Provides Community Savings	–	Jobs-to-housing ratio
LUP-5	Distributed Services	Encourage the wider distribution of commonly used facilities and services in order to reduce the need for or length of vehicular trips to and from places of work and residence.	See LUP-4	See LUP-4	Low	Unknown	Unknown	Mid-Term	Community Development	New & Existing Development	Voluntary	Improves Mobility	Supports Local Economy	–	New residential development permits issued Additional commercial and industrial square footage
Expand Sustainable Circulation and Transportation Options (CTO) Modify the transportation infrastructure such that bicycling, walking, and transit are viable options regularly used by all Sunnyvale residents and employees.															
CTO-1	Bicycle, Pedestrian, and Transportation Design Elements	Create streets and connections that facilitate bicycling, walking, and transit use throughout the city.	-4,070	-4,380	Very High	Low	Very High	Near-Term	Public Works & Community Development	New & Existing Development	Voluntary	Improves Mobility	–	–	Miles of bike lanes and sidewalks installed
CTO-2	Bicycle, Pedestrian, and Transportation Travel Operations	Prioritize safe, efficient, and convenient access for non-automotive travel to destinations in and outside of Sunnyvale.	Supportive Measure	Supportive Measure	Very High	Minimal	Low-Med	Mid-Term	Public Works, Community Development, & Public Safety	New & Existing Development	Voluntary	Improves Mobility	–	–	Number of bicycle support facilities Miles of bikeways

#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics
			2020	2035		Costs	Savings								
CTO-3	Transit	Facilitate the use of public and private transit such as buses, Caltrain, Amtrak, and shuttles to and from Sunnyvale and within the city.	-5,920	-19,940	Low	Low	Low	Near-Term	Community Development & Public Works	New & Existing Development	Mandatory	Improves Mobility	—	—	VTA transit ridership in Sunnyvale
CTO-4	Commute Programs	Reduce single-occupant vehicle trips to major employers (100 employees or more) located in Sunnyvale.	-5,420	-5,840	Low-Med	Minimal	Medium	Mid-Term	Community Development & Public Works	New & Existing Development	Mandatory for New, Voluntary for Existing	Provides Community Savings	—	—	Participation in commute trip reduction programs
CTO-5	School Commutes	Encourage carpooling, bicycling, walking, and transit access to elementary, middle, and high schools so that the number of car trips is no more than 50% of the number of students at any school.	-1,250	-2,220	High	Minimal	Low-Med	Mid-Term	Community Development	Other	Voluntary	Improves Public Health	Provides Educational Opportunities	Improves Mobility	Commute to school mode share
Optimize Vehicular Travel (OVT) Minimize the environmental impact of vehicular travel.															
OVT-1	Clean Alternative Motor Vehicles and Fuels	Promote the use of clean alternative motor vehicles and fuels to reduce emissions from vehicular travel.	-7,860	-19,980	High	Minimal	Very High	Long-Term	Public Works & Environmental Services	New & Existing Development	Voluntary	Improves Public Health	—	—	Number of NEVs in operation and number of parking spaces designated for EV or clean fuel vehicles Square footage of new commercial and industrial development
OVT-2	Car Sharing	Promote the use of car sharing in Sunnyvale in order to establish and maintain at least one viable car-share operation within the city by 2020.	-1,810	-1,950	Low	Low	Medium	Long-Term	City Manager & Community Development	New & Existing Development	Voluntary	Improves Mobility	—	—	Number of car-share operations or vehicles

#	Policy Topic	Reduction Measure	GHG Reductions (MTCO <sub>2</sub> e/year)		City Costs	Community		Time Frame	Responsible Agencies	Applicability	Compliance	Community Benefits			Performance Metrics
			2020	2035		Costs	Savings								
OVT-3	Circulation Efficiency	Improve the flow and efficiency of vehicular traffic throughout the city to avoid idling and reduce fuel consumption.	-4,110	-4,180	High	Minimal	High	Mid-Term	Community Development & Public Works	New & Existing Development	Mandatory	Improves Mobility	Improves Public Health	–	Reduction in vehicle idling times  Vehicle miles traveled on weekdays
Adaptation (A) Plan and prepare the City of Sunnyvale for the potential impacts of climate change.															
A-1	Regional Coordination	Participate in regional efforts such as that of the San Francisco Bay Area Conservation and Development Commission (BCDC) and the Joint Policy Committee (JPC) to analyze and prepare for the impacts of climate change in the Bay Area.	N/A	N/A	Minimal	Minimal	Minimal	Near-Term	City Manager	Other	Voluntary	Adaptation Measure	Provides Educational Opportunities	–	Staff reports to Council every year on adaptation efforts
A-2	Preparedness	Ensure that Sunnyvale is prepared for potential environmental risks and hazards related to climate change, with a special emphasis on vulnerable populations such as seniors.	N/A	N/A	Low	Unknown	Unknown	Near-Term	Community Services	Other	Voluntary	Adaptation Measure	Provides Educational Opportunities	–	One training session every two years
A-3	Adaptive Planning	Integrate potential climate change impacts into local planning documents and processes.	N/A	N/A	Unknown	Unknown	Unknown	Near-Term	Community Development	New Development	Voluntary	Adaptation Measure	Provides Educational Opportunities	–	N/A
A-4	Monitoring	Monitor climate change science and policy and regularly inform stakeholders of new information.	N/A	N/A	Low	Unknown	Unknown	Near-Term	Community Development	Municipal	Voluntary	Adaptation Measure	Provides Educational Opportunities	–	N/A



## CHAPTER 6

### GLOSSARY

The Glossary defines key terms used throughout the Climate Action Plan.





## GLOSSARY

**Air Basin:** A land area with generally similar meteorological and geographic conditions throughout. To the extent possible, air basin boundaries are defined by the California Air Resources Board (CARB) along political boundary lines and include both the source and receptor areas. California is currently divided into 15 air basins.

**Air Pollutants:** Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects to humans, animals, vegetation, and/or materials.

**American Recovery and Reinvestment Act (ARRA):** Commonly referred to as the Stimulus Plan or Recovery Act, ARRA is an economic stimulus package enacted by the federal government in 2009. The intent of the stimulus is to create jobs and promote investment and consumer spending during the economic recession.

**Assembly Bill (AB) 32, California Global Warming Solutions Act of 2006:** Establishes a comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of greenhouse gases (GHG) for the State of California. Designates CARB as the responsible agency for monitoring and reducing statewide GHG emissions to reduce emissions to 1990 levels by 2020.

**Assembly Bill (AB) 811:** Authorizes all cities and counties in California to designate areas within which willing property owners may finance the installation of distributed renewable energy generation, as well as energy efficiency improvements through low-interest loans. These financing programs are commonly referred to as Property Assessed Clean Energy, or PACE programs.

**Assembly Bill (AB) 939:** Establishes a goal of achieving a statewide waste diversion rate of 75% and requires cities and counties to divert a minimum of 75% of their waste stream for reuse or recycling.

**Association of Bay Area Governments (ABAG):** The regional planning agency for the 9 counties and 101 incorporated cities in the San Francisco Bay Area.

**Business-As-Usual (BAU):** A business-as-usual projection forecasts greenhouse gas emissions without regulatory or technical intervention to reduce GHG emissions.

**California Climate Adaptation Strategy (CAS):** Summarizes the best-known science on climate change impacts to California and provides recommendations on how to manage the risks.

**California Environmental Quality Act (CEQA):** A state law requiring state and local agencies to regulate activities with consideration for environmental protection. If a proposed activity has the potential for a significant adverse environmental impact, an environmental impact report (EIR) must be prepared and certified as to its adequacy before action can be taken on the proposed project. General plans require the preparation of a program EIR.



**California Green Building Standards Code (CALGreen):** The 2010 California Green Building Standards Code, commonly referred to as the CALGreen Code, is a statewide mandatory construction code that was developed and adopted by the California Buildings Standards Commission and the Department of Housing and Community Development. The CALGreen standards require new residential and commercial buildings to comply with mandatory measures under the topics of planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. CALGreen also provides voluntary tiers and measures that local governments may adopt that encourage or require additional measures in the five green building topics.

**California Solar Initiative (CSI):** Allows the California Public Utilities Commission (CPUC) to provide incentives to install solar technology on existing residential, commercial, nonprofit, and governmental buildings if they are customers of the state's investor-owned utilities: Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), or Southern California Edison (SCE).

**Carbon Dioxide (CO<sub>2</sub>):** A colorless, odorless gas that occurs naturally in the earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion. (See also the California Climate Change Glossary.)

**Carbon Dioxide Equivalent (CO<sub>2</sub>e):** A metric measure used to compare the emissions from various greenhouse gases based on their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP.

**Carbon Sequestration:** The process through which agricultural and forestry practices remove carbon dioxide from the atmosphere. The term "carbon sinks" is also used to describe agricultural and forestry lands that absorb carbon dioxide.

**Carl Moyer Program:** Created to reduce air pollution emissions from older heavy-duty diesel engines. The program offers incentives to on-road and off-road heavy-duty vehicle owners to retrofit the engine or replace the entire vehicle with a cleaner or alternative-fuel engine.

**Car Sharing:** A type of car rental where people rent cars for short periods of time, often by the hour.

**Clean Air Act:** Requires the EPA to set National Ambient Air Quality Standards for six common air pollutants, known as "criteria pollutants," that are found all over the United States: particle pollution (particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. The EPA regulates them by developing human health-based and/or environmentally based criteria (science-based guidelines) for setting permissible levels.

**Clean Car Fuel Standards (AB 1493, Pavley):** Signed into law in 2002 and commonly referred to as Pavley standards. Require carmakers to reduce GHG emissions from new passenger cars and light trucks beginning in 2011. CARB anticipates that the Pavley standards will reduce GHG emissions from new California passenger vehicles by about 22% in 2012 and about 30% in 2016, all while improving fuel efficiency and reducing motorists' costs.

**Climate Action Plan (CAP):** Strategic plans that establish policies and programs for reducing (or mitigating) a community's greenhouse gas emissions and adapting to the impacts of climate change. This plan serves the function of a CAP.

**Climate Change (also referred to as global climate change):** The term "climate change" is sometimes used to refer to all forms of climatic inconsistency, but because the earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another. In some cases, climate change has been used synonymously with the term "global warming"; scientists, however, tend to use the term in the wider sense to also include natural changes in climate.

**Climate Change Adaptation:** The adjustment in natural or human systems to respond to actual or expected climate changes to minimize harm or take advantage of beneficial opportunities.

**Climate Change Mitigation:** A technical or behavioral intervention to reduce the sources of greenhouse gas emissions in order to reduce the potential effects of climate change.

**Climate Zone:** The California Energy Commission has classified the distinct climates throughout California by climate zone to recognize the variability in energy use based on local weather patterns. The Energy Commission uses these climate zones to determine energy budgets for new and renovated buildings and prescriptive packages for each climate zone to ensure that they meet the State's Title 24 energy efficiency standards.

**Co-Benefits:** An additional benefit occurring from the implementation of a GHG reduction measure that is not directly related to reducing greenhouse gas emissions. In this document, the co-benefits are defined as follows:



**Cool Roof:** A roof with high solar reflectivity is considered a cool roof. Cool roofs reduce heat transfer into the indoors and can reduce indoor energy demand.

**Community Choice Aggregation:** Community Choice Aggregation or CCA is a program that allows cities or counties to purchase or generate electricity for a community's residents or businesses. Through the CCA program, the investor owned utility, such as PG&E continues to deliver the electricity through the transmission and distribution system. Many jurisdictions implementing CCA programs have set goals to significantly increase the amount of renewable energy provided to customers.

**Complete Streets:** Complete Streets policies ensure that transportation planners and engineers consistently design and operate the entire roadway with all potential users in mind. This includes bicyclists, public transportation vehicles and riders, and pedestrians of all ages and abilities. In 2007, the State of California adopted AB 1358, which directs the legislative body of a city or county, upon revision of the circulation element of its general plan, to identify how the jurisdiction will provide for the routine accommodation of all users

**Compressed Natural Gas (CNG):** A fossil-fuel substitute for gasoline, diesel, or propane that can be used in passenger and heavy-duty vehicles.

**Conservation:** Planned management of a natural resource to prevent exploitation, destruction, or neglect.

**Construction and Demolition Waste (C&D):** C&D materials consist of the waste generated during the construction, demolition, or renovation of buildings, roads, and other construction projects. C&D materials may include heavy, bulky materials such as concrete, glass, wood, and metal, among other materials.

**Distributed Energy Resources (DER):** Small, modular, energy generation and storage technologies that provide electric capacity or energy located where it's needed. DERs typically produce less than 10 megawatts (MW) of power and include wind turbines, photovoltaics (PV), fuel cells, microturbines, reciprocating engines, combustion turbines, cogeneration, and energy storage systems. DER systems may be either connected to the local electric power grid or isolated from the grid in stand-alone applications.

**Easement, Conservation:** A tool for acquiring open space with less than full-fee purchase, whereby a public agency buys only certain specific rights from the landowner. These may be positive rights (providing the public with the opportunity to hunt, fish, hike, or ride over the land) or they may be restrictive rights (limiting the uses to which the landowner may devote the land in the future).

**Emission Standard:** The maximum amount of pollutant legally permitted to be discharged from a single source, either mobile or stationary.

**Energy Conservation:** Reducing energy waste, such as turning off lights, heating, and motors when not needed.

**Energy Efficiency:** Doing the same or more work with less energy, such as replacing incandescent light bulbs with compact fluorescent light bulbs or buying an Energy Star appliance to use less energy for the same or greater output.

**Energy Efficiency and Conservation Block Grant (EECBG):** The EECBG program funded through the American Recovery and Reinvestment Act and managed by the Department of Energy to assist cities, counties, states, and territories to develop, promote, and implement energy efficiency and conservation programs and projects.

**Energy Efficiency Standards (Title 24, Part 6):** Title 24 standards were first adopted in 1978 and established minimum energy efficiency standards for residential and nonresidential buildings. These standards are updated continually by providing more stringent energy budgets for new buildings in an effort to reduce California's energy consumption.

**Energy Star:** A joint program of the US Environmental Protection Agency and the US Department of Energy to provide consumers with information and incentives to purchase the most energy-efficient products available.

**Energy Star Portfolio Manager:** An online management tool that allows nonresidential building owners and tenants to track and assess energy and water use over time. Benchmarking energy and water use allows building owners to identify investment priorities, determine underperforming buildings, and verify efficiency improvements.

**Environment:** In CEQA, "the physical conditions which exist within the area which will be affected by a proposed project, including land, air, water, mineral, flora, fauna, noise, and objects of historic or aesthetic significance."

**Environmental Impact Report (EIR):** A report required by the California Environmental Quality Act which assesses all the environmental characteristics of an area and determines what effects or impacts will result if the area is altered or disturbed by a proposed action or project. See California Environmental Quality Act (CEQA).

**Environmentally Preferable Purchasing (EPP):** California law requires state government to practice environmentally preferable purchasing, which is the procurement of goods and services that have a reduced impact on human health and the environment as compared to other goods and services serving the same purpose.

**Feasible:** Capable of being accomplished in a successful manner within a reasonable time, taking into account economic, environmental, social, and technological factors.

**Floodplain:** The relatively level land area on either side of the banks of a stream regularly subject to flooding. That part of the floodplain subject to a 1% chance of flooding in any given year is designated as an "area of special flood hazard" by the Federal Insurance Administration.

**Floodway:** The channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the 100-year flood without cumulatively increasing the water surface elevation more than 1 foot.

**Fossil Fuel Facilities:** Include, but are not limited to, oil and gas wells, separators, and refineries.

**Global Warming Potential (GWP):** An index used to translate the level of emissions of various gases into a common measure in order to compare the relative potency of different gases without directly calculating the changes in atmospheric concentrations. Greenhouse gases are expressed in terms of carbon dioxide equivalent. Global warming potentials are expressed in terms relative to carbon dioxide, which has a global warming potential of one.

**Green Building:** Sustainable or "green" building is a holistic approach to design, construction, and demolition that minimizes the building's impact on the environment, the occupants, and the community. See California Green Building Standards Code for green building regulations in California.

**Greenhouse Gas or Greenhouse Gases (GHG):** Gases which cause heat to be trapped in the atmosphere, warming the earth. Greenhouse gases are necessary to keep the earth warm, but increasing concentrations of these gases are implicated in global climate change. Greenhouse gases include all of the following gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The majority of greenhouse gases come from natural sources, although human activity is also a major contributor.

**Greenhouse Gas Inventory:** A greenhouse gas (GHG) inventory provides estimates of the amount of GHGs emitted to and removed from the atmosphere by human activities. A city or county that conducts an inventory looks at both community emission sources as well as emissions from government operations. A base year is chosen and used to gather all data from that year. Inventories include data collection from such things as vehicle miles traveled (VMTs), energy usage from electricity and gas, and waste. Inventories include estimates for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs), which are referred to as the six Kyoto gases.

**Green Waste:** Refers to lawn, garden, or park plant trimmings and materials and can be used in home-composts or picked up curbside by municipal waste haulers.

**Greywater:** See Recycled Water.

**Groundwater:** Subsurface water in a zone of saturation.

**Groundwater Overdraft:** Develops when long-term groundwater extraction exceeds aquifer recharge, producing declining trends in aquifer storage. Overdraft is usually evident by declines in surface-water levels and stream flow, reduction or elimination of vegetation, land subsidence, and seawater intrusion.

**Groundwater Recharge:** Any of the approved methods that are designed to detain or slow surface water runoff so that percolation is enhanced.

**Habitat:** The physical location or type of environment in which an organism or biological population lives or occurs.

**Imported Water:** Water brought into the city from outside its boundaries (e.g., State Water Project).

**Indicator:** Types of data or information that can be used to determine the progress or success of each reduction measure.

**LEED:** Leadership in Energy and Environmental Design, a standard established by the US Green Building Council.

**Light-Emitting Diode (LED):** A lower energy consuming and longer-lasting alternative to incandescent and compact fluorescent light bulbs.

**Low Carbon Fuel Standard (S-1-07):** An executive order from former Governor Schwarzenegger, the Low Carbon Fuel Standard established the goal of reducing the carbon intensity of transportation fuels in California by 10% by 2020.

**Low Impact Development (LID):** An innovative stormwater management approach with a basic principle to design the built environment to remain a functioning part of an ecosystem rather than exist apart from it. LID's goal is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source.

**Metropolitan Planning Organization (MPO):** A federally funded transportation planning organization comprising representatives from local government agencies and transportation authorities.

**Mixed Use:** Properties on which various uses such as office, commercial, institutional, and residential are combined in a single building or on a single site in an integrated development project with significant functional interrelationships and a coherent physical design. A single site may include contiguous properties.

**National Ambient Air Quality Standards:** The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

**Neighborhood Electric Vehicle (NEV):** Small, battery-powered, low-speed electric vehicles. NEVs are typically limited to streets with a posted speed limit of 25 mph or less. NEVs are classified by the California Air Resources Board as zero emissions vehicles, as they do not produce any tailpipe emissions.

**Nonattainment:** The condition of not achieving a desired or required level of performance. Frequently used in reference to air quality.

**Nonrenewable Energy:** Energy from sources that use a nonrenewable natural resource such as uranium or fossil fuels such as coal, oil, or natural gas.

**Operations and Maintenance (O&M):** Refers to the activities related to the routine, preventive, predictive, scheduled, and unscheduled actions aimed at preventing equipment failure or decline with the goal of increasing efficiency, reliability, and safety.

**Ordinance:** A law or regulation set forth and adopted by a governmental authority, usually a city or county.

**Ozone:** Produced when gases or vapors created by cars, solvents, factories, and pesticides mix and react in the presence of sunlight. This results in certain health effects such as breathing difficulties, lung damage, coughing, and chest pains.



**Particulate Matter (PM<sub>10</sub>) and Fine Particulate Matter (PM<sub>2.5</sub>):** Fine mineral, metal, smoke, soot, and dust particles suspended in the air. While particulate matter also has many natural sources, human-derived sources such as vehicle exhaust, road dust, mineral quarries, grading, demolition, agricultural tilling, and burning are major contributors to exceedances. In addition to reducing visibility, particulate matter can lodge in the lungs and cause serious, long-term respiratory illness and other health problems. The smaller the size of the particle, the deeper it can penetrate into the lungs and the more difficult it is to expel.

**Preservation:** To keep safe from injury, harm, or destruction.

**Property Assessed Clean Energy (PACE):** See Assembly Bill 811.

**Recycled Water, Reclaimed Water, Treated Sewage Effluent Water, or Greywater:** Treated or recycled wastewater of a quality suitable for non-potable uses such as landscape irrigation; not intended for human consumption.

**Reduction Measure:** A goal, strategy, program, or set of actions that target and reduce a specific source of greenhouse gas emissions.

**Regional Transportation Plan (RTP):** A long-term blueprint of the region's transportation systems. The RTP is a federally mandated comprehensive long-range regional planning document that identifies the region's transportation needs, sets forth an action plan of projects, determines actions and programs to address the needs and issues, and documents the financial resources needed to implement the RTP.

**Renewable Energy:** Energy from sources that regenerate and are less damaging to the environment, such as solar, wind, biomass, and small-scale hydroelectric power.

**Renewable Portfolio Standard (RPS):** A regulation requiring utility companies in California to increase the production of renewable energy from solar, wind, or biomass, or from geothermal sources.

**Retrofit Upon Sale:** Requirements on real property to replace inefficient water or energy fixtures as a condition of escrow. Retrofit upon sale requirements typically require a certificate or other form of verification from local government agencies to ensure that the fixtures are replaced and meet minimum efficiency requirements.

**Safe Routes to School (SR2S or SRTS):** A national movement aimed at providing safe environments to encourage walking and bicycling surrounding local schools through engineering, enforcement, education, encouragement, and evaluation. Safe Routes to School programs are typically funded through federal, state, and local grants. SR2S is the California program; SRTS is the national program.

**Scopes:** Scopes help to identify where emissions originate and what entity retains regulatory control and the ability to implement efficiency measures. The scopes are defined as follows:



- **Scope 1** – Direct emissions sources located within the unincorporated areas of the city, primarily from combustion of fuels. Examples of Scope 1 sources include the use of fuels such as gasoline or natural gas. GHG emissions from off-road agriculture equipment and nitrogen fertilizer application are considered Scope 1 emissions, while methane emissions from livestock are considered Scope 3.
- **Scope 2** – Indirect emissions that result because of activities in the unincorporated areas of the city and limited to electricity, district heating, steam, and cooling consumption. Scope 2 emissions sources include purchased electricity used in the unincorporated areas and associated with the generation of greenhouse gas emissions at the power plant. These emissions should be included in community-wide analysis, as they are the result of the community's electricity consumption.
- **Scope 3** – All other indirect emissions that occur as a result of activity in the unincorporated areas. Examples of Scope 3 emissions include methane emissions from solid waste generated within the community, which decomposes at landfills either inside or outside of the unincorporated areas of the city.

**Senate Bill (SB) 7:** Passed in 2009, SB 7 requires the state to achieve a 20% reduction in per capita water use by 2020. This law also requires local water providers to comply with the 20% reduction at the risk of becoming ineligible for state grant or loan funding.

**Senate Bill (SB) 97:** Requires lead agencies to analyze GHG emissions and climate change impacts under the California Environmental Quality Act.

**Senate Bill (SB) 375:** Directs the metropolitan planning organizations in California to create a Sustainable Communities Strategy (SCS) as part of the regional transportation plan. The SCS will demonstrate how the region will achieve the 2020 and 2035 greenhouse gas reduction targets for the region set by CARB.

**Senate Bill (SB) 407:** Adopted in 2010, SB 407 requires inefficient plumbing fixtures be replaced with more efficient models at the time of property sale or improvement. See Retrofit Upon Sale.

**Senate Bill (SB) 610 (Chaptered at Water Code 10910):** Requires CEQA review of certain large residential and commercial projects to include a water supply assessment that proves that adequate water exists for the project.

**Senate Bill (SB) 1016:** Adopted in 2008, SB 1016 establishes per capita waste disposal rate requirements and goals for local agencies in California. The requirements are expressed in a pounds per person per day measurement.

**Senate Bill (SB) 1881:** Requires local agencies to adopt a water-efficient landscape ordinance, limiting the amount of water used for landscaping purposes.

**Smart Grid:** The smart grid delivers electricity from suppliers to consumers using two-way digital communications. The smart grid is envisioned to overlay the ordinary electrical grid with an information and net metering system, which includes smart meters. Smart meters will allow consumers to become more aware of their energy use and in the future will allow smart grid enabled appliances to be pre-programmed to operate at a time when electricity costs are lowest.

**Sustainability:** Community use of natural resources in a way that does not jeopardize the ability of future generations to live and prosper.

**Sustainable Communities Strategy (SCS):** The land use element of each MPO's Regional Transportation Plan as required by SB 375. The SCS will demonstrate how the region will achieve the 2020 and 2035 VMT and GHG reduction targets for the region set by CARB.

**Sustainable Development:** Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

**Transit-Oriented Development (TOD):** A mixed-use residential or commercial area designed to maximize access to transit options.

**Transportation Demand Management (TDM) Plan:** A voluntary or mandatory program developed by local agencies, large employers, or high traffic commercial services to limit the amount of congestion and pollution related to transportation demand. TDM plans may include incentives, regulations, and education about transportation alternatives.

**Trustee Agency:** A state agency having jurisdiction by law over natural resources affected by a project which are held in trust for the people of the State of California. There are four trustee agencies: the Department of Fish and Game, the State Lands Commission, the Department of Parks and Recreation, and the University of California.

**Urban Heat Island:** The term "heat island" describes built-up areas that are hotter than nearby rural areas. On a hot, sunny summer day, roof and pavement surface temperatures can be 50–90°F (27–50°C) hotter than the air, while shaded or moist surfaces remain close to air temperatures. These surface urban heat islands, particularly during the summer, have multiple impacts and contribute to atmospheric urban heat islands. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.

**Urban Reserve:** An area outside of an urban service area but within an urban growth boundary, in which future development and extension of municipal services are contemplated but not imminent.

**Vehicle Miles Traveled (VMT):** A key measure of overall street and highway use. Reducing VMT is often a major objective in efforts to reduce vehicular congestion and achieve regional air quality goals.

**Volatile Organic Compounds (VOC):** A variety of chemicals with both short- and long-term adverse health effects. VOCs are emitted as gases from a wide array of products such as paints, lacquers, cleaning supplies, markers, and office equipment and furnishings.

**Vulnerable Populations:** There are three primary segments of vulnerable populations: those at risk to adverse climate change impacts due to exposure, sensitivity, or adaptive capacity.

- **Exposure:** Physical conditions may put particular populations at risk to the impacts of climate change. For instance, populations living in low-lying or coastal areas may be more exposed to flooding events and sea level rise, while those who work outside may suffer from health-related issues due to increased temperatures and decreased air quality.
- **Sensitivity:** Certain populations, including young children and those over the age of 65, are physiologically more sensitive to extreme temperatures and increased instances of air pollution.
- **Adaptive Capacity:** The adaptive capacity of lower-income and institutionalized populations can be limited due to lower access to the resources necessary to prepare for or react to the long-term impacts of climate change and the increased frequency of disasters.

**Water Conservation:** Reducing water use, such as turning off taps, shortening shower times, and cutting back on outdoor irrigation.

**Water Efficiency:** Replacing older technologies and practices in order to accomplish the same results with less water; for example, by replacing toilets with new low-water-using models and by installing “smart controllers” in irrigated areas.

**Water-Efficient Landscape:** Native or low-water-using landscapes. Water-efficient landscapes are required by law in all cities and counties in California to conserve water.

**Watershed:** The total area above a given point on a watercourse that contributes water to its flow; the entire region drained by a waterway or watercourse that drains into a lake or reservoir.

**Zero Emissions Vehicle (ZEV):** A vehicle that does not emit any tailpipe emissions from the on-board source of power. Both electric and hydrogen fuel cell vehicles are classified as ZEVs.



## APPENDIX A



### GHG INVENTORY METHODOLOGY

This technical appendix provides additional information on how the results of the City's 2008 community-wide greenhouse gas emissions inventory were calculated. A brief overview of how emissions are calculated using activity data and emissions factors is presented, followed by an explanation of overarching data parameters and limitations that are common in GHG inventories.



## BASELINE GREENHOUSE GAS EMISSIONS INVENTORY METHODOLOGY

This technical appendix provides additional information on how the results of the City's 2008 community-wide greenhouse gas emissions inventory were calculated. First, a brief overview of how emissions are calculated using activity data and emissions factors will be presented, followed by an explanation of overarching data parameters and limitations that are common in GHG inventories. Next, a more detailed explanation of the data used to calculate emissions will be presented. Specifically, the following information is provided for each emissions sector found in the baseline inventory section of **Chapter 2**:

- Activity data and source
- Emissions factor and source
- Calculation methodology
- Modeling methodology (if applicable)

### Inventory Background

Sunnyvale's GHG inventory is guided by the Bay Area Air Quality Management District (BAAQMD) California Environmental Quality Act Air Quality Guidelines, adopted in June 2010. The guidelines include an appendix entitled "Recommended Plan-Level GHG Quantification Guidance." The guidance is recommended for any plan or program that will be used as a programmatic tiering document under the California Environmental Quality Act (CEQA) according to BAAQMD's definition of a Qualified GHG Reduction Strategy.

### GHG Emissions Activities

The guidelines indicate that the following sources are to be included in any inventory that will be used in a Qualified GHG Reduction Strategy:

- Commercial and industrial energy (natural gas and electricity, including direct access)
- Residential energy (natural gas and electricity)
- Transportation (highway, non-highway)
- Waste (direct landfill emissions, emissions from community waste)
- Water (wastewater treatment, energy for filtration and movement)
- Off-road equipment and vehicles (lawn and garden equipment, construction vehicles and equipment)
- Stationary sources (major industrial point source emissions)

BAAQMD's guidance is consistent with industry best practices and international protocol. In the absence of a California or national community-wide inventory protocol, it is the best-available methodology for use within the BAAQMD's boundary.

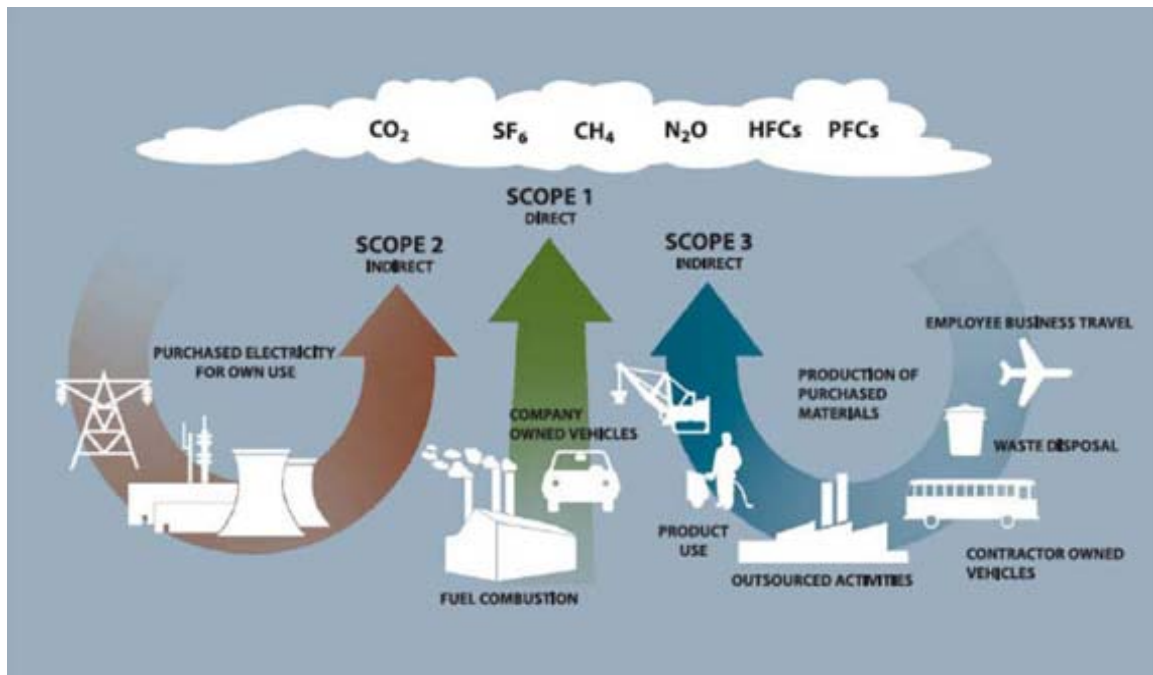


## GHG Emissions Scopes

Scopes help to identify where emissions originate and what entity retains regulatory control and the ability to implement efficiency measures. The scopes are depicted in **Figure A-1** and defined as follows:

- Scope 1 – Direct emissions sources located within the city, primarily from combustion of fuels. Examples of Scope 1 sources include the use of fuels such as gasoline or natural gas. GHG emissions from off-road agriculture equipment and nitrogen fertilizer application are considered Scope 1 emissions, while methane emissions from livestock are considered Scope 3.
- Scope 2 – Indirect emissions that result because of activities in the city and limited to electricity, district heating, steam and cooling consumption. Scope 2 emissions sources include purchased electricity used in the unincorporated areas and associated with the generation of greenhouse gas emissions at the power plant. These emissions should be included in community-wide analysis, as they are the result of the community's electricity consumption.
- Scope 3 – All other indirect emissions that occur as a result of activity in the unincorporated areas. Examples of Scope 3 emissions include methane emissions from solid waste generated within the community, which decomposes at landfills either inside or outside of the city boundary.

**FIGURE A-1 – GHG EMISSIONS ACTIVITIES BY SCOPE**



Source: New Zealand Business Council for Sustainable Development. 2002. *The Challenge of GHG Emissions: The "why" and "how" of accounting and reporting for GHG emissions: An Industry Guide*

## Overview of Calculation Methodology

The GHG emissions inventory starts with collecting activity data for each sector listed above, such as the kilowatt-hours (kWh) of electricity used or therms of natural gas used for the residential, commercial, and industrial energy sectors, the vehicle miles traveled for the transportation sector, or million gallons (MG) of water used by the community in a single calendar year. These activities are converted into GHG emissions using an emissions factor or coefficient. These emissions factors are supplied by the energy provider or emissions modeling software and indicate the greenhouse gases that are emitted for every kWh produced, mile traveled, or ton of waste disposed. The coefficients used for calculating emissions from each activity follow international inventory standards and are utility-, county-, or California-specific, when available.

For example, if a community consumed 1 million kilowatt-hours of electricity and each kWh of electricity results in 0.0004 metric tons (MT) of CO<sub>2</sub>, the CO<sub>2</sub> emissions calculation would be as follows:

$$1 \text{ million kWh} * .0004 \text{ MTCO}_2/\text{kWh} = 400 \text{ MTCO}_2$$

## Primary Greenhouse Gases

The inventory measures three primary GHG emissions—carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). These greenhouse gases are then converted to carbon dioxide equivalents (CO<sub>2</sub>e), enabling the City to consider different greenhouse gases in comparable terms. The conversion of greenhouse gases is done by comparing the global warming potential (GWP) of each gas to CO<sub>2</sub>. For example, methane (CH<sub>4</sub>) is 21 times more powerful than CO<sub>2</sub> on a per weight basis in its capacity to trap heat, and therefore one metric ton of CH<sub>4</sub> would be calculated as 21 metric tons of CO<sub>2</sub>e, while nitrous oxide (N<sub>2</sub>O) is 310 times more powerful than CO<sub>2</sub> and would be calculated as 310 MTCO<sub>2</sub>e.

## Data Parameters

The inventory was developed with the best-available tools, data, and methodology; however, as with any GHG inventory, there are limitations to representing all sources of emissions in a local jurisdiction. The main factors that limit GHG inventories include (1) data availability, (2) privacy laws, and (3) deficient methodology. The following section highlights specific emissions sources or methodology deficiencies that limit the inclusion of specific sources in a GHG inventory.

## Data Availability

Greenhouse gas inventories are a relatively new practice at the local government level. As such, there are some emissions sources for which no data is available or for which there is no methodology to convert activity to emissions. Lack of available data or methodology prevented the calculation of emissions from the following sources for the following reasons:

- Off-road vehicles and equipment (aside from lawn/garden and construction equipment) – The CARB OFFROAD 2007 software provides emissions from a range of activities. These numbers are aggregated for the entire Santa Clara County area, including incorporated, unincorporated, and state- or federally owned land. The BAAQMD has provided guidance on attributing countywide off-road equipment emissions from lawn and garden equipment as well as construction equipment to each jurisdiction, but at this time, there is not a method to disaggregate the remaining data by jurisdiction. Examples of remaining off-road emissions sources include watercraft, recreational vehicles, and mining equipment.
- Rail (aside from Caltrain) – The federal government does not release information regarding the efficiency, fuel consumption, or mileage of locomotives traveling through Sunnyvale.
- Propane use – Propane is essentially an unregulated fuel in California (except for storage and safety issues, which are regulated). Because it is an unregulated commodity, no data is collected by the State on propane sales or usage.
- Refrigerants – Similar to propane, above, the amount of fugitive refrigerant emissions cannot be calculated because sales are not tracked.

The above-mentioned sources are recognized data limitations for local inventories. Many of these sources are available at the state, county, or national level, but cannot yet be accurately estimated for the City based on available activity data indicators.

## Privacy Laws

Commercial, industrial, and institutional electricity and natural gas are combined into a nonresidential category due to the California 15/15 rule. The 15/15 rule was adopted by the California Public Utilities Commission in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. The 15/15 Rule requires that any aggregated information provided by the utilities must include at least 15 customers and that a single customer's load must be less than 15% of an assigned category. If the number of customers in the compiled data is below 15, or if a single customer's load is more than 15% of the total data, categories must be combined before the information is released. The rule further requires that if the 15/15 Rule is triggered for a second time after the data has been screened already using the 15/15 Rule, the customer must be dropped from the information provided.

## Methodology Limitations

An appropriate methodology for estimating life-cycle emissions is still under development and is not recommended for inclusion in a community-wide inventory. Life-cycle emissions are emissions associated with the production and disposal of items consumed by a community (i.e., “cradle-to-grave”). For instance, a life-cycle assessment of vehicle emissions would include those from designing, extracting raw materials, producing, delivering, and disposing of each car in the city. In contrast, this analysis only captures how much that car is driven in the city consistent with standard protocol.

Review of similar inventories, including the California Greenhouse Gas Inventory prepared by the California Air Resources Board, indicates that those sources not included in the inventory for the reasons stated above comprise less than 5% of total emissions in the city. The emissions identified in this report are primarily GHGs that the community has directly caused and has the ability to reduce through implementation of conservation actions, a CAP, or corresponding efforts.

## Inventory Detail by Scope and Sector

This inventory includes Scope 1, Scope 2, and Scope 3 sources from the following sectors: residential energy, commercial/industrial energy, transportation landfill gas, community waste, water, mobile off-road equipment, Caltrain, and stationary sources.

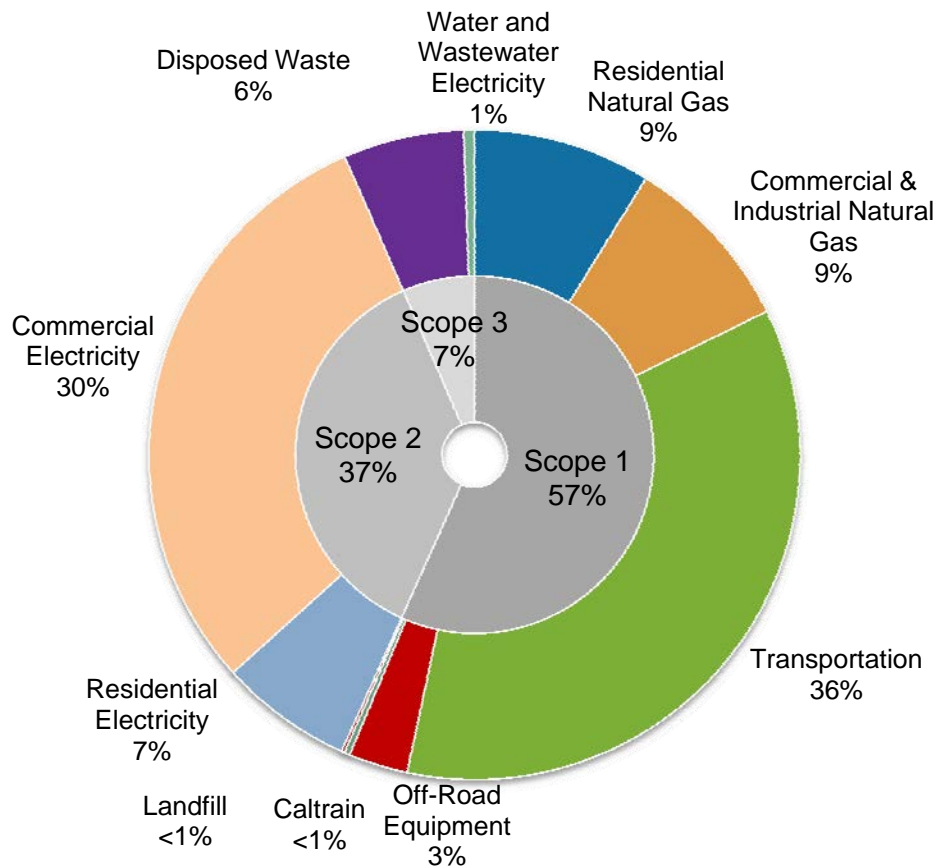
Sunnyvale emitted approximately 1,270,170 metric tons of carbon dioxide equivalents (MTCO<sub>2</sub>e) in the baseline year 2008. As shown in **Table A-1** and **Figure A-2**, the commercial/industrial energy sector is the largest contributor at 39%, producing approximately 502,210 MTCO<sub>2</sub>e in 2008. Emissions from the transportation sector were the next largest contributor, accounting for 35% of the total emissions, producing approximately 442,610 MTCO<sub>2</sub>e. The residential sector accounted for 16% of the total emissions (198,140 MTCO<sub>2</sub>e), and emissions from community waste comprised 6% of the total (76,970 MTCO<sub>2</sub>e). Emissions were also inventoried for off-road equipment and water/wastewater treatment, making up 3% and 1% of total emissions, or 37,830 MTCO<sub>2</sub>e and 6,870 MTCO<sub>2</sub>e, respectively. Landfill and Caltrain emissions were the smallest contributors with 3,600 MTCO<sub>2</sub>e and 1,944 MTCO<sub>2</sub>e, respectively.

**Figure A-2** also shows that the majority of emissions are within Scope 1 (56%) and Scope 2 (37%). These emissions were either emitted within the city or directly and immediately caused by activity within the city in 2008. Scope 3 emissions are 7% of the inventory and include emissions that are caused by activity within the city, but are either emitted over long periods or have a less direct impact than Scope 1 and 2 emissions under best-available methodologies.

**TABLE A-1– DETAILED EMISSIONS BY SOURCE AND SECTOR**

Sector	Subsector	Activity		Source	MTCO <sub>2</sub> e	Scope
Residential Energy	Electricity	292,574,600	kWh	PG&E	84,850	2
	Natural Gas	21,346,400	Therms	PG&E	113,290	1
Commercial/Industrial Energy	Electricity	1,336,804,600	kWh	PG&E	387,700	2
	Natural Gas	21,576,000	Therms	PG&E	114,510	1
Community Waste	Landfilled Waste	100,900	Tons	CalRecycle	76,970	3
	Alternative Daily Cover	700	Tons	CalRecycle		

Sector	Subsector	Activity		Source	MTCO <sub>2</sub> e	Scope
Transportation	On-road Vehicles	881,838,400	VMT	TDF Model, CARB	442,610	1
Water	Water Supply	6,500	Million Gallons	BAWSCA	1,720	3
	Water Treatment & Distribution	7,509,800	kWh	BAWSCA, CEC	2,180	3
	Wastewater Treatment	10,251,700	kWh	CEC	2,970	3
Off-Road	Lawn and Garden	900	Gallons of Gasoline	CARB	2,900	1
		400	Gallons Diesel	CARB		
	Construction	200	Gallons of Gasoline	CARB	34,930	1
		9,500	Gallons Diesel	CARB		
Landfill	Landfill Gas Emissions	58,000,000	Cubic Ft Gas	City Staff	3,600	1
Caltrain	Passenger Miles Traveled	29,156,400	Passenger Miles	Caltrain, LGOP	1,940	1
<b>TOTAL</b>					<b>1,270,170</b>	

**FIGURE A-2– EMISSIONS BY SCOPE AND SECTOR**

### Stationary Sources

Stationary sources are any fixed emitter of air pollutants, such as power plants, petroleum refineries, petrochemical plants, food-processing plants, and other heavy industrial sources. At the recommendation of the BAAQMD, stationary source emissions are discussed in this inventory for informational purposes only, as stationary source emissions are influenced by market forces beyond the City's local influence and are instead best addressed and regulated by the BAAQMD or through federal and state programs. The baseline inventory is intended to guide future local policy decisions that relate to emissions within the City's influence; therefore, stationary source emissions are excluded from **Table A-1** and **Figure A-2** as well as from all further discussions of this inventory after **Table A-2**.

A list of stationary source emissions within the City of Sunnyvale was not available so emitters in Sunnyvale were included from the BAAQMD's 2008 report titled "Source Inventory of Bay Area Greenhouse Gas Emissions." These sources are listed below in **Table A-2**.

**TABLE A-2 – LARGE STATIONARY EMITTERS**

Source	MTCO <sub>2</sub> e
Lockheed Martin Corporation	18,630
City of Sunnyvale/Public Works	14,200
City of Sunnyvale Water Pollution Control	2,350
Northrop Grumman Systems Corporation	7,350
Spansion LLC	4,560
Onizuka Air Force Base	3,570
<b>TOTAL</b>	<b>50,660</b>

Excluding stationary sources allows the City to set accurate emissions reduction targets. The exclusion of large stationary sources from local inventories and reduction plans is also supported by the BAAQMD. Stationary sources accounted for approximately 50,660 MTCO<sub>2</sub>e in 2008. It is unknown whether or how stationary source emissions will change in the future; however, new potential emitters will be approved and noticed by the BAAQMD through current permitting processes.

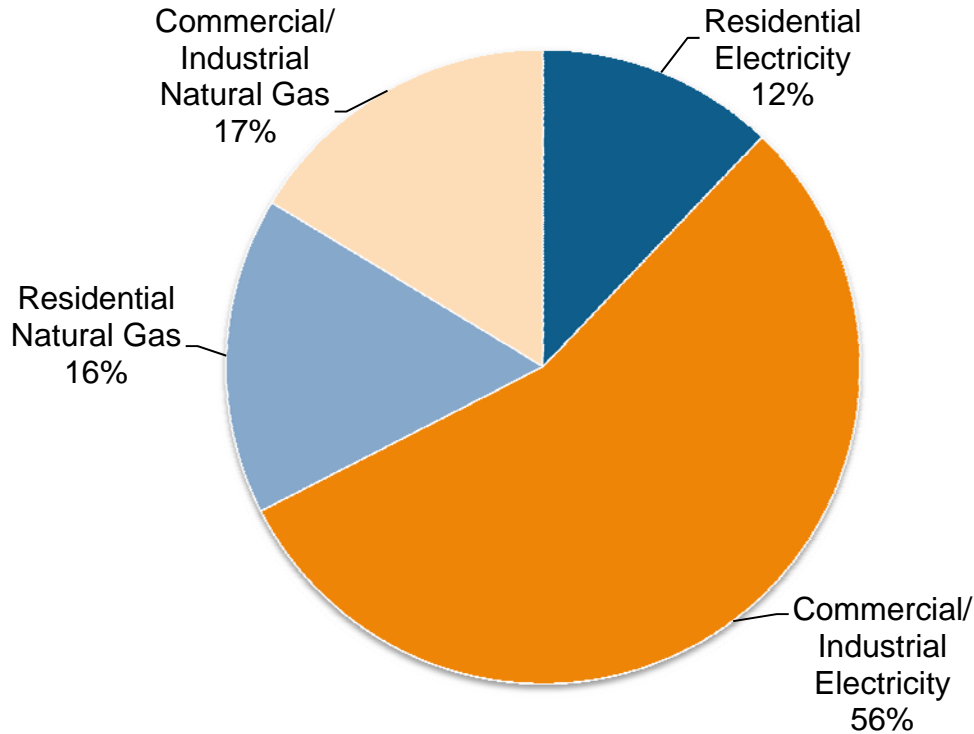
### The Built Environment

With all scopes and sectors aggregated, 55% of total community-wide emissions in the year 2008 came from the “built environment” (see residential and commercial/industrial energy sectors in **Table A-1**). The built environment comprises residential and commercial/industrial natural gas and electricity consumption. As shown in **Figure A-3** below, nonresidential electricity use makes up 56% of emissions from the built environment, while nonresidential gas, residential natural gas, and residential electricity make up 17%, 16%, and 12%, respectively.

Pacific Gas and Electric Company (PG&E) provided electricity and natural gas consumption for entities within the city. Commercial, industrial, and direct access electricity are combined in the nonresidential category due to the California 15/15 rule (see Privacy Laws subsection).

PG&E provided a 2008 carbon dioxide (CO<sub>2</sub>) coefficient for electricity and natural gas. Coefficients for methane (CH<sub>4</sub>) and nitrogen dioxide (N<sub>2</sub>O) emissions were provided by the California Air Resources Board’s Local Government Operations Protocol (LGOP) version 1.1 and were converted into carbon dioxide equivalents and added to the CO<sub>2</sub> coefficient to create a CO<sub>2</sub>e coefficient.



**FIGURE A-3 – BUILT-ENVIRONMENT GHG EMISSIONS BY SECTOR**

## Transportation

Transportation emissions accounted for 36% of the 2008 inventory (see **Table A-1**). As with the majority of California municipalities, travel by on-road motorized vehicles constitutes the greatest percentage of GHG emissions in the city. Using origin-destination analysis, three types of vehicle trips were tracked separately for AM and PM peak periods in Sunnyvale:

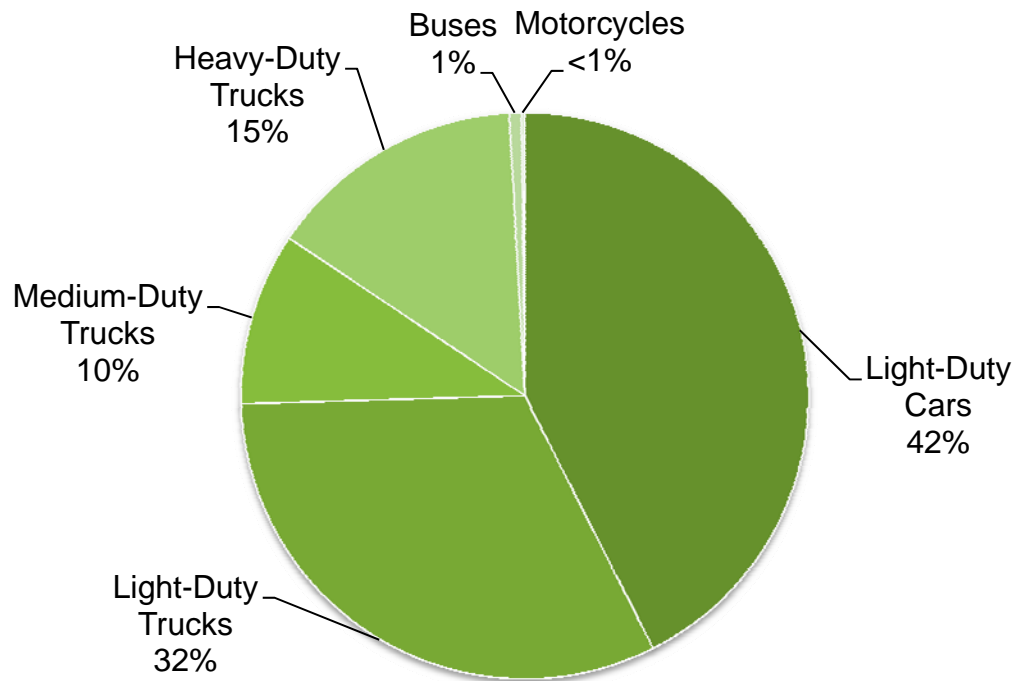
- Internal-Internal: Vehicle trips that remained inside Sunnyvale
- Internal-External and External-Internal: Vehicle trips that have an ending or a beginning in Sunnyvale and another outside of Sunnyvale
- External-External: Vehicle trips that pass through Sunnyvale

Using the recommendation of the Regional Target Advisory Committee (RTAC), the body responsible for Senate Bill 375 target setting, vehicle miles traveled (VMT) from trips of type 1, 2, and 3 were counted 100%, 50%, and 0% respectively toward jurisdiction-generated VMT.

Transportation-related greenhouse gas emissions were calculated using the CARB Emissions Factor 2007 (EMFAC2007) software. The GHG emissions by vehicle type are shown in **Figure A-4**. Light-duty autos such as compact cars and light-duty trucks such as SUVs and pickup trucks contribute 42% and 32% of transportation-related emissions, respectively. The remaining 26% of emissions are the result of medium and heavy-duty vehicles, buses, and motorcycles. EMFAC2007 provides carbon dioxide emissions

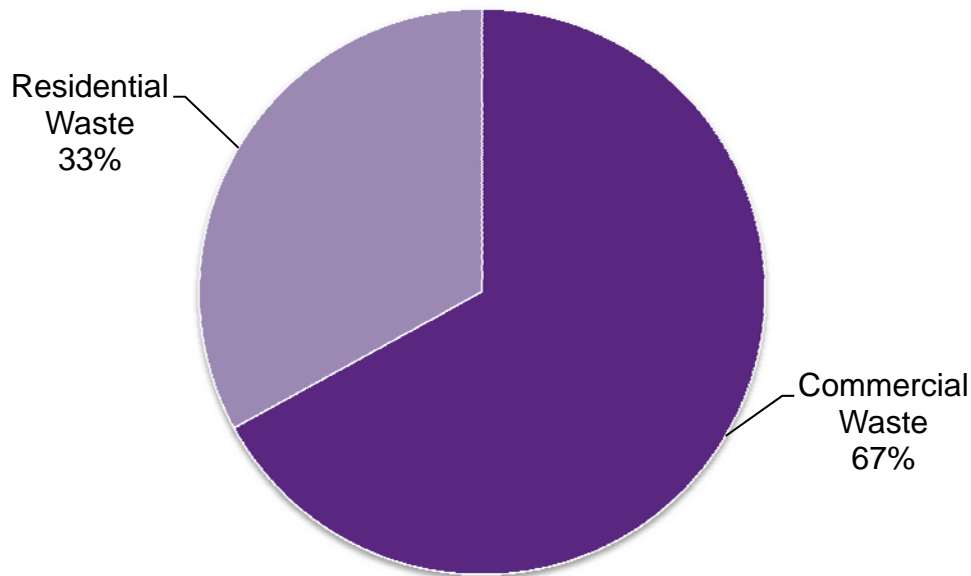
according to the unique vehicle composition of each county in California, including Santa Clara County, which was used for this report. Individual GHGs such as carbon dioxide, methane, and nitrous oxide are converted to CO<sub>2</sub>e by multiplying the CO<sub>2</sub> emissions by a conversion factor provided by the US Environmental Protection Agency of 100/95.

**FIGURE A-4 – TRANSPORTATION-RELATED GHG EMISSIONS BY VEHICLE CLASS**



## Waste

Solid waste disposed of at managed landfills was responsible for 6% of total emissions for the community (see **Table A-1**). Waste emissions are considered Scope 3 emissions because they are not generated in the base year but will result from the decomposition of waste generated in 2008 over the full 100-year cycle of its decomposition. Waste and alternative daily cover (ADC) tonnages were provided by CalRecycle. Waste tonnages include waste sent to landfills from Sunnyvale. ADC is the temporary cover material placed on top of landfilled waste at the end of each day to control occurrences such as odors and scavenging. The ADC is landfilled along with other waste, and some types of ADC, including green waste and sludge, release GHG emissions. According to CalRecycle, 33% of Sunnyvale's waste is from residential sources and 67% from commercial; these percentages are translated into emissions in **Figure A-5**.

**FIGURE A-5 – WASTE EMISSIONS BY SECTOR**

Landfill emissions are estimated using the California Air Resources Board Landfill Emissions Tool, version 1.2. The Landfill Emissions Tool uses the Intergovernmental Panel on Climate Change (IPCC) first-order decay model to calculate methane emissions. The tool defaults to an anaerobically degradable organic carbon (ANDOC) value of 8% based on California statewide waste composition in 2005. The analysis relied on the California statewide waste composition since localized data was not available. CO<sub>2</sub> emissions are not included in this analysis due to their biogenic origin.

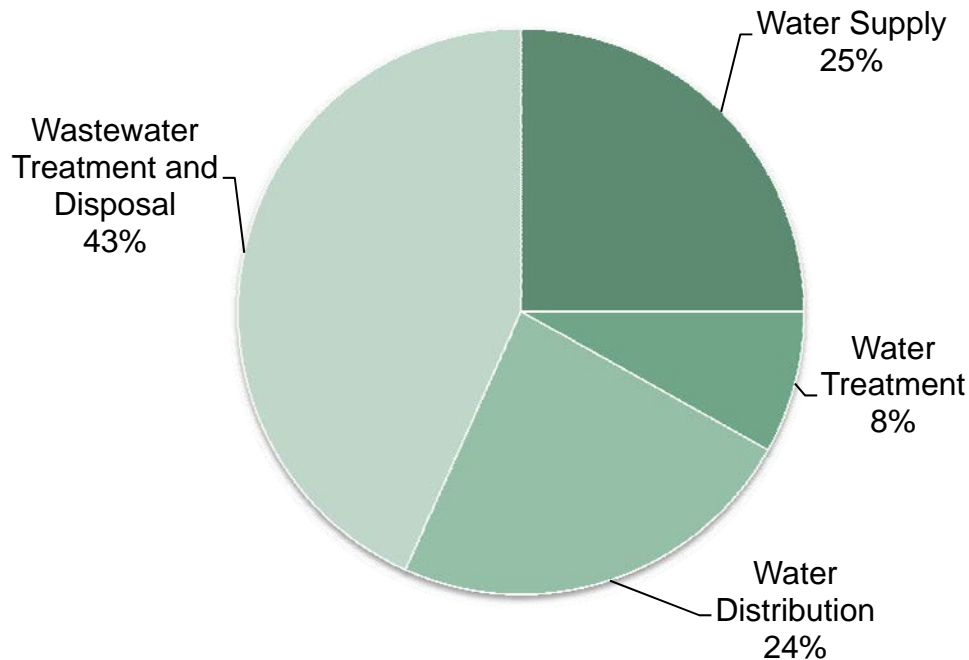
### Water/Wastewater

Water-related emissions include the electricity use required to convey, treat, distribute, collect, and dispose of water used by residences, businesses, and institutions in the City of Sunnyvale. These emissions also include the direct process emissions from wastewater treatment. Sunnyvale receives its water from a variety of sources, including the San Francisco Public Utilities Commission (SFPUC), Santa Clara Valley Water District (SCVWD), wells, and recycled water.

Water and wastewater emissions accounted for 1% of total GHG emissions in 2008 (see **Table A-1**). This inventory includes emissions from the electricity used to process, treat, and move water and wastewater to and from the city and direct process emissions from wastewater treatment. GHG emissions by type of activity are summarized in **Figure A-6**. While this sector may potentially double-count electricity consumption captured in the energy sector, water and wastewater emissions are calculated separately to comply with BAAQMD guidance. The overlap between electricity and water and wastewater energy is anticipated to have a negligible effect on the inventory, due to the small contribution of the water and wastewater sector.

Indirect emissions from the conveyance, treatment, and delivery of water and the treatment and disposal of wastewater were provided by the CPUC's 2010 water-energy relation inventory and the CEC's 2006 water energy inventory.

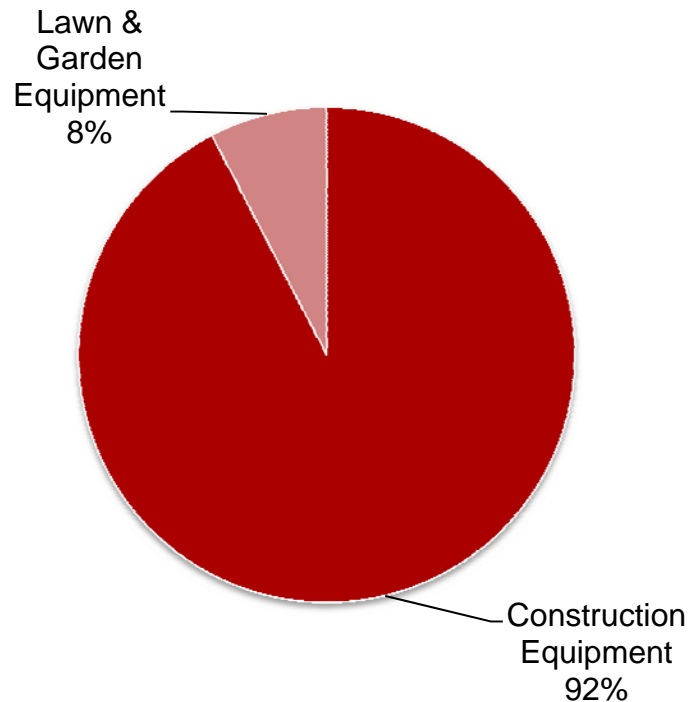
**FIGURE A-6 – DETAILED WATER AND WASTEWATER EMISSIONS BY SOURCE**



## Off-Road

Off-road vehicles and equipment related to construction and lawn and garden activities accounted for 3% of emissions in 2008 (see **Table A-1**). While several other off-road equipment uses contribute to emissions in Santa Clara County, currently there is no practical methodology to attribute countywide marine, recreational, airport, or other equipment and vehicles to each individual jurisdiction within the county. CARB's OFFROAD 2007 program provides construction and lawn and garden activity per county in the state. As shown in **Figure A-7**, GHG emissions from construction and lawn and garden activity make up 92% and 8% of off-road emissions, respectively. Per BAAQMD guidance, county-level activity and emissions for off-road equipment were attributed to the city using the following indicators:

- Total county construction equipment emissions were attributed to Sunnyvale using the proportion of new housing units built within the city compared to the entire county using the US Department of Housing and Urban Development's (HUD's) State of the Cities Data Systems building permit reporting system.
- Total county lawn and garden emissions were attributed to the city using the proportion of existing households within Sunnyvale compared to the entire county using California Department of Finance (DOF) figures for 2008.

**FIGURE A-7 – OFF-ROAD EMISSIONS BY SOURCE**

### Caltrain

Emissions in 2008 from trips taken to or from Sunnyvale by Caltrain are a result of the combustion of diesel fuel on the locomotive fleet and contribute less than 1% of total emissions in 2008. The total number of trips and trip lengths that begin or end in Sunnyvale were determined using 2008 annual weekday Caltrain ridership counts. Weekday trips were summed to determine a weekly and annual number of trips and annual passenger miles traveled to or from Sunnyvale. Total annual passenger miles traveled were multiplied by MTCO<sub>2</sub>e per passenger mile coefficient. Half of each trip was attributed to Sunnyvale as the other half of the trip would be attributed to the origin or destination outside of the city. Emissions coefficients for locomotives are provided by the Local Government Operations Protocol (LGOP).

### Landfill Gas

Direct landfill gas (LFG) emissions from the closed Sunnyvale Landfill are measured directly through the gas capture system in place. Mark Bowers, the City's Solid waste Division Manager, provided these measurements in the form of standard cubic feet. This volume of LFG captured for 2008 was converted into MTCO<sub>2</sub>e using equation 9.2 in the Local Government Operations Protocol v1.1. For information not available regarding the landfill and the exact content of the gas capture, default factors, found in LGOP, were used. The City was able to capture about 58 million cubic feet of LFG in 2008. Captured landfill gas is blended with waste water digester gas to power Sunnyvale's wastewater treatment plant. However, since not all LFG can be captured, an additional 3,600 MTCO<sub>2</sub>e were also emitted resulting in <1% of total community-wide emissions.



## APPENDIX B



### GHG TECHNICAL APPENDIX

This Technical Appendix provides detailed descriptions, performance indicators, estimated costs, and assumptions for each GHG reduction measure in this Climate Action Plan.





# CLIMATE ACTION PLAN TECHNICAL APPENDIX – METHODOLOGY AND ASSUMPTIONS FOR GHG QUANTIFICATION

This Technical Appendix provides detailed descriptions, performance indicators, estimated costs, and assumptions for each GHG reduction measure in this Climate Action Plan.

## OS-1 Open Space

Maintain and increase the amount of open space in Sunnyvale consistent with the Council policy and the Consolidated General Plan so that there is a minimum of 5.34 acres per 1,000 population.

### Action Items:

OS-1.1. Achieve and maintain an open space to population ratio of 5.5 acres per 1,000 residents.

### GHG Assumptions:

	2010	2020	2035
New park space (acres)	0	64	146
Number of trees per acre	10	10	10
Number of trees planted	0	637	1,456

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e)	0	20	50

### Performance Indicators:

New acres of parkland

### Costs and Savings:

City Costs:	<i>Very High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

The City of Sunnyvale Parks and Recreation Department completed the Parks of the Future Plan in November 2008. The plan states that Sunnyvale has a current park-to-population ratio of 5.5 acres of parkland per 1,000 residents. While the plan outlines ways in which the City can achieve a future ratio of 5.3 acres per 1,000 residents, this analysis assumes a more realistic target of maintaining the current park-to-resident ratio in 2020 and 2035. This would necessitate 64 more acres of parkland by 2020 and 14 additional acres by 2035. This reduction measure assumes a rate of 10 new trees per acre of new parkland. This ratio is based on regional averages and observed practices. Total emissions reduction includes annual sequestration during a 40-year life cycle of open space vegetation and trees and avoided emissions from the reduction in electricity consumption as a result of direct shading and overall climate cooling. This measure assumes a distribution of 70% deciduous and 30% evergreen trees and a 30-60-10 distribution of large, medium, and small trees.

### Sources:

City of Sunnyvale Parks and Recreation Department. 2008. Parks of the Future Plan.

McPherson, et al. 2000. The potential of urban tree plantings to be cost effective in a carbon market.

## OS-2 Outdoor Meeting Space

Provide availability and access to outdoor space for recreation or social purposes, including access to public open spaces on privately owned property such as retail shopping centers.

**Action Items:**

–

**GHG Reduction:**

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	Supportive Measure		

**Performance Indicators:**

N/A

**Costs and Savings:**

City Costs:	<i>Minimal</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

**Methodology:**

This cost and greenhouse gas impact of this measure is unknown.

**Sources:**

N/A

**OS-3 Urban Forestry**

Increase the number of shade trees planted in the community, and protect the existing tree stock.

### Action Items:

OS-3.1. Continue to implement the City's Tree Preservation requirements.

OS-3.2. Develop and implement canopy coverage requirements for City-owned parking lots, with exceptions for solar installations.

OS-3.3. Promote tree planting on private property through incentive and support programs.

OS-3.4. Expand existing park, open space, and boulevard tree inventory through the replacement of trees with a greater number of trees when trees are removed due to disease, park development, or other reasons.

OS-3.5. Clarify codes and policies to maximize the preservation of the largest longest-living trees, and ensure the expansion of the urban forest over time as appropriate for the site.

### GHG Assumptions:

	2010	2020	2035
Number of trees planted (private and public)	925	7,400	18,500
Percentage increase in tree planting	1%	4%	10%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	40	330	820
GHG Reduction with CCA	40	290	730

### Performance Indicators:

Number of new street trees planted

### Costs and Savings:

City Costs:	<i>Medium</i>
City Savings:	<i>Low</i>
Community Costs:	<i>Low</i>
Community Savings:	<i>Medium</i>

### Methodology:

Total emissions reduction includes annual sequestration during a 40-year life cycle of a forestry program and avoided emissions from the reduction in electricity consumption as a result of direct shading and overall climate cooling. The City of Sunnyvale maintains over 37,000 street trees. For this measure, we assume that there is one private property tree for every street tree in Sunnyvale and assume that the City will facilitate a 4% and 10% increase in trees by 2020 and 2035, respectively. This measure assumes a distribution of 70% deciduous and 30% evergreen trees and a 30-60-10 distribution of large, medium, and small trees. Distribution of trees is proportional to the distribution of the age of the city's building stock based on regional averages.

### Sources:

McPherson, et al. 2000. The potential of urban tree plantings to be cost effective in a carbon market.

## EC-1 Lighting Efficiency

Increase the use of efficient indoor and outdoor lighting technologies.

### Action Items:

EC-1.1. Replace City-owned streetlights and park and parking lot lighting with energy-efficient lighting such as light-emitting diode (LED) or induction lights as technology becomes more affordable and when return on investment is less than five years.

EC-1.2. Participate in an illumination bank that provides loans for upfront cost of energy-efficient lighting technologies to be paid back over three to seven years.

EC-1.3. Require new private parking lot lighting to use energy-efficient lighting technologies.

### GHG Assumptions:

	2010	2020	2035
Number of streetlights replaced with LED	0	6,647	8,862
Energy savings (kWh)	0	1,359,874	1,813,165
Percentage of streetlights replaced	0%	75%	100%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	330	390
GHG Reduction with CCA	0	220	210

### Performance Indicators:

Percentage of City streetlights replaced with LED

### Costs and Savings:

City Costs:	<i>Very High</i>
City Savings:	<i>Medium-High</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

In 2007, the City completed a Climate Action Plan for City government operations. The CAP included an estimate of energy savings from LED streetlight replacements for the City's 8,862 streetlights. The kWh savings are for 2006 energy consumption; however, streetlight energy consumption is assumed to be consistent from year to year. Parking lot lighting is not quantified as part of this measure due to overlap with the City's Green Building Ordinance.

### Source:

KEMA. 2007. City of Sunnyvale Climate Action Plan – City Operations.



## EC-2 New Construction and Remodels

Require green building practices in new residential and commercial development and remodels.

### Action Items:

EC-2.1. Evaluate and update the 2009 Zoning Code for Green Buildings for single-family, multi-family, and nonresidential building construction and major remodels every three to five years consistent with upgrades to the California Green Building Standards Code (CALGreen).

EC-2.2. Continue to require energy-efficient siting of buildings. Buildings should be oriented and landscape material should be selected to provide maximum energy efficiency for the buildings.

EC-2.3. Continue to provide incentives for new construction and remodels to adhere to a higher green building standard than required by the City.

### GHG Assumptions:

	2010	2020	2035
Improvement over Title 24 minimum requirements	0%	15%	15%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	5,130	12,890
GHG Reduction with CCA	0	4,440	10,570

### Performance Indicators:

Compliance with Green Building Ordinance and CALGreen

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>High</i>
Community Savings:	<i>High</i>

### Methodology:

This measure calculates the impact of the adopted Sunnyvale Green Building Checklist for residential and nonresidential buildings. The Build It Green and LEED checklists were analyzed for consistency with voluntary measures of the 2008 CALGreen Code and then analyzed using the 2008 Title 24 Impact Analysis completed by the California Energy Commission in 2007. Cost and savings to the community are based on the Pacific Gas & Electric analysis of a 15% CALGreen standard for Sunnyvale's climate zone. The majority of City costs to update and maintain the Green Building Code are assumed to be covered by impact fees.

### Sources:

California Building Standards Commission. 2010. 2010 California Green Building Standards Code. California Code of Regulations Title 24, Part 11. Sacramento.

California Energy Commission. 2010b. 2008 Title 24 Impact Analysis. [http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/2007-11-07\\_IMPACT\\_ANALYSIS.PD](http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/2007-11-07_IMPACT_ANALYSIS.PD).

City of Sonoma. 2010. Analysis of CALGreen (California Green Building Standards Code) with Mandatory Tier 1 (CALGreen+Tier1) Compared to Existing City of Sonoma Green Building Requirements. [http://www.asgi.us/calgreen /CALGreenTier1\\_CityOfSonoma\\_analysis.pdf](http://www.asgi.us/calgreen /CALGreenTier1_CityOfSonoma_analysis.pdf).

City of Sunnyvale. 2010. Green Building Checklist.

Pacific Gas & Electric. 2010. Codes and Standards Title 24 Energy-Efficient Local Ordinances. [http://www.energy.ca.gov/title24/2008standards/ordinances /sancarlos/2010-12-29\\_pge\\_zone\\_3\\_Cost\\_Study.pdf](http://www.energy.ca.gov/title24/2008standards/ordinances /sancarlos/2010-12-29_pge_zone_3_Cost_Study.pdf).

## EC-3 Residential Energy Efficiency

Reduce residential energy use, with emphasis on existing homes built before 1990.

### Action Items:

EC-3.1. Participate in a Property Assessed Clean Energy (PACE) or similar financing program to offer low-interest loans to residents for energy-efficiency upgrades.

EC-3.2. Prioritize non-general funds to assist low-income homeowners achieve energy-efficient improvements. Program annual Community Development Block Grant (CDBG) funds to fund weatherization programs.

### GHG Assumptions:

	2010	2020	2035
PACE residential participation rate	0%	15%	35%
Average energy reduction per household	25%	25%	25%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	210	4,670	10,610
GHG Reduction with CCA	210	4,160	9,090

### Performance Indicators:

Percentage of homes and businesses that respond to energy audits and percentage that participate in a PACE program

New units receiving building permits

### Costs and Savings:

City Costs:	<i>Medium-High</i>
City Savings:	<i>Minimal</i>

Community Costs:	<i>Very High</i>
Community Savings:	<i>Very High</i>

### Methodology:

**Property Assessed Clean Energy:** This measure assumes a 15% and 30% participation rate for homes 2020 and 2035, respectively. Savings are only applied to owner-occupied homes. A 25% savings in electricity and natural gas consumption is assumed per home and business based on the past performance of PACE programs and as summarized by the National Resources Defense Council (NRDC). The community and City cost of a PACE program is based on the NRDC paper.

**Low-Income Weatherization:** The energy savings from low-income weatherization programs such as LIHEAP or CARE are included based on past performance of these programs. According to the state of California, 0.46% of eligible households have been served by a low-income weatherization program. This percentage was applied to Sunnyvale's eligible households per the Housing Element.

### Sources:

California Department of Finance. 2008. California Statewide Population.

California Energy Commission. 2010a. Nonresidential Building Energy Performance Rating Disclosure Regulations. Sacramento: CEC.

City of Berkeley. 2010. Berkeley FIRST Initial Evaluation. Berkeley, CA.

City of Sunnyvale. 2009 General Plan Housing Element. Sunnyvale, CA.

Natural Resources Defense Council. 2010. Property Assessed Clean Energy Programs White Paper.

<http://pacenow.org/documents/PACE%20White%20Paper%20May%203%20update.pdf>.

State of California, Community Services and Development. 2009. CSD Helps Low-Income Families Manage and Reduce Energy Costs. [http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20\(2008\).pdf](http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20(2008).pdf).

## EC-4 Commercial Energy Efficiency

Establish a regulatory and incentive-based structure that facilitates

commercial and industrial energy efficiency and conservation.

### Action Items:

EC-4.1. Consistent with California AB 1103, require all nonresidential building owners to disclose building energy consumption and building energy ratings upon sale or lease of the building.

EC-4.2. Participate in a Property Assessed Clean Energy (PACE) or similar financing program to offer low-interest loans to businesses for energy efficiency upgrades.

EC-4.3. Create an ordinance to facilitate energy efficiency improvements in nonresidential buildings through incentives and regulations that may include energy performance reports, time of sale upgrades, and/or innovative partnerships to reduce energy use.

EC-4.4. Identify businesses that are likely to be the largest consumers of energy within the city and target City outreach to these businesses.

### GHG Assumptions:

	2010	2020	2035
Percentage of businesses sold, leased, or remodeled	0%	25%	60%
Participation rate of properties	0%	35%	60%
PACE commercial participation rate	0%	10%	15%
Average energy reduction per property	0%	25%	25%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	63,490	91,100
GHG Reduction with CCA	0	47,900	60,520

### Performance Indicators:

Percentage of commercial properties retrofitted upon sale and percentage of businesses that participate in PACE

### Costs and Savings:

City Costs:	<i>High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Very High</i>
Community Savings:	<i>Very High</i>

### Methodology:

Energy Conservation Ordinance (ECO): It was assumed that 25% of businesses will participate in, or be subject to, this program between now and 2020 and 60% by 2035. Assume that 35% of owners will implement the energy-saving recommendations of the audit. Average savings are estimated to be 25% for electricity and natural gas. These reductions are exclusive of the cool roof and insulations savings accounted for in the 2008 Title 24 standards for nonresidential alterations. The community and City costs of an ECO program are based on costs for the program in Berkeley, Calif.

Property Assessed Clean Energy (PACE): This measure assumes a 10% and 15% participation rate for homes 2020 and 2035, respectively. Savings are only applied to owner-occupied homes. A 25% savings in electricity natural gas consumption is assumed per home and business based on the past performance of PACE programs and as summarized by the National Resources Defense Council (NRDC). The community and City cost of a PACE program is based on the NRDC paper.

### Sources:

California Energy Commission. 2010a. Nonresidential Building Energy Performance Rating Disclosure Regulations. Sacramento: CEC.

City of Berkeley. 2010. Berkeley FIRST Initial Evaluation. Berkeley, CA.

Natural Resources Defense Council. 2010. Property Assessed Clean Energy Programs White Paper. <http://pacenow.org/documents/PACE%20White%20Paper%20May%203%20update.pdf>.

## EC-5 Smart Grid

Increase awareness and utilization of real-time energy consumption data and pricing available through PG&E's Smart Meter program.

### Action Items:

EC-5.1. Require new construction and major remodels to install interior real-time energy monitors.

EC-5.2. Connect businesses and residents with rebate programs that give priority to appliances with smart grid technology.

EC-5.3. Inform the community of metering options, such as online applications and in-home monitors.

### GHG Assumptions:

	2010	2020	2035
Existing residential monitoring program participation	1%	50%	75%
New residential monitoring program participation	0%	75%	95%
Existing commercial monitoring program participation	0%	50%	75%
New commercial monitoring program participation	0%	75%	95%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	17,150	26,110
GHG Reduction with CCA	0	10,300	12,050

### Performance Indicators:

Percentage of new and existing homes and businesses that participate in monitoring program

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Low-Medium</i>

Community Savings:	Very High
--------------------	-----------

### Methodology:

The integration of smart grid technology and implementation of dynamic pricing programs will provide energy users with detailed information about their energy use and the costs of energy. Energy customers will be able to use these technologies to track and monitor energy use in real time to understand the relationship between energy consumption patterns and energy costs. Smart grid technology equips individuals to alter behaviors to use less energy and shift higher energy uses to times when the costs are lowest. Research on consumer energy use and the rate of feedback on those patterns has shown that the more frequently a consumer is reminded of the level/amount of energy they are using, the more they will change their behaviors to consume less energy. Utility companies have demonstrated that by providing instantaneous energy data in addition to monthly utility bills with total energy consumption and costs, consumers are equipped to more effectively manage energy consumption. New tools such as web-based applications or indoor energy monitors provide instantaneous and constant feedback on energy use and have been shown to reduce energy use by an average of 7%. PG&E installed Smart Meters on all customer buildings in 2010 and the first quarter of 2011. This measure estimates that in 2020, 50% of energy customers will reduce their energy use by 7% and that by 2035, 80% of customers will reduce their energy use.

In addition to behavioral changes, the development of new household appliances that can be programmed or timed to operate when energy prices fall below a certain point will also promote energy-saving behaviors. While the widespread availability of these appliances is dependent on the gradual reduction in cost that will result from increased consumer demand and product options, up to an additional 7% energy savings may be achieved for households or businesses that install these smart grid appliances. Requirements for new residential and commercial development to include these appliances will further reduce the community's energy use, and such requirements may yield a larger impact when coupled with incentives to encourage current energy users to purchase smart grid appliances when replacing washers, dryers, dishwashers, and other appliances. The Energy Star program illustrates the phasing of market penetration for energy-efficient appliances and demonstrates the feasible rate of integration of smart grid appliances. The program was launched in 1990, and by 2010, 12% of all homes included Energy Star products. Assuming that smart grid appliances are available within the next few years, we can anticipate similar growth in market penetration to the Energy Star program. The percentage of new buildings to include smart grid appliances by 2020 and 2035 is based on the current number of new buildings that include Energy Star products.



## Sources:

Ehrhardt-Martinez, K., K. Donnelly, and J. Laitner. 2010. Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities. American Council for an Energy-Efficient Economy. Report Number E105. <http://www.aceee.org/sites/default/files/publications/researchreports/e105.pdf>.

Energy Star. 2008. Clothes Washer Product Snapshot. [http://www.energystar.gov/ia/partners/reps/pt\\_reps\\_res\\_retail/files/CW\\_ProductSnapshot\\_May08.pdf](http://www.energystar.gov/ia/partners/reps/pt_reps_res_retail/files/CW_ProductSnapshot_May08.pdf).

Energy Star. n.d. Residential New Construction: An Overview of Energy Use and Energy Efficiency Opportunities. [http://www.energystar.gov/ia/business/challenge/learn\\_more/ResidentialNewConstruction.pdf](http://www.energystar.gov/ia/business/challenge/learn_more/ResidentialNewConstruction.pdf).

Pike Research. 2010. Smart Appliance Sales. <http://www.smartgridnews.com/artman/publish/Smart-Grid-Press-Releases/Smart-appliance-sales-to-start-off-slow-but-118-million-units-will-be-sold-worldwide-by-2019-forecasts-Pike-Research-3290.html> and <http://www.pikeresearch.com/>.

## EC-6 "Cool" Roofs and Pavements

Reduce the amount of dark, nonreflective roofing and paving material in order to mitigate the urban heat island effect and reduce energy associated with heating and cooling.

### Action Items:

EC-6.1. Require all new and resurfaced parking lots, sidewalks, and crosswalks to be made of materials with high reflectivity, such as concrete or reflective aggregate in paving materials.

EC-6.2. Require new multi-family buildings and re-roofing projects to install "cool" roofs consistent with the current California Green Building Code (CALGreen) standards for commercial and industrial buildings.

EC-6.3. Commit to using a warm aggregate mix for all asphalt patching, overlay, and reconstruction.

EC-6.4. Consider the lifespan and embedded GHG content of pavement materials for public projects.

### GHG Assumptions:

	2010	2020	2035
Percentage of existing crosswalks and parking lots with high albedo materials	0%	15%	50%
Percentage decrease in energy consumption per 1 degree decrease in temperature	2%	2%	2%
Increase in Solar Reflectivity Index	45%	45%	45%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	–	710	2,250
GHG Reduction with CCA	–	470	1,200

### Performance Indicators:

All new parking lots, crosswalks, and sidewalks are made of high albedo content

New office, industrial, retail, and services floor area permitted (SunGIS)

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Low</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Medium-High</i>

### Methodology:

This measure includes the GHG benefit of cool pavements. Cool pavements retain less heat than traditional pavement materials like black asphalt, causing urban surface temperatures to decrease and creating less demand for air conditioning in buildings. Please note that this measure does not include the GHG impact of cool roofs, which is included in the quantification

of the 2008 CALGreen Code (state-mandated).

### Sources:

Akbari, Hashem. 2005. Energy Savings Potentials and Air Quality Benefits of Urban Heat Island Mitigation. <http://heatisland.lbl.gov/>.

Pomerantz, Melvin. 2010. EPA Presentation, "Cool Pavements for Cool Communities."

US Environmental Protection Agency. 2005b. Reducing Urban Heat Island Compendium of Strategies: Cool Pavements. <http://www.epa.gov/heatisd/resources/pdf/CoolPavesCompendium.pdf>.

## EP-1 Renewable Energy Portfolio

Increase the renewable energy portfolio of electricity delivered to Sunnyvale so that more than 50% of delivered energy comes from renewable sources by 2035.

### Action Items:

EP-1.1. Create or join a community choice aggregation (CCA) program to take control of power generation for city residents and businesses.

### GHG Assumptions:

	2010	2020	2035
Percentage of customers with light green option	0%	60%	60%
Percentage of customers with dark green option	0%	20%	30%
Light green renewable mix	0%	50%	65%
Dark green renewable mix	0%	100%	100%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2e</sub> )	–	–	–
GHG Reduction with CCA	–	233,400	338,420

### Performance Indicators:

Percentage of "light green" and "dark green" participants and renewable mix for "light green" and "dark green"

### Costs and Savings:

City Costs:	<i>Low-Medium</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

Under this measure, the City would create or participate in a community choice aggregation (CCA) program. The program could follow the structure of Marin Clean Energy by operating as an opt-out program. Under this structure, energy customers in Sunnyvale would automatically be enrolled in the "light green" option. Customers could opt out and receive PG&E's default renewable energy mix or they could opt in to the "dark green" option and receive 100% renewable energy. The light green option is estimated to achieve a 50% renewable mix by 2020 and a 65% renewable mix by 2035. Based on the current status of the Marin CCA program, this measure assumes that 20% of energy customers would opt out. Of the customers participating in the CCA program, 80% of customers in Sunnyvale would remain in the light green option and 20% would sign up for the dark green option.

### Sources:

California Public Utilities Commission (CPUC). 2009. 33% Renewable Portfolios Standard Implementation Analysis Report. <http://www.cpuc.ca.gov/NR/rdonlyres/1865C207-FEB5-43CF-99EB-A212B78467F6/0/33PercentRPSImplementationAnalysisInterimReport.pdf>.

Marin Energy Authority. 2010. Marin Clean Energy Implementation Plan. [http://marincleanenergy.info/images/stories/PDF/MEA\\_Implementation\\_Plan\\_Jan\\_2010.pdf](http://marincleanenergy.info/images/stories/PDF/MEA_Implementation_Plan_Jan_2010.pdf).

## EP-2 Local Renewable Energy

Increase the number of renewable energy installations in and available to the community.

### Action Items:

EP-2.1. Require new homes and businesses and major remodels to be “solar ready” by pre-wiring for solar water heating and solar electricity.

EP-2.2. Participate in a Property Assessed Clean Energy (PACE) or similar financing program to offer low-interest loans to residents and businesses for renewable energy installations.

EP-2.3. Prevent buildings and additions from shading more than 10% of roofs of other structures.

EP-2.4. Continue to allow and encourage solar facilities above paved parking areas.

EP-2.5. Maintain incentives for alternative energy installations in new and existing development, including solar and small-scale wind turbines.

EP-2.6. Advocate for the development of a regional or statewide feed-in tariff that further encourages the development of mid-sized renewable energy installations.

### GHG Assumptions:

	2010	2020	2035
PACE residential participation rate	0%	15%	30%
PACE commercial participation rates	0%	10%	15%
kW of solar installed	5,100	6,800	15,299

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	2,590	33,820	50,240
GHG Reduction with CCA	2,590	20,980	24,670

### Performance Indicators:

Residential and nonresidential participation rates

Permitted new square footage of commercial offices, retail and service space, and industry

New residential units receiving building permits (SunGIS)

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Very High</i>
Community Savings:	<i>Very High</i>

### Methodology:

This measure includes the anticipated benefit of a Property Assessed Clean Energy (PACE) program or equivalent financing mechanism to the number of solar photovoltaic (PV) and solar hot water systems in Sunnyvale. Based on the performance of existing PACE programs like that of Sonoma County and Palm Desert, it is estimated that 15% of residents will participate in the program by 2020 and 30% by 2035. It is estimated that 10% and 15% of nonresidential establishments will participate by 2020 and 2035, respectively. Of these participants, 80% will install a small-scale solar PV or solar thermal system along with their energy-efficiency retrofit. According to an independent review of nationwide PACE programs, the average residential solar PV system is assumed to be 3.4 kW, based on current installation sizes in the City of Sunnyvale. The average nonresidential solar PV system is assumed to contribute 80% of the establishment's annual energy load.

Community costs are based on the current cost per kW of solar. City cost to establish a PACE program is based on cost estimates from other Bay Area communities.

## Sources:

California Department of Community Services and Development. 2009. CSD Helps Low-Income Families Manage and Reduce Energy Costs. [http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20\(2008\).pdf](http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20(2008).pdf).

California Department of Finance. 2008. California Statewide Population.

California Energy Commission (CEC). 2010a. Nonresidential Building Energy Performance Rating Disclosure Regulations. Sacramento: CEC.

California Solar Initiative. 2011. California Solar Initiative Geographic Statistics. [http://www.californiasolarstatistics.ca.gov/reports/locale\\_stats/](http://www.californiasolarstatistics.ca.gov/reports/locale_stats/).

City of Berkeley. 2010. Berkeley FIRST Initial Evaluation. Berkeley, CA.

City of Sunnyvale. 2009 General Plan Housing Element. Sunnyvale, CA.

Go Solar California. 2010. [http://www.gosolarcalifornia.org/professionals/2-17-10\\_CalFIRST\\_FACT\\_SHEET.pdf](http://www.gosolarcalifornia.org/professionals/2-17-10_CalFIRST_FACT_SHEET.pdf).

Natural Resources Defense Council. 2010. Property Assessed Clean Energy Programs White Paper. <http://pacenow.org/documents/PACE%20White%20Paper%20May%203%20update.pdf>.

## WC-1 Water Sources and Efficiency

Decrease the amount of energy needed to filter, transport, and treat water used within Sunnyvale.

### Action Items:

WC-1.1. Prepare a feasibility study to expand the City's current recycled water program citywide and improve the quality of recycled water to expand potential uses to industrial facilities or other applications.

WC-1.2. Promote “purple pipe” (reclaimed water) infrastructure in new construction or major renovation in preparation for a growing, usable network.

WC-1.3. Create a purple pipe network for citywide use of recycled water for irrigation and other outdoor purposes.

WC-1.4. Create flexible provisions and encourage residents and businesses to collect rainwater to use for irrigation purposes.

### GHG Assumptions:

	2010	2020	2035
Percentage of delivered water from reclaimed source	6.9%	15%	25%
Million gallons of water recycled	455	1,091	2,107

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	230	530

### Performance Indicators:

Annual reclaimed water use

Average daily water consumption per capita

### Costs and Savings:

City Costs:	<i>Very High</i>
City Savings:	<i>Low</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Low-Medium</i>

### Methodology:

The greenhouse gas reduction potential of a greywater system is based on an estimate that local recycled water will increase from 6.9% of the water supply to 15% in 2020 and 25% in 2035. The GHG reduction benefit of this change is calculated using the methodology outlined by CAPCOA. Although this change will result in a lower GHG inventory, the energy reduction benefit will largely occur outside of Sunnyvale and therefore community savings are low-medium.



### Sources:

Bay Area Water Supply & Conservation Agency. 2010. Annual Survey and Water Conservation Report Fiscal Year 2008–2009.

California Air Pollution Control Officers Association. 2010. Quantifying Greenhouse Gas Mitigation Measures.

## WC-2 Water Conservation

Reduce indoor and outdoor potable water use in residences, businesses, and industry.

### Action Items:

WC-2.1. Require new development to reduce potable indoor water consumption by 30% (Tier 1 CALGreen) and outdoor landscaping water use by 40%.

WC-2.2. Revise development standards to ensure the use of greywater, recycled water, and rainwater catchment systems is allowed in all zones.

WC-2.3. Require new open space and street trees to be drought-tolerant.

WC-2.4. Implement the City's Urban Water Management Plan to facilitate a 20% reduction in per capita water use by 2020.

### GHG Assumptions:

	2010	2020	2035
Residential water use reductions (MG)	0	39	106
Nonresidential water use reductions (MG)	0	19	52

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2e</sub> )	80	750	990

### Performance Indicators:

Gallons per capita per day water consumption

Square footage of permitted new construction (SunGIS)

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Medium</i>
Community Savings:	<i>Very High</i>

### Methodology:

This measure calls for the City to require new development to achieve 30% indoor water savings and 40% outdoor water savings consistent with the 2008 CALGreen Code. This requirement would be adopted as a mandatory component of the City's Green Building Code and would occur upon the next update of the City's Code. City costs are anticipated to be low in combination with the enforcement of the City's Green Building Code.

### Sources:

Bay Area Water Supply & Conservation Agency. 2010. Annual Survey and Water Conservation Report Fiscal Year 2008–2009.

California Building Standards Commission. 2010. California Code of Regulations, Title 24: Part 11: California Green Building Standards Code. [http://www.documents.dgs.ca.gov/bsc/CALGreen/2010\\_CA\\_Green\\_Bldg.pdf](http://www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf).

## LW-1 Materials Management

Reduce the availability or use of common materials that are not recyclable or that are cost-ineffective to recycle.

### Action Items:

LW-1.1. Reduce the use of plastic bags at grocery stores and convenience stores in the community through incentives or requirements.

LW-1.2. Ban the sale or dispersal of disposable, single-use plastic water bottles at public events permitted by the City.

LW-1.3. Ban the use of expanded polystyrene (EPS) take-out containers at restaurants and fast-food facilities.

## GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	Supportive Measure		

## Performance Indicators:

N/A

## Costs and Savings:

City Costs:	<i>Low-Medium</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

## Methodology:

This is a supporting measure for LW-2, Recycling and Composting. The cost and savings to the community are currently unknown for a plastic bag ban.

## Sources:

N/A

## LW-2 Recycling and Composting

Increase the amount of waste recycled and composted by 1% per year according to the City's Zero Waste Strategic Plan.

## Action Items:

LW-2.1. Require multi-family homes to participate in the City's Multi-family Recycling Program.

LW-2.2. Select materials to be targeted for diversion and diversion methods, services, or technologies based on the results of the Zero Waste Strategic Plan.

### GHG Assumptions:

	2010	2020	2035
Disposal rate (PPD)	3.5	1.5	0.5
Total tons disposed	85,305	46,879	15,877
Total tons diverted	18,901	66,794	122,098

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	14,310	53,960	96,190

### Performance Indicators:

Per capita disposal rates or overall diversion rate

### Costs and Savings:

City Costs:	<i>Medium</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Medium</i>
Community Savings:	<i>Minimal</i>

### Methodology:

The GHG reduction benefit of this measure is based on the assumption that waste per person per day will decrease to 1.5 pounds per day (PPD) in 2020 and 0.5 PPD in 2035. The cost of this measure to the community is unknown until the Zero Waste Strategic Plan is complete.

### Sources:

CalRecycle. 2011. Jurisdiction Diversion/Disposal Rate Summary. <http://www.calrecycle.ca.gov/LGCentral/Tools/MARS/DrmcMain.asp>.

## OR-1 Lawn and Garden Equipment

Encourage residents and businesses to use efficient lawn and garden maintenance equipment or to reduce the need for landscape maintenance through native planting.

### Action Items:

OR-1.1. Partner with the Bay Area Air Quality Management District to re-establish a voluntary exchange program for residential electric lawnmowers and backpack-style leaf blowers.

OR-1.2. Require new buildings to provide electrical outlets on the exterior in an accessible location to charge electric-powered lawn and garden equipment.

OR-1.3. In project review, encourage the replacement of high-maintenance landscapes (like grass turf) with native vegetation to reduce the need for gas-powered lawn and garden equipment.

### GHG Assumptions:

	2010	2020	2035
Percentage of leaf blowers exchanged	0%	25%	50%
Number of leaf blowers exchanged	0	1,434	2,869
Percentage of lawnmowers exchanged	0%	25%	50%
Number of lawnmowers exchanged	0	391	782

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	30	100

### Performance Indicators:

Percentage of lawnmowers and leaf blowers exchanged

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Medium</i>
Community Savings:	<i>Minimal</i>

### Methodology:

The GHG reduction potential of switching leaf blowers and lawnmowers to electric from gasoline or diesel will result in decreased fuel consumption and air pollution but will also result in a small increase in electricity use to power this equipment.

### Sources:

Bay Area Air Quality Management District (BAAQMD). 2010b. History of the Air District: 1995–2000. <http://www.baaqmd.gov/Divisions/Communications-and-Outreach/News-Media-and-Features/History-of-Air-District-2005/1995–2000.aspx>.

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

California Air Resources Board (CARB). 2007. Off-Road Software.

## OR-2 Construction Equipment

Reduce emissions from heavy-duty construction equipment by limiting idling and utilizing cleaner fuels, equipment, and vehicles.

### Action Items:

OR-2.1. Idling times will be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]), or less. Clear signage will be provided at all access points to remind construction workers of idling restrictions.

OR-2.2. Construction equipment must be maintained per manufacturer's specifications.

OR-2.3. Planning and Building staff will work with project applicants to limit GHG emissions from construction equipment by selecting one of the following

measures, at a minimum, as appropriate to the construction project:

- a. Substitute electrified or hybrid equipment for diesel- and gasoline-powered equipment where practical.
- b. Use alternatively fueled construction equipment on-site, where feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel.
- c. Avoid the use of on-site generators by connecting to grid electricity or utilizing solar-powered equipment.
- d. Limit heavy-duty equipment idling time to a period of three minutes or less, exceeding CARB regulation minimum requirements of five minutes.

### GHG Assumptions:

	2010	2020	2035
Percentage of equipment that is hybrid, CNG, electric, or biodiesel	0%	40%	65%
Percentage of equipment that meets City idling restrictions	0%	50%	50%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	7,400	13,720

### Performance Indicators:

Percentage of equipment that is fuel-efficient and/or alternatively fueled

Idling restrictions

### Costs and Savings:

City Costs:	<i>Minimal</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

Reducing maximum idling times from the state requirement of five minutes to three minutes will result in approximately 40% less fuel used for idling equipment. It is estimated that idling accounts for 5% of all fuel used in construction equipment. Additionally, voluntary conversion of construction equipment from diesel to CNG, electric, or biodiesel will result in fewer GHG emissions.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

California Air Resources Board (CARB). 2007. Off-Road Software.

## CA-1 Community Outreach and Involvement

Educate and involve the community regarding actions they can do at home to reduce energy, water, waste, and fuel consumption.

### Action Items:

CA-1.1. Create a structure or partner with other groups of volunteers, residents, and other organizations to help achieve Sunnyvale's sustainability goals.

CA-1.2. Provide regular communication with schools, businesses, faith groups, community members, and neighborhood groups to increase participation in the city's progress toward sustainability.

CA-1.3. Develop and encourage a mechanism for neighborhoods to share equipment and resources to improve sustainability.

CA-1.4. Provide a toolkit of resources, including web-based efficiency calculators, for residents and businesses to analyze their greenhouse gas emissions in comparison to their neighborhood, the city, and the region.

CA-1.5. Develop and implement a competitive greenhouse gas reduction program with an award component between groups of citizens in the city.

CA-1.6. Use sustainability initiatives within City operations to educate the community on ways to achieve sustainability by example.

CA-1.7. Actively promote the use of alternative modes of transportation as safe modes of travel. When applicable, promote viable programs sponsored by 511.org, the BAAQMD, and other recognized agencies on the City's



website and publications.

CA-1.8. Through selected projects and efforts to improve City operations, demonstrate how sustainability efforts are possible and successful.

CA-1.9. Make comparison an intrinsic part of consumption. Bring awareness of how our consumption compares to other communities, regions, and others in our neighborhood.

CA-1.10. Use the City's Sustainability Commission and coordinator as a structure to coordinate with other groups of volunteers, residents, and other organizations to help achieve Sunnyvale's sustainability goals.

CA-1.11. Actively engage with Sunnyvale businesses to identify areas for GHG reduction and financial savings.

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	Supportive Measure		

### Performance Indicators:

Number of community events related to sustainability

### Costs and Savings:

City Costs:	<i>Medium-High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

Community outreach is essential to the implementation of the CAP goals and measures; however, outreach does not result in a direct reduction of GHG emissions.

### Sources:

N/A

## CA-2 School Education and Involvement

Educate local schoolchildren about climate change and ways that they and their families can reduce greenhouse gas emissions.

### Action Items:

CA-2.1. Recommend and advocate schools to use the Bay Area Air Quality Management District curriculum or other programs for local schoolteachers to teach children about climate change, greenhouse gas emissions, and local actions.

CA-2.2. Continue to provide and improve the bicycle driver education program for elementary, middle, and high school students.

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	Supportive Measure		

### Performance Indicators:

Number of school outreach events conducted

### Costs and Savings:

City Costs:	<i>Medium</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

Community outreach is essential to the implementation of the CAP goals and measures; however, outreach does not result in a direct reduction of GHG emissions.

### Sources:

N/A

## LUP-1 Parking

Reduce the amount of free or unrestricted parking available within the city to promote alternative modes of transportation and avoid unnecessary vehicle circulation.

### Action Items:

LUP-1.1. Build and maintain an electronic parking management system for City-owned parking structures in the downtown and consider expanding to other City lots in the downtown and in proximity to other commercial areas.

LUP-1.2. Create maximum parking requirements and reduce minimum parking requirements for mixed-use development. Require parking lot sharing for mixed-use or commercial development with complementary hours of operation.

LUP-1.3. Implement parking management tools for residential uses such as decreased or flexible standards, unbundled parking, and shared parking plans.

LUP-1.4. Establish parking meters throughout downtown Sunnyvale to optimize parking availability and reduce unnecessary vehicle circulation.

LUP-1.5. Retain a residential parking permit program for residential areas adjacent to commercial areas of the city where parking is in higher demand.

LUP-1.6. Designate street parking stalls in the vicinity of key commercial and multi-family residential locations for efficient or alternatively fueled vehicles.

### GHG Assumptions:

	2010	2020	2035
Reduction in parking provision compared to a parking generation rate	0%	10%	10%
Monthly parking cost due to unbundling, residential	–	\$10	\$10

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	4,970	5,350

### Performance Indicators:

Percentage reduction in parking provision compared to a parking generation rate

\$10 monthly parking cost

### Costs and Savings:

City Costs:	<i>Medium</i>
City Savings:	<i>Unknown</i>
Community Costs:	<i>Unknown</i>
Community Savings:	<i>Unknown</i>

### Methodology:

This measure includes the GHG benefit of LUP-1.2 (parking requirements) and LUP-1.3 (unbundle parking costs). The remaining measures are included in the City's Transportation Demand Forecast model or are not quantifiable.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## LUP-2 Transit-Oriented, Higher Density, Mixed-Use Development

Facilitate development in designated core and corridor areas that is transit-oriented, higher density, and mixed-use.

### Action Items:

LUP-2.1. Continue to plan for most new residential, commercial, and industrial developments in specific plan areas, near transit, and close to employment and activity centers.

LUP-2.2. Continue to identify underutilized areas that can support higher-density housing and mixed-use development.

LUP-2.3. Facilitate the development of affordable housing near transit.

LUP-2.4. Expand the zoning opportunities for the construction of accessory

dwelling units in existing residential neighborhoods near transit as a means to increase affordable housing near transit.

LUP-2.5. Continue to allow for the development of live/work spaces in commercial zoning districts and mixed-use residential zoning districts.

### GHG Assumptions:

	2010	2020	2035
Percentage of new housing that is deed-restricted below market rate	0%	15%	15%
VMT reduction from increased density	0%	2%	2%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	14,010	15,090

### Performance Indicators:

Percentage of new housing units deed-restricted below market rate

### Costs and Savings:

City Costs:	<i>Unknown</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

This measure includes the GHG benefit of increased density and a greater amount of below-market-rate housing. Density reductions are based on citywide changes in dwelling units per acre according to the City's Transportation Demand Forecast model. Finally, the benefit of below-market-rate housing is based on the assumption that 15% of new housing units in Sunnyvale will be deed-restricted below market rate.

**Sources:**

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

**LUP-3 Local Commerce and Food**

Increase the amount of locally generated and consumed goods in order to decrease the need for travel and promote healthier communities.

**Action Items:**

LUP-3.1. Amend the Zoning Code to allow small-scale, commercial urban farms to operate in residential areas.

LUP-3.2. Ensure that every residential portion of mixed-use developments has opportunities for growing produce locally.

LUP-3.3. Establish community gardens for public use.

LUP-3.4. Develop and implement a purchasing policy that requires food and other appropriate materials purchased by the City to be purchased from as local a supply as possible.

**GHG Reduction:**

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	Supportive Measure		

**Performance Indicators:**

N/A

**Costs and Savings:**

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Low</i>

### Methodology:

This measure does not have a quantifiable VMT or GHG reduction benefit.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## LUP-4 Jobs/Housing Balance

Plan for an improved jobs/housing balance in order to reduce the need for long-distance travel between residences and places of work.

### Action Items:

LUP-4.1. Support the retention and expansion of local anchor and growth industries.

LUP-4.2. Review land use plans and regulations and revise as needed to support additional live/work opportunities and home occupations, provided they are compatible with the existing neighborhood.

### GHG Assumptions:

	2010	2020	2035
Jobs-to-housing ratio	1.39	1.50	1.65
VMT reduction from increased diversity of land uses	0.0%	0.2%	0.2%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	900	970

### Performance Indicators:

Jobs-to-housing ratio

### Costs and Savings:

City Costs:	<i>Unknown</i>
City Savings:	<i>Unknown</i>
Community Costs:	<i>Unknown</i>
Community Savings:	<i>High</i>

### Methodology:

The benefit of destination and land use diversity is applied to mixed-use areas such as downtown Sunnyvale and Lawrence Station vehicle miles. These areas have a beneficial jobs/housing balance, a greater distribution of services, and higher density. The GHG benefit of this measure is shared between LUP-2 (Transit-Oriented, Higher Density, Mixed-Use Development), LUP-4 (Jobs/Housing Balance), and LUP-5 (Distributed Services).

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## LUP-5 Distributed Services

Encourage the wider distribution of commonly used facilities and services in order to reduce the need for or length of vehicular trips to and from places of work and residence.

### Action Items:

LUP-5.1. Encourage the establishment and even distribution of neighborhood-serving facilities such as day-care providers, banking/ATM locations, markets, and drugstores in existing residential, commercial, and industrial areas in order to reduce the need for vehicle trips.

LUP-5.2. Require new development to reduce the need for external trips by providing useful services/facilities on-site such as an ATM, vehicle refueling, and shopping.



### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	See LUP-4		

### Performance Indicators:

New residential development permits issued

Additional commercial and industrial square footage

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Unknown</i>
Community Savings:	<i>Unknown</i>

### Methodology:

Quantifying the GHG reduction benefit of distributed services is difficult to separate from diversity of land uses and other transportation measures and has therefore been quantified as part of other transportation and land use measures.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## CTO-1 Bicycle, Pedestrian, and Transportation Design Elements

Create streets and connections that facilitate bicycling, walking, and transit use throughout the city.

### Action Items:

CTO-1.1. Incorporate the provisions of AB 1358, the California Complete Streets Act of 2008, into roadway design, construction, and maintenance activities.

CTO-1.2. Implement the street space allocation policy (RTC 8-085, April 28, 2009) in coordination with road reconstruction or resurfacing projects to provide road configurations that accommodate all travel modes.

CTO-1.3. Require new development to provide cross-parcel access and linkages from the development entrance to the public sidewalk system, transit stops, nearby employment and shopping centers, schools, parks, and other parcels for ease of pedestrian and cyclist access.

CTO-1.4. Improve pedestrian safety and comfort through design elements such as landscaped medians, pedestrian-level amenities, sidewalk improvements, and compliance with Americans with Disabilities Act (ADA) design standards, particularly for areas serving high volumes of traffic.

CTO-1.5. Improve bicycle facilities and perceptions of comfort through pavement marking/coloring, physical separation, specialized signs and markings, and other design elements.

CTO-1.6. Require sidewalks to be a minimum of 6 feet wide in order to allow side-by-side walking at identified locations that currently serve high pedestrian traffic volumes or locations planned to serve high volumes of pedestrian traffic.

CTO-1.7. Actively promote intermodal linkages to and from regional transit options by establishing or improving well-defined, convenient intermodal hubs in downtown and specific plan areas. Work with the Valley Transportation Authority, Peninsula Corridor Joint Powers Board, Advisory Committee on Accessibility, and others to establish the best places for these locations.

### GHG Assumptions:

	2010	2020	2035
VMT reduction from improved bike and pedestrian network	0%	1%	1%
Commute to work bicycle mode share	1%	2%	2%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	4,070	4,380

### Performance Indicators:

Miles of bike lanes and sidewalks installed

### Costs and Savings:

City Costs:	<i>Very High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Low</i>
Community Savings:	<i>Very High</i>

### Methodology:

Providing a pedestrian access network to link areas within the city encourages people to walk instead of drive. This mode shift results in people driving less and thus a reduction in VMT.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

City of Sunnyvale. 2006. Bicycle and Pedestrian Master Plan. <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/Transportation/SunnyvaleBicyclePlan2006.pdf>

## CTO-2 Bicycle, Pedestrian, and Transportation Travel Operations

Prioritize safe, efficient, and convenient access for non-automotive travel to destinations in and outside of Sunnyvale.

### Action Items:

CTO-2.1. Require public areas and new development to provide bicycle parking consistent with the Valley Transportation Authority Bicycle Technical Guidelines, as amended.

CTO-2.2. Require secure bicycle parking at public and large private events.

CTO-2.3. Increase awareness of the city's bicycle facilities by updating the city bicycle map to show locations of public and private bicycle parking, creating a web-based application for members of the public to identify locations of private parking, and establishing information kiosks at key city locations to provide maps and highlight alternative modes of transportation.

CTO-2.4. Fully fund the City's bicycle and pedestrian improvement plans for completion by 2035.

CTO-2.5. Implement projects and programs to improve the safety of cyclists and pedestrians through increased enforcement of pedestrian right-of-way laws, removing crossing impediments, improving crossing time at signalized intersections for pedestrians and cyclists, requiring drive-through food establishments to serve bicyclists, and providing center refuge areas for pedestrians and bicyclists to pause when crossing arterials.

CTO-2.6. Create at least one day a year when a portion of streets and plazas is designated for pedestrian and/or bicycle access only.

CTO-2.7. Support business efforts to plan and implement a bike-sharing program for major commercial and industrial areas.

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	Supportive Measure		

### Performance Indicators:

Number of bicycle support facilities

Miles of bikeways

### Costs and Savings:

City Costs:	<i>Very High</i>
City Savings:	<i>Low</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Low-Medium</i>

### Methodology:

Providing infrastructure and facilities are both essential to facilitate non-automotive travel in Sunnyvale. Because the provisions of both are essential, the GHG reduction benefit of this measure cannot be quantified separately from CTO-1.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## CTO-3 Transit

Facilitate the use of public and private transit such as buses, Caltrain, Amtrak, and shuttles to and from Sunnyvale and within the city.

### Action Items:

CTO-3.1. Continue sponsoring projects to provide transit rider amenities at bus stops and rail stations.

CTO-3.2. Work with the Valley Transportation Authority (VTA) and neighboring jurisdictions to provide transit priority signal timing in order to decrease travel time.

CTO-3.3. Work with other agencies to provide High Occupancy Toll (HOT) lanes, and support expenditure of HOT lane revenue on projects that reduce vehicle miles traveled in Sunnyvale. Support regional congestion pricing measures.

CTO-3.4. Advocate for transit service improvements by area transit providers consistent with established performance standards, with an emphasis on coordinating public transit schedules and connections and for subsidies for a higher level of transit service and/or more transit passes for residents and/or

employees.

CTO-3.5. Partner with GreenTRIP and other local or regional organizations to implement trip reduction programs in new residential, commercial, and mixed-use developments.

### GHG Assumptions:

	2010	2020	2035
Percentage of new development participating in GreenTRIP program	0%	80%	80%
Minimum VMT reduction from GreenTRIP program participants	0%	30%	30%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2e</sub> )	0	5,920	19,940

### Performance Indicators:

VTa transit ridership in Sunnyvale

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Unknown</i>
Community Costs:	<i>Low</i>
Community Savings:	<i>Low</i>

### Methodology:

The VMT reduction benefit of these measures are incorporated into the City's travel demand forecast model and to avoid double counting, components of this measure have been listed as a supporting measure.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## CTO-4 Commute Programs

Reduce single-occupant vehicle trips to major employers (100 employees or more) located in Sunnyvale.

### Action Items:

CTO-4.1. Require existing and future major employers to utilize a variety of transportation demand management (TDM) measures such as flexible work schedules, telecommuting, guaranteed rides home, low- or no-cost transit passes, parking "cash-out" incentives, and other programs that provide employees with alternatives to single-occupant commutes.

CTO-4.2. Create a TDM program for City staff to promote alternative transportation modes and carpooling to the greatest extent possible.

CTO-4.3. Continue to provide density and other zoning incentives or procedural or financial incentives to developments for establishment of alternative transportation infrastructure within the private as well as adjacent public right-of-way, such as increased bicycle parking, separated sidewalks, bike lanes and signage, and change and shower facilities.

CTO-4.4. Explore programs to encourage large employers to hire Sunnyvale residents.

### GHG Assumptions:

	2010	2020	2035
Reduction in VMT from telecommuting	0	2,000,306	2,296,092
Reduction in VMT from ride-share program	0	5,000,764	5,740,230

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2e</sub> )	0	5,420	5,840

### Performance Indicators:

Participation in commute trip reduction programs

### Costs and Savings:

City Costs:	<i>Low-Medium</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Medium</i>

### Methodology:

A commute trip reduction program is a voluntary, multi-strategy program that encompasses a combination of individual measures such as transit fare subsidies, ride-share programs, parking permit programs, and alternative work schedules, among other opportunities. The quantification of this measure estimates that all employees within the Moffett Park Specific Plan would be eligible to participate, and approximately 25% of employees in other areas of the city would be likely participants.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## CTO-5 School Commutes

Encourage carpooling, bicycling, walking, and transit access to elementary, middle, and high schools so that the number of car trips is no more than 50% of the number of students at any school.

### Action Items:

CTO-5.1. Support the creation of walking school bus programs in coordination with schools and parent organizations.

CTO-5.2. Encourage schools to link employees and guardians of students with an online system such as 511.org that provides carpool matching.

CTO-5.3. Continue to implement a Safe Routes to School program for increased bicycle and pedestrian safety to and from schools.



### GHG Assumptions:

	2010	2020	2035
Reduction in school commute-related VMT	–	35%	50%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	1,250	2,220

### Performance Indicators:

Commute to school mode share

### Costs and Savings:

City Costs:	<i>High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Low</i>
Community Savings:	<i>Low-Medium</i>

### Methodology:

The City's Bicycle Master Plan identified range estimates of current bike to school commute behaviors at approximately 5%. This measure estimates the number of vehicle trips associated with school pickups and drop-offs and sets a goal to achieve the number of car trips that is no more than 20% of the number of students at any school.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

City of Sunnyvale. 2006. Bicycle Master Plan. <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/Transportation/SunnyvaleBicyclePlan2006.pdf>.

US Census Bureau. 2011. Profile of General Population and Housing Characteristics: 2010, City of Sunnyvale, CA.

## OVT-1 Clean Alternative Motor Vehicles and Fuels

Promote the use of clean alternative motor vehicles and fuels to reduce emissions from vehicular travel.

### Action Items:

OVT-1.1. Designate preferred parking stalls for electric, hybrid, and other alternative fuel vehicles in all public and private parking lots consistent with the California Green Building Code.

OVT-1.2. Secure funding to install electric vehicle recharging stations or other alternative fuel vehicle support infrastructure in existing public and private parking lots.

OVT-1.3. Require sufficient electrical service in the garages/parking facilities of new residential development to support electric vehicle charging.

OVT-1.4. Increase the number of efficient or alternatively fueled vehicles in the City fleet as vehicles are turned over.

OVT-1.5. Collaborate with taxi franchises to use low-emissions vehicles such as hybrids, compressed natural gas vehicles, biodiesel vehicles, or electric vehicles.

OVT-1.6. Explore zoning or other incentives to encourage alternative fuel stations like biodiesel and compressed or liquefied natural gas in place of or in combination with traditional gasoline and diesel fueling stations.

OVT-1.7. Facilitate new fueling stations that offer alternative fuels.

OVT-1.8. Accommodate neighborhood electric vehicles (NEVs) by enacting regulations consistent with the California Vehicle Code and the Manual of Uniform Traffic Control Devices.

### GHG Assumptions:

	2010	2020	2035
NEVs in operation	0	1,500	2,500
New electric vehicle charging stations	0	2,660	5,470

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	7,410	18,820
GHG Reduction with CCA	0	7,860	19,980

### Performance Indicators:

Number of NEVs in operation and number of parking spaces designated for EV or clean fuel vehicles

Square footage of new commercial and industrial development

### Costs and Savings:

City Costs:	<i>High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Medium-High</i>
Community Savings:	<i>Very High</i>

### Methodology:

This measure quantifies the VMT and fuel savings impacts of expanded use of electric vehicles through the installation of public and private electric vehicle charging stations. It is anticipated that approximately 2% of all new parking spaces will be installed with electric vehicle charging stations. NEVs are also included in this measure and are an effective form of transportation for short trips and on appropriate streets. It is estimated that 800 households will have NEVs by 2020 and will reduce VMT from traditional vehicles by approximately 12%.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## OVT-2 Car Sharing

Promote the use of car sharing in Sunnyvale in order to establish and maintain at least one viable car-share operation within the city by 2020.

### Action Items:

OVT-2.1. Work with car sharing companies such as Zipcar and City Car Share to increase the availability of car-share programs in Sunnyvale.

OVT-2.2. Identify appropriate locations, and require facilities for car share vehicles in new parking garages, job, centers, commercial cores, neighborhoods, and transit hubs.

### GHG Assumptions:

	2010	2020	2035
VMT reduction	0.00%	0.40%	0.40%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	1,810	1,950

### Performance Indicators:

Number of car-share operations or vehicles

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Low</i>
Community Savings:	<i>Medium</i>

### Methodology:

The increased availability and participation in car-sharing programs has been found to decrease VMT and even car ownership. It is estimated that the expansion of car-sharing programs will result in an approximate 0.4% decrease in VMT.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## OVT-3 Circulation Efficiency

Improve the flow and efficiency of vehicular traffic throughout the city to avoid idling and reduce fuel consumption.

### Action Items:

OVT-3.1. Increase signal coordination as warranted to facilitate traffic flow along arterials and major collectors.

OVT-3.2. Educate and enforce idling restrictions associated with delivery trucks and school pickups and drop-offs.

### GHG Assumptions:

	2010	2020	2035
Reduction in idling times through enforcement and education		40%	40%

### GHG Reduction:

	2010	2020	2035
GHG Reduction (MTCO <sub>2</sub> e )	0	4,110	4,180

### Performance Indicators:

Reduction in vehicle idling times

Vehicle miles traveled on weekdays

### Costs and Savings:

City Costs:	<i>High</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>

Community Savings:	<i>High</i>
--------------------	-------------

### Methodology:

Continuing to improve and renovate streets to accommodate all transportation user modes will provide a safer pedestrian environment and encourage residents to make trips by foot or other alternative modes instead of by car. This analysis estimates that traffic calming features will encourage increased walking, resulting in a VMT reduction of 0.3%.

### Sources:

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.

## A-1 Regional Coordination

Participate in regional efforts such as that of the San Francisco Bay Area Conservation and Development Commission (BCDC) and the Joint Policy Committee (JPC) to analyze and prepare for the impacts of climate change in the Bay Area.

### Action Items:

A-1.1. Appoint a staff liaison to attend and participate in regional meetings focusing on adaptation and resilience and to report back to staff on a regular basis.

### Performance Indicators:

Staff reports to Council every year on adaptation efforts

### Costs and Savings:

City Costs:	<i>Minimal</i>
City Savings:	<i>Minimal</i>
Community Costs:	<i>Minimal</i>
Community Savings:	<i>Minimal</i>

### Methodology:

N/A

### Sources:

N/A

## A-2 Preparedness

Ensure that Sunnyvale is prepared for potential environmental risks and hazards related to climate change, with a special emphasis on vulnerable populations such as seniors.

### Action Items:

A-2.1. Regularly train and inform the Department of Public Safety, Office of Emergency Services on potential climate change risks and hazards.

A-2.2. Update the City Emergency Plan and Emergency Preparedness Workbook to address climate change impacts.

### Performance Indicators:

One training session every two years

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Unknown</i>
Community Costs:	<i>Unknown</i>
Community Savings:	<i>Unknown</i>

### Methodology:

N/A

### Sources:

N/A

## A-3 Adaptive Planning

Integrate potential climate change impacts into local planning documents and processes.

### Action Items:

A-3.1. Analyze and disclose possible impacts of climate change on the project or plan area, with an emphasis on sea level rise.

A-3.2. Integrate climate change adaptation into future updates of the Zoning Code, Building Code, General Plan, and other related documents.

### Performance Indicators:

N/A

### Costs and Savings:

City Costs:	<i>Unknown</i>
City Savings:	<i>Unknown</i>
Community Costs:	<i>Unknown</i>
Community Savings:	<i>Unknown</i>

### Methodology:

N/A

### Sources:

N/A

## A-4 Monitoring

Monitor climate change science and policy and regularly inform stakeholders of new information.

### Action Items:

A-4.1. Dedicate a page of the City's website to climate change and climate change adaptation.

A-4.2. On a regular basis, assess adaptation efforts of the City, region, and state and identify goals or gaps to be addressed.



### Performance Indicators:

N/A

### Costs and Savings:

City Costs:	<i>Low</i>
City Savings:	<i>Unknown</i>
Community Costs:	<i>Unknown</i>
Community Savings:	<i>Unknown</i>

### Methodology:

N/A

### Sources:

N/A



## APPENDIX C



### BAAQMD COMPLIANCE

The City of Sunnyvale developed this Climate Action Plan (CAP) to meet the requirements of the Bay Area Air Quality Management District's (BAAQMD) criteria for a Qualified Greenhouse Gas Reduction Strategy as defined in the BAAQMD's California Environmental Quality Act (CEQA) Air Quality Guidelines. The City's Climate Action Plan follows both the state CEQA Guidelines and BAAQMD's guidelines by incorporating the standard elements of a Qualified GHG Reduction Strategy into the CAP.



## BAAQMD COMPLIANCE

The City of Sunnyvale developed this Climate Action Plan (CAP) to meet the requirements of the Bay Area Air Quality Management District's (BAAQMD) criteria for a Qualified Greenhouse Gas Reduction Strategy as defined in the BAAQMD's California Environmental Quality Act (CEQA) Air Quality Guidelines. These guidelines were updated in 2010 in response to the State of California's amendment to the state CEQA Guidelines through Senate Bill (SB) 97. SB 97 requires all projects subject to CEQA to analyze and mitigate the greenhouse gas (GHG) emissions that will occur.

The purpose of the BAAQMD CEQA Air Quality Guidelines is to assist lead agencies in evaluating the air quality impacts of proposed projects and plans in the San Francisco Bay Area Air Basin. The guidelines were updated to establish thresholds of significance for impacts related to GHG emissions to be consistent with the requirements of CEQA. These thresholds can be used to assess plan-level and project-level impacts and allow a lead agency to determine that a project's impact on GHG emissions is less than significant if it is in compliance with a Qualified Greenhouse Gas Reduction Strategy.

The City's CAP follows both the State CEQA Guidelines and BAAQMD's guidelines by incorporating the standard elements of a Qualified GHG Reduction Strategy into the CAP. The standard elements of a Qualified GHG Reduction Strategy include the following steps:

- 1) Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic range.
- 2) Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable.
- 3) Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area.
- 4) Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.
- 5) Monitor the plan's progress.
- 6) Adopt the greenhouse gas reduction strategy in a public process following environmental review.

The remainder of this appendix describes in detail how the City's CAP has been developed to satisfy the requirements of the BAAQMD's guidelines on the standard elements of a Qualified GHG Reduction Strategy and will allow future development projects to determine that a project has a less than significant impact on GHG emissions so long as it is in compliance with the City's CAP.

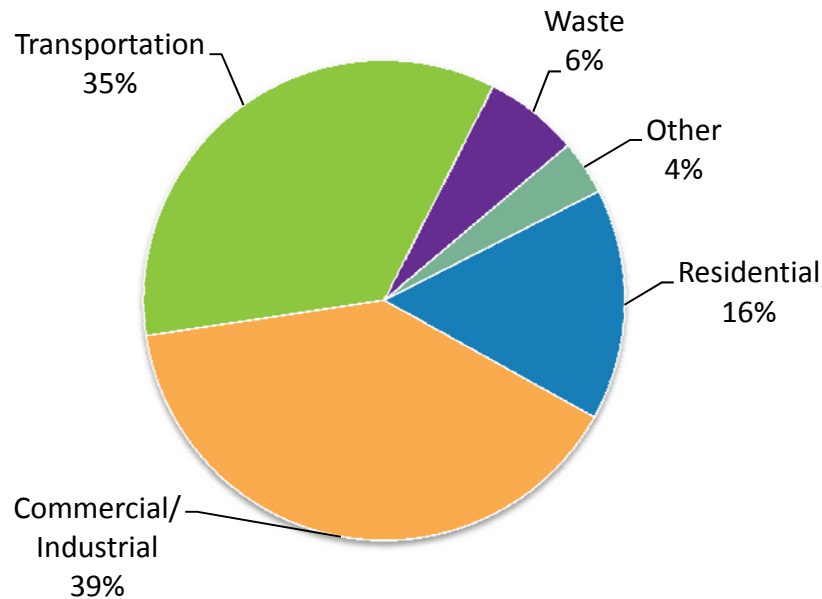
## GHG EMISSIONS INVENTORY

The first component of a Qualified GHG Reduction Strategy is to conduct an inventory of GHG emissions within a specified geographic boundary. The City of Sunnyvale's GHG inventory utilizes a baseline year of 2008 to inventory carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>) generated from activities by the Sunnyvale community.

The emissions sources calculated in the baseline GHG inventory include commercial, residential, and industrial electricity and natural gas use, on-road transportation, solid waste disposal, energy use and direct process emissions related to water and wastewater, and off-road equipment use for construction and lawn and garden activities. GHG emissions from these activities were calculated from activity data such as kilowatt-hours of electricity, therms of natural gas, tons of waste disposed, and vehicle miles traveled (VMT) from trips with an origin or destination in Sunnyvale. In 2008, the City of Sunnyvale emitted approximately 1,270,170 metric tons of carbon dioxide equivalents (MTCO<sub>2</sub>e) (see **Table C-1** and **Figure C-1**).

**TABLE C-1 – 2008 COMMUNITY-WIDE BASELINE EMISSIONS BY SECTOR**

2008 Baseline Greenhouse Gas Emissions	MTCO <sub>2</sub> e	Percentage of Total
Residential	198,140	16%
Commercial/Industrial	502,210	39%
Transportation	442,610	35%
Community Waste	76,970	6%
Landfill Gas	3,600	<1%
Water	6,870	1%
Off-Road	37,830	3%
Caltrain	1,940	<1%
<b>Total</b>	<b>1,270,170</b>	<b>100%</b>

**FIGURE C-1 – 2008 BASELINE GHG EMISSIONS BY SECTOR**

Stationary source emissions have also been examined in this emissions inventory. Stationary sources are defined as any fixed emitter of air pollutants, such as power plants, petroleum refineries, petrochemical plants, food processing plants, and other heavy industrial sources. The stationary sources of emissions for the City of Sunnyvale total 50,660 MTCO<sub>2</sub>e in 2007, as reported by the BAAQMD in the 2007 Source Inventory of Bay Area Greenhouse Gas Emissions. **Table C-2** shows the list of stationary source emissions located in Sunnyvale.

**TABLE C-2 – SUNNYVALE LARGE STATIONARY EMITTERS**

Source	MTCO <sub>2</sub> e
Lockheed Martin Corporation	18,630
City of Sunnyvale/Public Works	14,200
City of Sunnyvale Water Pollution Control	2,350
Northrop Grumman Systems Corporation	7,350
Spancion LLC	4,560
Onizuka Air Force Base	3,570
<b>TOTAL</b>	<b>50,660</b>

Stationary source emissions are included in the GHG emissions reduction strategy for information purposes only, as stationary source emissions are most effectively addressed and regulated by the BAAQMD or through federal and state programs. The baseline inventory is intended to guide future local policy decisions that relate to emissions within the City's control; therefore, stationary source emissions are excluded from all further discussions of the inventory for the purpose of setting accurate emissions reduction targets.

## GHG EMISSIONS PROJECTIONS

The basis for all growth scenarios is a business-as-usual (BAU) projection. The BAU projection forecasts emissions to reflect the City's growth projections without regulatory or technical intervention to reduce GHG emissions. The BAU projection is based on population, housing, employment, and vehicle miles traveled projections for 2020 and 2035, as shown in **Table C-3**. The population, housing, and employment forecasts come from the City's General Plan, while VMT projections are derived from the Sunnyvale Travel Demand Forecast Model.

**TABLE C-3 – SUNNYVALE COMMUNITY GROWTH INDICATORS**

	2008	2010	2020	2035	PERCENTAGE CHANGE
Population	133,110	135,100	145,020	159,910	20%
Households	54,130	55,050	59,660	66,570	23%
Jobs	73,630	76,320	89,750	109,900	49%
Service Population	206,740	211,420	234,770	269,810	31%

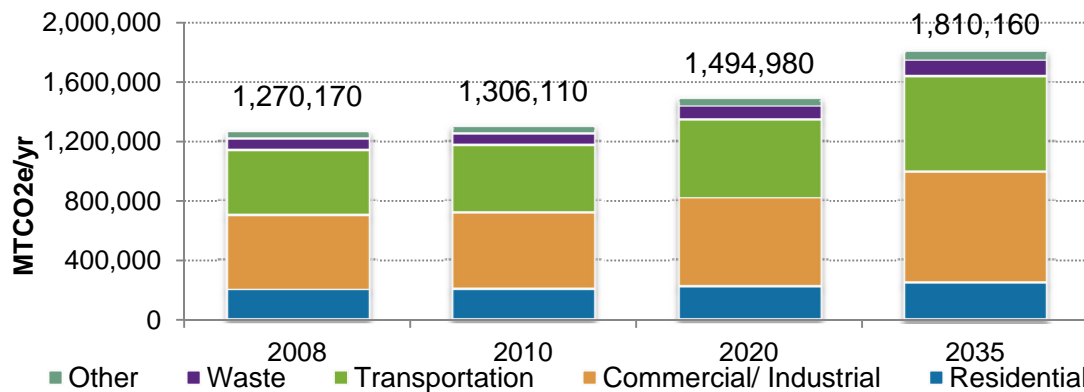
These indicators are then applied to the 2008 GHG emissions inventory to determine a BAU growth scenario. Under the BAU scenario, community-wide emissions will grow by approximately 18% by the year 2020 to 1,494,980 MTCO<sub>2</sub>e and by 43% by 2035 to 1,810,160 MTCO<sub>2</sub>e, as shown in **Table C-4** and **Figure C-2**.



**TABLE C-4 – SUNNYVALE COMMUNITY GHG EMISSIONS FORECAST**

Sector	Source	2008 Baseline	2010 Estimate	2020 Forecast	2035 Forecast
Residential	Electricity	84,850	86,160	93,020	104,350
	Natural Gas	113,290	115,040	124,200	139,320
Commercial/ Industrial	Electricity	387,700	399,380	463,240	578,680
	Natural Gas	114,510	117,950	136,820	170,910
Transportation	VMT	442,610	457,680	533,070	646,150
Landfilled Waste	Commercial	51,570	53,120	61,620	76,970
	Residential	25,400	25,790	27,850	31,240
Landfill Gas	Landfill Gas	3,600	3,460	2,830	2,100
Water	Gallons	6,870	7,000	7,730	8,960
Off-Road	Construction	34,930	35,620	39,310	45,580
	Lawn & Garden	2,900	2,940	3,180	3,560
Caltrain	Trips	1,940	1,970	2,110	2,340
<b>TOTAL</b>		<b>1,270,170</b>	<b>1,306,110</b>	<b>1,494,980</b>	<b>1,810,160</b>
Percentage Change Since Baseline			3%	18%	<b>43%</b>

\* The 2010 and 2020 business-as-usual growth forecasts are linear interpolations of the growth between 2008 and 2035 under the adopted General Plan growth scenario

**FIGURE C-2 – BUSINESS-AS-USUAL GHG FORECAST, 2008–2035\***

\* Other sources include water and wastewater, landfill gas, and off-road emissions representing less than 5% of the inventory.

In addition to AB 32, California has adopted and started to implement several state-level programs that will impact local GHG emissions. In order to effectively determine the emissions reductions that will need to be implemented at the local level to meet the City's emissions reduction target, the impact of state-level programs has been incorporated into an adjusted business-as-usual (ABAU) forecast. The state-level programs included in this adjusted forecast include the Renewables Portfolio Standard (RPS), updates to Title 24 Energy Efficiency Standards, California Solar Initiative rebates, and the implementation of the Clean Car Fuel Standard, commonly referred to as the Pavley standards. The impact of these state programs (shown in **Table C-5**) will play a critical role in helping Sunnyvale to achieve the emissions reduction target.

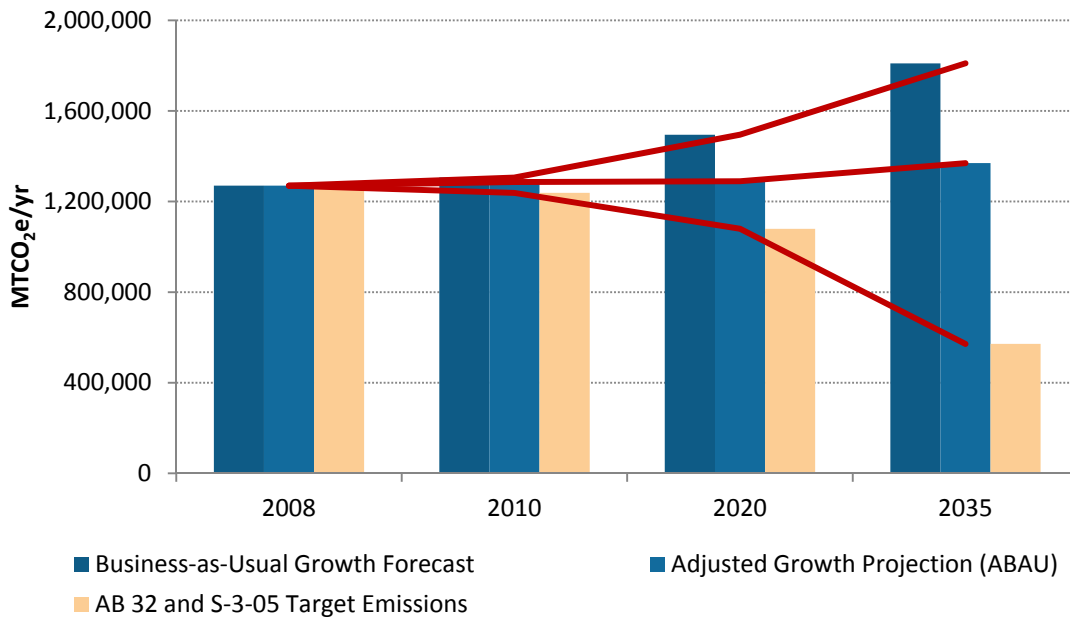
**TABLE C-5 – STATE REDUCTIONS SUMMARY**

	2008	2010	2020	2035
BAU Forecast	1,270,170	1,306,110	1,494,980	1,810,160
BAU Forecast Growth Percentage		3%	18%	43%
Pavley I – Clean Car Fuel Standard	–	0	-81,150	-159,460
Renewables Portfolio Standard	–	-19,700	-90,800	-173,690
CALGreen & 2008 Title 24 Standards	–	0	-31,210	-105,400
Caltrain Electrification	–	0	-1,900	-2,100
Total State/Regional Reductions	–	-19,700	-205,060	-440,650
Adjusted BAU Forecast	1,270,170	1,286,410	1,289,920	1,369,510
ABAU Forecast Growth Percentage	0%	1%	2%	8%

## GHG EMISSIONS REDUCTION TARGET

After state and regional efforts are factored into Sunnyvale's growth forecast, the City's challenge to meet the GHG reduction targets of 15% below baseline levels by 2020 and progress toward the 80% below 1990 levels by 2050 will be fulfilled by the CAP. **Figure C-3** identifies the gap between the City's GHG emissions forecast and the GHG reduction targets if policies and programs are not developed to reduce GHG emissions.

**FIGURE C-3 – GREENHOUSE GAS EMISSIONS FORECASTS AND STATE REDUCTION TARGETS**



## GHG REDUCTION MEASURES

The GHG reduction measures included in this CAP demonstrate the City's ability to reach the GHG reduction target of 15% below baseline levels by 2020. Emissions reductions were quantified for three different years: 2010, 2020, and 2035. Emissions reductions for 2010 have been quantified to demonstrate the actual emissions reduction progress that the City has already made in implementing measures within the CAP, while the 2020 and 2035 emissions reductions are the potential reductions that will be achieved through the implementation of these measures over the next several years. The GHG reduction strategies are separated by goal or topic area to correspond with the sectors and sources of GHG emissions as follows:



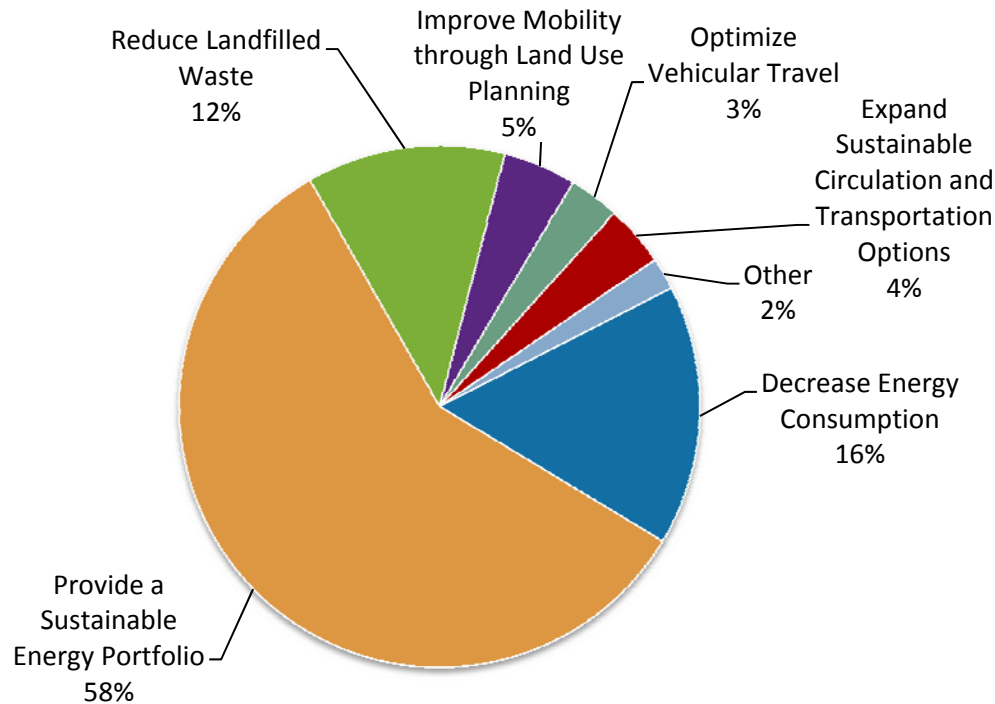
It is important to identify how the City will meet or exceed the minimum GHG reduction target of 15% below baseline levels by 2020 to ensure the City can utilize the CAP as a Qualified GHG Reduction Strategy for use in environmental review of projects. This Plan identifies a clear path to allow the City to exceed the community-wide GHG reduction target of 15% below baseline levels by 2020.

The reduction measures included in this Plan are a diverse mix of regulatory and incentive-based programs. The reduction measures aim to reduce GHG emissions from each source to avoid reliance on any one strategy or sector to achieve the target. In total, existing actions, state programs, and GHG reduction measures in this Plan will reduce GHG emissions in the City of Sunnyvale in 2020 by 434,890 MTCO<sub>2</sub>e (see **Table C-6**), more than double the required GHG reductions necessary to meet AB 32 targets. **Figure C-4** identifies the GHG reductions to be achieved by 2020 by goal.

**TABLE C-6 – GHG REDUCTION SUMMARY BY TOPIC (WITH EP-1)**

Sector	2020 GHG Reductions (MTCO <sub>2</sub> e/yr)	2035 GHG Reductions (MTCO <sub>2</sub> e/yr)
Open Space and Urban Forestry	-310	-780
Decrease Energy Consumption	-67,520	-93,820
Provide a Sustainable Energy Portfolio	-254,380	-363,090
Decrease Water Consumption	-980	-1,520
Reduce Landfilled Waste	-53,960	-96,190
Reduce Off-Road Equipment Emissions	-7,430	-13,820
Increase and Retain Awareness of Sustainability Issues	0	0
Improve Mobility through Land Use Planning	-19,880	-21,410
Expand Sustainable Circulation and Transportation Options	-16,660	-32,380
Optimize Vehicular Travel	-13,770	-26,110
<b>Total Reductions</b>	<b>-434,890</b>	<b>-649,210</b>

**FIGURE C-4 – 2020 EMISSIONS REDUCTIONS BY GOAL, MTCO<sub>2</sub>E (WITH EP-1)**

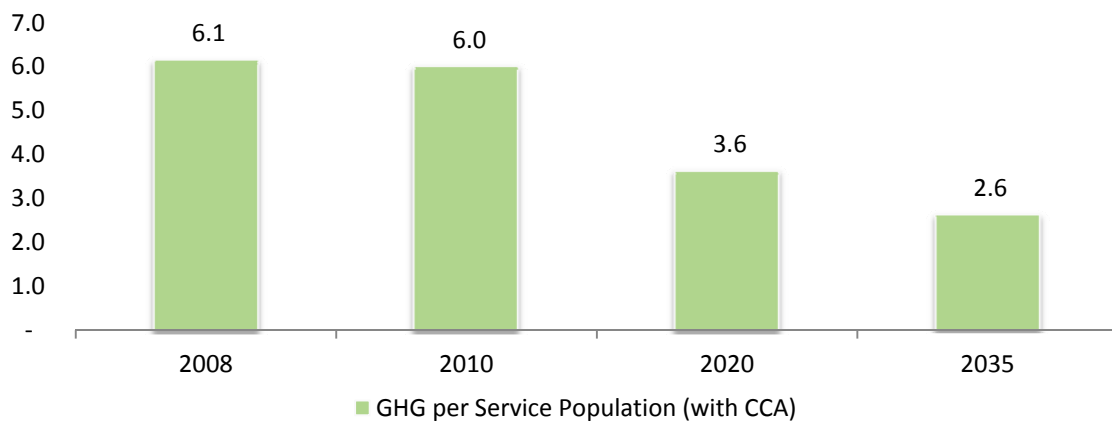


Measure EP-1 directs the City of Sunnyvale to create or join a community choice aggregation program. Since the City's current GHG reduction strategy relies on this strategy to account for nearly half of the GHG reductions, an analysis has also been completed to demonstrate that the City will still meet the 15% reduction target by 2020 if this program is not implemented. **Table C-7** shows the GHG impact of each goal area if Measure EP-1 is not implemented by 2020. If EP-1 is not implemented, the GHG benefit of measures related to electricity will increase.

**TABLE C-7 – GHG REDUCTION SUMMARY BY TOPIC (WITHOUT EP-1)**

Sector	2020 GHG Reductions (MTCO <sub>2</sub> e/yr)	2035 GHG Reductions (MTCO <sub>2</sub> e/yr)
Open Space and Urban Forestry	-350	-870
Decrease Energy Consumption	-91,550	-143,840
Provide a Sustainable Energy Portfolio	-33,820	-50,240
Decrease Water Consumption	-980	-1,520
Reduce Landfilled Waste	-53,960	-96,190
Reduce Off-Road Equipment Emissions	-7,430	-13,820
Increase and Retain Awareness of Sustainability Issues	0	0
Improve Mobility through Land Use Planning	-19,880	-21,410
Expand Sustainable Circulation and Transportation Options	-16,660	-32,380
Optimize Vehicular Travel	-13,330	-24,950
<b>Total Reductions</b>	<b>-237,960</b>	<b>-385,220</b>

Implementation of the CAP by 2020 will exceed state recommendations and BAAQMD threshold requirements for developing a Qualified GHG Reduction Strategy by approximately 15%. As shown in **Figure C-5**, through the implementation of this Plan, the City's GHG emissions will decrease from 6.1 MTCO<sub>2</sub>e per person per year in 2008 to 2.6 MTCO<sub>2</sub>e per person per year in 2035.

**FIGURE C-5 – GHG EMISSIONS PER SERVICE POPULATION (MTCO<sub>2</sub>E) (WITH EP-1)**

In addition to quantifying the emissions reductions associated with each strategy in the CAP, BAAQMD guidance recommends that the City clearly specify the measures within the CAP applicable to new construction projects to demonstrate compliance with the City's GHG emissions reduction strategy and determine that the project's GHG emissions are less than significant. To ensure that each new construction project complies with the City's CAP, the City will develop a checklist to be submitted by the project applicant following CAP adoption.

## IMPLEMENTATION AND MONITORING

To ensure the timely implementation of the City's CAP, the City will identify staff to coordinate program implementation, track implementation of GHG reduction strategies and progress toward GHG reduction targets, and prepare annual reports to the City Council on CAP implementation and progress. To assist staff, the City will develop an implementation and monitoring tracking tool that identifies the major implementation milestones and the necessary actions to be taken for each measure. The tool enables the City to quickly update the GHG emissions inventory and streamline the reporting of CAP implementation on an annual basis. The monitoring tool also outlines the necessary procedures to update the inventory and reduction measures, as needed. This tool will serve as the primary instrument in measuring the City's progress toward achieving emissions reduction targets and to ensure timely implementation occurs.

## PUBLIC PROCESS AND ENVIRONMENTAL REVIEW

The final requirement of a Qualified GHG Reduction Strategy is to adopt the Plan through a public hearing process following environmental review. The City has involved numerous stakeholders throughout the development of the CAP. The CAP will undergo environmental review as part of the public hearing and adoption process.

During the development of the CAP, the City has engaged stakeholders and interested community members during three public workshops. The Horizon 2035 Advisory Committee, a 15-member advisory group made up of a broad cross-section of the community, was convened to assist in CAP development. The public has also had opportunities to participate in the development of this CAP through the public hearing and review process at Planning Commission and City Council meetings.

To comply with CEQA, the CEQA Guidelines recommend that the CAP undergo environmental review and demonstrate that it will have a less than significant environmental impact for all impacts analyzed. An Initial Study and Negative Declaration have been prepared to analyze the potential environmental effects of the CAP.





## APPENDIX D

### WORKS CITED





## WORKS CITED

- Akbari, Hashem. 2005. Energy Savings Potentials and Air Quality Benefits of Urban Heat Island Mitigation. <http://heatisland.lbl.gov/>.
- Bay Area Air Quality Management District (BAAQMD). 2008. Source Inventory of Greenhouse Gas Emissions. [http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/Emission%20Inventory/regionalinventory2007\\_2\\_10.ashx](http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/Emission%20Inventory/regionalinventory2007_2_10.ashx).
- . 2010a. California Environmental Quality Act Air Quality Guidelines. San Francisco: BAAQMD.
- . 2010b. History of the Air District: 1995–2000. <http://www.baaqmd.gov/Divisions/Communications-and-Outreach/News-Media-and-Features/History-of-Air-District-2005/1995--2000.aspx>.
- Bay Area Water Supply & Conservation Agency. 2010. Annual Survey and Water Conservation Report Fiscal Year 2008–2009.
- California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures.
- California Air Resources Board (CARB). 2007. Off-Road Software.
- . 2010a. Assembly Bill 32: Global Warming Solutions Act. <http://www.arb.ca.gov/cc/ab32/ab32.htm>.
- . 2010b. Clean Car Standards – Pavley, Assembly Bill 1493. <http://www.arb.ca.gov/cc/ccms/ccms.htm>.
- . 2010c. Pavley I and Low Carbon Fuel Standard Postprocessor Version 1.0. <http://www.arb.ca.gov/cc/sb375/tools/postprocessor.htm>.
- California Air Resources Board, California Climate Action Registry, and ICLEI. 2008. Local Government Operations Protocol, Version 1.0. Sacramento: CARB.
- California Building Standards Commission. 2010a. California Code of Regulations, Title 24: Part 11: California Green Building Standards Code. [http://www.documents.dgs.ca.gov/bsc/CALGreen/2010\\_CA\\_Green\\_Bldg.pdf](http://www.documents.dgs.ca.gov/bsc/CALGreen/2010_CA_Green_Bldg.pdf).
- . 2010b. 2010 California Green Building Standards Code. California Code of Regulations, Title 24, Part 11.
- California Department of Finance. 2008. California Statewide Population.

- California Department of Community Services and Development. 2009. CSD Helps Low-Income Families Manage and Reduce Energy Costs. [http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20\(2008\).pdf](http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20(2008).pdf).
- California Department of Finance, Demographic Research Unit. 2010. E-5 Population and Housing Estimates for Cities, Counties and the State, 2001–2010, with 2000 Benchmark. <http://www.dof.ca.gov/research/demographic/reports/view.php#objCollapsiblePanelEstimatesAnchor>.
- California Energy Commission (CEC). 2006. Our Changing Climate: Assessing the Risks to California. Web Document. Sacramento: CEC.
- . 2007. Impact Analysis: 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings.
- . 2009. California Energy Commission's Climate Change Activities. <http://www.energy.ca.gov/climatechange/index.html>.
- . 2010a. Nonresidential Building Energy Performance Rating Disclosure Regulations. Sacramento: CEC.
- . 2010b. 2008 Title 24 Impact Analysis. [http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/2007-11-07\\_IMPACT\\_ANALYSIS.PDF](http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/2007-11-07_IMPACT_ANALYSIS.PDF).
- California Natural Resources Agency. 2009. California Climate Adaptation Strategy. Sacramento.
- California Public Utilities Commission (CPUC). 2009. Renewable Portfolio Standard Implementation Analysis Preliminary Results. <http://www.cpuc.ca.gov/NR/rdonlyres/1865C207-FEB5-43CF-99EB-A212B78467F6/0/33PercentRPSImplementationAnalysisInterimReport.pdf>.
- CalRecycle. 2011. Jurisdiction Diversion/Disposal Rate Summary. <http://www.calrecycle.ca.gov/LGCentral/Tools/MARS/DrmcMain.asp>
- Cascadia Consulting Group. 2010. City of Sunnyvale Waste Characterization Report. [http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/recycling/SV\\_ReportUpdate\\_FINALV3KG.pdf](http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/recycling/SV_ReportUpdate_FINALV3KG.pdf).
- City of Berkeley. 2010. Berkeley FIRST Initial Evaluation. Berkeley, CA.
- City of Sonoma. 2010. Analysis of CALGreen (California Green Building Standards Code) with Mandatory Tier 1 (CALGreen+Tier1) Compared to Existing City of Sonoma Green Building Requirements. [http://www.asgi.us/calgreen/CALGreenTier1\\_CityOfSonoma\\_analysis.pdf](http://www.asgi.us/calgreen/CALGreenTier1_CityOfSonoma_analysis.pdf).
- City of Sunnyvale. 2006. Bicycle and Pedestrian Master Plan. <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/Transportation/SunnyvaleBicyclePlan2006.pdf>.
- . 2008. Parks of the Future Plan. Parks and Recreation Department.

———. 2009. General Plan Housing Element.

———. 2010. Green Building Checklist.

California Public Utilities Commission (CPUC). 2009. 33% Renewable Portfolios Standard Implementation Analysis Report. <http://www.cpuc.ca.gov/NR/rdonlyres/1865C207-FEB5-43CF-99EB-A212B78467F6/0/33PercentRPSImplementationAnalysisInterimReport.pdf>.

California Solar Initiative. 2011. California Solar Initiative Geographic Statistics. [http://www.californiasolarstatistics.ca.gov/reports/locale\\_stats/](http://www.californiasolarstatistics.ca.gov/reports/locale_stats/).

Ehrhardt-Martinez, K., K. Donnelly, and J. Laitner. 2010. Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities. American Council for an Energy-Efficient Economy. Report Number E105. <http://www.aceee.org/sites/default/files/publications/researchreports/e105.pdf>.

Energy Star. 2008. Clothes Washer Product Snapshot. [http://www.energystar.gov/ia/partners/rep/pt\\_rep\\_res\\_retail/files/CW\\_ProductSnapshot\\_May08.pdf](http://www.energystar.gov/ia/partners/rep/pt_rep_res_retail/files/CW_ProductSnapshot_May08.pdf).

Energy Star. n.d. Residential New Construction: An Overview of Energy Use and Energy Efficiency Opportunities. [http://www.energystar.gov/ia/business/challenge/learn\\_more/ResidentialNewConstruction.pdf](http://www.energystar.gov/ia/business/challenge/learn_more/ResidentialNewConstruction.pdf).

Go Solar California. 2010. [http://www.gosolarcalifornia.org/professionals/2-17-10\\_CalFIRST\\_FACT\\_SHEET.pdf](http://www.gosolarcalifornia.org/professionals/2-17-10_CalFIRST_FACT_SHEET.pdf).

Intergovernmental Panel on Climate Change (IPCC). 1997. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.html>.

———. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

KEMA. 2007. City of Sunnyvale Climate Action Plan – City Operations.

Marin Energy Authority. 2010. Marin Clean Energy Implementation Plan. [http://marincleanenergy.info/images/stories/PDF/MEA\\_Implementation\\_Plan\\_Jan\\_2010.pdf](http://marincleanenergy.info/images/stories/PDF/MEA_Implementation_Plan_Jan_2010.pdf).

McPherson, et al. 2000. The potential of urban tree plantings to be cost effective in a carbon market.

Met Office, Hadley Centre. 2009. Mapping Climate Impacts. <http://webarchive.nationalarchives.gov.uk/20100623194820/>.

National Academy of Sciences. 2008. Understanding and Responding to Climate Change. Washington DC: The National Academies.

- National Oceanic and Atmospheric Administration, National Climatic Data Center. 2008. NOAA Satellite and Information Service. <http://www.ncdc.noaa.gov/oa/climate/globalwarming.html#q1>.
- Natural Resources Defense Council. 2010. Property Assessed Clean Energy Programs White Paper. <http://pacenow.org/documents/PACE%20White%20Paper%20May%203%20update.pdf>.
- Pacific Gas & Electric. 2010. Codes and Standards Title 24 Energy-Efficient Local Ordinances. [http://www.energy.ca.gov/title24/2008standards/ordinances/sancarlos/2010-12-29\\_pge\\_zone\\_3\\_Cost\\_Study.pdf](http://www.energy.ca.gov/title24/2008standards/ordinances/sancarlos/2010-12-29_pge_zone_3_Cost_Study.pdf).
- Pike Research. 2010. Smart Appliance Sales. <http://www.smartgridnews.com/artman/publish/Smart-Grid-Press-Releases/Smart-appliance-sales-to-start-off-slow-but-118-million-units-will-be-sold-worldwide-by-2019-forecasts-Pike-Research-3290.html> and <http://www.pikeresearch.com/>.
- Pomerantz, Melvin. 2010. EPA Presentation, "Cool Pavements for Cool Communities."
- Rosenweig, C., et al. 2007. Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.
- State of California, Community Services and Development. 2009. CSD Helps Low-Income Families Manage and Reduce Energy Costs. [http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20\(2008\).pdf](http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20(2008).pdf).
- Tufts University. 2009. Tufts Sustainability. <http://sustainability.tufts.edu/?pid=31>.
- US Census Bureau. 2011. Profile of General Population and Housing Characteristics: 2010, City of Sunnyvale, CA.
- US Department of Housing and Urban Development (HUD). 2011. SOCDS Building Permits Database. <http://socds.huduser.org/permits/>.
- US Environmental Protection Agency. 2003. EPA Denies Petition to Regulate Greenhouse Gas Emissions from Motor Vehicles.
- . 2005a. Emissions Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle. <http://www.epa.gov/otaq/climate/420f05004.pdf>.
- . 2005b. Reducing Urban Heat Island Compendium of Strategies: Cool Pavements. <http://www.epa.gov/heatisd/resources/pdf/CoolPavesCompendium.pdf>.