

CITY OF MORRO BAY FINAL CLIMATE ACTION PLAN

*Adopted by the City Council
January 14, 2014*



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City of Morro Bay

Final Climate Action Plan

Adopted by the City Council
January 21, 2014

Prepared for:



City of Morro Bay

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Acronyms

AB	Assembly Bill
APCD	San Luis Obispo County Air Pollution Control District
Cal/EPA	California Environmental Protection Agency
CAL FIRE	California Department of Forestry and Fire Protection
CALGreen	California Green Building Standards Code
Caltrans	California Department of Transportation
CAFE	Corporate Average Fuel Economy
CAP	Climate Action Plan
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CH ₄	Methane
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
EPA	Environmental Protection Agency
GHG	Greenhouse gas
HFC	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt hours
LCFS	Low Carbon Fuel Standard
LED	Light-Emitting Diode
MPO	Metropolitan Planning Organization
MT	Metric tons
N ₂ O	Nitrous oxide
O ₃	Ozone
PFCs	Perfluorocarbons
PG&E	Pacific Gas and Electric
PV	Photovoltaic
RTA	Regional Transit Authority
SB	Senate Bill
SLOCOG	San Luis Obispo Council of Governments
TDM	Transportation demand management
VMT	Vehicle miles traveled

EXECUTIVE

SUMMARY

Executive Summary

The City of Morro Bay Climate Action Plan (CAP) is a long-range plan to reduce greenhouse gas (GHG) emissions from City government operations and community activities within Morro Bay and prepare for the anticipated effects of climate change. The CAP will also help achieve multiple community goals such as lowering energy costs, reducing air pollution, supporting local economic development, and improving public health and quality of life. Specifically this CAP is designed to:

- Benchmark Morro Bay's 2005 baseline GHG emissions and 2020 projected emissions relative to the statewide emissions target established under California Assembly Bill (AB) 32 of 1990 levels by 2020 (approximately 15 percent below 2005 levels by the year 2020).
- Provide a roadmap for achieving the city's GHG emissions reduction target of 15 percent below 2005 levels by the year 2020 and help Morro Bay prepare for anticipated climate change impacts.
- Serve as a qualified and comprehensive plan for addressing the cumulative impacts of GHG emissions within Morro Bay (see California Environmental Quality Act [CEQA] Guidelines, Section 15183.5, and the San Luis Obispo County Air Pollution Control District [APCD] CEQA Air Quality Handbook, Sections 3.3 and 4.6).
- Support tiering and streamlining the analysis of GHG emissions for future projects within Morro Bay pursuant to State CEQA Guidelines Sections 15152 and 15183.5.

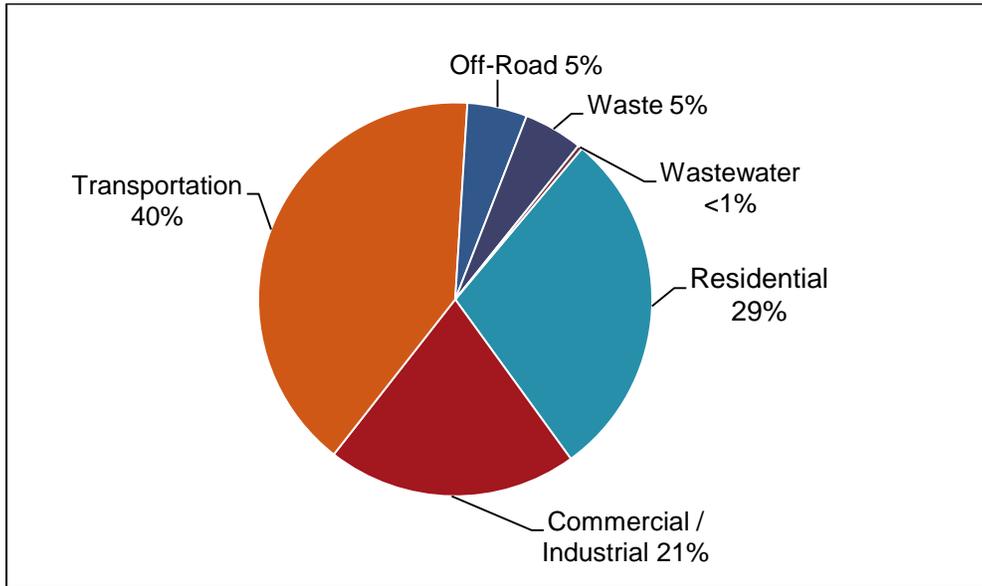
Morro Bay's GHG Emissions

The *City of Morro Bay 2005 Greenhouse Gas Emissions Inventory Update (2012)* (GHG Emissions Inventory) was prepared to identify the major sources and quantities of GHG emissions produced in Morro Bay in 2005 and forecast how these emissions may change over time. The GHG Emissions Inventory provides information on the scale of emissions from various sources and where the opportunities to reduce emissions lie. It also provides a baseline against which the City can measure its progress in reducing GHG emissions.

According to the GHG Emissions Inventory, in 2005, the Morro Bay community emitted approximately 55,677 metric tons of carbon dioxide equivalent GHG emissions (MT CO₂e), as a result of activities that took place within the transportation, residential energy use, commercial and industrial energy use, off-road vehicles and equipment,¹ solid waste, and wastewater sectors. As shown in **Figure ES-1**, the largest contributors of GHG emissions were the transportation (40 percent), residential energy use (29 percent) and commercial/industrial energy use (21 percent) sectors. The remainder of emissions resulted from the off-road (five percent), solid waste (five percent), and wastewater (less than one percent) sectors.

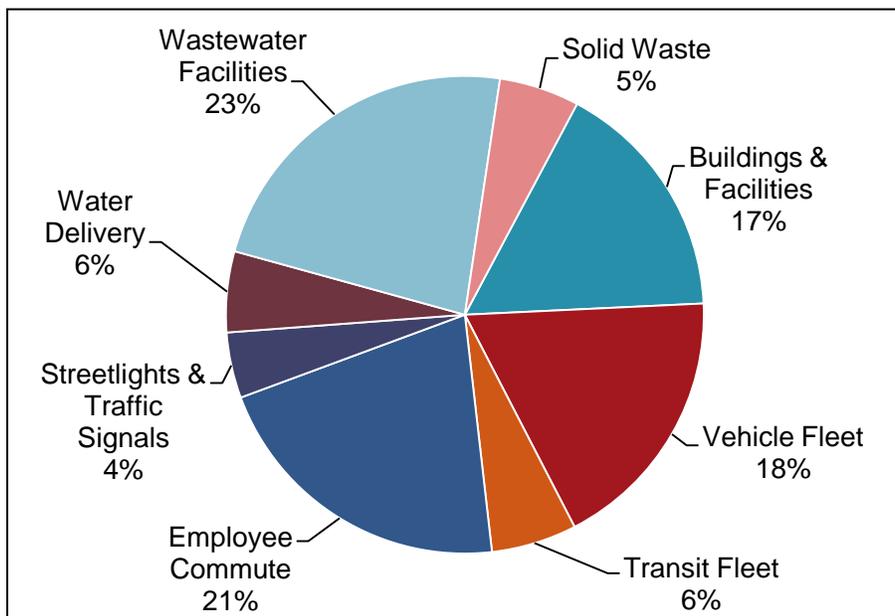
¹ The off-road vehicles and equipment sector includes GHG emissions resulting from gasoline, diesel, and compressed natural gas fuel used to power agricultural vehicles and equipment, lawn and garden equipment, construction vehicles and equipment, light commercial equipment and industrial equipment.

Figure ES-1: Community-wide GHG Emissions by Sector (2005)



The GHG Emissions Inventory also analyzed emissions from City government operations and facilities. The City government operations inventory is a subset of the community-wide inventory, and is included within the community-wide inventory. In 2005, City government operations generated approximately 1,955 MT CO₂e. This quantity represents approximately four percent of Morro Bay’s total community-wide GHG emissions. As shown in **Figure ES-2**, the majority of these GHG emissions resulted from the City’s wastewater facilities (23 percent), employee commutes (21 percent), vehicle fleet (18 percent), and building and facility energy use (17 percent).

Figure ES-2: City Government Operations GHG Emissions by Sector (2005)



The GHG emissions forecast is a projection of how GHG emissions will change in the future with projected changes in population and jobs.² The “business-as-usual scenario” provides a forecast of how GHG emissions will change in the year 2020 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32.

Under the business-as-usual scenario, Morro Bay’s GHG emissions are projected to grow approximately 14 percent above 2005 GHG emissions levels by the year 2020, from 55,677 MT CO₂e to 63,395 MT CO₂e. Emissions associated with the transportation sector will experience the highest level of growth (24 percent). Emissions for the other sectors will range from a decrease of one percent to an increase of 18 percent. **Table ES-1** shows the forecast results of the business-as-usual scenario.

Table ES-1: 2020 Business-As-Usual GHG Emissions Forecast

Sector	2005 (MT CO ₂ e)	2020 (MT CO ₂ e)	Percent Change from 2005 to 2020
Residential	16,094	15,991	-1%
Commercial / Industrial	11,442	13,501	18%
Transportation	22,506	27,789	24%
Off-Road	2,740	3,237	18%
Solid Waste	2,695	2,678	-1%
Wastewater	200	199	-1%
Total	55,677	63,395	14%

The *AB 32 Climate Change Scoping Plan* (2008) (AB 32 Scoping Plan), prepared by the California Air Resources Board (CARB) pursuant to AB 32, identifies several State measures that are approved, programmed, and/or adopted and would reduce GHG emissions within Morro Bay. These State measures require no additional local action. In addition to the State measures, the City of Morro Bay has implemented, adopted, and/or programmed a number of local measures since the 2005 baseline inventory year that will reduce the community’s GHG emissions. Therefore, these measures were incorporated into the forecast and reduction assessment to create an “adjusted forecast scenario,” which provides a more accurate picture of future emissions growth and the responsibility of the City once State and local measures to reduce GHG emissions have been implemented.

As shown in **Table ES-2**, state and local measures will reduce GHG emissions in Morro Bay by an estimated 12,137 MT CO₂e by 2020. Under the adjusted forecast scenario GHG emissions are projected to decrease to 51,258 MT CO₂e (approximately 19 percent below the business-as-usual scenario of 63,395 MT CO₂e).

² Population and job projections for the year 2020 were obtained from the San Luis Obispo Council of Governments (SLOCOG) 2040 Population, Housing & Employment Forecast (August 2011) (see Chapter 2).

Table ES-2: Summary of Reductions from State and Local Measures and 2020 GHG Emissions

	GHG Emissions (MT CO₂e)
2020 Business-as-Usual Forecast	63,395
2020 Reduction from State Measures	-11,871
2020 Reduction from Local Measures	-266
Total Reduction from State and Local Measures	-12,137
2020 Adjusted Forecast	51,258

GHG Emissions Reduction Target

The City is committed to reducing its GHG emissions by 15 percent below 2005 levels by 2020, consistent with AB 32. As shown in **Table ES-3**, based on the 15 percent reduction target Morro Bay would need to reduce its community-wide GHG emissions to 47,325 MT CO₂e by 2020. To meet this target, Morro Bay will need to reduce its GHG emissions eight percent below the adjusted forecast level (equivalent to 3,933 MT CO₂e) by 2020 through implementation of local measures and actions.

Table ES-3: Morro Bay’s GHG Emissions, Target, and Reduction Necessary to Meet Target

	GHG Emissions (MT CO₂e)
2005 Baseline Emissions	55,677
2020 Adjusted Forecast	51,258
Target (15% below 2005 levels by 2020)	47,325
Remaining Gap Necessary to Meet Target	3,933

Climate Action Measures

To achieve the City’s target of 15 percent below 2005 levels (47,325 MT CO₂e) by 2020 and prepare for the anticipated effects of climate change, the CAP identifies climate action measures. These measures are organized into the following focus areas: City government operations, energy, transportation and land use, off-road, solid waste, and tree planting. The measures were selected based on careful consideration of the emission reductions needed to achieve the target, the distribution of emissions revealed in the GHG Emissions Inventory, existing priorities and resources, policies and strategies of neighboring jurisdictions and regional agencies, and the potential costs and benefits of each measure. Collectively, the measures identified in the CAP have the potential to reduce GHG emissions within Morro Bay by 5,248 MT CO₂e (17 percent below the 2005 baseline) by 2020 and meet the reduction target.

Implementation and Monitoring

Implementation and monitoring are essential processes to ensure that Morro Bay reduces its GHG emissions and meets its target. To facilitate this, each climate action measure identifies implementation actions, departments responsible for implementation and monitoring, cost and savings estimates, the GHG reduction potential, a performance indicator to monitor progress, and an implementation time frame. Measure implementation is separated into three phases: near-term (by 2015), mid-term (2016-2017), and long-term (2018-2020).

In order to ensure that measures are implemented and their progress is monitored, upon adoption of the CAP, the City will establish a CAP Coordinator who will provide essential CAP oversight and coordination of a multi-departmental CAP Implementation Team comprised of key staff in each selected department. The CAP Implementation Team will meet at least one time per year to assess the status of CAP efforts. The City's CAP Coordinator will be responsible for developing an annual progress report to the City Council that identifies the implementation status of each measure, evaluates achievement of or progress toward performance indicators (where applicable), assesses the effectiveness of various measures and actions included in the CAP, and recommends adjustments to measures or actions, as needed. To evaluate the performance of the CAP as a whole, the City will update the community and City government GHG emissions inventories every five years, using the most up-to-date calculation methods, data, and tools.

CHAPTER 1

INTRODUCTION

1.0 Introduction

Although climate change is a global issue, the State of California recognizes that it poses risks to the public health, environment, economic well-being, and natural resources of California, and has taken an active approach to address climate change through the adoption of legislation and policies. In 2005, the governor issued Executive Order S-3-05 to reduce statewide GHG emissions to 1990 levels by 2020 (approximately 15 percent below 2005 levels) and to 80 percent below 1990 levels by 2050. Enactment of several related pieces of climate action legislation followed, including AB 32 (the Global Warming Solutions Act of 2006), which codified the 2020 target, and SB 97 (the CEQA and GHG Emissions bill of 2007), which requires lead agencies to analyze GHG emissions and mitigate climate change impacts under CEQA. These laws together create a framework for GHG emissions reductions and identify local governments as having a vital role to play in assisting the State in meeting these mandates. The AB 32 Scoping Plan, prepared by CARB pursuant to AB 32, notes that local governments have broad influence and, in some cases, exclusive authority over activities that result in GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and City government operations. In recognition of the important role local governments will play in the successful implementation of AB 32, the AB 32 Scoping Plan recommends a GHG emission reduction target for local governments of 15 percent below 2005 levels by 2020 to match the statewide reduction target and to mitigate their impacts on climate change.

Recognizing the important role and responsibility that local governments have in reducing GHG emissions and mitigating their potential climate change impacts, the City has prepared this CAP. This chapter describes the purpose, scope, and content of Morro Bay's CAP. This chapter also summarizes the scientific and regulatory framework under which this plan has been developed.

1.1 Purpose and Scope

The City's CAP is a long-range plan to reduce GHG emissions from community-wide activities and City government operations within Morro Bay to support the State's efforts under AB 32 and to mitigate the community's contribution to global climate change. Specifically, the CAP does the following:

- Summarizes the results of the *City of Morro Bay 2005 Greenhouse Gas Emissions Inventory Update*, which identifies the major sources and quantities of GHG emissions produced within Morro Bay and forecasts how these emissions may change over time.
- Identifies the quantity of GHG emissions that Morro Bay will need to reduce to meet the State-recommended target of 15 percent below 2005 levels by the year 2020.
- Sets forth City government and community-wide GHG reduction measures, including performance standards which, if implemented, would collectively achieve the specified emission reduction target.
- Identifies proactive strategies that can be implemented to help Morro Bay prepare for anticipated climate change impacts.

1.0 INTRODUCTION

- Sets forth procedures to implement, monitor, and verify the effectiveness of the CAP measures and adapt efforts moving forward as necessary.

In addition to reducing Morro Bay's GHG emissions consistent with AB 32 and mitigating the community's contribution to global climate change, implementation of the CAP will help achieve multiple community-wide goals, such as lowering energy costs, reducing air pollution, supporting local economic development, and improving public health and quality of life. The CAP may also be utilized to tier and streamline the analysis of GHG emissions of future development within Morro Bay pursuant to State CEQA Guidelines Sections 15152 and 15183.5 (refer to Section 1.4, *Relationship to CEQA*).

1.2 Content

The CAP is organized into the following chapters:

1.0 Introduction – describes the purpose, scope, and content of Morro Bay's CAP. It also summarizes the scientific and regulatory framework under which this plan has been developed.

2.0 GHG Emissions and Reduction Target – identifies the sources of GHG emissions in Morro Bay, quantifies emissions for a baseline year (2005), and forecasts how emission levels would change through 2020. This chapter also quantifies the GHG emissions reduction target for the year 2020.

3.0 Climate Action Measures – organizes the CAP measures into the following focus areas: City government operations, energy, transportation and land use, off-road, solid waste, and tree planting.. Each GHG reduction measure is presented with implementation actions, estimated GHG reductions in 2020, and estimated cost and future savings.

4.0 Adaptation –includes a discussion of modeled climate change predictions, an urban system assessment, a vulnerability assessment, and adaptation measures to prepare for and minimize the risk associated with anticipated climate change impacts.

5.0 Implementation and Monitoring – sets forth procedures to implement and monitor the individual CAP measures, evaluate the CAP's performance, and amend the plan if it is not achieving targeted reduction levels. It also identifies potential sources of funding to implement the CAP.

1.3 Background and Planning Process

In 2007, the San Luis Obispo County Air Pollution Control District (APCD) convened a committee of agency stakeholders (Stakeholder Committee) from the cities of Atascadero, Arroyo Grande, Grover Beach, Morro Bay, Paso Robles, Pismo Beach, and San Luis Obispo and the County of San Luis Obispo to initiate a discussion on climate change, including science, policy, funding, mitigation, adaptation, and public engagement. The APCD also coordinated the preparation of GHG emissions inventories for each of the jurisdictions. Both the City and County

of San Luis Obispo received federal stimulus funds to support the development of their CAPs. San Luis Obispo County approved its EnergyWise Plan in November 2011, and the City of San Luis Obispo adopted its Climate Action Plan in July 2012. The APCD worked with the remaining six cities to secure funds for individual CAPs, including the City of Morro Bay CAP, through the Pacific Gas and Electric Company (PG&E) Green Communities Program, Southern California Gas Company (SoCalGas), and APCD's mitigation grant funding.

City staff and its consultants worked with members of the community and elected officials to develop the CAP. The public outreach program involved two community workshops that introduced the project gathered input and ideas for the document and on potential GHG reduction measures. A virtual town hall also provided an opportunity for community members to evaluate a preliminary set of GHG reduction measures and suggest additional ideas. Public outreach also included posting project information and updates to the project website (www.centralcoastghgplanning.com) and eNewsletter announcements. Public comment was also considered during Planning Commission and City Council meetings.

1.4 Relationship to CEQA

According to the California Natural Resources Agency (2009) and the State's Office of the Attorney General (2009), GHG emissions may be best analyzed and mitigated at the programmatic level (i.e., in a GHG reduction plan/CAP). In 2009, the California Natural Resources Agency amended the State CEQA Guidelines to add a new provision, Section 15183.5, which provides a framework for programmatic GHG emissions reduction plans (i.e., a CAP). Section 15183.5 states a plan for the reduction of GHG emissions should:

- Quantify GHG 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 GHG emissions from activities covered by the plan would not be cumulatively considerable;
- Identify and analyze the GHG emissions resulting from sources in the community;
- Identify a suite of specific, enforceable measures that, collectively, will achieve the emissions targets;
- Establish a mechanism to monitor the plan's progress and to require amendment if the plan is falling short; and
- Be adopted in a public process following environmental review.

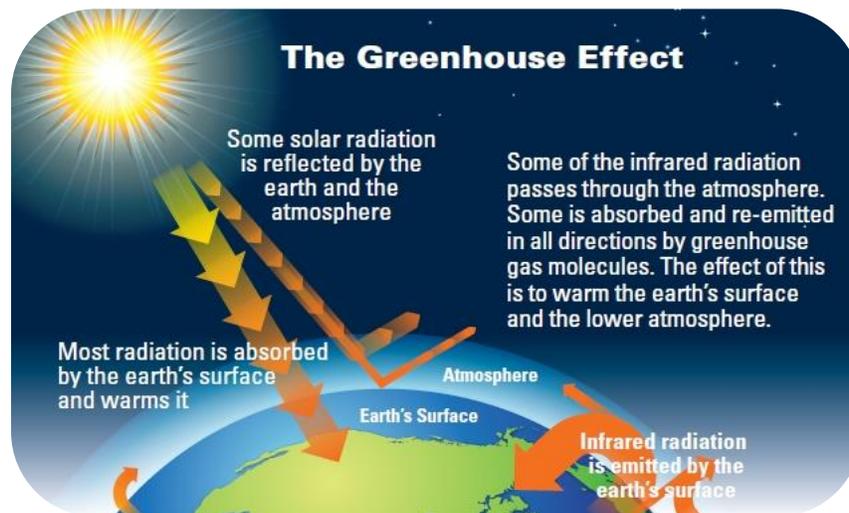
This CAP was developed to be consistent with State CEQA Guidelines Section 15183.5. Once the CAP is adopted following environmental review, a lead agency may determine that projects that are consistent with the CAP will not have significant GHG-related impacts, thereby shortening the CEQA process, which can save time and money for these projects. **Appendix C** contains a worksheet that project applicants may use to demonstrate project-level compliance. If a project is found to be inconsistent with the CAP, the APCD thresholds discussed in Section 1.8.3 should be applied.

1.5 Scientific Background

In order to make meaningful and effective decisions regarding the mitigation of GHG emissions and adaptation to anticipated changes in climate, it is important to understand the science under which this CAP has been developed. This section provides a brief introduction to the scientific research efforts to understand how climate change occurs and its implications.

Global climate change refers to changes in the average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation, and storms. Global warming, a related concept, is the observed increase in average temperature of the Earth's surface and atmosphere caused by increased GHG emissions, which can contribute to changes in global climate patterns. GHGs, such as water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and ozone (O₃), are gases in the Earth's atmosphere that play a critical role in determining the Earth's surface temperature. Specifically, GHGs allow high-frequency solar radiation to enter the Earth's atmosphere, but trap the low frequency, long wave energy which is radiated back from the Earth to space, resulting in a warming of the atmosphere. The trapping of heat at the Earth's surface is known as the "greenhouse effect" (refer to **Figure 1-1**).

Figure 1-1: The Greenhouse Effect

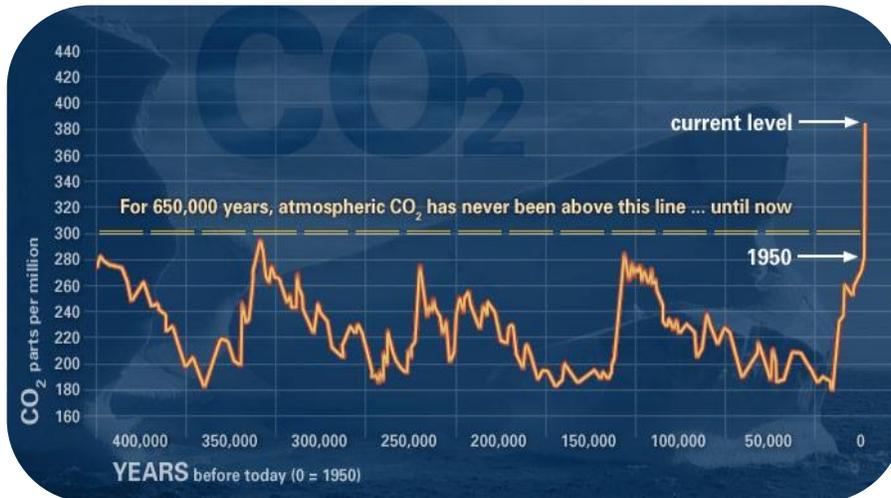


Source: National Oceanic & Atmospheric Administration (NOAA), 2009

GHGs are the result of both natural and anthropogenic activities. The consumption of fossil fuels for power generation and transportation, forest fires, decomposition of organic waste, and industrial processes are the primary sources of GHG emissions. Without human intervention, the Earth maintains an approximate long-term balance between the emission of GHGs into the atmosphere and its storage in oceans and terrestrial ecosystems. Following the industrial revolution, however, increased combustion of fossil fuels (e.g., gasoline, diesel, coal, etc.) and other industrial processes have contributed to the rapid increase in atmospheric levels of GHGs (refer to **Figure 1-2**) (NOAA, 2009). This increase in GHGs correlates with the recent increase

in global average temperature (which has risen approximately 1.4°F since the early 20th century) (IPCC, 2007; NOAA, 2009).

Figure 1-2: Historic Fluctuations and Recent Increases in Atmospheric Carbon Dioxide



This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO₂ has increased since the Industrial Revolution (NASA, 2011).

The principal GHGs that enter the atmosphere as a result of human activities are discussed below.

- **Carbon dioxide (CO₂)** is released into the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., cement production) and deforestation. Carbon dioxide is also removed from the atmosphere (or “sequestered”) when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH₄)** is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from agricultural practices, such as the raising of livestock, and by the decomposition of organic waste in landfills.
- **Nitrous oxide (N₂O)** is emitted during agricultural and industrial activities, as well as during the burning of fossil fuels and solid waste.
- **Fluorinated gases** (i.e., hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) are synthetic GHGs that are emitted from a variety of industrial processes (e.g., aluminum production) and used in commercial, industrial, and consumer products (e.g., automobile air conditioners and refrigerants). These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as “high global warming potential” gases.

Each GHG has a different potential for trapping heat in the atmosphere, called global warming potential. For example, one pound of methane has 21 times more heat capturing potential than one pound of carbon dioxide. To simplify reporting and analysis of GHGs, GHG emissions are typically reported in metric tons of carbon dioxide equivalent (MT CO₂e) units. When dealing with an array of emissions, the gases are converted to their carbon dioxide equivalents for comparison purposes. The global warming potentials for common GHGs are shown in **Table 1-1**.

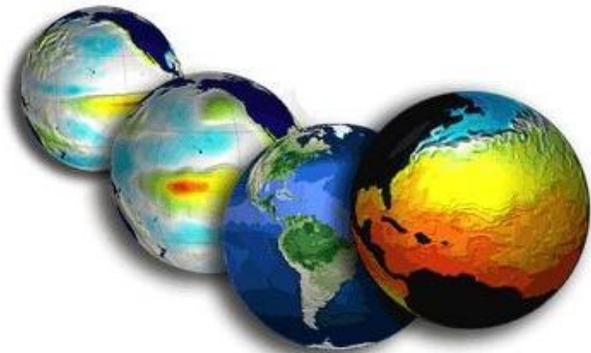
Table 1-1: Global Warming Potential of GHGs

GHG	Global Warming Potential
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous Oxide (N ₂ O)	310
Hydroflourocarbons (HFCs)	140-11,700
Perflourocarbons (PFCs)	6,500-9,200
Sulfur Hexaflouride (SF ₆)	23,900

Notes: Each of the GHGs listed above differs in its ability to absorb heat in the atmosphere, or in its global warming potential. The values presented above are based on the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report and United Nations Framework Convention on Climate Change reporting guidelines (IPCC, 1996). Although the IPCC Fourth Assessment Report presents different estimates, the current inventory standard relies on the Second Assessment Report's intensity factors to comply with reporting standards and consistency with regional and national inventories (USEPA, 2010).

1.6 Climate Change Impacts

Increases in the globally averaged atmospheric concentration of GHGs will cause the lower atmosphere to warm, in turn inducing a myriad of changes to the global climate system. These large-scale changes will have unique and potentially severe impacts in the western United States, California, and the central coast region. Current research efforts coordinated through CARB, California Energy Commission, California Environmental Protection Agency (EPA), University of California system, and other entities are examining the specific changes to California's climate that will occur as the Earth's surface warms.



The best available climate models indicate that climate change could impact the natural environment in California in the following ways, among others (California Natural Resources Agency, 2009):

- Rising sea levels along the California coastline caused by ocean expansion and glacier melt

- Extreme-heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent
- An increase in heat-related human deaths, infectious diseases, and a higher risk of respiratory problems caused by deteriorating air quality
- Reduced snow pack and stream flow in the Sierra Nevada Mountains, affecting winter recreation and water supplies
- Potential increase in the severity and historical pattern of winter storms, affecting peak stream flows and flooding
- Changes in growing season conditions that could affect California agriculture, causing variations in crop quality and yield
- Changes in distribution of plant and wildlife species brought about by changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects

1.7 Implications for Morro Bay

Rising temperatures affect local and global climate patterns, and these changes are forecasted to manifest themselves in a number of ways that may impact the central coast region. As further discussed in Chapter 4, *Adaptation*, according to *ClimateWise: Integrated Climate Change Adaptation Planning in San Luis Obispo County in November 2010* (ClimateWise) potential climate changes that could occur in Morro Bay by the end of this century include:

- Increased temperatures
- Sea level rise
- Storm surges
- Erosion
- Changed precipitation

1.8 Regulatory Background

This section summarizes the federal, state, and regional legislation, regulations, policies, and plans that have guided the preparation and development of this CAP.

1.8.1 FEDERAL

Clean Air Act. The U.S. EPA is the federal agency responsible for implementing the Clean Air Act. The U.S. Supreme Court ruled in its decision in *Massachusetts et al. v. Environmental Protection Agency et al.*, issued on April 2, 2007, that carbon dioxide is an air pollutant as defined under the Clean Air Act and that the U.S. EPA has the authority to regulate emissions of GHGs as pollutants. In 2011, the U.S. EPA began regulating GHG emissions from new power plants and refineries through a set of New Source Performance Standards. These regulations

are found in 40 CFR Part 60 and apply to new, modified and reconstructed affected facilities in specific source categories such as manufacturers of glass, cement, rubber tires and wool fiberglass.

Energy Independence and Security Act. The Energy Independence and Security Act of 2007 includes several provisions that will increase energy efficiency and the availability of renewable energy, which in turn will reduce GHG emissions. First, the Act sets a Renewable Fuel Standard that requires fuel producers to use at least 36 billion gallons of biofuel by 2022. Second, it increased Corporate Average Fuel Economy (CAFE) Standards to require a minimum average fuel economy of 35 miles per gallon for the combined fleet of cars and light trucks by 2020. Third, it includes a variety of new standards for lighting and for residential and commercial appliance equipment, including residential refrigerators, freezers, refrigerator-freezers, metal halide lamps, and commercial walk-in coolers and freezers.

1.8.2 STATE OF CALIFORNIA

The State of California has been proactive in working to reduce emissions and has a long history of leadership in addressing energy and climate issues spanning the last 40 years. In 1988, AB 4420 (Sher, Chapter 1506, Statutes of 1988) designated the California Energy Commission as the lead agency for climate change issues in California. Since that time, numerous initiatives in California have addressed climate change and energy efficiency, the majority of legislation passed since 2000. These initiatives have strengthened the ability of entities in California to engage in accurate data collection and have created targets and regulations that will directly lead to reductions in GHG emissions. These initiatives are described below.

Executive Order S-3-05. Executive Order S-3-05, issued in 2005, was the first comprehensive state policy to address climate change. It established ambitious GHG reduction targets for the State: reduce GHG emissions to 2000 levels by 2010, to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050. This Executive Order is binding only for State agencies and has no force of law for local governments. However, S-3-05 is important for two reasons. First, it obligated State agencies to implement GHG emission reduction strategies. Second, the signing of the Order sent a clear signal to the Legislature about the framework and content for legislation to reduce GHG emissions as a necessary step toward climate stabilization.

Assembly Bill 32 (California Global Warming Solutions Act of 2006). AB 32 codified the State's 2020 GHG emissions target by directing CARB to reduce California's statewide emissions to 1990 levels by 2020. AB 32 also required CARB to develop a policy plan for reaching the 2020 emissions target and to adopt and enforce regulations to implement the plan. The resulting AB 32 Scoping Plan was adopted by CARB in December 2008. Key elements of the plan for achieving the 2020 target include:

- Adopting and implementing measures pursuant to existing state laws and policies, including California's goods movement measures and the Low Carbon Fuel Standard
- Expanding energy efficiency programs and green building practices

- Reducing methane emissions at landfills
- Developing a California cap-and-trade program
- Establishing and seeking to achieve reduction targets for transportation-related GHG emissions
- Increasing waste diversion, composting, and commercial recycling toward zero-waste
- Strengthening water efficiency programs
- Preserving forests that sequester carbon dioxide

Although the AB 32 Scoping Plan does not identify specific reductions for local governments, it identifies overall reductions from local government operations and land use decisions as a strategy to meet the 2020 target. The AB 32 Scoping Plan states that land use planning and urban growth decisions will play an important role in the State's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions. It further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. However, the AB 32 Scoping Plan stopped short of identifying mandatory targets for local government compliance. Instead, it encourages local governments to adopt a target for City government and community-wide emissions that parallels the State's AB 32 target and reduces emissions by approximately 15 percent by 2020.

Senate Bill 97. SB 97 (2007) established that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis and required the Governor's Office of Planning and Research to develop guidelines to analyze GHG impacts under CEQA. The guidelines were adopted on December 31, 2009, requiring lead agencies to analyze GHG emissions and the effects of GHG emissions during CEQA review.

Assembly Bill 1493 (Pavley Regulations). AB 1493 (referred to as Pavley I) (2002) directed CARB to develop and adopt standards for vehicle manufacturers to reduce GHG emissions coming from passenger vehicles and light-duty trucks at a "maximum feasible and cost effective reduction" by January 1, 2005. Pavley I took effect for model years starting in 2009 to 2016 and Pavley II will cover 2017 to 2025. Fleet average emission standards would reach 22 percent reduction by 2012 and 30 percent by 2016.

Executive Order S-1-07 (Low Carbon Fuel Standard). This 2007 order requires fuel providers to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020.

Senate Bill 375. SB 375 (2008) supports implementation of AB 32 by aligning regional transportation planning efforts with land use and housing allocations in order to reduce transportation-related GHG emissions. Specifically, SB 375 directed CARB to set regional GHG emissions targets for passenger vehicles and light trucks for the years 2020 and 2035 for each Metropolitan Planning Organization (MPO) region, which were adopted in February 2011. The San Luis Obispo Council of Governments (SLOCOG), Morro Bay's MPO, has adopted reduction

targets for per capita emissions from passenger vehicles of 8 percent below baseline (2005) for the years 2020 and 2035 (CARB, 2011). These targets apply to the SLOCOG region as a whole, and not to individual cities or sub-regions. In 2008, GHG emissions from passenger vehicles in the San Luis Obispo region were approximately 16.5 pounds CO₂e per capita. Therefore, SLOCOG must reduce emissions to at least 15.18 pounds CO₂e per capita by 2020 and maintain or further reduce that level through 2035 to meet the target. SLOCOG's 2010 Regional Transportation Plan and Preliminary Sustainable Communities Strategy (RTP-PSCS), adopted in 2010, details how the region will meet the target (refer to the discussion of SLOCOG's 2010 RTP-PSCS in Section 1.8.3 below).

Senate Bill 1078, Senate Bill 107, and Senate Bill 2X (Renewables Portfolio Standard).

Established in 2002 under SB 1078, and accelerated in 2006 under SB 107, California's Renewables Portfolio Standard required investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources by at least 1 percent of their retail sales annually, until they achieved 20 percent by 2010. SB 2X raises the target from the current 20 percent, requiring private and public utilities to obtain 33 percent of their electricity from renewable energy sources by 2020.

Senate Bill 1368. SB 1368 (2006) directs the California Energy Commission and the California Public Utilities Commission to adopt a performance standard for GHG emissions for the future electricity used in California, regardless of whether it is generated in-state or purchased from other states.

Assembly Bill 811. AB 811 (2008) authorizes California cities and counties to designate districts within which willing property owners may enter into contractual assessments to finance the installation of renewable energy generation and energy efficiency improvements that are permanently fixed to the property. These financing arrangements would allow property owners to finance renewable energy generation and energy efficiency improvements through low-interest loans that would be repaid as an item on the property owner's property tax bill.

California Green Building Code. The California Green Building Code (2008) (the CALGreen Code) is the statewide green building code, which was developed to provide a consistent approach for green building within California. It lays out minimum requirements for newly constructed buildings in California, which will reduce GHG emissions through improved efficiency and process improvements. It requires builders to install plumbing that cuts indoor water use by as much as 20 percent, divert 50 percent of construction waste from landfills to recycling, and use low-pollutant paints, carpets, and floors.

California Code of Regulations Title 24, Part 6. Although it was not originally intended specifically to reduce GHG emissions, California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated periodically to allow consideration and possible incorporation of new energy-efficient technologies and methods. The California Energy Commission estimates that the 2008 standards reduce consumption by 10 percent for residential buildings and 5 percent for

commercial buildings, relative to the previous standards. For projects implemented after January 1, 2014, the California Energy Commission estimates that the 2013 Title 24 energy efficiency standards will reduce consumption by 25 percent for residential buildings and 30 percent for commercial buildings, relative to the 2008 standards. These percentage savings relate to heating, cooling, lighting, and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses.

Assembly Bill 341. AB 341 (2011) establishes a new policy goal of the State of California to divert at least 75 percent of solid waste generated by the year 2020 in an effort to reduce GHG emissions. It also provides for mandatory commercial and multi-family residential recycling, and requires cities and counties to add a commercial and multi-family residential recycling element to their existing resource reduction plans.

1.8.3 REGIONAL

SAN LUIS OBISPO COUNTY AIR POLLUTION CONTROL DISTRICT

The APCD has primary responsibility for the development and implementation of rules and regulations designed to attain the National Ambient Air Quality Standards and California Ambient Air Quality Standards, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations within San Luis Obispo County, which is located within the South Central Coast Air Basin. The APCD regulates most air pollutant sources, except for mobile sources, which are regulated by CARB or California EPA. State and local government projects, as well as projects proposed by the private sector, are subject to APCD requirements if the sources are regulated by the APCD.

The AB 32 Scoping Plan does not provide an explicit role for local air districts in implementing AB 32, but it does state that CARB will work actively with air districts in coordinating emissions reporting, encouraging and coordinating GHG reductions, and providing technical assistance in quantifying reductions. The ability of air districts to control emissions (both criteria pollutants and GHGs) is provided primarily through permitting as well as through their role as CEQA lead or commenting agency, the establishment of CEQA thresholds, and the development of analytical guidance for CEQA documents.

In March 2012, the APCD adopted GHG thresholds in order to help lead agencies meet the GHG reduction goals of AB 32. The APCD's approach to developing a threshold of significance for GHG emissions was to identify the GHG emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions. Different thresholds were developed to accommodate various development types and patterns and are summarized below in **Table 1-2**.

Table 1-2: APCD GHG Significance Thresholds

GHG Emission Source Category	Operational Emissions
Residential and Commercial Projects	Compliance with Qualified GHG Reduction Strategy OR Bright-Line Threshold of 1,150 MT CO ₂ e/yr OR Efficiency Threshold of 4.9 MT CO ₂ e/SP*/yr
(Industrial) Stationary Sources	10,000 MT of CO ₂ e/yr

*SP = Service Population (residents + employees). YR = Year
 For projects other than stationary sources, compliance with either a Qualified GHG Reduction Strategy, or with the Bright-Line (1,150 CO₂e/yr) or Efficiency Threshold (4.9 MT CO₂e/SP/yr) would result in an insignificant determination, and in compliance with the goals of AB 32. The construction emissions of projects will be amortized over the life of a project and added to the operational emissions. Emissions from construction-only projects (e.g. roadways, pipelines, etc.) will be amortized over the life of the project and compared to an adopted GHG Reduction Strategy or the Bright-Line Threshold only.

The APCD recommends that lead agencies within the county use the adopted GHG thresholds of significance when considering the significance of GHG impacts of new projects subject to CEQA. Further, projects with GHG emissions that exceed the thresholds will need to implement mitigation to reduce the impacts to a less than significant level, which can be accomplished through a Mitigated Negative Declaration or an Environmental Impact Report.

As identified in the APCD thresholds, if a project is consistent with an adopted Qualified GHG Reduction Strategy (e.g., CAP meeting criteria identified in Section 1.4 above) that addresses the project’s GHG emissions, it can be presumed that the project will not have significant GHG emission impacts. This approach is consistent with CEQA Guidelines Section 15183.5.

As discussed in Section 1.4 above, this CAP was developed to be consistent with CEQA Guidelines Section 15183.5 to mitigate emissions and climate change impacts and will therefore serve as a Qualified GHG Reduction Strategy for the City of Morro Bay.

SAN LUIS OBISPO COUNCIL OF GOVERNMENTS

SLOCOG is the local Council of Governments with responsibility for regional planning for San Luis Obispo County. SLOCOG’s planning efforts address regional issues relating to transportation, land use and urban form, housing, environment, economic development, regional public facilities, and climate change. Plans that SLOCOG has adopted that support GHG emissions reductions in Morro Bay are described below.

Rideshare Program. The Rideshare Program is a division of SLOCOG that focuses on outreach and events to promote bicycling, walking, carpooling, vanpooling, and riding the bus. Some of the major programs include:

- Bike month and Rideshare month.

- **Transportation Choices Program** – This is a free program in San Luis Obispo County offered to businesses and organizations that encourage their employees to use sustainable transportation. The goal of the Transportation Choices Program is to equip employers with the tools needed promote positive change in employee commuting habits.
- **Mobility Management Program** - The goal of the program is to bridge the communications gap between Public Transit Operators and Social Services Agencies.
- **Safe Routes to School Program** - Safe Routes to School is a national and international movement to enable and encourage students to walk and bicycle to school. Through the use of education, encouragement, enforcement, engineering and evaluation, programs and projects are being developed to create a safe, healthy and fun environment for walking and biking to school.
- **Senior Transportation Choices Program** - Rideshare works hand-in-hand with seniors throughout the county, providing tools and education on how to use public transportation and community transportation services. Through our Senior Transportation Choices Program, we provide transportation information, Transit Field Trips and personalized trip planning.

Planning for Alternative Modes. SLOCOG focuses planning efforts to support the use of the following alternative modes of transportation:

- **Bikes** – SLOCOG supports and promotes bicycling as a viable transportation choice. SLOCOG staff attend Bicycle Advisory Committees in the City of San Luis Obispo and San Luis Obispo County. SLOCOG staff also review and advise jurisdictions on approval of BTA eligible Bicycle Plans.
- **Pedestrians** – SLOCOG is in the process of developing the Northern San Luis Obispo County Salinas River Corridor Anza Trail Master Plan.
- **Bus** – SLOCOG works with all transit providers to coordinate services. The Transit Operators Group is an Ad Hoc committee of transit operators, contractors, and SLOCOG staff. Coordinating projects include the Coordinated Human Services Public Transportation Plan, the Region Wide Fare Improvement Study, and the Long Range Transit Plan.
- **Rail** – SLOCOG coordinates and prepares agendas for the Coast Rail Coordinating Council. The purpose of the Coast Rail Coordinating Council is to improve the frequency and speed of passenger trains on the coast route between San Francisco and Los Angeles.

Community 2050 Regional Blueprint. Community 2050 is a collaborative planning effort that utilizes scenario planning to study long-range regional growth. Community 2050 outlines a program to improve multimodal mobility through a combination of strategies and investments to accommodate growth in transportation demand and reduce congestion that will contribute to a strong economy.

2010 Regional Transportation Plan – Preliminary Sustainable Communities Strategy (RTP-PSCS). The RTP-PSCS, most recently updated in 2010, is a comprehensive plan guiding transportation policy for the region and makes recommendations concerning improvements to the existing transportation network of highways, transit, air, water, rail and bicycling. The plan helps position the region to achieve smarter, more sustainable growth that meets the transportation needs of the growing population and changing region. The primary purpose of the RTP-SCS is to integrate sustainable communities strategies developed under the Community 2050 Regional Blueprint and continue progress in accomplishing the intermodal mix of policies, programs and projects in the adopted RTP, Vision 2025, adopted in 2005. The 2010 RTP-PSCS contains a “Preliminary” Sustainable Communities Strategy consistent with the purpose and intent of state bills related to GHG emissions GHGs and climate change, including AB 32 and the SB 375.

2012 SCS-compliant RTP Update. SLOCOG is currently working to prepare a 2012 SCS-complaint RTP. This update will build upon and further refine the efforts of the 2010 RTP-PSCS to adjust alternatives to satisfy State requirements of SB 375. SLOCOG must reduce per capita GHG emissions from passenger vehicles by 8 percent relative to 2005 levels in 2020 and 2030.

LOCAL GOVERNMENT ROLES AND RESPONSIBILITIES

The AB 32 Scoping Plan establishes a framework for achieving statewide GHG reductions required by AB 32. Specifically, the AB 32 Scoping Plan describes a list of measures that the State will undertake, and the anticipated GHG reductions associated by these measures, by 2020. Because the State does not have jurisdictional control over all of the activities that produce GHG emissions in California, the AB 32 Scoping Plan articulates a unique role for local governments in helping to achieve the statewide GHG reduction target, noting their broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and City government operations. As such the AB 32 Scoping Plan recommends that local governments reduce GHG emissions from both their City government operations and community at large.

CHAPTER 2

GHG EMISSIONS AND REDUCTION TARGET

2.0 GHG Emissions and Reduction Target

A GHG emissions inventory identifies the major sources and quantities of GHG emissions produced by community-wide activities and City government facilities and operations within a jurisdiction's boundaries for a given year. Estimating GHG emissions enables local governments to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdiction, set targets for future reductions, and create an informed mitigation strategy based on this information.

This chapter summarizes the results of the GHG Emissions Inventory (2012). The GHG Emissions Inventory includes a 2005 baseline inventory of GHG emissions resulting from community-wide activities and City government facilities and operations within Morro Bay. It also includes a 2020 business-as-usual forecast of how emissions would change over time as a result of population and job growth if consumption trends and efficiencies remained at their 2005 levels, absent of any new policies or actions that would reduce emissions. Since 2005, there have been several State regulations and local initiatives that have been implemented that will reduce Morro Bay's GHG emissions. Therefore, this chapter also presents a 2020 adjusted forecast to account for the impact of these measures to provide a more accurate picture of future emissions growth in 2020. In addition, this chapter identifies the City's GHG emissions reduction target for the year 2020 consistent with AB 32. **Appendix A** contains the complete GHG Emissions Inventory and supporting documentation.

2.1 2005 Baseline GHG Emissions

This section summarizes the methodology used to complete the 2005 baseline inventory of community-wide activities and City government facilities and operations, and the results.

2.1.1 METHODOLOGY

The 2005 baseline inventory quantifies the amount of GHG emissions that occurred within the City's jurisdictional boundary in the year 2005. It includes a community-wide inventory that details the sources and quantities of GHG emissions resulting from activities from the Morro Bay community as a whole, and a City government operations inventory that identifies the sources and quantities of emissions resulting from the City of Morro Bay's operations and facilities. The City government operations inventory is a subset of the community-wide inventory, such that the City government's emissions are included within the community-wide inventory.

The community-wide inventory is divided into the following sectors, or categories of emissions sources: residential energy use, commercial and industrial energy use, transportation, off-road vehicles and equipment, solid waste, and wastewater. The City government operations inventory provides a more detailed analysis of emissions resulting from City-owned or -operated buildings and facilities, fleet vehicles, transit vehicles, and streetlights and traffic signals; water delivery; wastewater; solid waste; and employee commute travel.

2.0 GHG EMISSIONS AND REDUCTION TARGET

The City government operations inventory follows the *Local Government Operations Protocol* (version 1.1), which was adopted in 2010 by CARB and serves as the national standard for quantifying and reporting GHG emissions from local government operations. The community-wide inventory follows the *Association of Environmental Professionals (AEP) California Community-wide GHG Baseline Inventory Protocol (AEP Protocol)* (June 2011) and *ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP)* (October 2009). These protocols provide standard accounting principles, boundaries, quantification methods, and procedures for reporting GHG emissions. Like all emissions inventories, this inventory must rely on the best-available data and calculation methodologies at the time of preparation, and therefore, represents a best estimate of GHG emissions following standard methodologies. As protocols are updated, as better data and calculation methodologies become available, the inventory can be updated and improved. Nevertheless, the findings of this analysis provide a solid basis upon which Morro Bay is planning and taking action to reduce its GHG emissions.

2.1.2 COMMUNITY-WIDE GHG EMISSIONS

In 2005, the Morro Bay community emitted approximately 55,677 MT CO₂e as a result of activities that took place within the residential energy use, commercial and industrial energy use, transportation, off-road, solid waste, and wastewater sectors. As shown in **Figure 2-1** and **Table 2-1**, the transportation sector was the largest contributor of GHG emissions, generating approximately 22,506 MT CO₂e, or 40 percent of total 2005 emissions. Transportation sector emissions are the result of diesel and gasoline fuel used in on-road vehicles traveling to and/or from locations within Morro Bay.¹ Electricity and natural gas consumption within the residential sector was the second largest contributor, generating 16,094 MT CO₂e, or 29 percent of the total emissions. Electricity and natural gas consumption in Morro Bay's commercial and industrial sector produced 11,442 MT CO₂e, or 21 percent of total community-wide emissions. Emissions from solid waste sent to landfills (2,695 MT CO₂e, or five percent), off-road vehicles and equipment (2,740 MT CO₂e, or five percent), and wastewater (200 MT CO₂e, or less than one percent) accounted for the remainder of community-wide emissions.

¹ Excludes pass-through trips that do not have an origin or destination within the city. . Emissions take into account the regional mix of vehicle classes and model years, as well as ambient conditions and travel speeds that determine fuel efficiency. Types of emissions accounted for include: running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak. Refer to **Appendix A** for further information.

Figure 2-1: Community-wide GHG Emissions by Sector (2005)

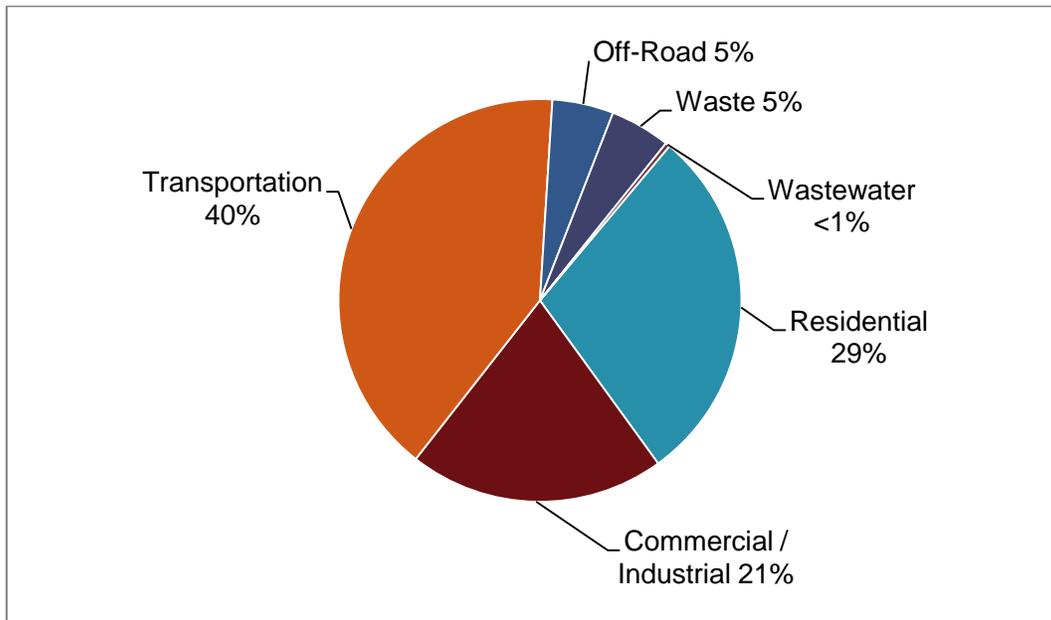


Table 2-1: Community-wide GHG Emissions by Sector (2005)

Sector	Description	GHG Emissions (MT CO ₂ e)	Percent of Total
Residential	Electricity and natural gas used in homes	16,094	29%
Commercial/Industrial	Electricity and natural gas used in commercial and industrial buildings	11,442	21%
Transportation	Gasoline and diesel used in on-road vehicles	22,506	40%
Off-Road Vehicles and Equipment	Gasoline, diesel, and compressed natural gas used in off-road vehicles and equipment	2,740	5%
Solid Waste	Methane from the decomposition of landfilled solid waste	2,695	5%
Wastewater	Methane and nitrous oxide released in the wastewater treatment process	200	<1%
Total		55,677	100%

2.1.3 CITY GOVERNMENT OPERATIONS GHG EMISSIONS

In 2005, City government operations generated approximately 1,955 MT CO₂e. This quantity represents approximately four percent of Morro Bay’s total community-wide GHG emissions. As shown in **Figure 2-2** and **Table 2-2**, the City’s wastewater facilities and employee commute were the largest contributors to the City’s emissions (generating approximately 23 percent and 21 percent of total emissions respectively). Emissions from the vehicle fleet (18 percent) and electricity and natural gas used at City buildings (17 percent) were also a significant source of

2.0 GHG EMISSIONS AND REDUCTION TARGET

emissions. Emissions from water delivery (six percent), the transit fleet (six percent), solid waste (five percent), and streetlights and traffic signals (four percent) accounted for the remainder of the City's emissions.

Figure 2-2: City Government GHG Emissions by Sector (2005)

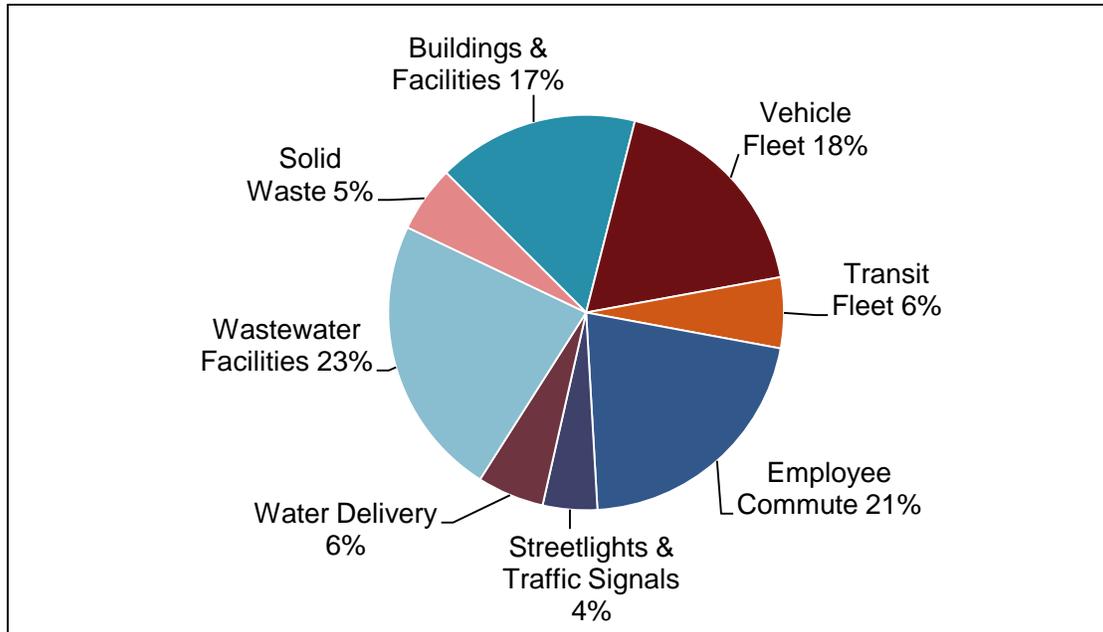


Table 2-2: City Government GHG Emissions by Sector (2005)

Sector	Description	GHG Emissions (MT CO ₂ e)	Percent of Total
Vehicle Fleet	Diesel and gasoline consumption and vehicle type	355	18%
Transit Fleet	Diesel and gasoline consumption	113	6%
Employee Commute	Annual vehicle miles travelled (VMT) from sample of employee commuting patterns	414	21%
Buildings and Facilities	Electricity and natural gas consumption in City-owned or – operated buildings and facilities	322	17%
Streetlights & Traffic Signals	Electricity used to power streetlights, traffic signal lights, and other public outdoor lighting	87	4%
Solid Waste	Annual waste tonnage sent to landfill	106	5%
Water Delivery	Electricity used for water transport resulting from City operations	107	6%
Wastewater Facilities	Electricity consumption from wastewater facilities	451	23%
TOTAL		1,955	100%

2.2 2020 GHG Emissions Forecast

2.2.1 METHODOLOGY

The GHG emissions forecast provides a “business-as-usual estimate,” or scenario, of how emissions will change in the year 2020 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32.

The GHG emissions forecast is based on projected growth trends in population, jobs, and VMT and the assumption that the emissions per sector will change over time in proportion to population, jobs, and VMT. The forecast relies on the San Luis Obispo Council of Governments’ (SLOCOG) *San Luis Obispo County 2040 Population, Housing & Employment Forecast* (August 2011) for year 2020 population and job projections and VMT estimates from SLOCOG’s regional travel demand model for the year 2020 were provided by Fehr & Peers. The “mid-range” cases for population and job growth were used.

2.2.2 2020 BUSINESS-AS-USUAL FORECAST

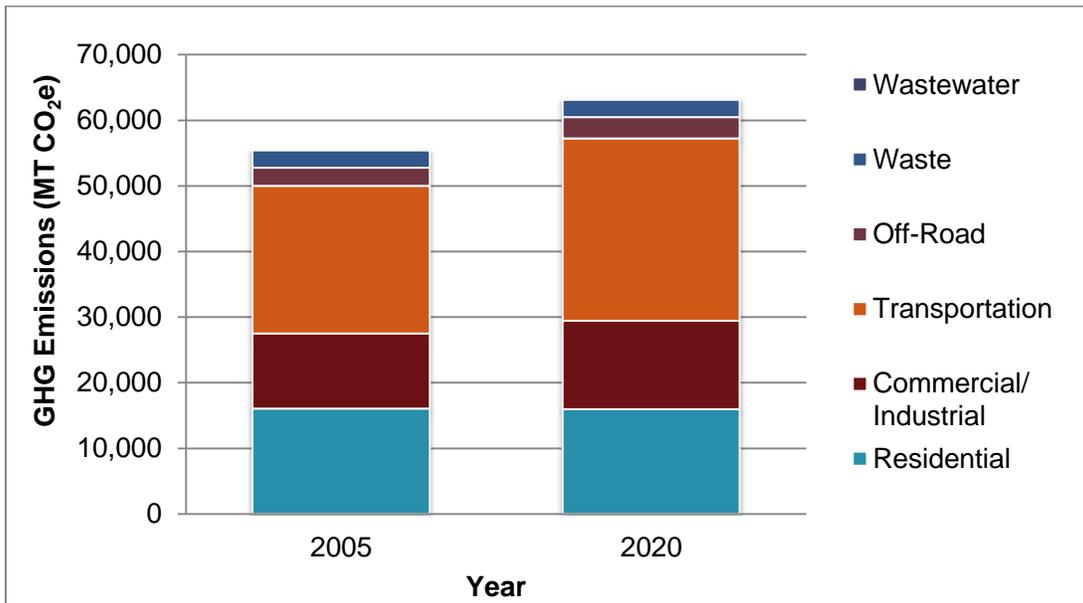
Under a business-as-usual scenario, Morro Bay’s GHG emissions are projected to grow by approximately 14 percent by the year 2020, from 55,677 MT CO₂e to 63,395 MT CO₂e. Emissions associated with the transportation sector are projected to experience the highest level of growth (24 percent). **Table 2-3** and **Figure 2-3** show the results of the forecast.

Table 2-3: 2020 Business-As-Usual GHG Emissions Forecast

Sector	2005 (MT CO ₂ e)*	2020 (MT CO ₂ e)*	Percent Change from 2005 to 2020
Residential	16,094	15,991	-1%
Commercial / Industrial	11,442	13,501	18%
Transportation	22,506	27,789	24%
Off-Road	2,740	3,237	18%
Solid Waste	2,695	2,678	-1%
Wastewater	200	199	-1%
TOTAL	55,677	63,395	14%

*Refer to **Appendix A** for details

Figure 2-3: 2020 Business-As-Usual GHG Emissions Forecast



2.2.3 2020 ADJUSTED FORECAST

A. INCORPORATION OF STATE REDUCTIONS INTO FORECAST

The AB 32 Scoping Plan identifies several State measures that are approved, programmed, and/or adopted and will reduce GHG emissions within Morro Bay. These State measures require no additional local action. Therefore, these measures were incorporated into the forecast and reduction assessment to create an “adjusted forecast,” which provides a more accurate picture of future emissions growth and the responsibility of the City once State measures to reduce GHG emissions have been implemented. A brief description of each of these measures is provided below and the calculation details are located in **Appendix B**, of this document. **Table 2-4** summarizes the reduction in local emissions that I anticipated to result.

Table 2-4: Summary of State Reductions

State Measure	2020 Reduction (MT CO ₂ e)*
Clean Car Standards, AB 1493 (Pavley I)	-3,690
Low-Carbon Fuel Standard (on-road transportation)	-2,410
Low-Carbon Fuel Standard (off-road vehicles)	-324
Title 24	-228
Renewable Portfolio Standard	-5,219
Total State Reduction	-11,871

*Refer to **Appendix B** for calculation details

Clean Car Standards, AB 1493 (Pavley I)

Signed into law in 2002, AB 1493 (Pavley I standard) requires vehicle manufactures to reduce GHG emissions from new passenger vehicles and light trucks from 2009 through 2016. The CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016. The Pavley I standard is expected to reduce transportation sector emissions in Morro Bay by approximately 3,690 MT CO₂e, or 13 percent, in 2020 compared to business-as-usual levels.

Low Carbon Fuel Standard

The Low Carbon Fuel Standard requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. Measured on a lifecycle basis, the carbon intensity represents the CO₂e emitted from each stage of producing, transporting, and using the fuel in a motor vehicle. This translates to an approximately 9 percent (or 2,410 MT CO₂e) reduction in Morro Bay's on-road transportation sector GHG emissions and a 10 percent (or 324 MT CO₂e) reduction in its off-road sector GHG emissions in 2020 compared to business-as-usual levels.

Title 24

Although it was not originally intended specifically to reduce GHG emissions, California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated periodically to allow consideration and possible incorporation of new energy-efficient technologies and methods. The updates that have occurred since the 2005 baseline year and, therefore, were not included in the business-as-usual forecast, include the 2008 and 2013 Title 24 Energy Efficiency Standards. The California Energy Commission estimates that the 2008 standards reduce consumption by 10 percent for new residential buildings and five percent for new commercial buildings, relative to the 2005 standards. For projects implemented after January 1, 2014, the California Energy Commission estimates that the 2013 Title 24 Energy Efficiency Standards will reduce consumption by 25 percent for new residential buildings and 30 percent for new commercial buildings, relative to the 2008 standards. The 2008 and 2013 Title 24 requirements would reduce emissions in Morro Bay by approximately 228 MT CO₂e in 2020.²

Renewable Portfolio Standard

The State of California Renewable Portfolio Standard requires investor-owned utilities, electric service providers, and community choice aggregators to increase the portion of energy that comes from renewable sources to 20 percent by 2010 and 33 percent by 2020. PG&E is the electricity provider in Morro Bay. In order to calculate future emissions that take into account the Renewable Portfolio Standard, PG&E's 2020 emissions factor was applied (PG&E, 2011). As

² The AB 32 Scoping Plan calls for the continuation of ongoing triennial updates to Title 24 that will yield regular increases in the mandatory energy and water savings for new construction. Future updates to Title 24 standards for residential and non-residential alterations are not taken into consideration due to lack of data and certainty about the magnitude of energy savings that will be realized with each subsequent update.

2.0 GHG EMISSIONS AND REDUCTION TARGET

shown in **Table 2-4**, the Renewable Portfolio Standard would reduce Morro Bay's GHG emissions by approximately by 5,219 MT CO₂e, or 40 percent, in 2020.

Sustainable Communities and Climate Protection Act – Senate Bill 375

SB 375, the Sustainable Communities and Climate Protection Action of 2008, enhances California's ability to reach its AB 32 target by aligning regional transportation planning efforts with land use and housing allocations in order to reduce transportation-related GHG emissions. As mentioned in Chapter 1, SLOCOG must reduce per capita GHG emissions from passenger vehicles by 8 percent relative to 2005 levels in 2020 and 2030.

While the outcome of SB 375 in terms of a reduction in VMT per capita is specified by the State, achievement of the target is dependent on regional and local actions and activities that are not regulated by the State. Many of these actions and activities are inextricably linked to local actions which rely on implementation assumptions that will need to be monitored to ensure effectiveness. Therefore, GHG reductions resulting from implementation of SB 375 have not been included as a State measure that would reduce GHG emissions within Morro Bay.

B. INCORPORATION OF LOCAL REDUCTIONS INTO FORECAST

In addition to the State measures described above, the City of Morro Bay has implemented a number of local measures since the 2005 baseline inventory year that will reduce the community's GHG emissions. It is important to note that local measures which rely on future implementation actions and assumptions are included in Chapter 3, *Climate Action Measures*, as they will need to be monitored to ensure effectiveness. A brief description of each of these local measures is provided below by topic area and the local reduction in GHG emissions in 2020 is summarized in **Table 2-5** (see **Appendix B** for supporting details).

Table 2-5: Summary of Local Reductions

Local Measure	2020 Reduction (MT CO ₂ e)
Energy	
Green Building Incentive Program	Included in Chapter 3 as a CAP measure ¹
Solar Energy Installation (Residential & Commercial)	-44
City Government Energy Efficiency Upgrades	-28
Transportation and Land Use	
Increase Density and Diversity of Land Uses	Included in Chapter 3 as a CAP measure ¹
Bicycle and Pedestrian Network Improvements	-29
Utilize Electric or Hybrid Vehicles	-2
Waste	
Construction and Demolition Debris Diversion	-155
Water	
Water Conservation Programs to Meet SB 7 Target	-8
Total Reduction from Local Measures	-266

¹ The reductions associated with this measure are quantified and included as part of the CAP measures identified in Chapter 3.

2.0 GHG EMISSIONS AND REDUCTION TARGET

Energy Measures

Between 2006 and 2012, residents of Morro Bay installed 150 kilowatts (kW) of solar photovoltaic systems and hot water heaters and businesses have installed 18 kW, which result in a reduction of 44 MT CO₂e.

In addition, since 2005, the City has completed a number of energy efficiency upgrades, installing new lighting fixtures and bulbs, upgrading HVAC systems, replacing exit signs, and updating walkway lighting. These projects have reduced electricity use by 208,546 kWh annually, reducing emissions by 28 MT CO₂e.

Transportation and Land Use Measures

Recent bicycle and pedestrian network improvements and the City's purchase of three electric and hybrid vehicles are estimated to reduce emissions by approximately 31 MT CO₂e in 2020.

Solid Waste Measures

As of 2010, the California Green Building Code requires all local jurisdictions to ensure that 50 percent of all non-hazardous construction and demolition solid waste is diverted from landfills. Within Morro Bay, this is estimated to reduce emissions by 155 MT CO₂e in 2020. The City also maintains a "green waste" recycling program with its contracted trash hauler.

Water Measures

The City has implemented a number of programs to reduce per capita water consumption by 20 percent, pursuant to SB X7-7. These programs include plumbing retrofits, turf removal, low-flow fixtures, and smart irrigation systems. In 2020, water conservation programs are expected to reduce GHG emissions by eight MT CO₂e.

C. ADJUSTED FORECAST

As shown in **Table 2-6**, State and local measures will reduce GHG emissions in Morro Bay by an estimated 12,137 MT CO₂e by 2020. Under the adjusted scenario GHG emissions are projected to decrease to 51,258 MT CO₂e (approximately 19 percent below the business-as-usual scenario of 63,395 MT CO₂e).

Table 2-6: Summary of Reductions from State and Local Measures and 2020 GHG Emissions

	GHG Emissions (MT CO ₂ e)
2020 Business-as-Usual Forecast	63,395
2020 Reduction from State Measures	-11,871
2020 Reduction from Local Measures	-266
Total Reduction from State and Local Measures	-12,137
2020 Adjusted Forecast	51,258

2.3 GHG Emissions Reduction Target

The City is committed to reducing its share of GHG emissions consistent with AB 32. The AB 32 Scoping Plan calls on local governments to establish a reduction target that “parallels the State’s commitment to reduce GHG emissions by approximately 15 percent from current levels by 2020.” Therefore, this CAP establishes a reduction target of 15 percent below 2005 levels by 2020. The 2005 baseline GHG emissions inventory and 2020 GHG emissions forecast under the adjusted scenario provide the necessary background for the City to identify the reduction in emissions needed from local measures to meet this target.

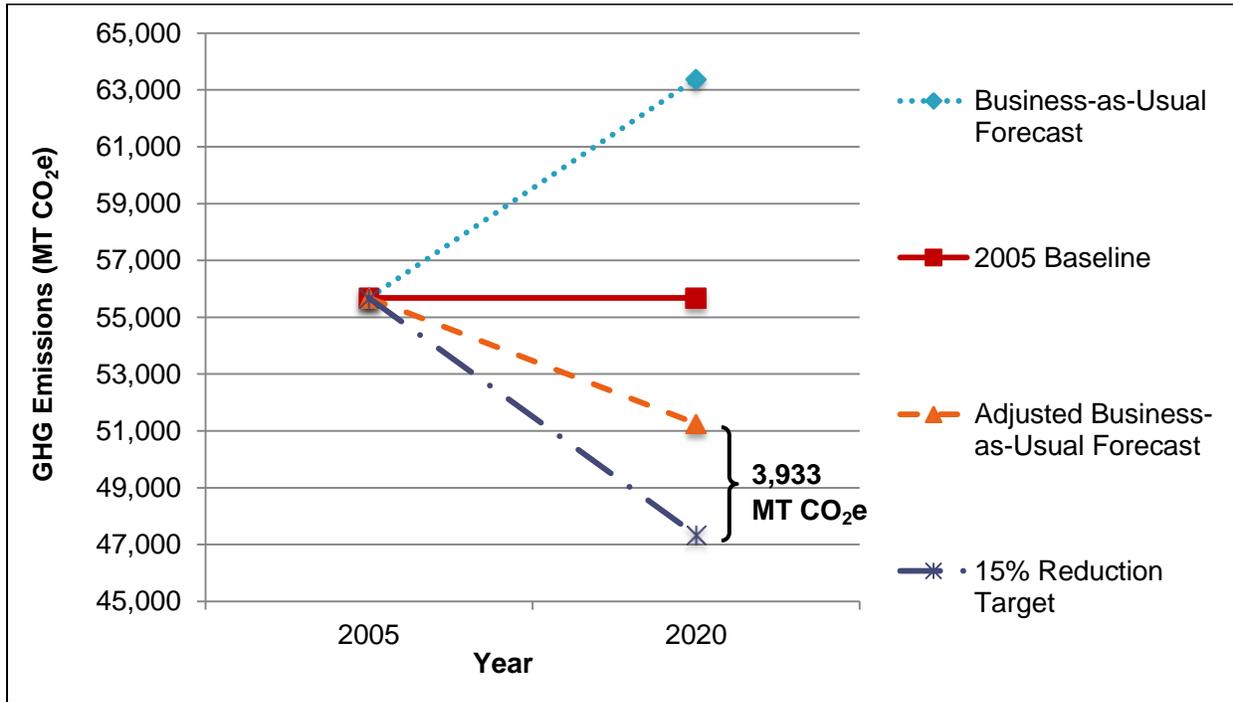
As shown in **Table 2-7** and **Figure 2-4**, based on the 15 percent reduction target, Morro Bay would need to reduce its community-wide emissions to 51,258 MT CO₂e by 2020. To meet this target, Morro Bay will need to reduce its GHG emissions eight percent below the adjusted forecast levels³ (equivalent to 3,933 MT CO₂e) by 2020 through implementation of local measures and actions.

Table 2-7: Morro Bay’s GHG Emissions, Target, and Reduction Necessary to Meet Target

	GHG Emissions (MT CO ₂ e)
2005 Baseline Emissions	55,677
2020 Adjusted Forecast	51,258
Target (15% below 2005 levels by 2020)	47,325
Remaining Gap Necessary to Meet Target	3,933

³ As described in Section 2.3, the adjusted 2020 forecast accounts for approved, programmed, and/or adopted State- and local-level measures that will reduce local GHG emissions. Therefore, it is used to determine the necessary reductions to meet the City’s reduction target as it provides a more accurate picture of future emissions growth and the proportionate share of emissions the City must reduce once State measures to reduce GHG emissions have been implemented.

Figure 2-4: GHG Emissions in Relation to Target



CHAPTER 3

CLIMATE ACTION MEASURES

3.0 Climate Action Measures

This chapter identifies the measures that the City will implement to achieve its GHG emissions reduction target of 15 percent below 2005 levels by 2020. The City has identified a set of measures based on careful consideration of the reductions in GHGs needed to achieve the target, the sources and distribution of emissions identified in the GHG emissions inventory, existing priorities and resources, and the potential costs and benefits of each measure. Many of the CAP measures are also consistent with the measures of neighboring jurisdictions and regional agencies which is important for feasible and effective implementation of GHG reduction measures. Detailed analyses of the GHG reduction potential and estimated costs and savings for each measure are located in **Appendix B**.

3.1 Chapter Organization

The climate action measures, which represent ways to reduce GHG emissions are organized into the following focus areas: City government operations, energy, transportation and land use, off-road, solid waste, and tree planting. The discussion of each focus area begins with an introduction, followed by a summary table listing the measures within the focus area and the associated GHG reduction potential, where applicable. Following the introduction to each focus area, each measure is presented with the following information:

- **Existing or Completed Efforts:** a list of efforts the City has implemented or is in the process of implementing since the baseline year (2005) to accomplish the measure.
- **Implementation Actions:** the specific steps the City will take to achieve the GHG emission reduction and outcome of the measure.
- **GHG Reduction Potential:** the estimated reduction in GHG emissions anticipated in 2020.
- **Costs and Savings:** for each measure, potential costs and savings to the City or community (private) are categorized as none, very low, low, medium, and high. **Table 3-1** summarizes these category definitions. Costs account for the expense that would occur beyond conducting business-as-usual (i.e., without implementation of the CAP).

Table 3-1: Measure Cost and Savings

Aggregated City Government Costs/Savings	Per Unit Community Cost/Savings
Very Low: \$1 - \$10,000	Very Low: \$1 - \$500
Low: \$10,001 - \$50,000	Low: \$501 - \$1,000
Medium: \$50,001 - \$100,000	Medium: \$1,001 - \$5,000
High: \$100,001 or greater	High: \$5,001 or greater

Details related to measure implementation and monitoring, including responsible parties, performance criteria, implementation time frames, and potential funding sources are located in Chapter 5, *Implementation and Monitoring*.

3.2 City Government Operations Measures

The City has already taken a number of steps that have resulted in GHG emissions reductions, as identified in Chapter 2, *GHG Emissions and Reduction Target*, and is committed to building on those efforts. This focus area identifies measures and actions the City can implement to further reduce GHG emissions from City government operations and facilities. Although the GHG emissions that result from City government operations and facilities account for less than four percent of Morro Bay’s community emissions, as an employer, property-owner, and regulatory entity, the City can set an example of GHG emissions reduction practices for the community and demonstrate additional benefits of the measures beyond reducing GHG emissions, such as cost savings in buildings and operations and improved operational efficiency. As shown in **Table 3-2**, the City government operations measures have the potential to reduce Morro Bay’s GHG emissions by 65 MT CO₂e by 2020.

In addition to reducing GHG emissions, the City government measures described in this section have the potential to provide other important benefits to the community. These benefits include:

- City leadership
- Reduced operating and maintenance costs
- Improved public health
- Improved air and water quality
- Resource conservation
- City beautification
- Lower maintenance costs and extended equipment lives

Table 3-2: City Government Operations GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reductions (MT CO ₂ e)
C-1	City Government Energy Efficiency Retrofits and Upgrades	28
C-2	City Government Energy Efficient Public Realm Lighting	7
C-3	Renewable Energy Systems on City Property	14
C-4	Zero and Low Emission City Fleet Vehicles	10
C-5	City Government Tree Planting Program	6
City Government Operations Total		65

C-1: City Government Energy Efficiency Retrofits and Upgrades

Establish a target to reduce City government energy use by 10 percent by 2020 and implement cost-effective improvements and upgrades to achieve that target.

Existing and/or Completed Efforts in Support of Measure:

- The City maintains a regular maintenance schedule for heating and cooling, ventilation, and other building functions.

Implementation Actions:

- **C-1.1:** Adopt a 10 percent City government energy use reduction target.
- **C-1.2:** Establish a prioritized list of energy efficiency upgrade projects and implement them as funding becomes available.

GHG Reduction Potential:
28 MT CO₂e

City Cost:
Varies

City Savings:
Low

Private Cost:
None

Private Savings:
None

C-2: City Government Energy Efficient Public Realm Lighting

Continue to replace City-owned or -operated street, traffic signal, park, and parking lot lights with higher efficiency lamp technologies.

Implementation Actions:

- **C-2.1:** Identify and secure funding to replace additional inefficient City-owned or -operated public lighting.

GHG Reduction Potential:
7 MT CO₂e

City Cost:
Low

City Savings:
Low

Private Cost:
None

Private Savings:
None

C-3: Renewable Energy Systems on City Property

Pursue small-scale on-site solar energy systems at City government facilities.

Implementation Actions:

- **C-3.1:** Identify funding sources and opportunities for small-scale on-site solar photovoltaic (PV) systems at City government facilities.
- **C-3.2:** Install small-scale on-site solar PV systems at select City government facilities.

GHG Reduction Potential:
14 MT CO₂e

City Cost:
Medium

City Savings:
Low

Private Cost:
None

Private Savings:
None

C-4: Zero- and Low-Emission City Fleet Vehicles

Continue to replace official City vehicles and equipment with more efficient and/or alternatively fueled vehicles.

Existing and/or Completed Efforts in Support of Measure:

- Between 2006 and 2012, the City purchased one electric and two hybrid vehicles (please note this was accounted for in Chapter 2).

Implementation Actions:

- **C-4.1:** Work with the Central Coast Clean Cities Coalition to obtain funding to purchase low-emission and zero-emission fleet vehicles.
- **C-4.2:** Replace five City vehicles with low- or zero-emission vehicles by 2020.

GHG Reduction Potential:
10 MT CO₂e

City Cost:
Low

City Savings:
Very Low

Private Cost:
None

Private Savings:
None

C-5: City Government Tree Planting Program

Establish a tree planting program to increase the number of native, drought-tolerant trees on City-owned property.

Existing and/or Completed Efforts in Support of Measure:

- The City’s Master Tree List and Planting Details was approved in 2010 and includes a list of approved street trees and details on how they should be planted.

Implementation Actions:

- **C-5.1:** Establish a municipal tree planting program and plant at least 500 trees on City property by 2020.

GHG Reduction Potential:
6 MT CO₂e

City Cost:
Medium

City Savings:
None

Private Cost:
None

Savings:
None

3.3 Community-wide Measures

3.3.1 ENERGY MEASURES

Energy use accounted for 44 percent of Morro Bay’s total GHG emissions in 2005. These emissions result from the combustion of fossil fuel, primarily coal, oil, and natural gas, which is used to heat, cool, and provide power to residential, commercial, and industrial buildings and other facilities. Factors affecting energy-related emissions in buildings include building design and the efficiency of technology and electronics in buildings. GHG emissions reductions can be achieved both by changes to the energy demand (e.g., improving energy efficiency and reducing consumption) and energy supply (e.g., switching from a high-carbon to a low- or zero-carbon technology or fuel). The energy measures listed in **Table 3-3** focus on these strategies and have the potential to reduce Morro Bay’s GHG emissions by 981 MT CO₂e by 2020.

In addition to reducing GHG emissions, the energy measures described in this section have the potential to provide other important benefits to the community, including:

- Reduced energy and operating costs
- Lower maintenance costs and extended equipment lives
- Increased building re-sale value
- Strengthened local economy
- Resource conservation
- Increased electricity reliability
- Improved air quality

Table 3-3: Energy GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reductions (MT CO ₂ e)
E-1	Energy Efficiency Outreach and Incentive Programs	114
E-2	Energy Audit and Retrofit Program	402
E-3	Income-Qualified Energy Efficient Weatherization Programs	25
E-4	Incentives for Exceeding Title 24 Building Energy Efficiency Standards	83
E-5	Small-Scale On-Site Solar Photovoltaic (PV) Incentive Program	320
E-6	Income-Qualified Solar PV Program	37
Energy Total		981

Measure E-1: Energy Efficiency Outreach and Incentive Programs

Expand participation in and the promotion of existing energy efficiency programs, such as Energy Upgrade California and San Luis Obispo County Energy Watch, to increase community awareness of existing energy efficiency rebates and financial incentives, and no- and low-cost actions community members can take to increase energy efficiency.

Existing and/or Completed Efforts in Support of Measure:

- The City currently directs community members to existing program websites, such as Energy Upgrade California and San Luis Obispo County Energy Watch.

Implementation Actions:

- **E-1.1:** Conduct additional outreach and promotional activities, either individually or in collaboration with San Luis Obispo County Energy Watch, targeting specific groups or sectors within the community (e.g., homeowners, renters, businesses, etc.).
- **E-1.2:** Designate one week per year to conduct an energy efficiency outreach campaign targeting a specific group. The campaign week can also be used to recognize and encourage programs and educational outreach conducted by industry organizations, non-governmental entities, government agencies, and other community groups.

GHG Reduction Potential:

114 MT CO₂e

City Cost:

Very Low

City Savings:

None

Private Cost:

Varies

Private Savings:

Very Low

Measure E-2: Energy Audit and Retrofit Program

Facilitate voluntary energy assessments, retrofits, and retrocommissioning of residential and commercial buildings within Morro Bay.

Existing and/or Completed Efforts in Support of Measure:

- The City currently participates in the AB 811 CaliforniaFIRST energy efficiency and renewable energy financing program for multi-family residential and commercial buildings.

Implementation Actions:

- **E-2.1:** Develop and promote a residential and commercial energy audit program, either individually or in collaboration with San Luis Obispo County Energy Watch, local utilities, and/or neighboring jurisdictions.

GHG Reduction Potential:

402 MT CO₂e

City Cost:

Very Low

City Savings:

None

Private Cost:

Medium

Private Savings:

Very Low to Low

- **E-2.2:** Conduct outreach and promotional activities targeting specific groups (e.g., owners of buildings built prior to Title 24 [1980]) in order to promote the audit and retrofit program.
- **E-2.3:** As part of the business licensing and renewal process, encourage businesses to participate in the program and receive an energy audit.
- **E-2.4:** Participate in and promote a single-family residential energy efficiency financing program to encourage investment in energy efficiency upgrades.
- **E-2.5:** Continue to participate in and promote the AB 811 CaliforniaFIRST energy efficiency financing program for multi-family residential and commercial buildings.
- **E-2.6:** Highlight the effectiveness of energy audits and retrofits by showcasing the success of retrofit projects (e.g., on the City's website or in its newsletter).

Measure E-3: Income-Qualified Energy Efficient Weatherization Programs

Facilitate energy efficient weatherization of low- and middle-income housing through promotion of existing programs.

Implementation Actions:

- **E-3.1:** Facilitate and promote existing income-qualified weatherization programs, such as PG&E's Middle Income Direct Install program, either individually or by partnering with a local organization.

GHG Reduction Potential:
25 MT CO₂e

City Cost:
Very Low

City Savings:
None

Private Cost:
None

Private Savings:
Low

Measure E-4: Incentives for Exceeding Title 24 Energy Efficiency Building Standards

Encourage new development to voluntarily exceed State energy efficiency standards.

Existing and/or Completed Efforts in Support of Measure:

- The City has a Green Building Incentive Program that offers applicants achieving LEED or GreenPoint Rated certification, upon documentation by the appropriate third-party organization, a building and plan check fee rebate. Additional optional green building incentives are available for exceeding Title 24, graywater systems, renewable generation, and a green roof.

GHG Reduction Potential:
83 MT CO₂e

City Cost:
Very Low

City Savings:
None

Private Cost:
Medium to High

Private Savings:
Very Low to Medium

3.0 CLIMATE ACTION MEASURES

Implementation Actions:

- **E-4.1:** Continue to collaborate with community organizations and businesses, local utilities, and other local jurisdictions in the region to develop and promote a technical assistance and best practices program that aids developers in selecting and implementing energy efficiency measures that exceed State standards.
- **E-4.2:** Identify, provide and promote incentives (e.g., streamlined permitting, public recognition, etc.) for applicants whose project exceeds State requirements by a specified percent.

Measure E-5: Small-Scale On-Site Solar PV Incentive Program

Facilitate the voluntary installation of small-scale on-site solar PV systems and solar hot water heaters in the community through expanded promotion of existing financial incentives, rebates, and financing programs, and by helping residents and business owners overcome common regulatory barriers and upfront capital costs.

Existing and/or Completed Efforts in Support of Measure:

- The City currently participates in the AB 811 CaliforniaFIRST energy efficiency and renewable energy financing program for multi-family residential and commercial buildings.

GHG Reduction Potential:
320 MT CO ₂ e
City Cost:
Very Low
City Savings:
None
Private Cost:
High
Private Savings:
Low to High

Implementation Actions:

- **E-5.1:** Conduct a comprehensive review of the City's solar permitting process based on the Governor's Office of Planning and Research's (OPR) *California Solar Permitting Guidebook* (June 2012), identifying any existing barriers to facility implementation.
- **E-5.2:** Improve the permit review and approval process for small solar PV systems by implementing recommendations for streamlined permitting identified in the *California Solar Permitting Guidebook* (e.g., use standardized forms, provide clear written instructions on the permitting process and a checklist of required application materials, make information available on the City's website and at the permit counter, etc.).
- **E-5.3:** Continue to collaborate with other local jurisdictions in the region to standardize requirements across jurisdiction, by using common promotion and permit materials, such as checklists and standard plans, to reduce permit submittal errors among contractors working throughout a region.
- **E-5.4:** Participate in and promote a single-family residential renewable energy financing program to encourage investment in small-scale on-site solar PV systems.

- **E-5.5:** Continue to participate in and promote the AB 811 CaliforniaFIRST renewable energy financing program for multi-family residential and commercial buildings.
- **E-5.6:** Expand education on and promotion of existing incentive, rebate, and financing programs for solar PV systems and solar hot water heaters targeting specific groups or sectors within the community.
- **E-5.7:** Designate one week per year to conduct a renewable energy outreach campaign targeting a specific group. The campaign week can also be used to recognize community members that have implemented noteworthy or unique renewable energy projects.

Measure E-6: Income-Qualified Solar PV Program

Facilitate the installation of small-scale on-site solar PV systems on and solar hot water heaters in income-qualified housing units by promoting existing programs offered through the California Solar Initiative and New Solar Homes Partnership and by collaborating with organizations, such as GRID Alternatives, on outreach and eligibility.

Implementation Actions:

- **E-6.1:** Collaborate with GRID Alternatives and/or other community organizations to provide targeted education and outreach to developers and homeowners about incentives offered through the Single Family Affordable Solar Homes (SASH) Program¹ and the Multifamily Affordable Solar Homes (MASH) Program.
- **E-6.2:** Provide targeted outreach regarding solar water heating incentives offered through the California Solar Initiative, including the SASH and MASH Programs.

GHG Reduction Potential:
37 MT CO₂e

City Cost:
Very Low

City Savings:
None

Private Cost:
None

Private Savings:
Low

¹ The California Solar Initiative's SASH Program provides fully subsidized systems to very low-income households, and highly subsidized systems to other low-income households. GRID Alternatives, a non-profit solar organization, manages the \$108 million SASH Program on the California Public Utility Commission's behalf.

3.3.2 TRANSPORTATION AND LAND USE MEASURES

Transportation-related emissions made up the 40 percent of Morro Bay’s 2005 GHG emissions inventory. Factors affecting GHG emissions from transportation include the number of VMT, fuel economy, and the type of fuel used. The number of VMT is directly influenced by the geographic distribution of people and places, especially the density of development and zoning. Therefore, land use measures are included as reduction policies in this section. The transportation and land use measures listed in **Table 3-4** focus on these strategies and have the potential to reduce Morro Bay’s GHG emissions by 2,733 MT CO₂e by 2020.

The transportation and land use measures in this section will not only help reduce GHG emissions, but also provide multiple other benefits to the community. These include:

- Reduced transportation costs
- Reduced traffic congestion
- Improved public health
- Strengthened local economy
- Improved infrastructure
- Increased equity
- Increased housing and travel options
- Resource conservation
- Reduced noise, air, and water pollution

Table 3-4: Transportation and Land Use GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reductions (MT CO ₂ e)
TL-1	Bicycle Network	231
TL-2	Pedestrian Network	163
TL-3	Transportation Demand Management Incentives	161
TL-4	Parking Supply Management	114
TL-5	Electric Vehicle Network and Alternative Fueling Stations	763
TL-6	Smart Growth	1,301
Transportation and Land Use Total		2,733

Measure TL-1: Bicycle Network

Continue to improve and expand the city's bicycle network and infrastructure.

Existing and/or Completed Efforts in Support of Measure:

- In 2012, the City adopted its Bicycle and Pedestrian Master Plan, which provides guidance for improving walking and bicycling conditions within the City of Morro Bay.
- The City annually identifies and schedules street improvement and maintenance projects to preserve and enhance the bicycle network.
- The City collaborates with SLOCOG and the San Luis Obispo Bicycle Coalition.
- The City enforces mandatory California Green Building Standards Code bicycle parking standards for non-residential development.

GHG Reduction Potential: 231 MT CO ₂ e
City Cost: Very Low
City Savings: None
Private Cost: None
Private Savings: Very Low

Implementation Actions:

- **TL-1.1:** Continue to pursue public and private funding to expand and link the city's bicycle network in accordance with the General Plan and Bicycle Plan.
- **TL-1.2:** Incorporate bicycle facility improvements into pavement resurfacing, restriping, and signalization operations where the safety and convenience of users can be improved within the scope of work.
- **TL-1.3:** Continue to coordinate with and support SLOCOG in the implementation of bicycle plans to facilitate non-auto travel within and between communities.
- **TL-1.4:** Continue to collaborate with the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month.
- **TL-1.5:** Through conditions of approval, require new subdivisions and large developments to incorporate bicycle lanes, routes, and/or shared-use paths into street systems to provide a continuous network of routes, facilitated with markings, signage, and bicycle parking.
- **TL-1.6:** Continue to enforce mandatory California Green Building Standards Code bicycle parking standards for non-residential development.

Measure TL-2: Pedestrian Network

Continue to improve and expand the City's pedestrian network.

Existing and/or Completed Efforts in Support of Measure:

- In 2012, the City adopted its Bicycle and Pedestrian Master Plan, which provides guidance for improving walking and bicycling conditions within the City of Morro Bay.
- The City annually identifies and schedules sidewalk improvement and maintenance projects to preserve and enhance the pedestrian circulation network.
- The City incorporates pedestrian facilities improvements into pavement resurfacing, restriping, and signalization operations where the safety and convenience of users can be improved within the scope of work.
- The City requires new development to implement traffic calming improvements as appropriate (e.g., marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, median islands, mini-circles, tight corner radii, etc.) through conditions of approval.

Implementation Actions:

- **TL-2.1:** Continue to pursue public and private funding to expand and link the City's pedestrian network.
- **TL-2.2:** Continue to expand and promote the Safe Routes to School program.
- **TL-2.3:** Require, through conditions of approval, that new development projects provide a pedestrian access network that internally links all uses and connects all existing or planned external streets and pedestrian facilities contiguous with the project site. Also require, through conditions of approval, that the new development projects minimize barriers to pedestrian access and interconnectivity.

GHG Reduction Potential:

163 MT CO₂e

City Cost:

Medium

City Savings:

None

Private Cost:

None

Private Savings:

Varies

Measure TL-3: TDM Incentives

Work with San Luis Obispo Regional Ride Share and Ride-On to conduct additional outreach and marketing of existing TDM programs and incentives to discourage single-occupancy vehicle trips and encourage alternative modes of transportation, such as carpooling, taking transit, walking, and biking.

Implementation Actions:

- **TL-3.1:** Collaborate with San Luis Obispo Ride Share and Ride-On to conduct additional outreach through event promotions and publications, targeting specific groups or sectors within the community (e.g., employers, employees, students, seniors, etc.).
- **TL-3.2:** Collaborate with San Luis Obispo Ride Share and the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month and Rideshare month.
- **TL-3.3:** Direct community members to existing program websites (e.g., Ride Share, Ride-On) by providing links on the City’s website.

GHG Reduction Potential:	161 MT CO ₂ e
City Cost:	Very Low
City Savings:	None
Private Cost:	None
Private Savings:	Medium

Measure TL-4: Parking Supply Management

Continue to facilitate implementation of the City’s Parking Management Plan as it relates to parking supply.

Existing and/or Completed Efforts in Support of Measure:

- The City of Morro Bay adopted a Parking Management Plan in 2007, which covers 42 blocks of the downtown (above the bluff) and Embarcadero (below the bluff) areas and develops parking management strategies for the area.
- The City is in the process of amending its Zoning Code to reduce parking requirements in the North Main Street Commercial Area.
- The adopted Zoning Code includes an In-Lieu Fee Parking Management Program, which allows developers to satisfy parking requirements by the payment of an in-lieu parking fee.

GHG Reduction Potential:	114 MT CO ₂ e
City Cost:	Very Low
City Savings:	None
Private Cost:	None
Private Savings:	Very Low

Implementation Actions:

- **TL-4.1:** Continue to implement action items identified in Chapter 5 of the City’s Parking Management Plan related to shared parking and in-lieu fee parking.

Measure TL-5: Electric Vehicle Network and Alternative Fueling Stations

Continue to work with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create and implement the electric vehicle readiness plan.

Implementation Actions:

- **TL-5.1:** Continue to work with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create and implement the electric vehicle readiness plan through expanding the use of alternative fuel vehicles and fueling stations in the community (e.g., through identifying and zoning locations for fueling stations, offering incentives for alternative fuel vehicles, etc.).
- **TL-5.2:** Provide streamlined installation and permitting procedures for vehicle charging facilities, utilizing tools provided in the electric vehicle readiness plan (e.g., sample charging permits, model ordinances, development guidelines, outreach programs).
- **TL-5.3:** Pursue funding for plug-in electric vehicle charging stations.

GHG Reduction Potential:	763 MT CO ₂ e
City Cost:	Very Low
City Savings:	None
Private Cost:	None
Private Savings:	None

Measure TL-6: Smart Growth

Facilitate mixed-use, higher density, and infill development near transit stops, in existing community centers/downtown, and in other designated areas.

Existing and/or Completed Efforts in Support of Measure:

- The City's High Density Residential designation allows up to 27 dwelling units per acre.
- The City's Mixed Commercial and Residential zoning designation allows for both residential development and an increase in the variety of commercial businesses.

Implementation Actions:

- **TL-6.1:** Provide and promote incentives (e.g., parking reductions, priority permitting, deferred permit fees, etc.) for mixed-use and high-density land use categories located within ¼-mile of a transit stop or park and ride facility with regularly scheduled, daily service.
- **TL-6.2:** Continue to work with private developers to encourage (through incentives or the removal of existing regulatory barriers) the development of convenient commercial, service, and shopping opportunities near existing employment and/or residential areas.

GHG Reduction Potential:	1,301 MT CO ₂ e
City Cost:	Very Low
City Savings:	None
Private Cost:	Varies
Private Savings:	High

3.3.3 OFF-ROAD MEASURES

Emissions in the off-road sector result from the combustion of fuel, primarily diesel, gasoline, and compressed natural gas, which is used to power off-road equipment and vehicles. Off-road equipment and vehicles include those used in construction, agriculture, commercial, industrial, and landscaping operations as well as recreational vehicles. Factors affecting off-road emissions include the age, type, and usage of the vehicle or equipment.

GHG emissions reductions can be achieved by reducing off-road equipment and vehicle usage and idling or by using equipment that runs on electricity or alternative fuels. The off-road equipment measures listed in **Table 3-5** focus on these strategies and have the potential to reduce Morro Bay’s GHG emissions by 832 MT CO₂e by 2020.

The off-road measures in this section will not only help reduce GHG emissions, but will also provide multiple other benefits to the community. These include:

- Improved air and water quality
- Reduced noise pollution
- Improved public health

Table 3-5: Off-Road GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reductions (MT CO ₂ e)
O-1	Construction Vehicles and Equipment	824
O-2	Off-Road Equipment Upgrades, Retrofits, and Replacements	8
Off-Road Total		832

Measure O-1: Construction Vehicles and Equipment

Reduce GHG emissions from construction vehicles and equipment by requiring various actions as appropriate to the construction project.

Implementation Actions:

- **O-1.1:** Require three percent of construction vehicles and equipment to be electrically-powered or use alternative fuels such as compressed natural gas.
- **O-1.2:** Limit heavy-duty vehicle and equipment idling time to a period of three minutes or less, exceeding CARB's standard of a five minute limit.

GHG Reduction Potential:

824 MT CO₂e

City Cost:

Very Low

City Savings:

None

Private Cost:

Varies

Private Savings:

Varies

Measure O-2: Off-Road Equipment Upgrades, Retrofits, and Replacements

Continue to work with the APCD and promote existing programs that fund vehicle and equipment upgrades, retrofits, and replacement through the Carl Moyer heavy-duty vehicle and equipment program or other funding mechanisms.

Implementation Actions:

- **O-2.1:** Conduct additional outreach and promotional activities targeting specific groups (e.g., agricultural operations, construction companies, homeowners, etc.).
- **O-2.2:** Direct community members to existing program websites (e.g., APCD, Carl Moyer Grant page).

GHG Reduction Potential:

8 MT CO₂e

City Cost:

Very Low

City Savings:

None

Private Cost:

None

Private Savings:

Varies

3.3.5 SOLID WASTE MEASURE

As solid waste decomposes in landfills, it releases methane, a GHG 21 times more potent than carbon dioxide (USEPA, 2012). In 2005, the Morro Bay community sent approximately 9,235 tons of waste to landfill.

Waste management is an important action that the community can take to reduce GHG emissions. Waste management can be achieved by reducing the amount of trash and other waste that is discarded; reusing containers, products, and building materials; and recycling as many materials as possible, including green waste and construction materials. The solid waste measure listed in **Table 3-6** has the potential to reduce Morro Bay’s GHG emissions by 631 MT CO₂e by 2020.

In addition to reducing GHG emissions, the solid waste measure described in this section has the potential to provide other important benefits to the community. These include:

- Improved air quality
- Resource conservation

Table 3-6: Solid Waste GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reductions (MT CO ₂ e)
S-1	Solid Waste Diversion	631
Solid Waste Total		631

Measure S-1: Solid Waste Diversion

Adopt a specified solid waste diversion rate that exceeds the state-mandated rate of 50 percent and identify programs to meet the identified rate by 2020.

Existing and/or Completed Efforts in Support of Measure:

- The City has developed and adopted an event recycling ordinance.

Implementation Actions:

- **S-1.1:** Adopt a solid waste diversion rate goal of 75 percent (25 percent above the state-mandated rate of 50 percent).
- **S-1.2:** Identify the current city-wide diversion rate, and options for increased recycling, waste diversion, and education and outreach to meet the City's goal.

GHG Reduction Potential:

631 MT CO₂e

City Cost:

Very Low

City Savings:

None

Private Cost:

None

Private Savings:

None

3.3.6 TREE PLANTING MEASURE

Trees and other vegetation absorb and capture the GHG carbon dioxide from the atmosphere in a process called carbon sequestration. By maintaining a healthy urban forest, prolonging the life of trees, and continually increasing the number of trees, Morro Bay can increase its net carbon storage over the long term. Trees and other vegetation also reduce local air and surface temperatures by shading buildings, streets, and sidewalks.

The tree measure listed in **Table 3-7** has the potential to reduce Morro Bay’s GHG emissions by 6 MT CO₂e by 2020.

In addition to reducing GHG emissions, the tree planting measure described in this section has the potential to provide other important benefits to the community. These include:

- City beautification
- Increased property values
- Improved air quality
- Improved water quality
- Improved public health
- Reduced surface and air temperatures
- Reduced noise pollution

Table 3-7: Tree Planting GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reductions (MT CO ₂ e)
T-1	Tree Planting Program	6
Tree Planting Total		6

Measure T-1: Tree Planting Program

Facilitate voluntary tree planting within the community, working with local non-profit organizations and community partners.

Existing and/or Completed Efforts in Support of Measure:

- The City has developed a tree planting assistance program, which provides resources, labor, and subsidies to participating community members.
- The City has developed and adopted tree planting guidelines that address tree and site selection, with emphasis placed on native, drought-tolerant trees.
- The City tracks the number of trees planted annually.
- The City has a Citizens Tree Committee.

Implementation Actions:

- **T-1.1:** Continue to provide tree planting assistance to facilitate tree planting within the community.

GHG Reduction Potential:

6 MT CO₂e

City Cost:

Low

City Savings:

None

Private Cost:

Very Low

Private Savings:

None

3.4 GHG Reduction Summary

As discussed in Chapter 2, *GHG Emissions and Reduction Target*, Morro Bay will need to reduce its GHG emissions by 3,933 MT CO₂e by 2020 to meet its 15 percent reduction target. The GHG reduction measures in this CAP are estimated to reduce Morro Bay’s GHG emissions by 5,248 MT CO₂e by 2020, as summarized in **Table 3-8**. Therefore, the implementation of the measures identified in this chapter would enable Morro Bay meets its 15 percent reduction target by 2020.

Table 3-8: Summary of GHG Reductions by Measure

Measure Number	Measure	2020 GHG Reduction (MT CO ₂ e)
City Government Operations		
C-1	City Government Energy Efficiency Retrofits and Upgrades	28
C-2	City Government Energy Efficient Public Realm Lighting	7
C-3	Renewable Energy Systems on City Property	14
C-4	Zero- and Low-Emission City Fleet Vehicles	10
C-5	City Government Tree Planting Program	6
<i>City Government Operations Subtotal</i>		65
Energy		
E-1	Energy Efficiency Outreach and Incentive Programs	114
E-2	Energy Audit and Retrofit Program	402
E-3	Income-Qualified Energy Efficient Weatherization Programs	25
E-4	Incentives for Exceeding Title 24 Building Energy Efficiency Standards	83
E-5	Small-Scale Solar PV Incentive Program	320
E-6	Income-Qualified Solar PV Program	37
<i>Energy Subtotal</i>		981
Transportation and Land Use		
TL-1	Bicycle Network	231
TL-2	Pedestrian Network	163
TL-3	TDM Incentives	161
TL-4	Parking Supply Management	114
TL-5	Electric Vehicle Network and Alternative Fueling Stations	763
TL-6	Smart Growth	1,301
<i>Transportation and Land Use Subtotal</i>		2,733
Off-Road		
O-1	Construction Equipment Techniques	824
O-2	Equipment Upgrades, Retrofits, and Replacements	8
<i>Off-Road Subtotal</i>		832
Solid Waste		
S-1	Solid Waste Diversion	631
<i>Solid Waste Subtotal</i>		631
Tree Planting		
T-1	Tree Planting Program	6
<i>Tree Planting Subtotal</i>		6
TOTAL REDUCTION		5,248

CHAPTER 4

ADAPTATION

4.0 Adaptation

There are two responses to climate change available to local governments: mitigation and adaptation. The previous chapter addressed climate change mitigation, by identifying measures to reduce GHG. This chapter identifies measures to prepare for and minimize the risks associated with anticipated climate change impacts and increase resiliency to those changes. Drawing on a recent climate adaptation planning process that took place in San Luis Obispo County, this chapter identifies climate change predictions for the region and specific to Morro Bay. This chapter also provides an assessment of populations and infrastructure within Morro Bay that are particularly vulnerable to the identified impacts and identifies measures to increase community resilience to those effects.

“Adaptation planning at the local, state, and national levels can limit the damage caused by climate change, as well as reduce the long-term costs of responding to the climate related impacts that are expected to grow in number and intensity in the decades to come” (PEW Center on Global Climate Change, 2011).

4.1 Climate Change Predictions and Vulnerability

Climate change is a global phenomenon that has the potential to impact local health, agriculture, natural resources, infrastructure, emergency response, tourism, and many other facets of society. As climate change continues to progress, increased stress to vulnerable populations and sectors of society are expected. In 2010, key stakeholders, elected officials, city and county planners, land managers, public health officials, concerned citizens, scientists, and the Local Government Commission initiated a process to address climate change adaptation in San Luis Obispo County. As part of this process, scientists from Geos Institute identified anticipated climate change impacts in the region and threats to socioeconomic and natural systems. The range of potential impacts presented in the document *ClimateWise: Integrated Climate Change Adaptation Planning in San Luis Obispo County in November 2010* (ClimateWise) are based on projections of climate change in the San Luis Obispo region using three of the best-available models (MIROC, HadCM, and CSIRO) and an emissions scenario drawn from those used by the Intergovernmental Panel on Climate Change (IPCC).

According to ClimateWise, climate change could lead to the following potential changes in the San Luis Obispo County region and the City of Morro Bay:

- Increased temperatures
- Seal level rise
- Storm surges
- Erosion
- Changed precipitation

Based on these climate changes, a vulnerability assessment was completed to determine the degree to which physical, socioeconomic, and natural factors are susceptible to, or unable to

4.0 ADAPTATION

accommodate, the anticipated effects of climate change. The assessment was comprised of three primary components:

- Exposure – the nature and degree to which a system experiences a stress or hazard
- Sensitivity – the degree to which the system is impacted by a given stressor, change or disturbance
- Adaptive Capacity – the ability to cope with extreme events, to make adaptive changes, or to transform to a greater extent, including the ability to moderate potential damages and to take advantage of opportunities

Each of these components contributes to understanding the overall vulnerability of a functional system (Snover, 2007). Climate change will most impact those individuals and systems that have both the greatest exposure and sensitivity to climate change impacts, in addition to the lowest adaptive capacity (see **Table 4-1**). For each climatic hazard, the population and economic sector most vulnerable depends on the unique combination of these three factors (ClimateWise, 2010).

Table 4-1: Climate Change Vulnerability

Components of Vulnerability	Climatic Risks	Populations or Infrastructure Particularly at Risk
Exposure	Floods Heat Drought Sea-level rise	Floodplain residents Outdoor workers Farmers, all water users Coastal residents, structures and facilities
Sensitivity	Heat Air pollution Drought	Infants, elderly Asthma sufferers, children Farmers
Adaptive Capacity	Floods Heat Sea-level rise	Institutionalized populations, low-income households Low-income residents Coastal residents, structures and facilities

Source: ClimateWise, 2010

4.1.1 INCREASED TEMPERATURES

Average temperatures in San Luis Obispo County are expected to become 2 to 4 degrees warmer by mid-century and possibly 4 to 8 degrees warmer by late century, depending on emission levels (ClimateWise, 2010). Greater warming is expected to occur in the summer months compared to winter.

Public health may be negatively impacted by a changing climate as a result of changing environmental conditions (e.g., extreme weather events, changes in temperature and rainfall that decrease water supply, worsening air quality, and increases in allergens and air pollutants).

This vulnerability assessment is consistent with California’s Adaptation Strategy in the identification of population segments that will be the most at risk from climate change impacts.¹ In addition, California’s Adaptation Strategy also identifies “individuals suffering from chronic heart or lung disease, persons with mental disabilities, the socially and/or economically disadvantaged as being vulnerable populations” (California Natural Resources Agency, 2009). In addition, increased temperatures are expected to accelerate sea level rise from both warming of the ocean (warmer water takes up more space than colder water) and melting of ice caps and glaciers (Karl, 2009).

4.1.2 SEA LEVEL RISE

Sea level changes affect storm related and long-term coastal erosion and retreat, flooding and inundation, and tsunami potential. Sea levels change over time based on changing volumes of seawater and sea basins. Higher temperatures correlate with greater water volumes due to expansion of warmer seawaters and increased melting of icecaps and glaciers.

Using the best available science, statewide studies conducted in 2009 projected that sea level could rise 12 to 16 inches above current levels by 2050 (Cal-Adapt 2010). This is double the increase California’s coastline has experienced over the entire past century. By the end of the century, sea levels are projected to rise 3.3 to 4.6 feet (23 to 55 inches) above current levels. Sea level rise is expected to result in higher storm surges and flood elevations, inundating transportation, commercial, and residential infrastructure in low-lying areas, as well as beach erosion, cliff failures, and permanent flooding of coastal wetlands.

As with many coastal cities, sea level rise may be the most significant threat due to climate change for the City of Morro Bay. While the downtown area lies above predicted sea level rise, significant areas along Morro Strand Beach, Moro Bay High School, the Dynegy Power Plant, the length of the Morro Bay State Park, and sections of Baywood-Los Osos will be highly vulnerable to coastal flooding, erosion, and salt-water infiltration. This is especially critical in the area around the outlet of Morro Creek. Most at risk will be coastal roads and bridges, the Moro Bay – Cayucos Wastewater Treatment Plant, wetlands and habitat in the South Bay, as well as docks and marinas throughout the bay.

4.1.3 STORM SURGES

Sea level rise combined with the tidal effect of larger and more intense oceanic storms is expected to create higher periodic storm surges. These extreme ‘high tides’ can cause impacts over and above those predicted to occur as a result of sea level rise mentioned above. Impacts from storm surges may include the following: flooding of low-lying coastal areas, beach and cliff erosion, and inundation of infrastructure and wetlands.

¹ California’s Adaptation Strategy was developed in 2009 by the California Natural Resources Agency (CNRA), working through the Climate Action Team. Seven sector-specific working groups led by 12 state agencies, boards and commissions, and numerous stakeholders were convened for this effort. The strategy proposes a comprehensive set of recommendations designed to inform and guide California decision makers as they begin to develop policies that will protect the state, its residents and its resources from a range of climate change impacts.

Businesses, residents, and infrastructure, such as the harbor, located within low-lying coastal areas would be more susceptible to damage or disruption by larger than average storm events. Currently, there is insufficient infrastructure to accommodate a momentary surplus of water, and large areas of impervious pavement prevent much of the water from infiltrating into the ground. This is most critical in the area surrounding the outlet of Morro Creek.

4.1.4 EROSION

Erosion is the movement of sediment away from the shore by means of wave or current action. Sea level rise facilitates this process by promoting offshore transport of sediment. Research suggests that shoreline recession can be as much as 50 to 200 times the rise in relative sea level (Bruun, 1962). Beaches, cliffs, and bluffs along the coast, as well as facilities and infrastructure within their vicinity, may be impacted by erosion.

Beaches and bluffs are subject to gradual wave-driven erosion, and naturally move landward over time. Projected sea level rise and larger storm events would accelerate the rate and extent of erosion and retreat as higher water levels create greater wave energy reaching the shoreline. Beach erosion will be greatest along Morro Strand Beach, the Morro Bay State Park beach, and the seaward sides of Morro Rock.

4.1.5 CHANGED PRECIPITATION

Precipitation, except during winter months, is anticipated to change little in the near future. However, climate models forecast drier conditions throughout San Luis Obispo County by 2075. As a result, droughts may become more frequent, longer and more severe. It is also projected that when rainfall does occur, it may be more likely to come in the form of intense downpours.

Morro Bay relies on water from the Lopez Lake Treatment Facility and from city wells. The Morro Bay Public Works Department supplies the water for urban use, and a limited number of private wells serve agricultural uses within the city limits. While climate models predict little change in rainfall patterns for the near future, they do forecast a drier climate during the last half of this century. This may result in longer and more severe periods of drought, therefore impacting the livestock and agriculture industry, which rely on annual precipitation for reliable grazing and water for crops. Limited water supplies will affect all water users in the city, particularly those living in rural areas that depend on groundwater alone.

4.2 Adaptation Measures

The following measures focus on items the City of Morro Bay can implement in adapting to climate change. The goal of these measures is to reduce impacts to the community, the economy, and local natural resources. Recognizing the link between public health and climate adaptation, this chapter recommends adaptation measures that are designed to reduce the negative impacts of climate change on sensitive populations and communities. Measures were developed from those identified in the ClimateWise program, the World Bank Primer on

Reducing Vulnerabilities to Disaster, International Council for Local Environmental Initiatives (ICLEI), and the California Natural Resources Agency's Climate Adaptation Strategy.

Measure A-1: Climate Change Vulnerability

Periodically reassess regional climate change vulnerabilities.

Implementation Actions:

- **A-1.1:** Participate in inter-agency and or inter-jurisdictional meeting and planning activities to periodically reassess regional climate change vulnerabilities.
- **A-1.2:** Incorporate newly identified adaptation measures into planning documents as appropriate.

Measure A-2: Public Health and Emergency Preparedness

Prepare for anticipated climate change effects on public health, the local economy, and populations that may bear a disproportionate burden of the climate change effects.

Implementation Actions:

- **A-2.1:** Collaborate with community-based organizations (such as health care providers, public health advocates, etc.) to disseminate public preparedness and emergency response information related to climate change.
- **A-2.2:** Conduct training exercises at public forums as well as distribute publicly available information on emergency exit routes and methods.
- **A-2.3:** Identify and focus planning and outreach programs on vulnerable populations including neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.

Measure A-3: Water Management

Implement new policies and programs to limit community exposure to threats such as flooding, and support those that encourage water use conservation and efficiency.

Implementation Actions:

- **A-3.1:** Collaborate with other jurisdictions to address water supply threats, flooding, and wastewater management.
- **A-3.2:** Continue to seek grants and other sources of funding, including the State Integrated Regional Water Management Grant Program and mitigation opportunities, to enhance flood control and improve water quality.

Measure A-4: Infrastructure

Work to improve the resilience of systems that provide the resources and services critical to community function.

Implementation Actions:

- **A-4.1:** Assess the potential impact of climate change as part of the update of plans that manage community infrastructure systems.
- **A-4.2:** Complete an assessment, including economic impacts and threats to public health and safety, for projected climate change impacts on local transportation, water, wastewater, stormwater, energy, and communication systems.
- **A-4.3:** Develop mitigation plans for the relocation of the wastewater treatment facility/water reclamation facility consistent with the state's sea level rise policies and climate change documents and consistent with the Local Coastal Program (LCP) and Coastal Act.

Measure A-5: Coastal Resource Protection

Prepare for anticipated climate change effects on vulnerable coastal resources.

Implementation Actions:

- **A-5.1:** Monitor and study specific beach profiles and resource vulnerability.
- **A-5.2:** Plan for future beach changes by developing and implementing policies and programs to address resource vulnerabilities, such as fresh water supplies, beach replenishment and/or artificial dune creation.
- **A-5.3:** Study measures to implement a program of managed realignment, i.e., setting back the line of actively maintained defenses, thus creating an intertidal habitat to attenuate wave energy and reduce erosion.

CHAPTER 5

IMPLEMENTATION AND MONITORING

5.0 Implementation and Monitoring

Implementation and monitoring are essential components of the CAP to ensure that Morro Bay reduces its GHG emissions and meets its target. This chapter identifies key steps that the City will take to implement the CAP and monitor the progress in reducing Morro Bay's GHG emissions consistent with AB 32. It also describes potential funding sources and mechanisms available to implement the CAP.

5.1 Implementation Matrix

Ensuring that the CAP measures translate into measurable reductions in GHG emissions is critical to the success of the CAP. To facilitate this, each measure and its corresponding implementation actions identified in Chapter 3, *Climate Action Measures*, and Chapter 4, *Adaptation*, is listed in the implementation matrix in **Table 5-1** along with the following items:

- **Responsible Department(s):** The City department that will be primarily responsible for implementing, monitoring, and reporting on the progress of the selected measure and corresponding actions.
- **Implementation Time Frame:** The phase in which this measure should begin implementation. Please note that measures already underway with existing or recently completed efforts in support of the measure are categorized as near-term. Time frames include:
 - Near-Term – By 2015
 - Mid-Term – 2016-2017
 - Long-Term – 2018-2020
- **City Cost and Savings Estimates:** For each measure, potential costs and savings to the City are categorized as none (\$0), very low (\$1-\$10,000), low (\$10,001-\$50,000), medium (\$50,001-\$100,000), and high (\$100,001 or greater). Supporting information on costs and savings is provided in **Appendix B**.
- **GHG Reduction Potential:** The GHG reduction potential value identifies the estimated annual emission reductions anticipated in 2020, measured in MT CO₂e. Supporting information pertaining to the GHG reduction calculations is provided in **Appendix B**.
- **Performance Indicator:** Performance indicators enable the City to generally monitor measure progress.

Table 5-1: Implementation Matrix

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
City Government Operations							
C-1: City Government Energy Efficiency Retrofits and Upgrades. Establish a target to reduce City government energy use by 10 percent by 2020 and implement cost-effective improvements and upgrades to achieve that target.	C-1.1: Adopt a 10 percent City government energy use reduction target. C-1.2: Establish a prioritized list of energy efficiency upgrade projects and implement them as funding becomes available.	Public Services	Varies	Low	28	10 percent energy savings from City government operations by 2020	Near-Term
C-2: City Government Energy Efficient Public Realm Lighting. Continue to replace City-owned or -operated street, traffic signal, park, and parking lot lights with higher efficiency lamp technologies.	C-2.1: Identify and secure funding to replace additional inefficient City-owned or -operated public lighting.	Recreation and Parks	Low	Low	7	25 LED street lights, 10 LED traffic signals, and 50 LED or CFL other outdoor lights installed by 2020	Near-Term
C-3: Renewable Energy Systems on City Property. Pursue	C-3.1: Identify funding sources and opportunities for small-scale on-site solar	Public Services	Medium	Low	14	50 kW of municipal solar PV installed	Mid-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
small-scale on-site solar energy systems at City government facilities.	photovoltaic (PV) systems at City government facilities. C-3.2: Install small-scale on-site solar PV systems at select City government facilities.					and 2 solar hot water heaters installed by 2020	
C-4: Zero- and Low-Emission City Fleet Vehicles. Continue to replace official City vehicles and equipment with more efficient and/or alternatively fueled vehicles.	C-4.1: Work with the Central Coast Clean Cities Coalition to obtain funding to purchase low-emission and zero-emission fleet vehicles. C-4.2: Replace five City vehicles with low- or zero-emission vehicles by 2020.	Public Services	Low	Very Low	10	5 additional municipal vehicles replaced by 2020	Mid-Term
C-5: City Government Tree Planting Program. Establish a tree planting program to increase the number of native, drought-tolerant trees on City-owned property.	C-5.1: Establish a municipal tree planting program and plant at least 500 trees on City property by 2020.	Public Services, Recreation and Parks	Medium	None	6	500 net new trees planted on City property by 2020	Mid-Term
Energy							
E-1: Energy Efficiency Outreach and Incentive Programs. Expand participation in and the	E-1.1: Conduct additional outreach and promotional activities, either individually or in collaboration with San Luis Obispo County Energy Watch,	Public Services	Very Low	None	114	35 percent of households and businesses participating	Near-Term

5.0 IMPLEMENTATION AND MONITORING

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
promotion of existing energy efficiency programs, such as Energy Upgrade California and San Luis Obispo County Energy Watch, to increase community awareness of existing energy efficiency rebates and financial incentives, and no- and low-cost actions community members can take to increase energy efficiency.	targeting specific groups or sectors within the community (e.g., homeowners, renters, businesses, etc.). E-1.2: Designate one week per year to conduct an energy efficiency outreach campaign targeting a specific group. The campaign week can also be used to recognize and encourage programs and educational outreach conducted by industry organizations, non-governmental entities, government agencies, and other community groups.					with 4 percent energy savings by 2020	
E-2: Energy Audit and Retrofit Program. Facilitate voluntary energy assessments, retrofits, and retrocommissioning of residential and commercial buildings within Morro Bay.	E-2.1: Develop and promote a residential and commercial energy audit program, either individually or in collaboration with San Luis Obispo County Energy Watch, local utilities, and/or neighboring jurisdictions. E-2.2: Conduct outreach and promotional activities targeting specific groups (e.g., owners of buildings built prior to Title 24 [1980]) in order to promote	Public Services	Very Low	None	402	500 households and 200 businesses audited by 2020, with an average energy savings of 20 percent per retrofit	Mid-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	<p>the audit and retrofit program.</p> <p>E-2.3: As part of the business licensing and renewal process, encourage businesses to participate in the program and receive an energy audit.</p> <p>E-2.4: Participate in and promote a single-family residential energy efficiency financing program to encourage investment in energy efficiency upgrades.</p> <p>E-2.5: Continue to participate in and promote the AB 811 CaliforniaFIRST energy efficiency financing program for multi-family residential and commercial buildings.</p> <p>E-2.6: Highlight the effectiveness of energy audits and retrofits by showcasing the success of retrofit projects (e.g., on the City's website or in its newsletter).</p>						
E-3: Income-Qualified Energy Efficient Weatherization Programs. Facilitate	E-3.1: Facilitate and promote existing income-qualified weatherization programs, such as PG&E's Middle Income Direct Install program,	Public Services	Very Low	None	25	20 residential units upgraded by 2020	Near-Term

5.0 IMPLEMENTATION AND MONITORING

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
energy efficient weatherization of low- and middle-income housing through promotion of existing programs.	either individually or by partnering with a local organization.						
E-4: Incentives for Exceeding Title 24 Energy Efficiency Building Standards. Encourage new development to voluntarily exceed State energy efficiency standards.	E-4.1: Continue to collaborate with community organizations and businesses, local utilities, and other local jurisdictions in the region to develop and promote a technical assistance and best practices program that aids developers in selecting and implementing energy efficiency measures that exceed State standards. E-4.2: Identify, provide and promote incentives (e.g., streamlined permitting, public recognition, etc.) for applicants whose project exceeds State requirements by a specified percent.	Public Services	Very Low	None	53	75 new or remodeled residences and 35 new non-residential buildings exceeding State standards by 20 percent by 2020	Mid-Term
E-5: Small-Scale On-Site Solar PV Incentive Program. Facilitate the voluntary installation of small-scale on-site solar PV	E-5.1: Conduct a comprehensive review of the City's solar permitting process based on the Governor's Office of Planning and Research's (OPR) <i>California</i>	Public Services	Very Low	None	320	80 solar PV systems installed on residential buildings, 20 solar PV	Near-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
systems and solar hot water heaters in the community through expanded promotion of existing financial incentives, rebates, and financing programs, and by helping residents and business owners overcome common regulatory barriers and upfront capital costs.	<p><i>Solar Permitting Guidebook</i> (June 2012), identifying any existing barriers to facility implementation.</p> <p>E-5.2: Improve the permit review and approval process for small solar PV systems by implementing recommendations for streamlined permitting identified in the <i>California Solar Permitting Guidebook</i> (e.g., use standardized forms, provide clear written instructions on the permitting process and a checklist of required application materials, make information available on the City's website and at the permit counter, etc.).</p> <p>E-5.3: Continue to collaborate with other local jurisdictions in the region to standardize requirements across jurisdiction, by using common promotion and permit materials, such as checklists and standard plans, to reduce permit submittal errors among contractors working</p>					systems installed on non-residential businesses, and 80 solar water heater installed by 2020	

5.0 IMPLEMENTATION AND MONITORING

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	<p>throughout a region.</p> <p>E-5.4: Participate in and promote a single-family residential renewable energy financing program to encourage investment in small-scale on-site solar PV systems.</p> <p>E-5.5: Continue to participate in and promote the AB 811 CaliforniaFIRST renewable energy financing program for multi-family residential and commercial buildings.</p> <p>E-5.6: Expand education on and promotion of existing incentive, rebate, and financing programs for solar PV systems and solar hot water heaters targeting specific groups or sectors within the community.</p> <p>E-5.7: Designate one week per year to conduct a renewable energy outreach campaign targeting a specific group. The campaign week can also be used to recognize community members that have implemented noteworthy</p>						

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	or unique renewable energy projects.						
E-6: Income-Qualified Solar PV Program. Facilitate the installation of small-scale on-site solar PV systems on and solar hot water heaters in income-qualified housing units by promoting existing programs offered through the California Solar Initiative and New Solar Homes Partnership and by collaborating with organizations, such as GRID Alternatives, on outreach and eligibility.	E-6.1: Collaborate with GRID Alternatives and/or other community organizations to provide targeted education and outreach to developers and homeowners about incentives offered through the SASH and MASH Programs. E-6.2: Provide targeted outreach regarding solar water heating incentives offered through the California Solar Initiative, including the SASH and MASH Programs.	Public Services	Very Low	None	37	20 low-income residential solar PV systems installed and 20 low-income residential solar water heaters installed by 2020	Near-Term
Transportation and Land Use							
TL-1: Bicycle Network. Continue to improve and expand the city's bicycle network and infrastructure.	TL-1.1: Continue to pursue public and private funding to expand and link the city's bicycle network in accordance with the General Plan and Bicycle Plan. TL-1.2: Incorporate bicycle	Public Services	Very Low	None	231	6 miles of bike lane added by 2020	Near-Term

5.0 IMPLEMENTATION AND MONITORING

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	<p>facility improvements into pavement resurfacing, restriping, and signalization operations where the safety and convenience of users can be improved within the scope of work.</p> <p>TL-1.3: Continue to coordinate with and support SLOCOG in the implementation of bicycle plans to facilitate non-auto travel within and between communities.</p> <p>TL-1.4: Continue to collaborate with the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month.</p> <p>TL-1.5: Through conditions of approval, require new subdivisions and large developments to incorporate bicycle lanes, routes, and/or shared-use paths into street systems to provide a continuous network of routes, facilitated with markings,</p>						

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	signage, and bicycle parking. TL-1.6: Continue to enforce mandatory California Green Building Standards Code bicycle parking standards for non-residential development.						
TL-2: Pedestrian Network. Continue to improve and expand the City's pedestrian network.	TL-2.1: Continue to pursue public and private funding to expand and link the City's pedestrian network. TL-2.2: Continue to expand and promote the Safe Routes to School program. TL-2.3: Require, through conditions of approval, that new development projects provide a pedestrian access network that internally links all uses and connects all existing or planned external streets and pedestrian facilities contiguous with the project site. Also require, through conditions of approval, that the new development projects minimize barriers to pedestrian access and interconnectivity.	Public Services	Medium	None	163	6 miles of sidewalk added by 2020	Near-Term

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Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
<p>TL-3: TDM Incentives. Work with San Luis Obispo Regional Ride Share and Ride-On to conduct additional outreach and marketing of existing TDM programs and incentives to discourage single-occupancy vehicle trips and encourage alternative modes of transportation, such as carpooling, taking transit, walking, and biking.</p>	<p>TL-3.1: Collaborate with San Luis Obispo Ride Share and Ride-On to conduct additional outreach through event promotions and publications, targeting specific groups or sectors within the community (e.g., employers, employees, students, seniors, etc.).</p> <p>TL-3.2: Collaborate with San Luis Obispo Ride Share and the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month and Rideshare month.</p> <p>TL-3.3: Direct community members to existing program websites (e.g., Ride Share, Ride-On) by providing links on the City's website.</p>	Public Services	Very Low	None	161	4 percent of employees participating in TDM programs	Near-Term
<p>TL-4: Parking Supply Management. Continue to facilitate implementation of the City's Parking Management Plan as it relates to parking supply.</p>	<p>TL-4.1: Continue to implement action items identified in Chapter 5 of the City's Parking Management Plan related to shared parking and in-lieu fee parking.</p>	Public Services	Very Low	None	114	Net reduction of 500 parking spaces by 2020	Mid-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
TL-5: Electric Vehicle Network and Alternative Fueling Stations. Continue to work with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create and implement the electric vehicle readiness plan.	<p>TL-5.1: Continue to work with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create and implement the electric vehicle readiness plan through expanding the use of alternative fuel vehicles and fueling stations in the community (e.g., through identifying and zoning locations for fueling stations, offering incentives for alternative fuel vehicles, etc.).</p> <p>TL-5.2: Provide streamlined installation and permitting procedures for vehicle charging facilities, utilizing tools provided in the electric vehicle readiness plan (e.g., sample charging permits, model ordinances, development guidelines, outreach programs).</p> <p>TL-5.3: Pursue funding for plug-in electric vehicle charging stations.</p>	Public Services	Very Low	None	763	4 percent increase in electric vehicles by 2020	Near-Term

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Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
TL-6: Smart Growth. Facilitate mixed-use, higher density, and infill development near transit stops, in existing community centers/downtown, and in other designated areas.	<p>TL-6.1: Provide and promote incentives (e.g., parking reductions, priority permitting, deferred permit fees, etc.) for mixed-use and high-density land use categories located within ¼-mile of a transit stop or park and ride facility with regularly scheduled, daily service.</p> <p>TL-6.2: Continue to work with private developers to encourage (through incentives or the removal of existing regulatory barriers) the development of convenient commercial, service, and shopping opportunities near existing employment and/or residential areas.</p>	Public Services	Very Low	None	1,301	6 percent reduction in VMT as a result of 95 percent of new residential units and 100 percent of new jobs being located within ¼-mile of transit, and an 8 percent increase from baseline density	Near-Term
Off-Road							
O-1: Construction Vehicles and Equipment. Reduce GHG emissions from construction vehicles and equipment by requiring various actions as appropriate to the construction	<p>O-1.1: Require three percent of construction vehicles or equipment to be electrically-powered or use alternative fuels such as compressed natural gas.</p> <p>O-1.2: Limit heavy-duty vehicle and equipment idling time to a period of three minutes or less,</p>	Public Services	Very Low	None	824	3 percent of construction vehicles/ equipment replaced with electric-powered vehicles/ equipment and	Long-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
project.	exceeding CARB's standard of a five minute limit.					3 percent replaced with alternatively fueled vehicles equipment by 2020	
O-2: Off-Road Equipment Upgrades, Retrofits, and Replacements. Continue to work with the APCD and promote existing programs that fund vehicle and equipment upgrades, retrofits, and replacement through the Carl Moyer heavy-duty vehicle and equipment program or other funding mechanisms.	O-2.1: Conduct additional outreach and promotional activities targeting specific groups (e.g., agricultural operations, construction companies, homeowners, etc.). O-2.2: Direct community members to existing program websites (e.g., APCD, Carl Moyer Grant page).	Public Services	Very Low	None	8	1 percent of off-road vehicles/ equipment replaced with electric-powered vehicles/ equipment and 1 percent of off-road vehicles/ equipment replaces with alternative fuels by 2020	Mid-Term
Solid Waste							
S-1: Solid Waste Diversion. Adopt a specified solid waste diversion rate that exceeds the state-mandated rate of 50 percent and identify	S-1.1: Adopt a solid waste diversion rate goal of 75 percent (25 percent above the state-mandated rate of 50 percent). S-1.2: Identify the current city-wide diversion rate, and	Public Services	Very Low	None	631	75 percent solid waste diversion by 2020	Mid-Term

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Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
programs to meet the identified rate by 2020.	options for increased recycling, waste diversion, and education and outreach to meet the City's goal.						
Tree Planting							
T-1: Tree Planting Program. Facilitate voluntary tree planting within the community, working with local non-profit organizations and community partners.	T-1.1: Continue to provide tree planting assistance to facilitate tree planting within the community.	Public Services	Low	None	6	500 net new trees planted by 2020	Near-Term
Adaptation							
A-1: Climate Change Vulnerability. Periodically reassess regional climate change vulnerabilities.	A-1.1: Participate in inter-agency and or inter-jurisdictional meeting and planning activities to periodically reassess regional climate change vulnerabilities. A-1.2: Incorporate newly identified adaptation measures into planning documents as appropriate.	Public Services	Very Low	None	NA	NA	Mid-Term
A-2: Public Health and Emergency Preparedness. Prepare for anticipated climate change effects on	A-2.1: Collaborate with community-based organizations (such as health care providers, public health advocates, etc.) to disseminate public	Public Services	Very Low	None	NA	NA	Long-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
public health, the local economy, and populations that may bear a disproportionate burden of the climate change effects.	<p>preparedness and emergency response information related to climate change.</p> <p>A-2.2: Conduct training exercises at public forums as well as distribute publicly available information on emergency exit routes and methods.</p> <p>A-2.3: Identify and focus planning and outreach programs on vulnerable populations including neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.</p>						
<p>A-3: Water Management. Implement new policies and programs to limit community exposure to threats such as flooding, and support those that encourage water use conservation and efficiency.</p>	<p>A-3.1: Collaborate with other jurisdictions to address water supply threats, flooding, and wastewater management.</p> <p>A-3.2: Continue to seek grants and other sources of funding, including the State Integrated Regional Water Management Grant Program and mitigation opportunities, to enhance flood control and</p>	Public Services	Very Low	None	NA	NA	Long-Term

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Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	improve water quality.						
A-4: Infrastructure. Work to improve the resilience of systems that provide the resources and services critical to community function.	A-4.1: Assess the potential impact of climate change as part of the update of plans that manage community infrastructure systems. A-4.2: Complete an assessment, including economic impacts and threats to public health and safety, for projected climate change impacts on local transportation, water, wastewater, stormwater, energy, and communication systems. A-4.3: Develop mitigation plans for protection of the wastewater treatment facility and the relocation or elevation of vulnerable infrastructure.	Public Services	Very Low	None	NA	NA	Long-Term
A-5: Coastal Resource Protection. Prepare for anticipated climate change effects on vulnerable coastal resources.	A-5.1: Monitor and study specific beach profiles and resource vulnerability. A-5.2: Plan for future beach changes by developing and implementing policies and programs to address resource vulnerabilities, such as fresh water supplies, beach	Public Services, Recreation and Parks	Very Low	None	NA	NA	Long-Term

Measure	Actions	Responsible Department	City Cost	City Savings	2020 GHG Reduction (MT CO ₂ e)	Performance Indicator	Implementation Time Frame
	replenishment and/or artificial dune creation. A-5.3: Study measures to implement a program of managed realignment, i.e., setting back the line of actively maintained defenses, thus creating an intertidal habitat to attenuate wave energy and reduce erosion.						

5.2 Implementation and Monitoring Policies

CAP implementation and monitoring will require City leadership to execute CAP measures and actions, report on the progress of implementation and performance, and if necessary, alter or amend the CAP in the future to ensure that the plan remains effective and on track toward meeting its target. The following policies and actions were developed to guide CAP implementation and monitoring.

I-1: CAP Implementation Team

Establish a CAP Coordinator and multi-departmental CAP Implementation Team to implement, monitor, and report on the status of measures and actions identified in the CAP. The CAP Implementation Team will meet at least one time per year to assess the status of City efforts.

Implementation Actions:

- **I-1.1:** Form a multi-departmental CAP Implementation Team that meets annually to implement, monitor, and report on the status of measures and actions identified in the CAP.
- **I-1.2:** Designate a City staff member on the CAP Implementation Team to have lead responsibilities for overseeing CAP implementation and monitoring. Duties of this position include coordinating the CAP Implementation Team meetings, preparing the annual CAP progress report to City Council, and coordinating the GHG emissions inventory and CAP updates, as specified in this chapter.
- **I-1.3:** Provide CAP implementation and GHG reduction training to staff.

I-2: CAP Measure Evaluation

Annually monitor and report on the implementation and performance of the CAP measures and actions.¹

Implementation Actions:

- **I-2.1:** Prepare an annual progress report for City Council review and consideration. The progress report should:
 - Identify the implementation status of each measure (including how new development projects have been implementing CAP measures);

¹ While a full GHG emissions inventory is necessary to assess community-wide and local government progress toward the 2020 goal, the City can track progress between inventories and provide insight on the effectiveness of specific actions. By evaluating whether the implementation of a measure is on track to achieve its performance criteria, the City can identify successful measures, and re-evaluate or replace under-performing measures.

- Evaluate achievement of or progress toward performance criteria;²
- Assess the effectiveness of measures included in the CAP;
- Report on the State's implementation of state-level measures included in the CAP; and
- Recommend adjustments to actions or tactics, as needed.

I-3: GHG Emissions Inventory and CAP Updates

Re-inventory GHG Emissions every five years to evaluate the performance of the CAP as a whole, and if necessary, alter or amend the CAP to ensure that the plan remains on track.³

Implementation Actions:

- **I-3.1:** Conduct a GHG inventory every five years and evaluate CAP performance.
- **I-3.2:** Update the CAP as necessary based on the results of the inventory, and to reflect new programs or policies to reduce GHG emissions.

At this time, the State has not created a mandate for further reductions beyond the 2020 target. It has identified a long-term goal for State agencies of reducing emissions to 80 percent below 1990 emissions levels by 2050 (in Executive Order S-3-05), but has not adopted the target and does not plan for meeting this goal. As such, this CAP does not identify a target beyond 2020. As the year 2020 approaches, the State is likely to adopt a target for later years and, at that time Morro Bay will adopt a reduction target for a later year consistent with the State's longer-term target. However, if the State has not adopted a reduction target by 2020, the City will set a reduction target based on the State's long-term reduction trajectory.

5.3 Funding Sources

One of the main barriers to an implementation and monitoring plan is lack of available funds. There are multiple grant and loan programs through state, federal, and regional sources to reduce GHG emissions. This section identifies potential funding sources that Morro Bay could pursue to offset the financial cost of implementing the CAP measures.

The spectrum of public and private funding options for the measures outlined in this CAP is ever evolving. The programs listed below represent the current (2013) status of those options that are most relevant to the CAP. These funding sources could quickly become out-of-date; therefore, it is important to evaluate the status of a given program before seeking funding, as availability and application processes are updated periodically. In addition, there are general

² The performance indicators, provided for each quantified measure, identify the level of participation or performance required to achieve the estimated level of GHG emissions reductions by 2020.

³ Inventory updates provide the best indication of CAP effectiveness as they will allow for comparison to the 2005 baseline. If an update reveals that the plan is not making progress toward meeting the GHG reduction target, the City will adjust the measures as necessary.

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sources of funding that provide the most up-to-date information and should be reviewed on a regular basis, including:

- U. S. Department of Energy
- U.S. Environmental Protection Agency
- U.S. Department of Housing and Urban Development
- California Energy Commission
- California Strategic Growth Council
- California Public Utilities Commission
- Caltrans
- CAL FIRE
- California Statewide Communities Development Authority
- Foundation for Renewable Energy and Environment
- SLOCOG
- SoCalGas
- PG&E

To reduce costs and improve the CAP's effectiveness, actions should be pursued concurrently whenever possible. Funding sources the City decides to pursue will be identified as implementation occurs.

The City can, in part, provide funding for various measures outlined in this CAP. This can be accomplished through the City's annual budgeting and Capital Improvement Program process which provides an opportunity for citizen input and guides decision-makers while helping them set priorities. The City can also partner with SLOCOG, local jurisdictions within San Luis Obispo County, community-based organizations, and private companies for joint programs.

5.3.1 ENERGY-RELATED FUNDING SOURCES

Many of the financing and incentive programs relevant to the CAP concern energy infrastructure and conservation. Some of these programs are tied to the American Recovery Reinvestment Act economic stimulus package enacted by Congress in February 2009. Access to these funds will be available for a limited period. The City should seek the most up-to-date information regarding the programs listed below.

Strategic Growth Council Sustainable Communities Planning Grant Program

California Strategic Growth Council

On behalf of the Strategic Growth Council, the Department of Conservation manages competitive grants to cities, counties, and designated regional agencies to promote sustainable community planning and natural resource conservation. The grant program supports development, adoption, and implementation of various planning elements. The Sustainable Communities Planning Grant Program offers a unique opportunity to improve and sustain the wise use of infrastructure and natural resources through a coordinated and collaborative approach.

Urban Greening for Sustainable Communities Grant Program

California Strategic Growth Council

Because of the built-out nature of California's urban areas, the Urban Greening for Sustainable Communities Program provides funds to preserve, enhance, increase, or establish community green areas such as urban forests, open spaces, wetlands, and community spaces (e.g., community gardens). The goal is for these greening projects to incrementally create more viable and sustainable communities throughout the state. This program has both an Urban Greening Planning Program, which provides funds to assist entities in developing a master urban greening plan, and an Urban Greening Project Program, which provides funds for projects that preserve, enhance, increase or establish community green areas.

Urban and Community Forestry Grant Program

CAL FIRE

The CAL FIRE Urban and Community Forestry Program works to expand and improve the management of trees and related vegetation in communities throughout California. This program offers funding through a variety of grants. The Urban Forest Management Plan Grant funds the development and implementation of a management plan to be used by a jurisdiction to manage its urban forest. Such plans will be holistic and long-term, must include the entire jurisdiction and take an ecosystem management approach, and may include a minimum level of a training or educational component. Local jurisdictions may request between \$30,000 and \$100,000 and matching contributions totaling 25 percent of the total project cost is required. The Green Trees for the Golden State Grant provides funding for urban tree planting projects and up to two years of initial maintenance. Local jurisdictions may request between \$30,000 and \$100,000. Matching contributions totaling 25 percent of the total project cost is required.

California Investor Owned Utilities (IOUs) Programs

PG&E

California IOUs, such as PG&E, are required by the CPUC to offer energy efficiency programs to their customers. Each IOU program is unique; generally the programs offer rebates, financing assistance, design assistance, educational seminars, and other forms of assistance. PG&E's rebates may be calculated based on the amount of energy savings or, alternatively, may be fixed rate financial assistance for specific energy efficiency technology.

In conjunction with its rebates and incentives programs, PG&E offers an Energy-Efficiency Retrofit Loan Program, also known as On-Bill Financing. The program for public agencies includes: zero-percent financing on qualifying measures for up to ten years; offsets to energy-efficient upgrade costs after rebates and incentives through PG&E; loans ranging from a minimum of \$5,000 up to \$250,000 per meter; and loan installments added to monthly PG&E bills.

PG&E also offers the Green Communities and Innovator Pilots energy efficiency programs, which are administrated by PG&E, using funds from the Public Goods Charge (PGC) authorized by the California Public Utility Commission (CPUC). Customers of California's three largest investor-owned utility companies pay the PGC through their electric utility bills. Customers pay the surcharge per unit of consumption (kilowatt-hours). Money raised by the PGC are spent on

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services and programs deemed to be in the public interest, including energy efficiency initiatives such as Green Communities and Innovator Pilots.

SoCalGas

Southern California Gas Company offers On-Bill Financing with rebates for energy efficient natural gas equipment. For institutional customers, such as the City of Morro Bay, zero-percent financing is available from \$5,000 to \$250,000 per meter, with a maximum payback period of 10 years. Monthly loan payments are added directly to the customer's energy bill.

Energy Conservation Assistance Account Program (ECAA) Energy Efficiency Financing

California Energy Commission

The California Energy Commission offers low-interest loans (1-3 percent) to help local jurisdictions and other public agencies finance energy-efficient projects as part of the ECAA Program. Projects with proven energy and/or capacity savings are eligible, provided they meet the eligibility requirements. Examples of projects include: lighting systems, pumps and motors, energy efficient streetlights and traffic signals, automated energy management systems/controls, building insulation, renewable energy generation and combined heat and power projects, heating and air conditioning modifications, and wastewater treatment equipment. The maximum loan amount is \$3 million per application for 15 years. There is no minimum loan amount.

California Solar Initiative State Rebate Program

California Energy Commission & California Public Utilities Commission

California Solar Initiative will provide over \$2 billion in statewide incentives over the next decade for solar photovoltaic systems, as well as other solar thermal generating technologies, such as water heaters, on existing residential homes, and existing and new commercial, industrial, and agricultural properties. Photovoltaic incentives are available for systems up to one megawatt in size for homeowners, commercial/industrial, government and non-profit customers. The program pays solar consumers an incentive based on system performance.

California Feed-In Tariff

The California feed-in tariff allows eligible customer-generators to enter into 10-, 15- or 20-year standard contracts with their utilities to sell the electricity produced by small renewable energy systems -- up to three megawatts -- at time-differentiated market-based prices. Time-of-use adjustments will be applied by each utility and will reflect the increased value of the electricity to the utility during peak periods and its lesser value during off-peak periods. These tariffs are not available for facilities that have participated in the California Solar Initiative, Self-Generation Incentive Program, Renewables Portfolio Standard, or other ratepayer funded generation incentive programs, including net-metering tariffs. For customers generating renewable energy not covered by the California Solar Initiative or Self-Generation Incentive Program (e.g., biomass or geothermal) the feed-in tariff is applicable. If customers prefer a long-term contract at a fixed price over a financial incentive paid in the short term, feed-in tariffs may be a beneficial financing tool.

5.3.2 TRANSPORTATION-RELATED FUNDING SOURCES

Many federal, state, and regional grant programs are available to fund transportation and infrastructure improvements. The programs listed below represent the current status of the most relevant of these programs.

Livability Grant Programs

Federal Transportation Authority

The Federal Transportation Authority provides resources on sustainable communities and transit oriented development. This includes access to transit oriented development resources and training free of charge to local government employees. The Federal Transportation Authority's Livable and Sustainable Communities program supports initiatives that demonstrate ways to improve the link between public transit and communities. The Federal Transportation Authority offers a broad selection of Livability Grant Programs that fund projects for accessible, livable, and sustainable communities. In particular, the Bus and Bus Facilities Discretionary Program provides capital assistance for new buses and intermodal transit centers. The New Starts and Small Starts Program supports transit "guideway" capital investments, such as rapid rail, light rail, commuter rail, automated guideway transit, people movers, bus rapid transit, and other high occupancy vehicles. Additionally, the Intercity Bus Program supports transit access to residents in non-urbanized areas.

Alternative and Renewable Fuel and Vehicle Technology Program

California Energy Commission

Assembly Bill 118 created the Alternative and Renewable Fuel and Vehicle Technology Program, within the California Energy Commission. The statute authorizes the Energy Commission to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's GHG reduction goals and reduce our dependence on foreign oil. The statute allows the Energy Commission to use grants, loans, loan guarantees, revolving loans, and other appropriate measures. Eligible recipients include: public agencies, private businesses, public-private partnerships, vehicle and technology consortia, workforce training partnerships and collaboratives, fleet owners, consumers, recreational boaters, and academic institutions. The Energy Commission must prepare and adopt an Investment Plan and convene an Advisory Committee to assist in preparing the Investment Plan. The Energy Commission has an annual program budget of approximately \$100 million.

Community-Based Transportation Planning Grant Program

Caltrans

The Community-Based Transportation Planning Grant Program is primarily used to seed planning activities that encourage livable communities. Grants assist local agencies to better integrate land use and transportation planning, to develop alternatives for addressing growth, and to assess efficient infrastructure investments that meet community needs. These planning activities are expected to help leverage projects that foster sustainable economies, increase available affordable housing, improve housing/jobs balance, encourage transit oriented and mixed use development, expand transportation choices, reflect community values, and include non-traditional participation in transportation decision making.

Local Assistance Program

Caltrans

Caltrans' Local Assistance Program oversees more than one billion dollars in federal and state funds annually available to over 600 cities, counties, and regional agencies for the purpose of improving their transportation infrastructure or providing transportation services.

Safe Routes to School Programs

Caltrans

Caltrans administers two separate Safe Routes to School Programs—one state program and one federal program. Both programs are intended to achieve the same basic goal of increasing the number of children walking and bicycling to school by making it safer for them to do so. Both programs fund qualifying infrastructure projects.

Bicycle Transportation Account

Caltrans

The Bicycle Transportation Account is an annual program providing state funds for city and county projects that improve safety and convenience for bicycle commuters. Caltrans expects to appropriate \$7.2 million annually for projects, on a matching basis with local jurisdictions. A wide variety of projects are eligible, including but not limited to new bikeways serving major transportation corridors, new bikeways removing travel barriers, and secure bicycle parking.

Environmental Enhancement and Mitigation Program

Caltrans

The Environmental Enhancement and Mitigation Program offers a total of \$10 million each year for grants to local, state, and federal government agencies and to nonprofit organizations for projects to mitigate the environmental impacts caused by new or modified public transportation facilities. Eligible projects must be directly or indirectly related to the environmental impact of the modification of an existing transportation facility or construction of a new transportation facility. Two of the grant categories include Highway Landscaping and Urban Forestry Projects, which are designed to offset vehicular emissions of carbon dioxide through the planting of trees and other suitable plants, and Roadside Recreation Projects, which provide for the acquisition and/or development of roadside recreational opportunities.

Highway Safety Improvement Program

Caltrans

The Highway Safety Improvement Program provides federal funding for work on any public road or publicly owned bicycle/pedestrian pathway or trail that corrects or improves the safety for its users. The program is intended to reduce traffic fatalities and serious injuries on all public roads. Local jurisdictions, such as counties and cities, may apply to Caltrans for funding ranging from \$100,000 to \$900,000 per project. Federal reimbursements cover up to 90 percent of total project costs. Eligible projects include, but are not limited to, improvements for pedestrian or bicyclist safety, intersection safety improvements, and shoulder widening.

Community Development Block Grant

California Department of Housing and Community Development

The Community Development Block Grant (CDBG) program funds projects and programs that develop viable urban communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low and moderate income. Federal CDBG Grantees may use funds for activities that include, but are not limited to, acquiring real property; building public facilities and improvements, such as streets, sidewalks, and recreational facilities; and planning and administrative expenses, such as costs related to developing a consolidated plan and managing CDBG funds. The State makes funds available to eligible agencies (cities and counties) through a variety of different grant programs.

Infill Infrastructure Grant Program

California Department of Housing and Community Development

The Infill Infrastructure Grant Program assists in the new construction and rehabilitation of infrastructure that supports higher-density affordable housing and mixed-income housing in locations designated as infill. Eligible applicants include, but are not limited to, localities and public housing authorities.

National Recreational Trails Program

California Department of Parks and Recreation

In California, the National Recreational Trails Program is administered by Department of Parks and Recreation to provide funding to develop recreational trails and related facilities for uses such as bicycling and hiking.

Federal Transportation Improvement Program for the San Luis Obispo County Region

SLOCOG

The Federal Transportation Improvement Program (FTIP) is a comprehensive listing of federally funded surface transportation projects in San Luis Obispo County. SLOCOG prepares and adopts the FTIP every two years in close cooperation with stakeholders such as cities and counties. As part of the FTIP, SLOCOG plans for the spending of flexible funding from the federal Surface Transportation Program, which applies to the following types of projects: enhanced transit services, expanding technology, freeway express bus stops, ridesharing, vanpooling, parallel routes along major transportation corridors, and Park-n-Ride lots. SLOCOG selects projects that promote the strategies and policies of the Regional Transportation Plan.

The FTIP also includes the allocation of funding under the state Transportation Development Act (TDA). Each year, SLOCOG disburses approximately \$10 million in funding from the TDA toward bicycle and pedestrian infrastructure, traffic calming, and other planning and capital improvement projects in the region.

Infrastructure State Revolving Fund Program

California Infrastructure and Economic Development Bank

The Infrastructure State Revolving Fund Program provides low-cost financing to public agencies for a wide variety of infrastructure projects. Program funding is available in amounts ranging

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from \$250,000 to \$10 million, with loan terms of up to 30 years. Interest rates are set on a monthly basis. Eligible project categories include city streets, county highways, state highways, drainage, water supply and flood control, educational facilities, environmental mitigation measures, parks and recreational facilities, port facilities, public transit, sewage collection and treatment, solid waste collection and disposal, water treatment and distribution, defense conversion, public safety facilities, and power and communications facilities.

5.3.3 SOLID WASTE-RELATED FUNDING SOURCES

Beverage Container Recycling Grant and Payment Programs

California Department of Resources Recycling and Recovery (CalRecycle)

CalRecycle administers funding programs to assist organizations with establishing convenient beverage container recycling and litter abatement projects, and to encourage market development and expansion activities for beverage container materials. The Beverage Container Recycling Grant provides funding to local governments, businesses, individuals, and non-profit organizations for projects that implement new programs or enhance existing programs to provide convenient beverage container recycling opportunities in various locations statewide. Eligible projects include, but are not limited to, the following locations: parks and recreational areas, sporting complexes, community events, office buildings, multifamily dwellings, entertainment/hospitality venues, curbside, restaurants, and schools and colleges. CalRecycle issues up to \$1.5 million annually for this program. The City/County Payment Program provides a total of \$10.5 million in grant funds annually to eligible cities and counties for beverage container recycling and litter abatement activities. Each city is eligible to receive a minimum of \$5,000 or an amount calculated by the Department based on per capita, whichever is greater.

5.3.4 OTHER FUNDING SOURCES

Community Assistance Grant

Bureau of Land Management

Funds are available to assist with hazardous fuels treatments, community wildfire protection planning, and education addressing wildfire safety and hazard risk reduction within the wildland-urban interface. Treatments may be focused on both Federal (with prior approval from local Bureau of Land Management field staff) and non-federal lands and aimed toward protecting communities at risk and resource values identified within a Community Wildfire Protection Plan and/or Community Fire Plans with an interdisciplinary and interagency collaborative process.

Wildland Urban Interface Grant

Fish and Wildlife Service

Wildland Urban Interface funds are available for hazard mitigation projects that protect communities at risk of wildfire by reducing hazardous fuels (non-federal lands), developing Community Wildfire Protection Plans (includes associated planning and compliance documents), and implementing wildfire education and outreach initiatives.

Partnerships with Other Jurisdictions and Community Organizations

Partnering with neighboring jurisdictions and community organizations is a key implementation strategy supporting the CAP. Various jurisdictions and organizations within the County could serve as potential partners in implementing the CAP strategies. The City should seek to partner with appropriate local governments, as identified within CAP measures.

CHAPTER 6

REFERENCES AND
PREPARERS

6.0 References and Preparers

6.1 References

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GLOSSARY

OF TERMS

Glossary of Terms

Actions: The steps that will be taken to implement the Climate Action Plan measures.

Adaptation: The ability to adjust to, or minimize, the potential impacts of climate change or other environmental disturbances.

Baseline Emissions: The amount of GHG emissions released in a designated year against which future changes in emissions levels are measured.

Business-as-Usual: A scenario used for the projection of GHG emissions at a future date based on current technologies and regulatory requirements in absence of other reductions.

California Environmental Quality Act (CEQA): A statute that requires state and local agencies to evaluate the environmental impacts of private or public proposed projects they undertake or permit and to avoid or mitigate potentially impacts, if feasible. If a proposed action has the potential for a significant environmental impact, an environmental impact report (EIR) must be prepared and certified before action can be taken.

Carbon Dioxide (CO₂): A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic GHG that affects the Earth's radiative balance. It is the reference gas against which other GHGs are measured and therefore has a Global Warming Potential of 1.

Carbon Dioxide Equivalent (CO₂e): A metric used to compare the emissions from various greenhouse gases based upon their global warming potential, or potency. Carbon dioxide equivalents are commonly expressed as "metric tons of carbon dioxide equivalents" (MT CO₂e). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated global warming potential. For example, the global warming potential for methane is 21. This means that one metric ton of methane is equivalent to 21 metric tons of carbon dioxide.

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.

Chlorofluorocarbons (CFCs): A family of inert, nontoxic, and easily liquefied chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere, they drift into the upper atmosphere, where their chlorine components destroy ozone.

Climate: Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is three decades, as defined by the World Meteorological Organization. These quantities

are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate Action Plan: A description of the measures and actions that a local government will take to reduce GHG emissions and achieve an emissions reduction target. Most plans include a description of existing and future year emissions; a reduction target; a set of measures, including performance standards, that will collectively achieve the target; and a mechanism to monitor the plan and require amendment if it is not achieving specified levels. Interchangeable with GHG Reduction Plan.

Climate Change: Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from: natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; natural processes within the climate system (e.g. changes in ocean circulation); human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.).

Co-Benefit: Additional benefits that occur as a result of GHG reduction measures. These include financial savings, improved air quality, increased health or safety, natural resource conservation, reduced energy use, etc.

Connectivity: A well connected circulation system with minimal physical barriers that provides continuous, safe, and convenient travel for all users of streets, roads, and highways.

Emissions: The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

Emissions Factor: A set of coefficients used to convert data provided on energy use and energy use reductions to emissions. These emission factors are the ratio of emissions of a particular pollutant (e.g., carbon dioxide) to the quantity of the fuel used (e.g., kilograms of coal). For example, when burned, 1 ton of coal = 2.071 tons of CO₂.

Emissions Forecast: The projected emissions that would occur in a future year based on growth multipliers applied to the baseline year.

Energy Conservation: Reducing energy consumption. Energy conservation can be achieved through energy efficiency (getting the most productivity from each unit of energy) or by reduced use of energy such as turning off appliances when not in use.

Energy Efficiency: Using less energy to provide the same level of service or complete the same task. For example, a more efficient light will use less electricity to provide the same amount of illumination.

Fossil Fuel: A general term for combustible geologic deposits of carbon, including coal, oil, natural gas, oil shale, and tar sands. These fuels emit carbon dioxide into the atmosphere when burned, thus significantly contributing to the enhanced greenhouse effect.

Fuel Efficiency: The distance a vehicle can travel on an amount of fuel. This is most often measured in miles traveled per gallon of fuel. A higher-efficiency vehicle travels farther on a gallon of fuel than similar vehicles.

Global Warming: Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of GHGs.

Green Building: Green, or sustainable, building is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition.

Greenhouse Effect: Trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. Some of the heat flowing back toward space from the Earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases in the atmosphere and then reradiated back toward the Earth's surface. If the atmospheric concentrations of these GHGs rise, the average temperature of the lower atmosphere will gradually increase.

Greenhouse Gas (GHG): Any gas that absorbs infrared radiation in the atmosphere. GHGs include, but are not limited to, water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O₃), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Greenhouse Gas Emissions Inventory: A GHG emissions 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 (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs), which are referred to as the "six Kyoto gases."

Hydrofluorocarbons (HFCs): Man-made compounds containing hydrogen, fluorine, and carbon, many of which have been developed as alternatives to ozone-depleting substances for industrial, commercial, and consumer products, that have a range of global warming potentials. HFCs do not have the potential to destroy stratospheric ozone, but they are still powerful GHGs.

Infill Site: A site in an urbanized area that meets criteria defined in Public Resources Code Section 21061.3.

Intergovernmental Panel on Climate Change (IPCC): The IPCC was established jointly by the United Nations Environment Program and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world's expert scientists as authors and thousands as expert reviewers. Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences. With its capacity for reporting on climate change, its consequences, and the viability of adaptation and mitigation measures, the IPCC is also looked to as the official advisory body to the world's governments on the state of the science of the climate change issue. For example, the IPCC organized the development of internationally accepted methods for conducting national GHG emission inventories.

Kilowatt (kW): One thousand watts.

Kilowatt-hour (kWh): an amount of electricity equivalent to the use of one kilowatt for one hour. A hundred watt light bulb that is on for 10 hours uses one kilowatt-hour of electricity (100 watts x 10 hours = 1,000 watt-hours = 1 kilowatt-hour). Electricity production or consumption is often expressed as kilowatt- or megawatt-hours produced or consumed during a period of time.

Methane (CH₄): A hydrocarbon that is a GHG with a global warming potential estimated at 21 times that of carbon dioxide (CO₂). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

Measure: A way to reduce GHG emissions.

Metric Ton (MT): Common international measurement for the quantity of GHG emissions. A metric ton is equal to 2,205 pounds or 1.1 short tons.

Mitigation: An action to either reduce the amount of GHGs being emitted into the atmosphere or remove previously emitted gases from the atmosphere.

Mixed-Use: Mixed Use development means combining a variety of compatible land uses in a single development, and can be creatively used to create vibrant centers for living, working, and shopping. The primary purpose of the Mixed-Use land use designations is to implement the principals of smart growth by applying the designation to certain areas along the City's main transportation corridors that could successfully support a combination of uses (multi-family residential, retail, office uses, etc.) within a single development plan.

Natural Gas: Underground deposits of gases consisting of 50 to 90 percent methane and small amounts of heavier gaseous hydrocarbon compounds such as propane and butane.

Perfluorocarbons (PFCs): Potent GHGs that accumulate in the atmosphere and remain there for thousands of years. Aluminum production and semiconductor manufacture are the largest known man-made sources of perfluorocarbons.

Recycling: Collecting and reprocessing a resource so it can be used again. An example is collecting aluminum cans, melting them down, and using the aluminum to make new cans or other aluminum products.

Renewable Energy: Energy generated from sources that are naturally replenished or not used up in the course of providing power (e.g., wind, solar, biomass, and geothermal).

Retrofit: The addition of new technology or features to older systems. For example, adding new energy-efficient lamps to existing lighting fixtures.

Sector: A term used to describe GHG emission inventory source categories for GHGs based on broad economic sectors.

Smart Growth: A compact, efficient, and environmentally sensitive pattern of development that provides people with additional travel, housing, and employment choices by focusing future growth closer to existing and planned job centers and public facilities, while preserving open space and natural resources.

Solar Photovoltaic (PV): A system that converts sunlight directly into electricity using cells made of silicon or other conductive materials. When sunlight hits the cells, a chemical reaction occurs, resulting in the release of electricity.

Source: Any process or activity that releases a GHG into the atmosphere.

Target Year: The year by which the GHG emissions reduction target should be achieved.

Transportation Demand Management (TDM): A general term for strategies that increase overall system efficiency by encouraging a shift from single-occupant vehicle trips to non-single-occupant vehicle modes, or shifting auto trips out of peak periods. TDM seeks to facilitate this shift by increasing travel options, by providing incentives and information, or by reducing the physical need to travel through transportation-efficient land uses.

Vehicle-Miles Traveled (VMT): One vehicle traveling the distance of one mile. Total vehicle miles is the aggregate mileage traveled by all vehicles. VMT is a key measure of overall street and highway use. Reducing VMT is often a major objective in efforts to reduce vehicular congestion and achieve air quality goals.

APPENDIX A

GHG EMISSIONS INVENTORY



CITY OF MORRO BAY

Community-Wide and Government Operations Greenhouse Gas Emissions Inventory Update

Prepared for:



SAN LUIS OBISPO COUNTY AIR POLLUTION CONTROL DISTRICT
ON BEHALF OF THE CITY OF MORRO BAY

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GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

Credits and Acknowledgements

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APPENDICES

Appendix A: CACP2009 Detailed Report for Community-Wide Emissions, 2005

Appendix B: CACP2009 Detailed Report for City Government Operations Emissions, 2005

Appendix C: Detailed Methodology for Community-Wide Inventory

Appendix D: Detailed Methodology for City Government Operations Inventory

Appendix E: City Employee Commute Survey, 2010

Executive Summary

A greenhouse gas (GHG) emissions inventory identifies the major sources and quantities of GHG emissions produced by community activities and City government facilities and operations within a jurisdiction's boundaries for a given year. Estimating GHG emissions enables local governments to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdiction, set targets for future reductions, and create an informed mitigation strategy based on this information.

This Inventory includes a 2005 baseline inventory of GHG emissions from community activities and City government facilities and operations within the city¹, and a 2020 business-as-usual forecast of how emissions in Morro Bay would change if no further actions are implemented to reduce those emissions. It is important to note that the City government operations inventory is a subset of the community inventory, meaning that the city government's emissions are included within the community inventory.

The community inventory is divided into six sectors, or sources of emissions: transportation, residential energy use, commercial and industrial energy use, solid waste, off-road vehicles and equipment, and wastewater. The City government inventory provides a more detailed analysis of emissions resulting from City-owned or -operated buildings, fleet vehicles, and lighting; water and sewage transport; City-generated solid waste; and employee commute travel.

INVENTORY UPDATE PURPOSE

In 2010, PMC prepared an inventory of Morro Bay's 2005 community-wide and City government emissions. Changes to GHG accounting protocols have prompted an update to the emissions

¹ In this report, the term "city" refers to the area inside the jurisdictional boundary of the City of Morro Bay, whereas "City government" refers to those activities which are under the operational control of City agencies.

What are Greenhouse Gas Emissions (GHGs)?

Gases that trap heat in the Earth's atmosphere are called greenhouse gases, or GHGs. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. While many of these gases occur naturally in the atmosphere, modern human activity has led to a steep increase in the amount of GHGs released into the atmosphere over the last 100 years. Collectively, these gases intensify the natural greenhouse effect, thus causing global average surface temperatures to rise, which in turn affects global climate patterns. GHGs are often quantified in terms of CO₂ equivalent, or CO₂e, a unit of measurement that equalizes the potency of GHGs.

Source: [Intergovernmental Panel on Climate Change \(IPCC\), 2007](#)

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

inventory and in 2012 Rincon Consultants conducted a peer-review and update to the Inventory. This Inventory is the updated assessment of GHG emissions in Morro Bay.

Rincon updated the Inventory methodology, emissions coefficients, and data for consistency with current protocols, including the Local Government Operations Protocol (LGOP) version 1.1 (May 2010), for the city government inventory, and the Association of Environmental Professionals (AEP) California Community-wide GHG Baseline Inventory Protocol (AEP Protocol) (June 2011) and ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP) (October 2009), for the community-wide inventory. Rincon also updated the Inventory to include all emissions sectors within the discretionary action authority of the City. The primary additions and revisions to the updated Inventory include the following:

- Calculation of emissions from additional off-road vehicle and equipment categories (lawn and garden equipment, construction equipment, industrial equipment, and light commercial equipment) for the community-wide inventory.
- Incorporation of improved emissions factors from the LGOP version 1.1.
- Incorporation of a refined methodology for on-road transportation emissions. The 2012 methodology estimates vehicle miles traveled (VMT) based on an origin-destination approach using the regional travel demand model and excludes vehicle trips that pass through the city. Transportation-related GHG emissions were then calculated using the California Air Resources Board Emissions Factor 2011 (EMFAC2011) software.
- Corrections to baseline electricity and natural gas consumption data, and waste stream profile data.
- Inclusion of updated population and employment projections using the San Luis Obispo Council of Governments' (SLOCOG) 2040 Population, Housing & Employment Forecast (August 2011).²
- Identification of methane emissions from wastewater treatment processes for the community-wide inventory

² SLOCOG's 2040 Population, Housing & Employment Forecast includes population, housing, and employment projections developed based on an analysis of historic growth and economic trends. See *San Luis Obispo County 2040 Population, Housing & Employment Forecast* (August 2011) for details.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

As a result of the Inventory update, Morro Bay’s community-wide 2005 baseline emissions decreased by 12,259 metric tons CO₂e and the 2020 forecast decreased by 23,194 metric tons CO₂e compared to the January 2011 inventory.

COMMUNITY-WIDE GHG INVENTORY RESULTS

The community of Morro Bay emitted approximately 55,677 metric tons of carbon dioxide equivalent (CO₂e) emissions in the baseline year 2005. As shown in **Figure ES-1** and **Table ES-1**, the transportation sector was the largest contributor to emissions (40.4%), producing approximately 22,506 metric tons of CO₂e in 2005. Transportation sector emissions are the result of diesel and gasoline fuel used in vehicles traveling on local roads and state highways within the jurisdictional boundaries of Morro Bay. Emissions from electricity and natural gas consumed in the residential sector were the next largest contributor (28.9%), producing approximately 16,094 metric tons of CO₂e. Electricity and natural gas consumed in the commercial and industrial sector combined accounted for 20.6% of the total. Emissions from landfilled solid waste comprised 4.8% of the total, emissions from off-road vehicles and equipment comprised 4.9%, and emissions from methane from wastewater treatment processes comprised 0.4%.

FIGURE ES-1: COMMUNITY GHG EMISSIONS BY SECTOR, 2005

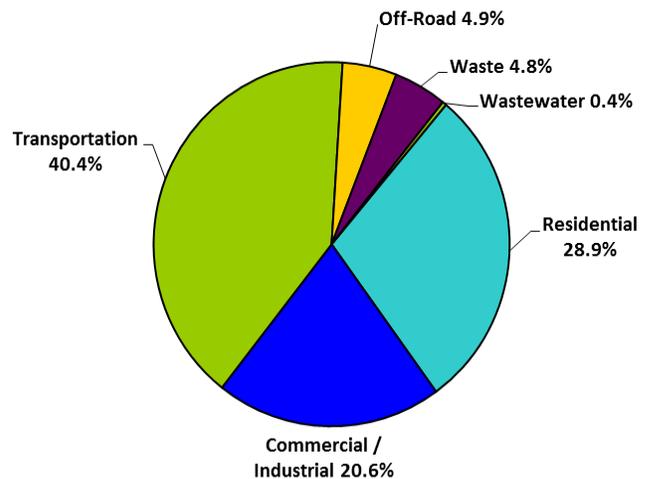


TABLE ES-1: COMMUNITY GHG EMISSIONS BY SECTOR, 2005

2005 Community Emissions by Sector	Residential	Commercial/Industrial	Transportation	Off-Road	Waste	Waste water	TOTAL
CO ₂ e (metric tons)	16,094	11,442	22,506	2,740	2,695	200	55,677
Percentage of Total CO ₂ e	28.9%	20.6%	40.4%	4.9%	4.8%	0.4%	100%

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

CITY GOVERNMENT OPERATIONS GHG INVENTORY RESULTS

City government operations and facilities produced approximately 1,955 metric tons of GHG emissions in 2005. As displayed in **Figure ES-2**, this represents approximately 3.5% of total community-wide emissions in the city. City government emissions result from waste, energy consumption from water and wastewater facilities, buildings, streetlights and other facilities, fuel consumption by the vehicle fleet and employee commutes, and miscellaneous equipment. The largest contributor to the City's emissions (23.1%) was from wastewater facilities. Waste water facilities produced 451 metric tons of carbon dioxide equivalents. Employee commute was the second largest contributor to the City's emissions (21.2%). Employees commuting to and from work produced 414 metric tons of carbon dioxide equivalents. The vehicle fleet and transit fleet, and buildings and facilities were the next largest contributors (23.9% and 16.5%) producing 468 and 322 metric tons of carbon dioxide equivalent, respectively. Solid waste, water delivery infrastructure, and streetlights and traffic signals contributed the remaining 15.3% of the City's total emissions (refer to **Figure ES-3** and **Table ES-2**).

FIGURE ES-2: CITY GOVERNMENT PORTION OF COMMUNITY-WIDE GHG EMISSIONS

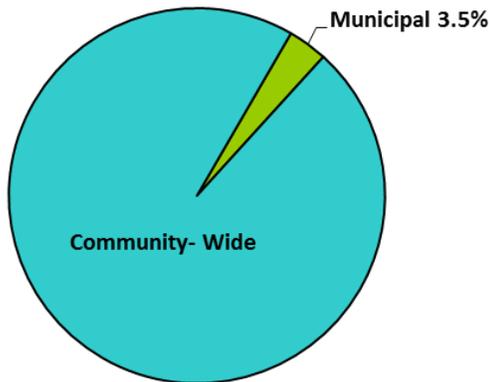
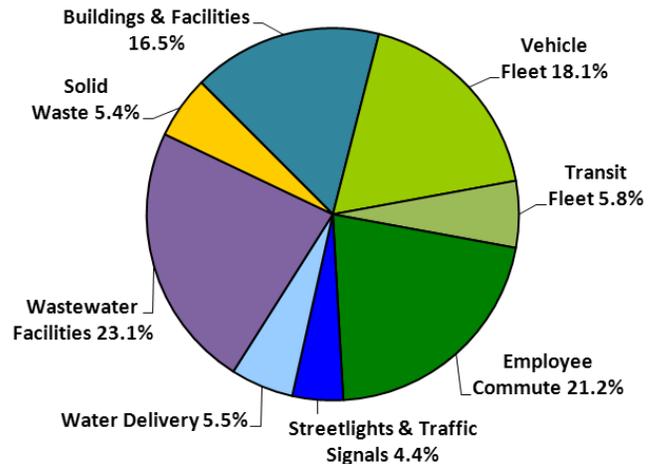


FIGURE ES-3: CITY GOVERNMENT OPERATIONS GHG EMISSIONS BY SECTOR, 2005



GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

TABLE ES-2: CITY GOVERNMENT GHG EMISSIONS BY SECTOR, 2005

2005 Emissions by Sector	Buildings & Facilities	Vehicle Fleet	Transit Fleet	Employee Commute	Street Lights & Traffic Signals	Water Delivery	Waste-water Facilities	Solid Waste	TOTAL
CO ₂ e (metric tons)	322	355	113	414	87	107	451	106	1,955
Percentage of CO ₂ e	16.5%	18.2%	5.8%	21.2%	4.5%	5.5%	23.1%	5.4%	100.0 %

City government operations emissions are a subset of the total community-wide emissions as outlined above. However, similar to the way in which businesses and factories perform their own facility-scale GHG Inventories this Inventory analyzes City emissions separately to identify opportunities for cost-savings and emissions-reduction in the future. The methodology for estimating emissions from local government operations is guided specifically by the LGOP version 1.1 (May 2010) developed by the California Air Resources Board, ICLEI – Local Governments for Sustainability, and the California Climate Registry.

DATA LIMITATIONS

This Inventory captures the major sources of GHGs caused by activities within the city per standard practice. However, it is important to note that some likely emission sources were not included in the Inventory, either because of privacy laws, lack of data, or a lack of reasonable methodology for calculating emissions. It is estimated that the sources not included in the inventory comprise less than 5.0% of total emissions in the city. It is likely that as GHG inventories become more common, methodology and accessibility to data will improve.

The sources that could not be included due to privacy laws, lack of data availability, and/or a reasonable methodology include the following:

- Refrigerants from City government operations facilities and vehicles, and the community-at-large
- Propane, wind or solar energy consumed by the community-at-large;
- Recreational off-road equipment and vehicles;
- Recreational and commercial watercraft; and

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

- Residential septic tanks systems.

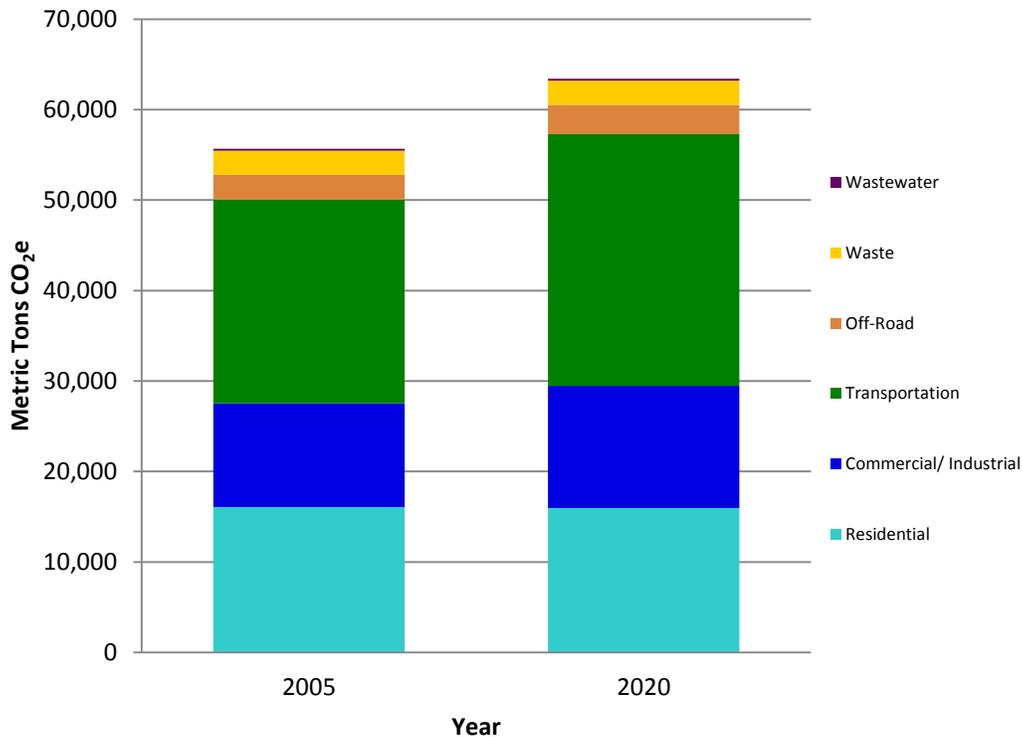
These limitations are explained further in this document.

BUSINESS-AS-USUAL FORECAST

The GHG emissions forecast provides a “business-as-usual estimate,” or scenario, of how emissions will change in the year 2020 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32.

As shown in **Figure ES-4** and **Figure ES-5**, if consumption trends continue the pattern observed in 2005 (i.e., under business-as-usual conditions) emissions will reach 63,395 metric tons of CO₂e by 2020, or a 13.9% increase over 2005 baseline levels (projections based on population and employment growth).

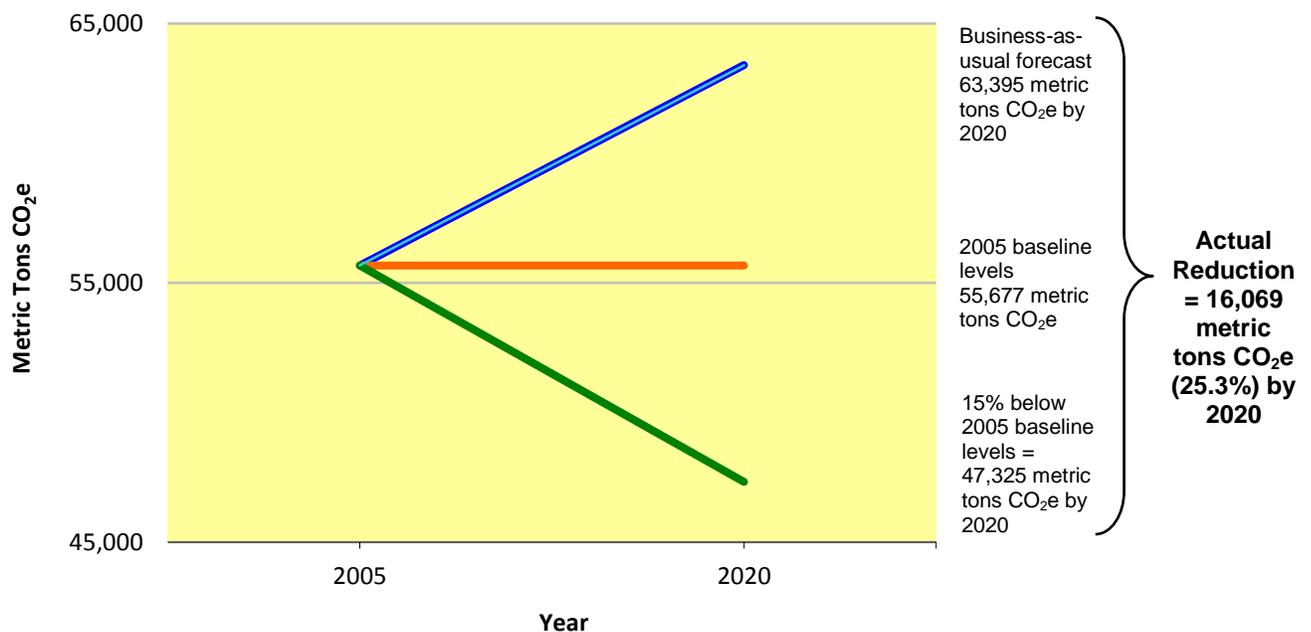
**FIGURE ES-4: 2020 CITY OF MORRO BAY
BUSINESS-AS-USUAL GHG EMISSIONS FORECAST**



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With this information, the City can make an informed determination regarding a reduction target. Conformance with the State of California's recommended reduction of 15% below present levels by 2020 would require a 25.3% reduction below the city's business-as-usual emissions (refer to Figure ES-5).³

FIGURE ES-5: BUSINESS-AS-USUAL FORECAST IN RELATION TO STATE-RECOMMENDED REDUCTION TARGET



³ AB 32 Scoping Plan, page 27 states that the California Air Resources Board encourages local governments to “move toward establishing similar goals for community emissions that parallel the State commitment to reduce GHG emissions by approximately 15 percent from current levels by 2020.” <http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm>

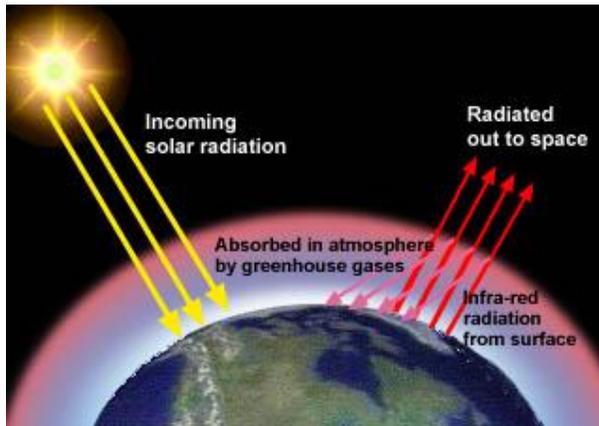
1. Introduction

This section introduces the Inventory, defines key terms used throughout the Inventory, and provides an overview of climate change science and regulation in California.

1.1 PURPOSE OF A GHG INVENTORY

This Inventory represents completion of the first step in the City's climate protection process. Quantifying recent-year emissions is essential to establish: (1) a baseline against which to measure future emission levels, and (2) an understanding of where the highest percentages of emissions are coming from, and, therefore, the greatest opportunities for emissions reductions. This Inventory presents estimates of GHG emissions in 2005 resulting from the community as a whole.

**FIGURE 1-1:
THE GREENHOUSE EFFECT**



Source: Tufts University

Climate Change – Scientific Background

Scientific consensus holds that the world's population is releasing GHGs 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. This release of gases, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), creates a blanket around the earth that allows light to pass through but traps heat at the surface preventing its escape into space (**Figure 1-1**). Known as the greenhouse effect, models show that this phenomenon could lead to a 2°F to 10°F temperature increase over the

next 100 years. The Intergovernmental Panel on Climate Change (IPCC) warns that most of the warming observed over the last 50 years is attributable to human activities.⁴

Although used interchangeably, there is a difference between the terms “climate change” and “global warming.” According to the State, climate change refers to “any long-term change in

⁴ Intergovernmental Panel on Climate Change. Fourth Assessment Report, Working Group I. 2007. Climate Change 2007: The Physical Science Basis, Summary for Policy Makers.

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average climate conditions in a place or region, whether due to natural causes or as a result of human activities.⁵ The use of the term “climate change” is becoming more prevalent because it encompasses all changes to the climate, not just temperature. Additionally, the term “climate change” conveys temporality, implying that climate change can be slowed with the efforts of local, regional, state, national, and world entities.

Changes in the earth’s temperature will have impacts for residents and businesses in the City of Morro Bay. Some of the major impacts to the Central Coast expected to occur include the following, separated by sector.⁶⁷

- **Coastline:** Morro Bay’s coastline could face inundation as a result of sea level rise and global warming. As temperatures rise, the ocean waters rise as well due to thermal expansion and the melting of glaciers and snowpack. The state’s 2009 Climate Change Impacts Assessment (the 2009 Scenarios Project) estimates that sea levels will rise by 12 to 18 inches by 2050 and 21 to 55 inches by 2100. This level of sea rise has the potential to negatively affect groundwater salination as well as the size and attractiveness of local beaches, which could affect property values and the tourism industry in the county;
- **Reduced Water Supply:** The 2009 Scenarios Project estimates a decrease in precipitation of 12-35% by 2050. In addition, more precipitation will fall as rain rather than snow, which will cause snow to melt earlier in the year and not in the warmer, drier months when water is in higher demand;
- **Agriculture:** Climate change could cause a shift in the type and location of agriculture in the area. As saltwater intrudes into coastal aquifers and groundwater resources decrease, it is possible that some crops will be forced out of the area, which affects the local economy and food supply. Water supplies to agriculture may be 20-23% below demand targets between 2020 and 2050;
- **Public Health:** Climate change could potentially threaten the health of residents of Morro Bay. Heat waves are expected to have a major impact on public health. There is also

⁵ California Natural Resources Agency. 2009 California Climate Adaptation Strategy Discussion Draft. August 2009.

⁶ California Climate Change Center. Our Changing Climate: Assessing the Risks to California (2006), www.climatechange.ca.gov

⁷ Governor’s Office of Planning and Research (OPR). Proposed CEQA Guideline Amendments for Greenhouse Gas Emissions. April 2009.

expected to be an increase in allergenic plant pollen and an increase in the frequency of wildfires. Although one city cannot resolve the issue of climate change, local governments can make a positive impact through cumulative local action. Cities and counties have the ability to reduce GHG emissions through effective land use and transportation planning, wise waste management, and the efficient use of energy. The City can achieve multiple benefits including lower energy bills, improved air quality, economic development, reduced emissions, and better quality of life through:

- Energy efficiency in City facilities and vehicle fleet;
- Sustainable purchasing and waste reduction efforts;
- Land use and transportation planning; and
- Efficient management of water resources.

This Inventory serves as a baseline measurement for implementing and tracking the effectiveness of these efforts.

1.2 CLIMATE CHANGE – LEGISLATIVE BACKGROUND

California continues to be a leader in addressing climate change in the United States and in the world. In June of 2005, Governor Schwarzenegger issued a landmark Executive Order establishing progressive GHG emissions targets for the entire state. Executive Order (EO) S-3-05 makes the following goals:

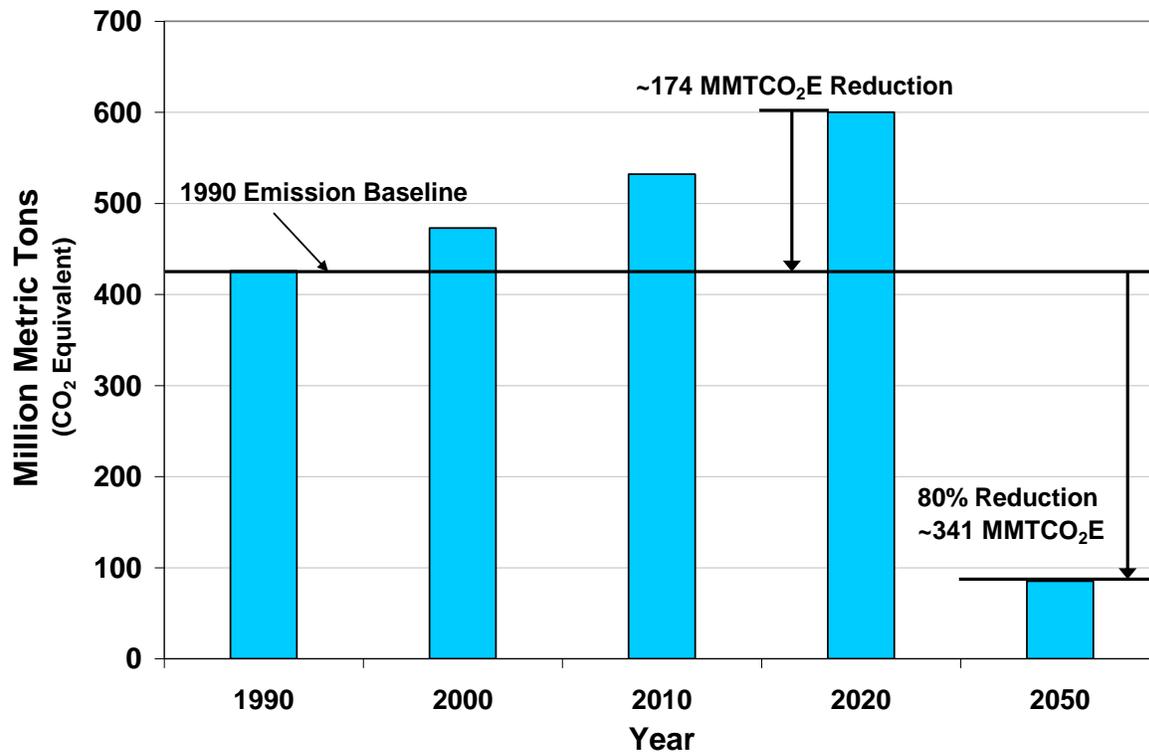
- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels;
- By 2050, reduce GHG emissions to 80% below 1990 levels.

To support these reduction targets, the California legislature adopted the California Global Warming Solutions Act of 2006, also known as Assembly Bill (AB) 32. The law requires the California Air Resources Board (CARB) to develop regulatory and market mechanisms that will reduce GHG emissions to 1990 levels by 2020 as shown in **Figure 1-2** below. To achieve this goal, CARB developed a set of early action measures in 2007 for priority implementation in 2010. These early action measures became part of the AB 32 implementation plan, or Scoping Plan, approved in December 2008. The Scoping Plan identifies a variety of GHG reduction activities including direct regulations, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade, and an implementation fee regulation to

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fund the program. The Scoping Plan also identifies local governments as “essential partners” and calls for cities and counties to adopt GHG reduction targets consistent with AB 32.

FIGURE 1-2: CALIFORNIA CLIMATE CHANGE EMISSIONS AND TARGETS



In support of the AB 32 reduction targets, California adopted Senate Bill (SB) 97 in August 2007, which formally acknowledges that climate change is an important environmental issue that requires analysis under the California Environmental Quality Act (CEQA). In response to SB 97, the Governor’s Office of Planning and Research (OPR) submitted their proposed amendments to the CEQA Guidelines for GHG emissions in April 2009. The Guidelines were formally adopted in February 2010. These revised CEQA Guidelines provide guidance to public agencies regarding the analysis of climate change and GHG emissions in CEQA documents.⁸

⁸ Governor’s Office of Planning and Research (OPR). CEQA Guideline Amendments for Greenhouse Gas Emissions. February 2010.

At the same time, the State is working to form regional approaches to reducing GHG emissions in response to the passage of Senate Bill 375. SB 375 aims to reduce GHG emissions by linking transportation funding to land use planning. It also requires Metropolitan Planning Organizations, including SLOCOG, to include a Sustainable Communities Strategy (SCS) in their Regional Transportation Plans (RTPs) for reducing suburban sprawl. The bill also creates incentives for implementation of sustainable communities strategies and sustainable transportation plans.

Additional efforts are under way for the overall transportation sector by mandating fewer emissions from vehicles, including Assembly Bill 1493, signed into law in 2002, which will require carmakers to reduce emissions from new passenger cars and light trucks beginning in 2009. US Environmental Protection Agency (EPA) approved the new emissions standards in June 2009.

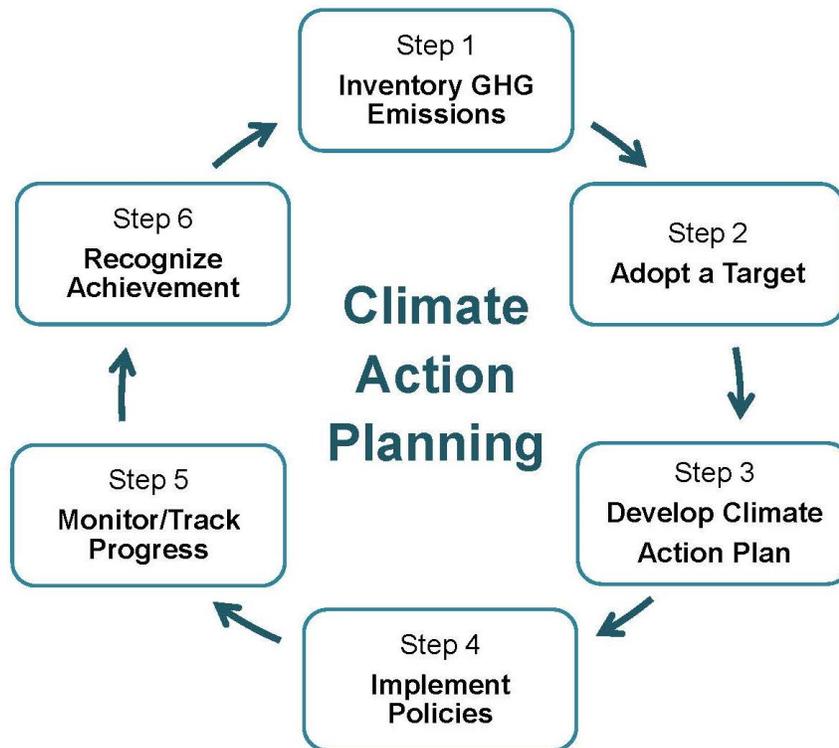
The State is also preparing for climate change resiliency in order to adapt to the inevitable effects of climate change. In November 2008, Governor Schwarzenegger signed Executive Order S-13-08 which asked the Natural Resources Agency to identify how state agencies can respond to rising temperature, changing precipitation patterns, sea level rise, and extreme natural events. The order requires the Natural Resources Agency to develop a Climate Adaptation Strategy (CAS) to analyze climate change impacts to the state and recommend strategies to manage those threats. The Natural Resources Agency released a discussion draft of the CAS in August 2009.

1.3 PLANNING PROCESS

The California Air Resources Board (ARB) provides a framework for local communities to identify and reduce GHG emissions, organized along six steps as represented in **Figure 1-3** below.⁹

⁹ California Air Resources Board. Local Government Toolkit, <http://www.coolcalifornia.org/local-government>

FIGURE 1-3: PLANNING PROCESS



This report represents the completion of the first step, and provides a foundation for future work to reduce GHG emissions in the City of Morro Bay.

1.4 LOCAL SUSTAINABILITY AND CLIMATE CHANGE MITIGATION ACTIVITIES

Many of the air pollution programs already in place throughout San Luis Obispo County reduce ozone forming pollutants and toxic emissions, but they also have ancillary benefits and reduce GHG emissions. The County, cities, and the Air Pollution Control District (APCD) implement rules and regulations, clean fuels programs, CEQA mitigation measures, grants, the Transportation Choices Program, pollution prevention activities, energy efficiency and conservation measures, water conservation programs, partnerships, and general public outreach that directly or indirectly address climate change and reduce GHG emissions.

The APCD Board approved the first report or plan to address climate change in the county. The plan, (Options for Addressing Climate Change in San Luis Obispo County (2005) identifies the

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following seven actions that could be implemented to specifically address GHGs at the local level:

- 1) Prepare a countywide inventory of GHG emissions;
- 2) Target a percentage of mitigation grant funds for GHG emission reductions;
- 3) Evaluate and quantify the GHG reduction benefits from existing district programs;
- 4) Develop public education and outreach campaigns on climate change;
- 5) Encourage and provide support for local governments to join the Cities for Climate Protection program;
- 6) Develop partnership with Cal Poly for addressing climate change; and
- 7) Join the California Climate Registry and encourage local industry participation.

As of November 2008, the APCD has initiated, promoted, or supported all of the implementation actions to address climate change and reduction of GHG emissions in the county. The APCD joined the California Climate Registry and conducted its GHG emissions inventory in the fall of 2008. The APCD facilitates regular meetings of Climate Change Stakeholders, a local group of city and county representatives that shares resources to address climate change. To encourage and support local GHG emissions inventories, the APCD is providing technical assistance to all of the incorporated cities to assist or perform GHG government operations and community-wide emissions inventories, similar to this Inventory, for all of the incorporated cities in San Luis Obispo County.

The APCD also coordinates the Central Coast Clean Cities Coalition (C5). C5 is a partnership of public/private entities whose goal is to promote the use of alternative fuels vehicles (AFV) on the Central Coast. By working with area fleet operators, C5 sponsors training seminars, public events, and grant funding workshops related to use of alternative fuels.

The City of Morro Bay has been pursuing energy efficiencies through such measures as:

- Implementation of a green building incentive program and partnership with SLO Green Build to promote energy efficiency in new development;
- Appliance rebate programs;
- Toilet retrofit program;

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- Water conservation rebate program;
- Home Investment Partnership Program to promote home energy efficiency and retrofits;
- Implementation of construction and demolition recycling program;
- Implementation of green waste/composting program and curbside recycling program to reduce waste sent to landfills;
- Construction of new and improvement of existing bike lanes and sidewalks along the harbor and North Main Street;
- Participation in the San Luis Obispo County Energy Watch Partnership;
- Tree planting and maintenance program; and
- Energy recovery projects at the desalination plant.

1.5 GHG EMISSIONS INVENTORY UPDATE

In 2011, PMC prepared an inventory of Morro Bay's 2005 community-wide and City government emissions. Changes to GHG accounting protocols have prompted an update to the emissions inventory and in 2012 Rincon Consultants conducted a peer-review and update to the Inventory. This Inventory is the updated assessment of GHG emissions in Morro Bay.

Rincon updated the Inventory methodology, emissions coefficients, and data for consistency with current protocols, including the Local Government Operations Protocol (LGOP) version 1.1 (May 2010), for the city government inventory, and the Association of Environmental Professionals (AEP) California Community-wide GHG Baseline Inventory Protocol (AEP Protocol) (June 2011) and ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP) (October 2009), for the community-wide inventory. Rincon also updated the Inventory to include all emissions sectors within the discretionary action authority of the City. The primary additions and revisions to the updated Inventory include the following:

- Calculation of emissions from additional off-road vehicle and equipment categories (lawn and garden equipment, construction equipment, industrial equipment, and light commercial equipment) for the community-wide inventory.
- Incorporation of improved emissions factors from the LGOP version 1.1.
- Incorporation of a refined methodology for on-road transportation emissions. The 2012 methodology estimates vehicle miles traveled (VMT) based on an origin-destination

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approach using the regional travel demand model and excludes vehicle trips that pass through the city. Transportation-related GHG emissions were then calculated using the California Air Resources Board Emissions Factor 2011 (EMFAC2011) software.

- Corrections to baseline electricity and natural gas consumption data, and waste stream profile data.
- Inclusion of updated population and employment projections using the San Luis Obispo Council of Governments' (SLOCOG) 2040 Population, Housing & Employment Forecast (August 2011).
- Identification of methane emissions from wastewater treatment processes for the community-wide inventory

As a result of the Inventory update, Morro Bay's community-wide 2005 baseline emissions decreased by 12,259 metric tons CO₂e and 2020 forecast decreased by 23,194 metric tons CO₂e compared to the January 2011 inventory.

2. Community and Government Operations Inventory Methodology

The first step toward reducing GHG emissions is to identify baseline levels and sources of emissions in the city. This information can later inform the selection of a reduction target and possible reduction measures to be included in a climate action plan.

This section outlines the methodology used to calculate the community and City government operations¹⁰ inventories, including the difference between the two inventories, and the data collection process, data sources, GHG emission scopes, data limitations, and means of calculation.

2.1 BASELINE AND FORECAST YEARS

The year 2005 was selected as the baseline year for the Inventory due to the availability of reliable data and consistency with other cities in San Luis Obispo County. The State of California uses 1990 as a reference year to remain consistent with the Kyoto Protocol, and also because it has well-kept records of transportation trends and energy consumption in that year. However, cities and counties throughout California typically elect to use 2005 or 2006 as a baseline year because of the more reliable recordkeeping from those years and because of the large amount of growth that has occurred since 1990.

This Inventory uses a forecast year of 2020 to be consistent with the State of California GHG Inventory¹¹ forecast year and AB 32 target, both of which reference 2020. In addition, it is likely that any forecast considerably beyond 2020 would have a significant margin of error because of unknown population growth rates and new technology.

2.2 THE TWO INVENTORIES: COMMUNITY-WIDE AND CITY GOVERNMENT OPERATIONS

This Inventory is separated into two sections, community-wide and City government operations. It is important to note that the City government operations inventory is a subset of the community inventory, meaning that all City government operations are included in the commercial/industrial, transportation, waste, or “other” categories of the community-wide

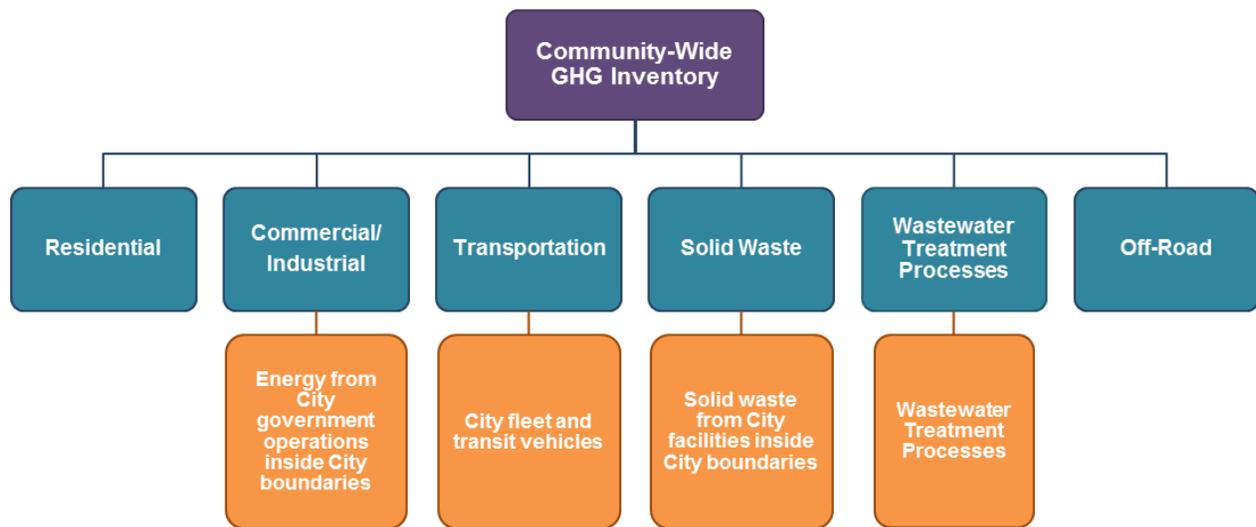
¹⁰ In this report, the term “city” refers to the incorporated area (the jurisdictional boundary of the City of Morro Bay), whereas “City” refers to those activities that are under the operational control of City agencies. “Community-wide” or “community” refers to all activities within the city (as defined above), including those from businesses, industrial processes, residents, vehicles, and City government operations.

¹¹ California Greenhouse Gas Inventory, <http://www.arb.ca.gov/cc/inventory/inventory.htm>

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inventory. The City's government operations inventory should not be added to the community analysis; rather it should be looked at as a slice of the complete picture as illustrated in **Figure 2-1**. Although City operations are a small contributor to the community's overall emissions levels, an inventory allows the City to track its individual facilities and vehicles and to evaluate the effectiveness of its emissions reduction efforts at a more detailed level.

FIGURE 2-1: THE RELATIONSHIP BETWEEN COMMUNITY-WIDE AND CITY GOVERNMENT INVENTORIES



Once completed, these inventories provide the basis for policy development, the quantification of emissions reductions associated with proposed measures, the creation of an emissions forecast, and the establishment of an informed emissions reduction target.

2.3 DATA COLLECTION AND METHODOLOGY

Creating the community and City government operations emissions inventories required the collection of information from a variety of sources. Sources for community data included the Pacific Gas and Electric Company (PG&E), the Southern California Gas Company, Caltrans, the California Air Resources Board, Cal-Recycle, and the County of San Luis Obispo. City government operations data sources included PG&E, the Southern California Gas Company, Morro Bay Garbage Service, and documentation from multiple City departments including Administration Services, Fire and Police Departments, Public Services, and more. Data from the year 2005 were used in both inventories, with the following exceptions:

- A subset of waste data by type was not available for 2005, therefore this study utilizes a California statewide waste characterization study conducted in 2003-2004;

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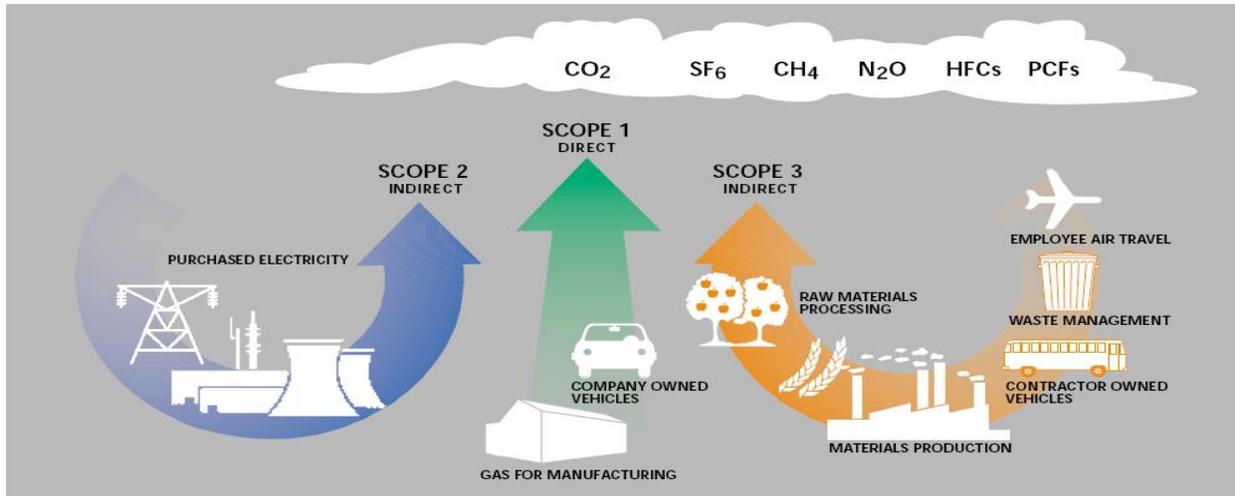
- City employee commuting trips were calculated using an employee survey conducted in 2009; and
- Propane, wind and solar power used in the within the City's geographic boundary.

For community activities and City operations, emissions sources are categorized by scope. Scopes help us identify where emissions originate from and what entity retains regulatory control and the ability to implement efficiency measures. The scopes are illustrated in **Figure 2-2** and defined as follows:

- **Scope 1.** Direct emissions sources located within the community, mostly from the combustion of fuels. Examples of Scope 1 sources include use of fuels such as gasoline and natural gas.
- **Scope 2.** Indirect emissions that result because of activities within the community, limited to electricity, district heating, steam and cooling consumption. An example of a Scope 2 source is purchased electricity used within the community. These emissions should be included in the 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 within the community. 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 community.

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FIGURE 2-2: GHG EMISSIONS SCOPES



Source: NZBCSD (2002), The Challenge of GHG Emissions: the “why” and “how” of accounting and reporting for GHG emissions: An Industry Guide, New Zealand Business Council for Sustainable Development, Auckland.

Appendices A and B of this report separate the community and City government operations emissions by scope. Each sector is labeled with a 1, 2, or 3 that corresponds to the scopes above.

2.4 DATA SOURCES

The data used to complete this Inventory came from multiple sources, as summarized in **Tables 2-1** and **2-2**. Utility providers supplied electricity and natural gas consumption data associated with commercial, industrial, residential, and City government buildings in 2005. Vehicle miles traveled (VMT) information was provided by Fehr and Peers and calculated using SLOCOG’s Regional Travel Demand model. These data sources are further explained in the sector-specific discussions of this document.

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TABLE 2-1: DATA SOURCES FOR COMMUNITY ANALYSIS, 2005

Sector	Information	Unit of Measurement	Data Source
Residential	Electricity consumption	kWh	PG&E
	Natural gas consumption	Therms	Southern California Gas Company
Commercial/Industrial	Electricity consumption	kWh	PG&E
	Natural gas consumption	Therms	Southern California Gas
Transportation	VMT excluding pass through trips	Average Weekday Daily VMT	Fehr & Peers
Solid Waste	Solid waste tonnage sent to landfill from activities in City of Morro Bay	Short tons	San Luis Obispo Integrated Waste Management Board
Wastewater Treatment Facilities	Methane and nitrous oxide released in the wastewater treatment process	Tonnes	Public Works Department Data Records
Off-Road Vehicles and Equipment	Emissions from off-road equipment	Tons/year of N ₂ O, CO ₂ , and CH ₄	California Air Resources Board OFFROAD2007 model

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**TABLE 2-2: DATA SOURCES FOR CITY GOVERNMENT OPERATIONS
ANALYSIS, 2005**

Sector	Information	Unit of Measurement	Data Source
Buildings & Facilities	Electricity consumption	kWh	PG&E
	Natural gas consumption	Therms	Southern California Gas Company
Vehicle Fleet	Diesel consumption and corresponding vehicle type	Gallons	Billing Records
	Gasoline consumption and corresponding vehicle type	Gallons	Billing Records
Employee Commute	Sample of employee commuting patterns	Annual VMT	Commuter Survey (June 2010)
Streetlights	Electricity consumption	kWh	PG&E Data Records
Water/Sewage	Electricity consumption	kWh	PG&E Data Records
	Methane and nitrous oxide released in the wastewater treatment process	Tonnes	Public Works Department Data Records
Waste	Annual waste tonnage sent to landfill	Tons	Billing Records

2.5 DATA LIMITATIONS

It is important to note that calculating community-wide GHG emissions with precision is a complicated task. The ICLEI Clean Air and Climate Protection (CACP2009) software relies on numerous assumptions and is limited by the quantity and quality of available data. Because of these limitations it is useful to think of any specific number generated by the model as an approximation of reality, rather than an exact value. The city's actual 2005 GHG emissions are likely to be *slightly* greater than what are reported in this document due to three main factors: (1) data limitations, (2) privacy laws, and (3) a lack of a reasonable methodology to collect or model emissions data. The following paragraphs highlight emissions that cannot be included in a GHG Inventory under current science and policy direction, or due to lack of reliable data.

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Data Limitations

Lack of available data prevented the calculation of emissions from community-wide freight and passenger trains, propane use, and City government operations refrigerants. For rail and port, as well as equipment emissions, the California Air Resources Board OFFROAD 2007 software provides emissions data; however, these numbers are aggregated for the entire San Luis Obispo County area, including incorporated, unincorporated, and state or federally owned land.

Lack of data availability also prevents the calculation of emissions from propane (liquefied petroleum gas, or LPG) created within the city's boundaries. Propane is basically 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. Another sector that was excluded from the inventory is City government operations refrigerants.

The City of Morro Bay made a best effort to gather data on the amount of refrigerants consumed by fleet vehicles, HVAC systems, and City government operations facilities; however City records were not suited to this purpose. It is recommended that the City look into amending its record keeping so that the amount of refrigerants purchased and consumed within a year is recorded.

Privacy Laws

This Inventory does not separately analyze site-level emissions from specific sources such as refineries or large industrial emitters. The emissions from industrial energy consumption and related transportation are included under the commercial/industrial category, but will not be analyzed independently as part of this Inventory for two reasons:

- 1) State privacy laws prevent us from obtaining site-level energy consumption data from utility providers. Notably the California Public Utilities Commission 15/15 rule,¹² prevents us from analyzing industrial emissions separately from commercial emissions.
- 2) It is the responsibility of the emitter, whether it is a large refinery or household, to perform their own energy audit and subsequent reduction process. Efforts to require site-level energy audits and GHG emissions reporting are being continually expanded and required by the California Climate Action Registry, U.S. Environmental Protection Agency, and California Air Resources Board.

¹² Commercial and Industrial Electricity and Natural Gas were combined into one section 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.

Lack of a Reasonable Methodology

There is a lack of reasonable methodology for estimating life cycle emissions for the community and, therefore, emissions associated with the production and disposal of items consumed by a community are not included in the Inventory. For instance, a life cycle assessment would estimate the emissions associated with the planning, production, delivery, and disposal of each car currently in the city. In contrast, this analysis only captures how much that car drives within the city.

Despite these limitations, the Clean Air and Climate Protection (CACP) software 2009¹³ and ICLEI methodology provide the best-available snapshot of the city's GHG emissions. Additionally, the CACP2009 tool is utilized to promote consistency among municipalities throughout the country and the world. Sector-specific data limitations or methodological issues are explained thoroughly in **Appendices C** and **D**.

However, it is important to note that 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 Climate Action Plan, or corresponding efforts.

2.6 CLEAN AIR AND CLIMATE PROTECTION SOFTWARE 2009

The City government operations and community-wide inventories use the Clean Air and Climate Protection (CACP2009) software package developed by ICLEI in partnership with the National Association of Clean Air Agencies (NACAA) and Torrie Smith Associates. This software calculates emissions resulting from energy consumption, vehicle miles traveled, and waste generation. The CACP2009 software calculates emissions using specific factors (or coefficients) according to the type of fuel used.

CACP2009 aggregates and reports the three main GHG emissions (CO₂, CH₄, and N₂O) and converts them to equivalent carbon dioxide units, or CO₂e. Equalizing the three main GHG emissions as CO₂e allows for the consideration of different GHGs in comparable terms. For example, methane (CH₄) is 21 times more powerful than carbon dioxide on a per weight basis in

¹³ The Clean Air and Climate Protection (CACP2009) software 2009 was developed by the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (SAPPA/ALAPCO), the International Council for Local Environmental Issues (ICLEI), and Torrie Smith Associates.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

its capacity to trap heat, so the CACP2009 software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents.¹⁴

The emissions coefficients and quantification method employed by the CACP2009 software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605).

¹⁴ The potency of a given gas in heating the atmosphere is defined as its Global Warming Potential, or GWP. For more information on GWP see: IPCC Fourth Assessment Report, Working Group I, Chapter 2, Section 2.10.

3. Community GHG Inventory Results

The City of Morro Bay contains primarily residential and commercial land uses. In the 2005 baseline year, there were approximately 10,310 people, 3,390 jobs, and 6,513 households in the city.¹⁵ The following section provides an overview of the emissions caused by activities within the jurisdictional boundary of the city and analyzes the emissions in terms of scope, sector, source, and population.

3.1 COMMUNITY-WIDE EMISSIONS BY SCOPE

Although there are countless items that can be included in a community-wide emissions inventory, as discussed in Chapter 2, this Inventory includes Scope 1, Scope 2, and Scope 3 sources from the following sectors, consistent with the ICLEI protocol:

- Residential
- Commercial / Industrial
- Transportation
- Waste
- Wastewater
- Off-Road Vehicles and Equipment Emissions.

What are Scopes?

The key principles to remember are that Scope 1 emissions are caused by activities within the city and emitted within the city (fuel combustion), while Scope 2 emissions are caused by activities within the city, but most likely are emitted outside of the city (electricity). Scope 3 emissions are indirect emissions, such as waste decomposition.

Table 3-1 summarizes the scopes of each sector in this analysis.

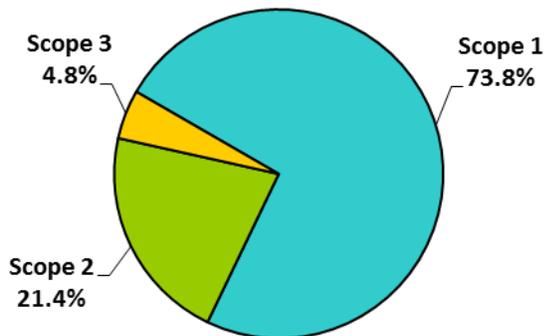
¹⁵ Baseline population, household, and job data for the year 2005 was obtained from SLOCOG's Long Range Socio-Economic Projections (Year 2030), prepared by Economics Research Associates (July 2006 Revision).

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

**TABLE 3-1: GHG EMISSIONS SOURCES INCLUDED IN 2005
COMMUNITY INVENTORY BY SCOPE AND SECTOR**

Sector	Scope 1	Scope 2	Scope 3
Residential	Natural Gas	Electricity	---
Commercial/Industrial	Natural Gas	Electricity	---
Transportation	Gasoline & Diesel	---	---
Waste	---	---	Methane from Decomposition
Wastewater	Methane and Nitrous Oxide from Wastewater Treatment Processes	---	---
Off-Road Vehicles and Equipment	Gasoline, Diesel & Compressed Natural Gas	---	---

FIGURE 3-1: COMMUNITY GHG EMISSIONS BY SCOPE, 2005



Including all sectors and scopes, the community emitted approximately 55,677 metric tons of CO₂e in 2005. As shown in **Figure 3-1** and **Table 3-2**, the majority of community GHG emissions were Scope 1 (73.8%), with Scope 2 (21.4%) and Scope 3 (4.8%) constituting the remainder.

The largest portion of Scope 1 emissions came from the transportation sector (refer to **Table 3-2** and **Figure 3-1**). These emissions qualify as Scope 1 because they involve the direct combustion of fuel within the jurisdictional boundary of the city. The second largest source of Scope 1 emissions was residential natural gas use. Commercial and Industrial uses generated the largest percentage of Scope 2 emissions. Emissions from waste operations account for the whole of Scope 3 emissions.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

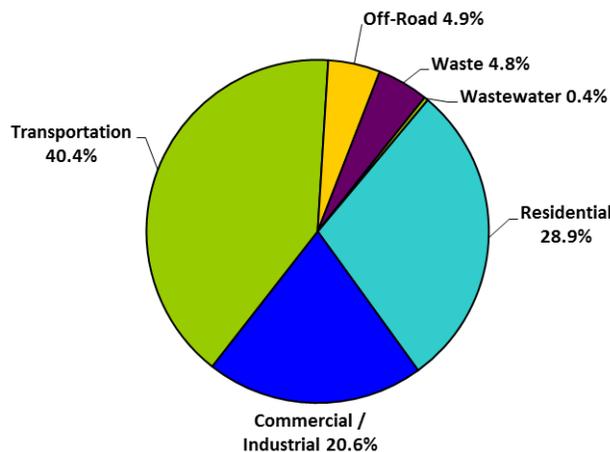
TABLE 3-2: COMMUNITY GHG EMISSIONS PER SECTOR PER SCOPE, 2005 (METRIC TONS OF CO₂E)

Sector	Scope 1	Scope 2	Scope 3	Total
Residential	10,710	5,384	---	16,094
Commercial/Industrial	4,929	6,513	---	11,442
Transportation	22,506	---	---	22,506
Off-Road	2,740	---	---	2,740
Waste	---	---	2,695	2,695
Wastewater	200	---	---	200
TOTAL	41,085	11,897	2,695	55,677
Percentage of Total CO ₂ e	73.8%	21.4%	4.8%	100.0%

3.2 ALL SCOPE EMISSIONS BY SECTOR

As noted above, the community emitted approximately 55,677 metric tons of CO₂e in calendar year 2005. In addition to analyzing the data by scope, it can also be aggregated by sector. As depicted in **Figure 3-2** and **Table 3-3** below, the transportation sector was the largest emitter (40.4%) in 2005. Emissions from the residential sector were the next largest contributor (28.9%), while the commercial and industrial sectors accounted for a combined 20.6% of the total. Emissions from solid waste comprised 4.8% of the total, emissions from off-road vehicles and equipment 4.9% of the total, and methane emissions from wastewater treatment processes comprised 0.4%.

FIGURE 3-2: COMMUNITY GHG EMISSIONS BY SECTOR, 2005



GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

TABLE 3-3: COMMUNITY GHG EMISSIONS BY SECTOR, 2005

2005 Community Emissions by Sector	Residential	Commercial/ Industrial	Transportation	Off- Road	Waste	Wastewater	TOTAL
CO ₂ e (metric tons)	16,094	11,442	22,506	2,740	2,695	200	55,677
Percentage of Total CO ₂ e	28.9%	20.6%	40.4%	4.9%	4.8%	0.4%	100%

3.3 TRANSPORTATION

Transportation sector emissions are the result of diesel and gasoline fuel used in vehicles traveling on local roads and state highways within the jurisdictional boundaries of Morro Bay. Consistent with the majority of California communities, travel by on-road motorized vehicles constitutes the greatest percentage of GHG emissions in the city (40.4%). Of the total emissions in the transportation sector, an estimated 93.2% was due to gasoline consumption, with the remaining 6.8% coming from diesel use (see **Figure 3-3** and **Table 3-4**).

FIGURE 3-3: COMMUNITY GHG EMISSIONS BY FUEL SOURCE

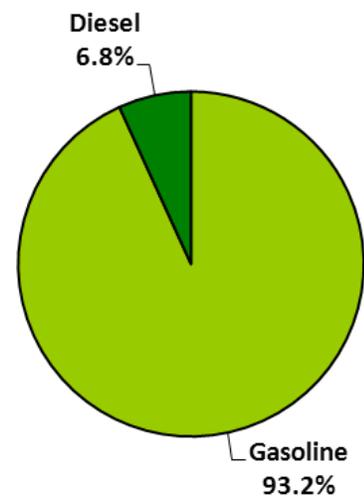


TABLE 3-4: TRANSPORTATION GHG EMISSIONS BY FUEL SOURCE

Transportation Fuel Emissions Sources 2005	Gasoline	Diesel	TOTAL
CO ₂ e (metric tons)	20,980	1,526	22,506
Percentage of Total CO ₂ e	93.2%	6.8%	100%

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

Using origin-destination analysis and the SLOCOG Regional Travel Demand Model, three types of vehicle trips were tracked in the city:

1. Internal-Internal: Vehicle trips that remained inside the city
2. Internal-External and External-Internal: Vehicle trips that have an ending or a beginning in the city
3. External-External: Vehicle trips that pass through the city without originating or ending in the city

Fehr & Peers calculated VMT for each of the three types of vehicle trips using the recommendation of the Regional Target Advisory Committee (RTAC), the body responsible for Senate Bill 375 target setting. VMT from trips of type 1, 2, and 3 (see above) were counted 100%, 50%, and 0% respectively toward jurisdiction-generated VMT.¹⁶ The VMT results are summarized in Appendix C. Annual VMT was then analyzed to determine GHG emissions from vehicle travel using the EMFAC2011 software developed by the California Air Resources Board. EMFAC2011 uses emissions rates for different types of vehicles in conjunction with travel activity statistics to calculate vehicle based emissions in metric tons per day. For a detailed description of the methodology used to estimate transportation-related emissions, please see Appendix C.

3.4 THE BUILT ENVIRONMENT (RESIDENTIAL, COMMERCIAL, INDUSTRIAL)

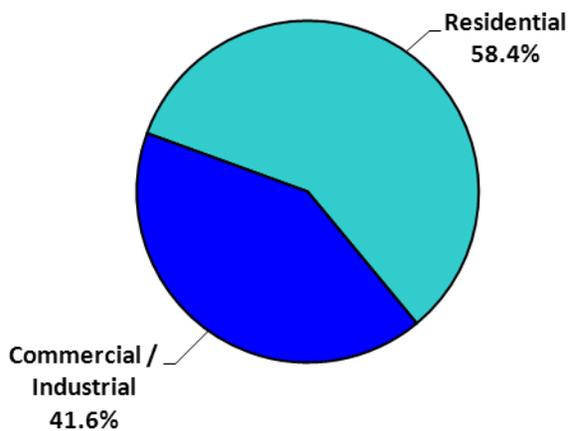
With all scopes aggregated, 49.5% of total community-wide emissions in the year 2005 came from the “built environment.” The built environment is comprised of the residential, commercial, and industrial natural gas and electricity consumption. This analysis does not include emissions from other types of energy such as propane, solar, and wind due to lack of reliable sales, construction, or consumption data. The commercial and industrial sectors are combined in this Inventory due to the mandatory aggregating of commercial and industrial data by PG&E previously referenced.

¹⁶ Since external-external VMT is the result of vehicle trips that pass through the city without originating or ending in the city, they are excluded from the inventory as the City is unable to directly impact these VMT. However, they are identified in Appendix C for informational purposes only.

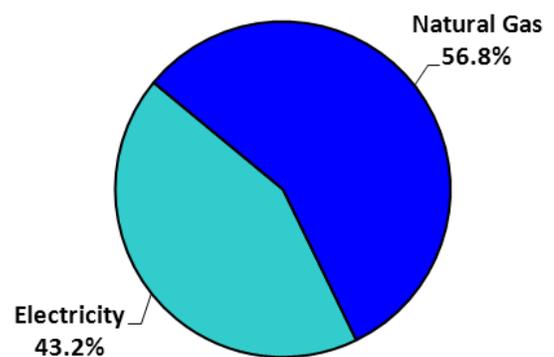
GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

In 2005, emissions from the residential sector accounted for more than half (58.4%) of the total emissions in the built environment. The commercial/industrial sector accounted for 41.6% of the built environment's emissions (see **Figure 3-4**). All of the emissions calculated from the built environment were the result of local natural gas consumption (Scope 1) and local consumption of electricity generated outside of the city (Scope 2). Overall, electricity consumption and natural gas consumption were split 43.2-56.8% as the cause of emissions from the built environment in 2005 as shown in **Figure 3-5**.

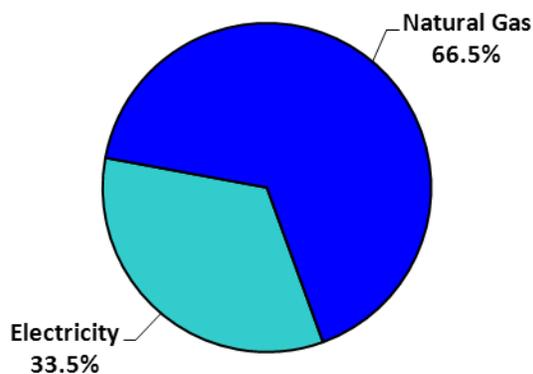
**FIGURE 3-4: BUILT ENVIRONMENT
GHG EMISSIONS BY SECTOR**



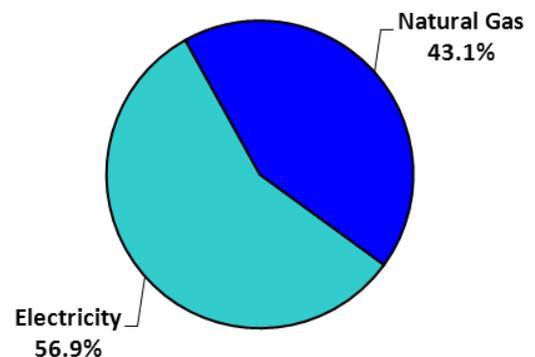
**FIGURE 3-5: BUILT ENVIRONMENT
GHG EMISSIONS BY SOURCE**



**FIGURE 3-6: RESIDENTIAL
GHG EMISSIONS
BY SOURCE**



**FIGURE 3-7: COMMERCIAL/
INDUSTRIAL GHG EMISSIONS BY
SOURCE**



GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

Approximately 66.5% of emissions in the residential sector resulted from combustion of natural gas for heating and cooking (see **Figure 3-6** and **Table 3-5**), while 43.1% of emissions in the commercial/industrial sector came from natural gas (see **Figure 3-7** and **Table 3-6**).

TABLE 3-5: RESIDENTIAL GHG EMISSIONS BY SOURCE

Residential Emissions Sources 2005	Electricity	Natural Gas	TOTAL
CO ₂ e (metric tons)	5,384	10,710	16,094
Percentage of Total CO ₂ e	33.5%	66.5%	100%
Energy Use (MMBtu)	82,168	201,328	283,496

TABLE 3-6: COMMERCIAL/INDUSTRIAL GHG EMISSIONS BY SOURCE

Commercial/Industrial Emissions Sources 2005	Electricity	Natural Gas	TOTAL
CO ₂ e (metric tons)	6,513	4,929	11,442
Percentage of Total CO ₂ e	56.9%	43.1%	100%
Energy Use (MMBtu)	99,389	92,651	192,040

3.5 WASTE

Solid waste disposed of at managed landfills was responsible for 4.8% of total emissions for the community. The CACP2009 software calculates methane generation from waste sent to landfill in 2005, and accounts for the reported methane recovery factors among the two landfills utilized in the 2005 baseline year (Cold Canyon and Chicago Grade), which have a 60% weighted average. The Cold Canyon Landfill accepted approximately 92% of the community's solid waste, while 8% went to the Chicago Grade Landfill. The methane recovery factors of the landfills are well documented by the San Luis Obispo Air Pollution Control District based on the system operations at that time. For more information, please see detailed methodology in **Appendix C**.

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 2005 over the full 100-

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

year+ cycle of its decomposition. In 2005, the community sent approximately 9,235 tons of waste to landfill. The 2004 California Statewide Waste Characterization Study provides standard waste composition for the State of California.¹⁷ Identifying the different types of waste in the general mix is necessary because decomposition of some materials generate methane within the anaerobic environment of landfills whereas others do not. Carbonaceous materials such as paper and wood actually sequester¹⁸ the methane released in managed landfills, therefore offsetting some or all of the emissions from food and plant waste. **Figure 3-8** and **Table 3-7** show the estimated percentage of emissions coming from the various types of organic, methanogenic waste.

FIGURE 3-8: WASTE GHG EMISSIONS BY TYPE

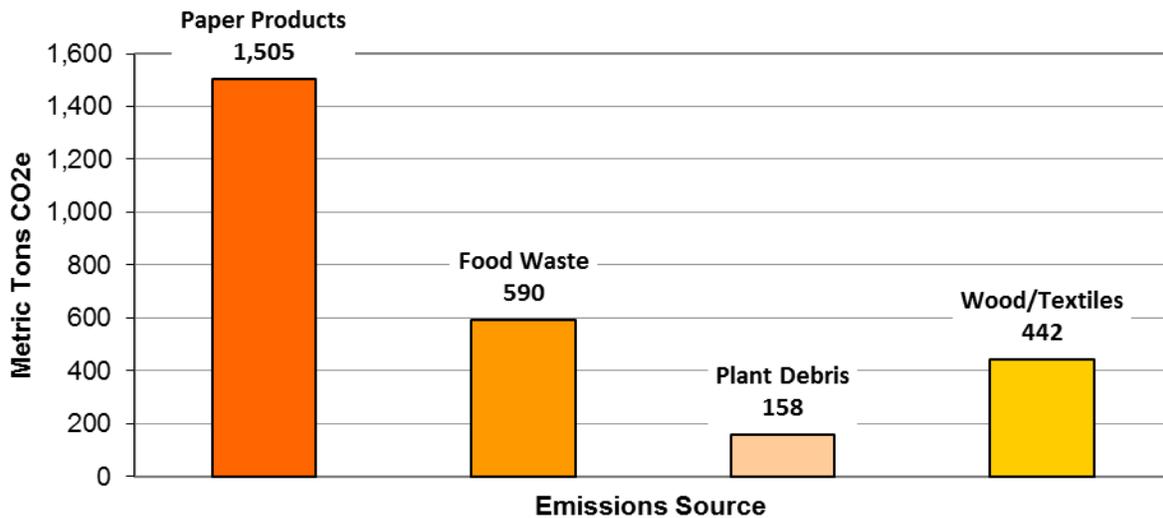


TABLE 3-7: WASTE GHG EMISSIONS BY WASTE TYPE

Waste Emissions Sources 2005	Paper Products	Food Waste	Plant Debris	Wood / Textiles	All Other Waste	TOTAL
CO ₂ e (metric tons)	1,505	590	158	442	0	2,695
Percentage of Total CO ₂ e	55.8%	21.9%	5.9%	16.4%	0.0%	100%

¹⁷ <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097>

¹⁸ Sequestration involves the storage of carbon dioxide in a solid material through biological or physical processes.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

3.6 WASTEWATER FACILITIES

The City of Morro Bay and Cayucos Community Services District (CSD) co-own the wastewater treatment plant to serve the residents and businesses of Morro Bay and Cayucos. Because the wastewater treatment plant serves residents and businesses outside the City, not all the emissions occurring at the plant should be attributed to the City of Morro Bay under the LGOP version 1.1. Emissions at the treatment plant were attributed to the City based on the percent of ownership (60%) outlined in the recorded agreement between the City of Morro Bay and Cayucos CSD (October 1982). Methane emissions released during wastewater treatment processes were responsible for 0.4% of total emissions for the community. Natural gas and electricity emissions associated with wastewater treatment facilities operations are accounted for within the commercial/industrial sector.

3.7 OFF-ROAD VEHICLES AND EQUIPMENT

Gasoline, diesel, and compressed natural gas fuel are used to power off-road equipment in the City of Morro Bay. Off-road equipment incorporated in this inventory includes agriculture, lawn and garden, construction and mining, light commercial equipment, and industrial equipment. Off-road vehicles and equipment accounted for 4.9% of the City's emissions in 2005. The California Air Resources Board's OFFROAD 2007 software provides emissions data for off-road equipment by county. The countywide data was attributed to city based on the indicators presented in **Table 3-8**.

TABLE 3-8: COUNTY-WIDE EQUIPMENT TYPE INDICATORS

Equipment Type	Allocation Indicator
Agricultural Equipment	Acres of cropland
Construction and Mining Equipment	Construction and mining jobs
Industrial Equipment	Industrial jobs
Lawn and Garden Equipment	Households
Light Commercial Equipment	Service and commercial jobs

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Approximately 64.4% of off-road equipment emissions in 2005 came from construction and mining equipment, while 13.5% were the result of lawn and garden equipment. The remaining off-road equipment activities included in this Inventory include light and commercial equipment, agricultural equipment, and industrial equipment, making up the remaining 22.1% of emissions collectively (see **Table 3-9** and **Figure 3-9**). Total emissions from off-road equipment for 2005

FIGURE 3-9: OFF-ROAD GHG EMISSIONS BY EQUIPMENT TYPE

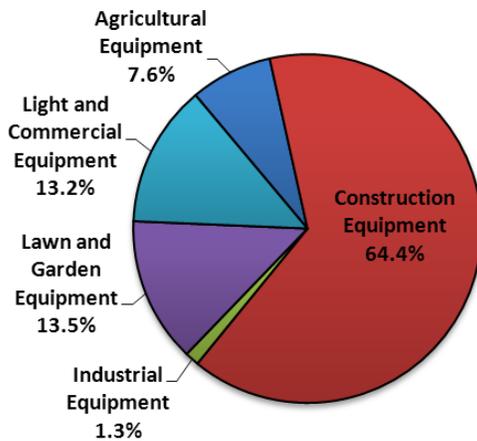
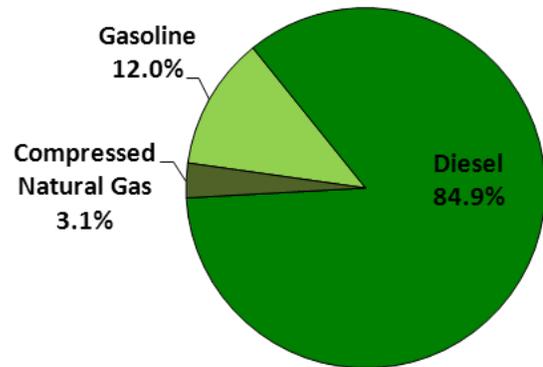


FIGURE 3-10: OFF-ROAD GHG EMISSIONS BY FUEL TYPE



are estimated to be approximately 2,740 MT CO₂e. Of the total emissions in the off-road sector, an estimated 84.9% was due to diesel consumption, with the remaining 15.1% coming from gasoline and compressed natural gas use (see **Table 3-10** and **Figure 3-10**).

TABLE 3-9: OFF-ROAD GHG EMISSIONS BY EQUIPMENT TYPE

Equipment Type Emissions Sources 2005	Agricultural Equipment	Construction Equipment	Industrial Equipment	Lawn and Garden Equipment	Light and Commercial Equipment	TOTAL
CO ₂ e (metric tons)	209	1,764	36	369	362	2,740
Percentage of Total CO ₂ e	7.6%	64.4%	1.3%	13.5%	13.2%	100%

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TABLE 3-10: OFF-ROAD GHG EMISSIONS BY FUEL TYPE

Off-Road Fuel Emissions Sources 2005	Gasoline	Diesel	Compressed Natural Gas	TOTAL
CO ₂ e (metric tons)	328	2,327	85	2,740
Percentage of Total CO ₂ e	12.0%	84.9%	3.1%	100%

3.8 OTHER – COMMERCIAL AND RECREATIONAL BOATING

This report recognizes there are emissions associated with commercial and recreational boating activities in and around Morro Bay Harbor; however, due to a lack of reasonable methodology and available data, these emissions cannot be quantified at this time. It is likely that as data become more available, emissions from commercial and recreational watercraft in the harbor can be quantified. It is unlikely emissions from commercial and recreational boating activities are a large source of Morro Bay’s GHG emissions.

The California Air Resources Board (ARB), California Environmental Protection Agency (Cal EPA), and the Commission for Environmental Cooperation in North America conducted a baseline emissions inventory (2006) of commercial marine shipping along the California coastline; however, the inventory’s primary focus is on large commercial marine shipping activity and major ports. Due to Morro Bay Harbor’s status as a small commercial fishing and recreational port, the ARB emissions inventory does not capture commercial marine activity occurring in and around the Morro Bay Harbor.

3.9 COMMUNITY EMISSIONS BY SOURCE

In addition to viewing emissions by sector and by scope, policy and programs development can benefit from an analysis of emissions according to their raw fuel or waste source. **Figure 3-11** and **Table 3-11** below demonstrates that 38.3% of all community emissions come from the consumption of gasoline on local roads and highways. Natural gas (28.2%) and electricity (21.4%) consumption from the built environment are the next most significant figures, with the remainder coming from diesel, off-road equipment and various waste products.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

FIGURE 3-11: COMMUNITY GHG EMISSIONS BY SOURCE, 2005

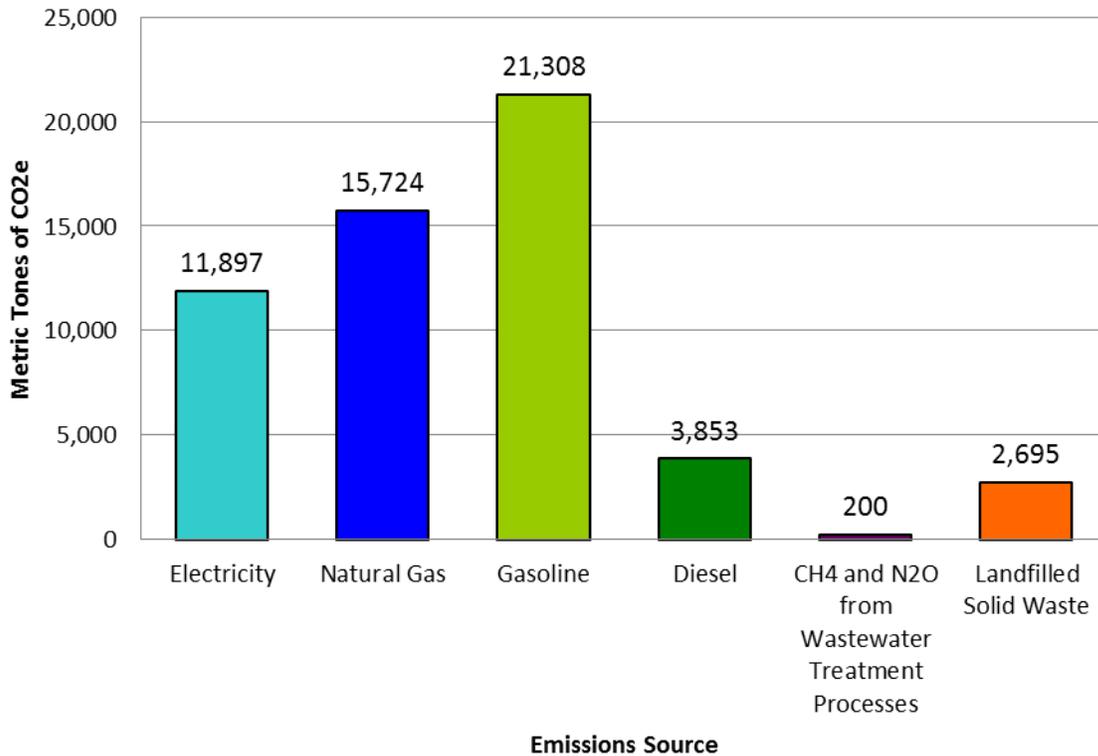


TABLE 3-11: COMMUNITY GHG EMISSIONS BY SOURCE, 2005

Community GHG Emissions 2005 by Source	CO ₂ e (metric tons)	CO ₂ e (percent of total)
Electricity	11,897	21.4%
Natural Gas	15,724	28.2%
Gasoline	21,308	38.3%
Diesel	3,853	6.9%
CH ₄ and N ₂ O from Wastewater Treatment Processes	200	0.4%
Landfilled Solid Waste	2,695	4.8%
TOTAL	11,897	21.4%

3.10 PER CAPITA EMISSIONS

Per capita emissions can be a useful metric for measuring progress in reducing GHGs and for comparing one community's emissions with neighboring cities and against regional and national averages. Currently it is difficult to make meaningful comparisons between local inventories because of variations in the scope of inventories conducted. For instance, this Inventory takes in to account emissions from off-road vehicles, which some inventories do not. Only when ICLEI, the California Air Resources Board, and other organizations adopt universal reporting standards will local inventories be prepared in a consistent manner and therefore be comparable.

Simply dividing total community GHG emissions by city population in 2005 (10,511) yields a result of 5.30 metric tons CO₂e per capita.¹⁹ It is important to understand that this number is not the same as the carbon footprint of the average individual living in the City of Morro Bay, which reflects a wider scope of emissions. The per capita emissions number for the city is not directly comparable to every per capita number produced by other emissions studies because of differences in emission inventory methods.

¹⁹ Baseline population data for the year 2005 was obtained from SLOCOG's Long Range Socio-Economic Projections (Year 2030), prepared by Economics Research Associates (July 2006 Revision).

4. City Government Operations GHG Emissions Inventory Results

In 2005, the City of Morro Bay government employed 110 people and was comprised of seven departments: City Administration, Administration Services, Fire and Police Departments, Harbor, Public Services, and Recreation and Parks Department. This chapter reviews the results of the City government operations inventory.

4.1 CITY GOVERNMENT OPERATIONS INVENTORY RESULTS

City government operations and facilities produced approximately 1,955 metric tons of GHG emissions in 2005. As displayed in **Figure 4-1**, this approximately 3.5% of total community-wide emissions. City government emissions result from waste, energy consumption from wastewater facilities, buildings, streetlights and other facilities, fuel consumption by the vehicle fleet and employee commutes, wastewater treatment processes, and miscellaneous equipment. The wastewater facilities and processes were the largest contributor to the City's emissions (23.1%) with 451 metric tons CO₂e. Employees commuting to and from work contributed were the second largest portion of the City emissions (21.2%) with 414 metric tons CO₂e. The vehicle fleet and buildings and facilities were the next largest contributors to the City's emissions (18.1% and 16.5%), contributing 355 and 322 metric tons CO₂e, respectively. The transit fleet was responsible for 5.8 percent of the City's emissions, or, 113 metric tons CO₂e. The City's water delivery infrastructure and amount of solid waste sent to the landfill resulted in a combined 10.9% of the City's total and streetlights and traffic signals contributed 4.4% of the City's total, respectively. (Refer to **Figure 4-2** and **Table 4-1** below)

As mentioned in the Introduction, these emissions are a subset of the community emissions inventory discussed in **Chapter 3**. The City's government operations emissions are separately analyzed in this section in a manner that is similar to how an industry or business would produce a facility-scale GHG audit. The LGOP version 1.1 developed by the California Air Resources Board, The Climate Registry, the California Climate Action Registry, and ICLEI guides the methodology for estimating emissions from local government operations.

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FIGURE 4-1: CITY GOVERNMENT CONTRIBUTION TO COMMUNITY-WIDE GHG EMISSIONS

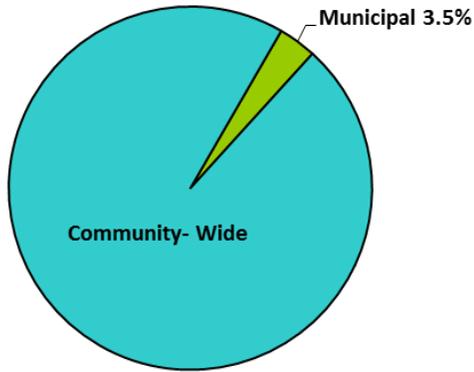


FIGURE 4-2: CITY GOVERNMENT GHG EMISSIONS BY SECTOR, 2005

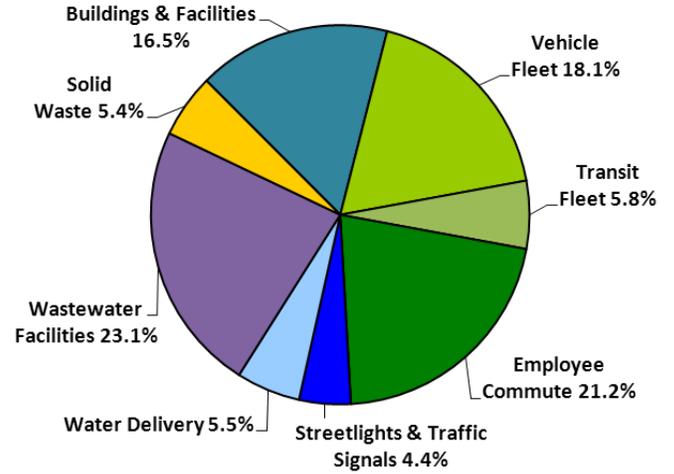


TABLE 4-1: CITY GOVERNMENT GHG EMISSIONS BY SECTOR, 2005

2005 Emissions by Sector	Buildings & Facilities	Vehicle Fleet	Transit Fleet	Employee Commute	Street Lights & Traffic Signals	Water Delivery	Waste-water Facilities	Solid Waste	TOTAL
CO ₂ e (metric tons)	322	355	113	414	87	107	451	106	1,955
Percentage of CO ₂ e	16.5%	18.2%	5.8%	21.2%	4.5%	5.5%	23.1%	5.4%	100.0%

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

4.2 BUILDING SECTOR

The building sector includes GHG emissions from energy consumption in facilities owned and operated by a municipality. The facilities included in this analysis include City Hall, Public Services Department, fire and police stations, recreation facilities, Chamber of Commerce, parks, and numerous other facilities. As depicted in **Figure 4-3** and **Table 4-2**, the majority of emissions resulted from natural gas consumption (59.9%).

These emissions and associated consumption data will be useful designating priority facilities for energy efficiency retrofits and conservation outreach.

FIGURE 4-3: BUILDING GHG EMISSIONS BY SOURCE

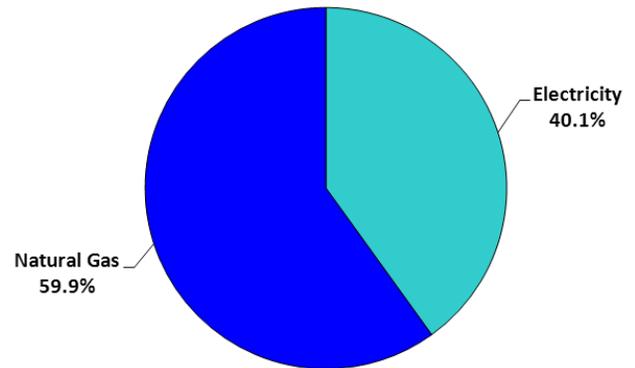


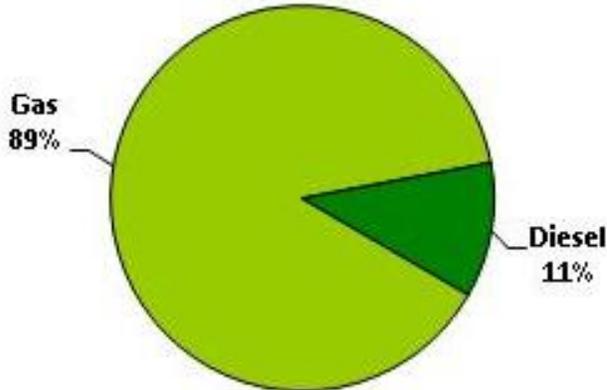
TABLE 4-2: BUILDING SECTOR GHG EMISSIONS BY SOURCE, 2005

2005 City Government Operations Emissions by Sector	Electricity	Natural Gas	Total
CO ₂ e (metric tons)	129	193	322
Percentage of Total CO ₂ e	40.1%	59.9%	100%
Energy Use (MMBtu)	1,985	851	2,836

4.3 VEHICLE FLEET AND TRANSIT FLEET

City-owned and -operated vehicles emitted approximately 468 metric tons of CO₂e, or 23.9% of total City government emissions. This sector includes gasoline and diesel consumption from all departments in the City operating vehicles. This estimate is based on 2005 fuel billing record data provided by the Finance Department. The City does own several watercraft; however, fuel billing records did not specifically identify fuel purchases for the City's boats and; therefore, emissions from watercraft were not separately quantified. Minor modifications to the City's recordkeeping can allow future analysis of the emissions related to the City's watercraft.

FIGURE 4-4: VEHICLE FLEET FUEL CONSUMPTION PER YEAR BY TYPE



The majority of fuel used by the City is gasoline (89%), with the remainder diesel (11%) (see **Figure 4-4**). When compared to the total emissions per fuel type, diesel emissions actually produce less CO₂e for the vehicle types used by the City. However, there are other, non-CO₂e emissions from diesel-like particulate matter that make such a comparison misleading to the reader. The trend for diesel to emit less CO₂e in this case does not necessarily mean that the City should aim to convert more vehicles to conventional diesel. There are multiple clean and alternative fuel options available,

including biodiesel conversion, electric vehicles, hybrid vehicles, smaller vehicles, and shared vehicles.

4.4 EMPLOYEE COMMUTE

This sector estimates GHG emissions from City employees traveling to and from work in 2005. The estimate is based on a June 2010 online survey conducted by the City, a blank version of which is included as **Appendix F**. Approximately 63 employees responded to the survey with usable information, meaning that all essential questions were answered. This results in approximately a 62% response rate, the results of which were applied to the City employment total for 2005.

The online survey found that most City employees travel to and from work by car. Employees were asked how many days of the week they travel by each commute mode, including driving alone (which includes motorcycles), carpooling, vanpooling, public transit, bicycling, walking, telecommuting, and other. The results show that employees get to and from 88.0% of their workdays by personal vehicle. The second most popular mode of transportation was bicycling and walking with a combined 5.3% of the total. Carpooling accounted for 1.7% of workday commutes. Employees were very unlikely take public transportation to work, accounting for 0.0% of workday commutes. Approximately 5.0% of employees responded with other forms of transportation or did not commute. This is likely the result of flexible working schedules.

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TABLE 4-3: DAYS OF CITY EMPLOYEE TRAVEL BY COMMUTE MODE

Mode of Travel	Days traveled by Commute mode	% of Total
Drive Alone	13,828	88.0%
Carpool	261	1.7%
Vanpool	0	0.0%
Public transit	0	0.0%
Bicycle	365	2.3%
Walk	470	3.0%
Other	783	5.0%
Total	15,707	100%

These figures for commute mode were combined with each respondent's travel distance to work, car model (if any), and fuel type (if any). The results show vehicle miles traveled (VMT) annually per vehicle type and fuel type (see **Table 4-4**). These VMT numbers were then adjusted for the total employee population in 2005 and entered into the CACP2009 software to obtain CO₂e.

Driving patterns were assumed to be constant for the purposes of this study; therefore, the 2010 sample was applied directly to the 2005 employee population. Only two modifications to the sample data was made in order to account for the large increase in hybrid car sales and consumption of biodiesel between 2005 and 2010. The proportion of hybrid to traditional vehicles was roughly two-thirds less in 2005 than in 2009, according to State sales data.²⁰ According to national sales data, 30% of the biodiesel consumed in 2008 was consumed in 2005.²¹

The 2010 survey results, adjusted for 2005 employee totals, resulted in an estimate of 414 metric tons CO₂e in 2005 from commuter travel to and from work. This figure comprises 21.2% of total GHG emissions released from City government operations. The calculation does not include employee business travel or travel during lunchtime hours.

²⁰ www.hybridcars.com

²¹ Biodiesel Supply and Consumption. Supplement to the Short-Term Energy Outlook. Energy Information Administration. April 2009. Accessed at http://www.eia.doe.gov/emeu/steo/pub/special/2009_sp_01.pdf on May 6, 2009.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

TABLE 4-4: EMPLOYEE COMMUTE VMT BY VEHICLE AND FUEL TYPE

Vehicle Group	2010 Survey results		Adjusted for 2005	
	Annual VMT	Fuel Type	Annual VMT	Fuel Type
Light Truck/SUV/Pickup	66,341.65	Gasoline	116,097.89	Gasoline
	0.00	Diesel	0.00	Diesel
Large Truck	29,732.16	Gasoline	52,031.29	Gasoline
	36,891.26	Diesel	64,559.71	Diesel
Passenger Vehicle	223,627.83	Gasoline	387,459.99	Gasoline
	0.00	Diesel	0.00	Diesel
	0.00	Biodiesel	0.00	Biodiesel
Motorcycle	0.00	Gasoline	0.00	Gasoline
Total	356,592.90		620,148.88	

Employee business travel is usually included in a City government GHG Inventory per protocol; however, we could not include it in this baseline analysis due to data limitations. The City maintains financial records of when employees travel by air or vehicle to conferences and other events; however, it does not keep records of business travel destinations. As such, this Inventory could not accurately account for GHG emissions from employee business travel. A minor adjustment to City recordkeeping would allow the data to be included in the next City government operations GHG inventory.

4.5 STREETLIGHTS AND TRAFFIC SIGNALS

The electricity consumed by City streetlights and traffic signals in calendar year 2005 resulted in approximately 87 metric tons of CO₂e, or approximately 4.4 % of total City government emissions. This Inventory accounts for two traffic signals and an unknown number of streetlights.

4.6 WATER AND WASTEWATER

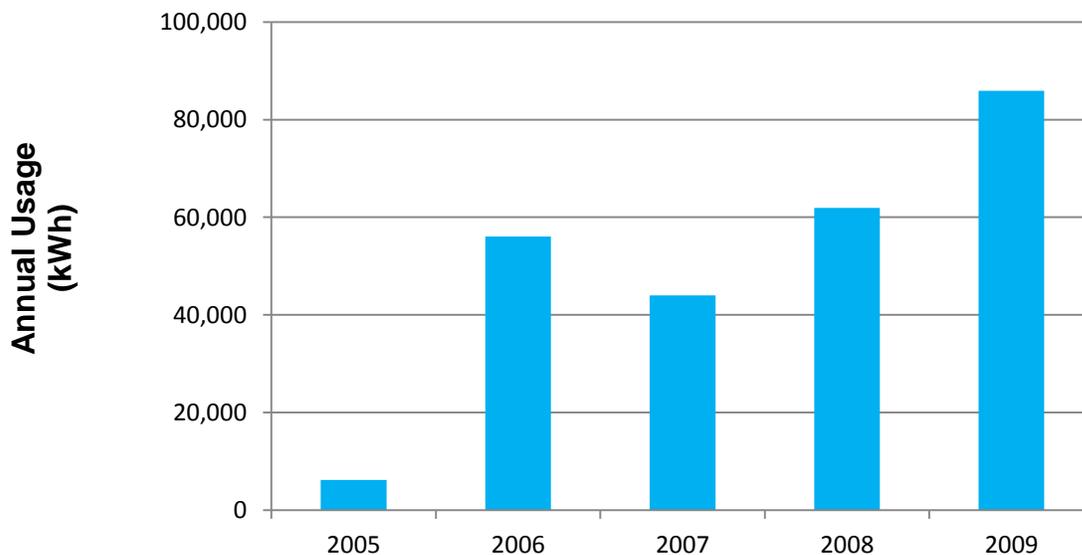
In 2005, the wastewater treatment plant emitted approximately 451 metric tons of CO₂e, or 23.1% of the City's total emissions. This category includes energy use in the Wastewater Treatment Plant buildings and the numerous lift stations and pumps necessary to convey effluent to the treatment plant. The City of Morro Bay and Cayucos Community Services District (CSD) co-own the wastewater treatment plant to serve the residents and businesses of Morro Bay and Cayucos. Because the wastewater treatment plant serves residents and businesses

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

outside the City, not all the emissions occurring at the plant should be attributed to the City of Morro Bay under the LGOP version 1.1. Emissions at the treatment plant were attributed to the City based on the percent of ownership (60%) outlined in the recorded agreement between the City of Morro Bay and Cayucos CSD (October 1982).

Electricity consumption from water facilities operated by the City emitted approximately 107 metric tons of CO₂e, or 5.5% of total emissions. This category includes energy use at the various wells and pumps to convey water to City residents as well as irrigation at City parks and facilities. The City owns a desalination plant to supply potable water during the period of every year when the state water project is offline. The process to remove salt and other minerals from seawater to make it potable is generally energy intensive. Because the City only relies on the desalination plant for a few months each year and primarily serves as the last resource for potable water, the energy consumption at the desalination plant varies from year to year. In 2005 use of the plant was minimal. However, since 2005 energy use at the plant has increased significantly due to additional processing that is occurring to correct for anthropogenic nitrate contamination that is now present in the Morro Ground Water Basin. It is anticipated that these processes will continue to be necessary indefinitely. Energy use at the plant in the baseline year (2005) and since is provided in **Figure 4-5**. This operational change will result in significantly higher emissions than projected based on 2005 baseline data. Additionally, as climate change impacts water resources throughout California, the City may be required to rely on the desalination plant more frequently.

FIGURE 4-5: DESALINATION PLANT OPERATION



GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

4.7 WASTE

Similar to the Community-wide analysis, waste produced by City facilities was calculated using the methane commitment method. The CACP2009 calculates the methane expected to be released from this landfilled waste over the course of its lifetime. In 2005, Morro Bay Garbage Service estimates City facilities sent a total of 298.3 tons of waste to landfill, producing 106 metric tons of CO₂e, or 5.4% of total emissions. Unlike other sectors analyzed, the emissions from waste disposed of in 2005 will occur over multiple years as the waste breaks down over time. This category includes only those emissions generated by waste produced at City facilities and does not include the total emissions released from the landfill.

4.8 CITY EMISSIONS BY SOURCE

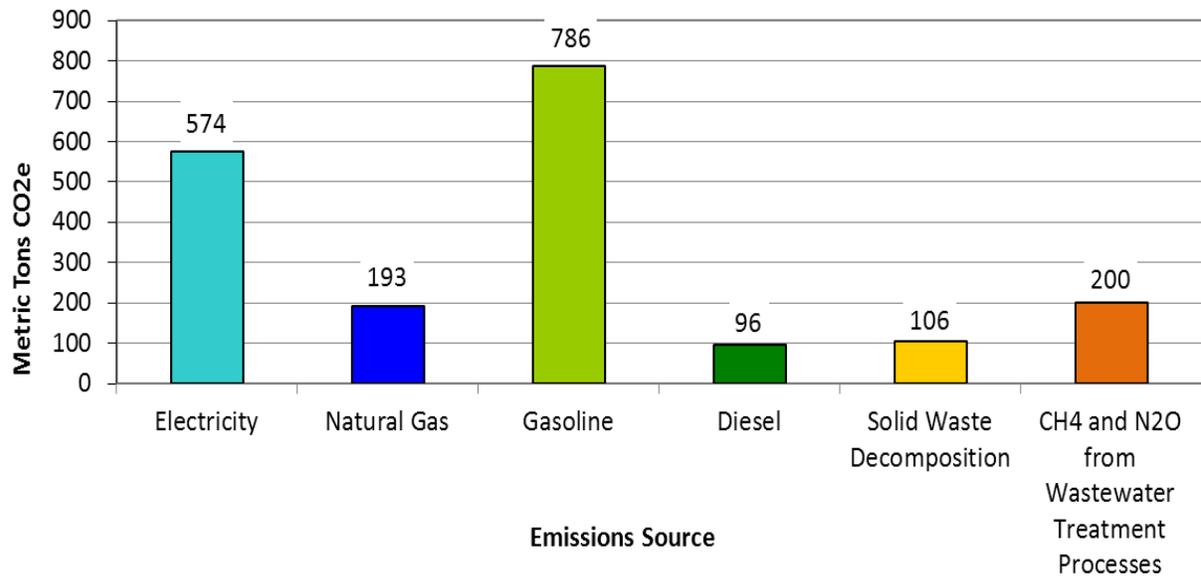
It can also be helpful to view overall City government emissions by source. As shown in **Table 4.5** and **Figure 4.6**, the majority of emissions result from the combustion of gasoline from the vehicle fleet, transit busses, and employee commute (35.6%). Electricity consumption in City-owned buildings, streetlights, and water/sewage facilities was the next largest source of emissions (26.0%). Methane from the wastewater treatment process was the third largest source of emissions (20.4%) while the remaining emissions resulted from natural gas, solid waste and diesel consumption.

TABLE 4-5: CITY GOVERNMENT GHG EMISSIONS BY SOURCE, 2005

City Emissions 2005 by Source	CO ₂ e (metric tons)	CO ₂ e (percent of total)
Electricity	574	29.4%
Natural Gas	193	9.9%
Gasoline	786	40.2%
Diesel	96	4.9%
Solid Waste Decomposition	106	5.4%
Wastewater Treatment Processes	200	10.2%
TOTAL	1,955	100.0%

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

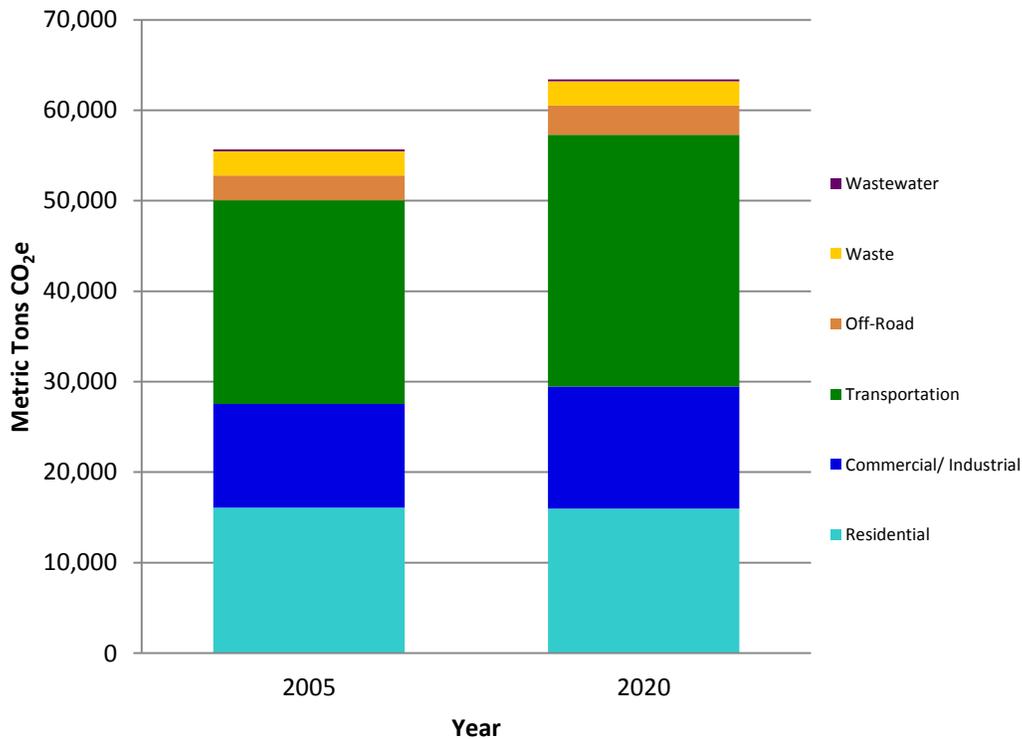
FIGURE 4-6: CITY GOVERNMENT GHG EMISSIONS BY SOURCE, 2005



5. Forecast

The emissions forecast for the City of Morro Bay represents a business-as-usual prediction of how community-wide GHG levels will change over time if consumption trends and behavior continue as they did in 2005. These predictions are based on the community inventory results included in this report and statistics on job and population growth from the 2040 Regional Growth Forecast. The analysis shows that if behavior and consumption trends continue as business-as-usual, emissions will reach 63,395 metric tons of CO₂e by 2020, or a 13.9% increase over 2005 baseline levels (see **Figure 5-1**).

**FIGURE 5-1: 2020 BUSINESS-AS-USUAL PROJECTED GROWTH IN
COMMUNITY-WIDE GHG EMISSIONS**



The forecast does not quantify emissions reductions from State or federal activities including AB 32, the renewable portfolio standard, and SB 375. Additionally, it does not take into account reduction activities already underway or completed since 2005, the results of which likely put the community's emissions on a track well below the business-as-usual linear projection.

GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

Forecasts were performed by applying job and population growth rates to 2005 community-wide GHG emissions levels. Baseline data and estimated growth were obtained from SLOCOG's report, "San Luis Obispo County 2040 Population, Housing & Employment Forecast" (August 2011). The "mid-range" cases for population and job growth were used in this forecast estimation. Data from this report is consistent with the San Luis Obispo Air Pollution Control District's GHG thresholds.

City government operations emissions are not separately analyzed as part of this forecast due to a lack of reasonable growth indicators for the City government sector. However, an increase in emissions is not expected for existing facilities and operations in the City government operations sector. If anything, the City expects that emissions within the scope of the 2005 City government operations inventory will decrease because of energy efficiency improvements and fleet upgrades. At the same time, it is likely the City will have to expand services and infrastructure to accommodate the expected growth in the region, which could add new sources of emissions to the City government operations inventory that did not exist in 2005.

6. Conclusion and Next Steps

The City of Morro Bay has made a formal commitment to reduce its GHG emissions. This report lays the groundwork for those efforts by estimating baseline emission levels against which future progress can be demonstrated.

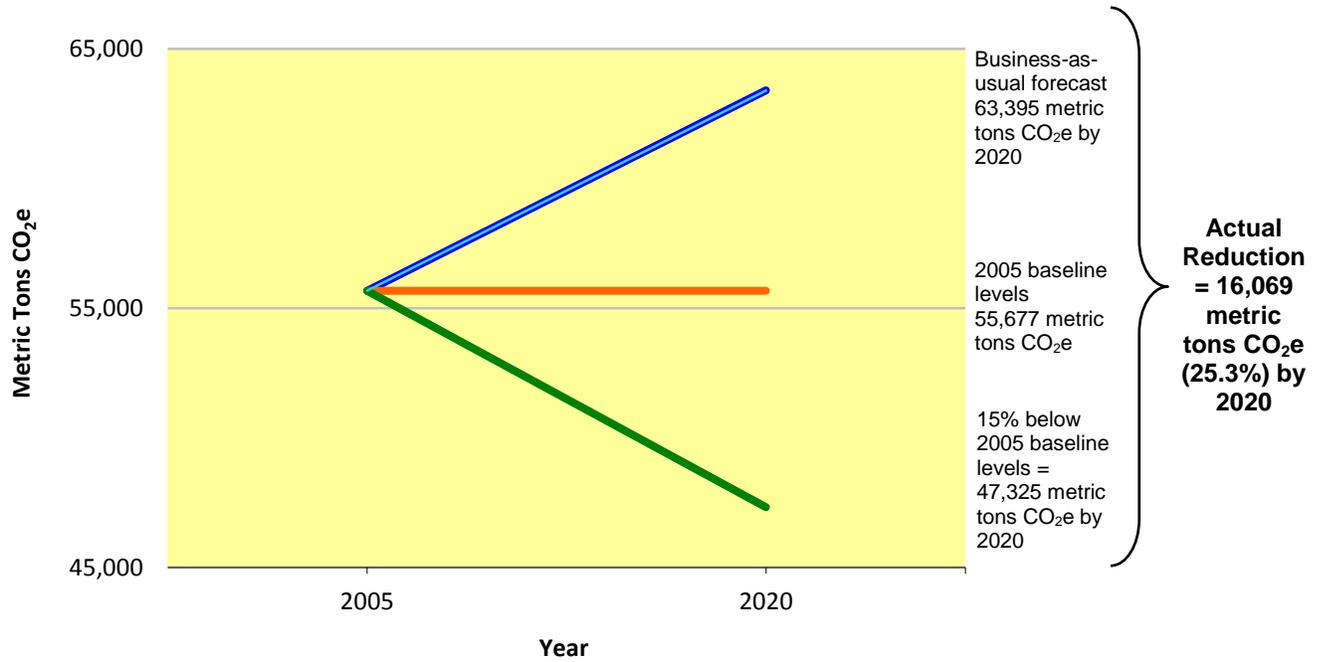
This analysis found that the community was responsible for emitting 55,677 metric tons of CO₂e in the base year 2005, with the transportation sector contributing the most (40.4%) to this total. As a component of the community-wide analysis, City government operations produced 1,955 metric tons of CO₂e, or 3.5% of the total. In addition to establishing the baseline for tracking progress over time, this report serves to identify the major sources of city emissions, and therefore the greatest opportunities for emission reductions. In this regard, the emissions inventory will inform the focus of the City's Climate Action Plan. If no action is taken, this report found that business-as-usual emissions will likely rise by 13.9% by 2020.

It is important to note that in order to remain consistent with GHG reduction methodology, all future quantifications of reduction activities must be subtracted from this 'business-as-usual' line. Not doing so would be assuming that emissions remain at constant 2005 levels while reduction activities are underway. In reality, the City's climate action efforts will be working against a rising emissions level due to job, population, and household growth. **Figure 6-1** below shows the business-as-usual emissions forecast in relation to 2005 baseline levels and the 15% reduction below 2005 levels recommended by the State Attorney General and Air Resources Board.²²

The difference between the business-as-usual forecast and the reduction targets is 25.3% in 2020. As noted in the Forecast section, it is likely that the City's sustainability efforts have already caused emissions to fall below the business-as-usual linear projection line, thus making the 16,069 metric tons CO₂e reduction by 2020 achievable.

²² The AB 32 Climate Change Scoping Plan Document prepared by the Air Resources Board calls for reducing GHG emissions to 1990 levels by cutting approximately 30 percent from business-as-usual emission levels projected for 2020, or about 15 percent from today's levels.

FIGURE 6-1: GHG FORECAST IN RELATION TO REDUCTION TARGET



As the City moves forward to the next milestones in the process, including designation of emission reduction targets and development of a climate action plan, the City should identify and quantify the emission reduction benefits of projects that have already been implemented since 2005, as well as the emissions reduction benefits of existing General Plan policies. The benefits of both existing strategies can be tallied against the baseline established in this report to determine the appropriate set of strategies that will deliver the City to its chosen emissions reduction goal.



**APPENDIX A:
CACP DETAILED REPORT FOR COMMUNITY-
WIDE EMISSIONS, 2005**



Community Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)	Energy (MMBtu)
Residential					
San Luis Obsipo APCD, CA					
<i>1 SoCal Gas Company Natural Gas - Residential</i>					
Natural Gas	10,682	20	1,007	10,710 19.3	201,328
<i>Subtotal 1 SoCal Gas Compan</i>	10,682	20	1,007	10,710 19.3	201,328
<p>Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs, Southern California Gas Co. (213) 244-3246, pmorais@semprautilities.com <mailto:pmorais@semprautilities.com>, May 2012.</p> <p>CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.</p>					
<i>2 PG&E Electricity - Residential</i>					
Electricity	5,340	120	328	5,384 9.7	82,168
<i>Subtotal 2 PG&E Electricity - R</i>	5,340	120	328	5,384 9.7	82,168
<p>Electricity data provided by Jillian Rich, jillian.rich@pge.com <mailto:jillian.rich@pge.com> and John Joseph, ghgdatarequests@pge.com <mailto:ghgdatarequests@pge.com>, PG&E.</p> <p>The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1 for California.</p>					
Subtotal Residential	16,023	140	1,334	16,094 29.0	283,496

Commercial

San Luis Obsipo APCD, CA

1 SoCal Gas Company Natural Gas - Commercial + Industrial

Natural Gas	4,916	9	463	4,929 8.9	92,651
<i>Subtotal 1 SoCal Gas Compan</i>	4,916	9	463	4,929 8.9	92,651

Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs, Southern California Gas Co. (213) 244-3246, pmorais@semprautilities.com <<mailto:pmorais@semprautilities.com>>, May 2012.

CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.

Community Greenhouse Gas Emissions in 2005 Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)	Energy (MMBtu)
<i>2 PG&E Electricity - Commercial + Industrial</i>					
Electricity	6,459	145	396	6,513 11.7	99,389
Subtotal 2 PG&E Electricity - C	6,459	145	396	6,513 11.7	99,389

Electricity data provided by Jillian Rich, jillian.rich@pge.com <<mailto:jillian.rich@pge.com>> and John Joseph, ghgdatarequests@pge.com <<mailto:ghgdatarequests@pge.com>>, PG&E.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO₂ emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1 for California.

Subtotal Commercial	11,375	155	860	11,441 20.6	192,040
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Waste

San Luis Obsipo APCD, CA

3 Solid Waste - Chicago Grade

Disposal Method - Managed Landfill

Paper Products	0	0	5,866	123 0.2	
Food Waste	0	0	2,301	48 0.1	
Plant Debris	0	0	617	13 0.0	
Wood or Textiles	0	0	1,723	36 0.1	
Subtotal 3 Solid Waste - Chica	0	0	10,507	221 0.4	

Source(s):

1. Total waste tonnage for the City in 2005 provided by the 2005 Disposal Quarterly Reports prepared by San Luis Obispo County Integrated Waste Management Authority on 6/17/05, 9/27/05, 12/27/05 and 3/6/06, provided by Peter Cron, pcron@iwma.com.

2. Percentages of waste share by type for landfill tonnage provided by CIWMB 2004 Statewide Waste Characterization Study. <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097>

Notes:

1. Waste Type data not collected by landfill. State average waste characterization data is used for residential, commercial and self haul waste.

2. Chicago Grade landfill reports a methane recovery factor of 60%. Chicago Grade total gas generated = 157.47 mmcf/yr. Total gas transferred = 94.48 mmcf/yr.

3. Cold Canyon landfill reports a methane recovery factor of 60%. Cold Canyon total gas generated = 700 mmcf/yr. Total gas transferred = 420 mmcf/yr.

Community Greenhouse Gas Emissions in 2005 Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes)	(%)	Energy (MMBtu)
<i>3 Solid Waste - Cold Canyon Landfill</i>						
<i>Disposal Method - Managed Landfill</i>						
Paper Products	0	0	65,790	1,382	2.5	
Food Waste	0	0	25,802	542	1.0	
Plant Debris	0	0	6,924	145	0.3	
Wood or Textiles	0	0	19,320	406	0.7	
Subtotal 3 Solid Waste - Cold Canyon Landfill	0	0	117,836	2,475	4.5	

Source(s):

1. Total waste tonnage for the City in 2005 provided by the 2005 Disposal Quarterly Reports prepared by San Luis Obispo County Integrated Waste Management Authority on 6/17/05, 9/27/05, 12/27/05 and 3/6/06, provided by Peter Cron, pcron@iwma.com.

2. Percentages of waste share by type for landfill tonnage provided by CIWMB 2004 Statewide Waste Characterization Study. <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097>

Notes:

1. Waste Type data not collected by landfill. State average waste characterization data is used for residential, commercial and self haul waste.

2. Chicago Grade landfill reports a methane recovery factor of 60%. Chicago Grade total gas generated = 157.47 mmcf/yr. Total gas transferred = 94.48 mmcf/yr.

3. Cold Canyon landfill reports a methane recovery factor of 60%. Cold Canyon total gas generated = 700 mmcf/yr. Total gas transferred = 420 mmcf/yr.

Subtotal Waste	0	0	128,343	2,695	4.9	
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Other

San Luis Obispo APCD, CA

1 - Off-Road and Agricultural Equipment

Carbon Dioxide	2,738	0	0	2,738	4.9	
Subtotal 1 - Off-Road and Agricultural Equipment	2,738	0	0	2,738	4.9	

Off-road vehicle and equipment emissions obtained from the California Air Resources Boards' OFFROAD2007 software. Emissions were calculated for construction equipment based on the city's share of countywide construction jobs, lawn & garden equipment based on the city's share of countywide households, industrial equipment based on the city's share of countywide industrial sector jobs, light commercial equipment based on the city's share of countywide commercial sector jobs, and agricultural equipment based on the city's share of countywide agricultural land. Household and job data obtained from the U.S. Census Bureau and agricultural data obtained from County GIS files.

1 - On-Road Transportation

Carbon Dioxide	22,506	0	0	22,506	40.6	
Subtotal 1 - On-Road Transportation	22,506	0	0	22,506	40.6	

Community Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)	Energy (MMBtu)
Sources:					
<ul style="list-style-type: none"> Average weekday vehicle miles traveled (VMT) were provided by Fehr & Peers, July 2012, using the San Luis Obispo Regional Travel Demand model. Transportation-related GHG emissions (carbon dioxide, methane, and nitrous oxide) were calculated using California Air Resources Board's Emissions Factor (EMFAC2011) software and converted to CO₂e. 					
Notes:					
<ul style="list-style-type: none"> Using origin-destination analysis, three types of vehicle trips were tracked separately for AM and PM peak periods in the City: <ol style="list-style-type: none"> Internal-Internal: Vehicle trips that remained inside the city Internal-External and External-Internal: Vehicle trips that have an ending or a beginning in the city External-External: Vehicle trips that pass through the city without originating or ending in the city 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 EMFAC2011 software. EMFAC2011 provides carbon dioxide, methane, and nitrous oxide emissions according to the unique vehicle composition of each county in California. Of the total on-road transportation emissions 93.2% are the result of gasoline consumption and 6.8% are the result of diesel fuel consumption. 					
Subtotal Other	25,244	0	0	25,244 45.5	
Total	52,642	295	130,537	55,474 100.0	475,536



**APPENDIX B:
CACP DETAILED REPORT FOR CITY
GOVERNMENT OPERATIONS EMISSIONS,
2005**



Government Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)		Energy (MMBtu)	Cost (\$)
Buildings and Facilities							
San Luis Obsipo APCD, CA							
<i>All Buildings and Facilities</i>							
Electricity	128	3	8	129	7.4	1,970	0
Natural Gas	192	0	18	193	11.0	3,626	0
<i>Subtotal All Buildings and Faci</i>	320	3	26	322	18.4	5,597	0

Revised Inventory Notes:

Updated natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs (213) 244-3246, pmorais@semprautilities.com, May 2012.

Update electricity data provided by Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E, May 2012.

1. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO₂ emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009).

2. N₂O, CH₄ and natural gas CO₂ emissions factors from LGOP v1.1

Subtotal Buildings and Facilities	320	3	26	322	18.4	5,597	0
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Streetlights & Traffic Signals

San Luis Obsipo APCD, CA							
<i>All Streetlights and Traffic Controls</i>							
Electricity	87	2	5	87	5.0	1,331	0
<i>Subtotal All Streetlights and Tr</i>	87	2	5	87	5.0	1,331	0

Revised Inventory Notes:

Source: Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E.

1. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO₂ emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009).

Original Inventory Notes: Electricity data received from PG&E (ghgdatarequests@pge.com).

Subtotal Streetlights & Traffic Si	87	2	5	87	5.0	1,331	0
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Government Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes)	(%)	Energy (MMBtu)	Cost (\$)
Water Delivery Facilities							
San Luis Obsipo APCD, CA							
<i>All Water Delivery Facilities</i>							
Electricity	106	2	6	107	6.1	1,627	0
Subtotal All Water Delivery Fac	106	2	6	107	6.1	1,627	0
Revised Inventory Notes: Source: Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com , PG&E. 1. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO ₂ emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Original Inventory Notes Electricity data received from PG&E (ghgdatarequests@pge.com).							
Subtotal Water Delivery Facilities:	106	2	6	107	6.1	1,627	0
Wastewater Facilities							
San Luis Obsipo APCD, CA							
<i>All Wastewater Facilities</i>							
Electricity	249	6	15	251	14.3	3,828	0
Subtotal All Wastewater Facilit.	249	6	15	251	14.3	3,828	0
Revised Inventory Notes: Source: Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com , PG&E. 1. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO ₂ emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Original Inventory Notes Electricity data received from PG&E (ghgdatarequests@pge.com). Natural gas data received from Colby Morrow, The Gas Company, CLMorrow@seprautilities.com .							
Subtotal Wastewater Facilities	249	6	15	251	14.3	3,828	0
Solid Waste Facilities							
San Luis Obsipo APCD, CA							
<i>All City Facilities</i>							
Carbon Dioxide	106	0	0	106	6.0	0	0
Subtotal All City Facilities	106	0	0	106	6.0	0	0

Information obtained from Municipal Solid Waste billing statements. Assumed 325 pounds of Municipal Solid Waste per cubic yard.

Government Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)		Energy (MMBtu)	Cost (\$)
Subtotal Solid Waste Facilities	106	0	0	106	6.0	0	0

Vehicle Fleet

San Luis Obsipo APCD, CA

1 Administration

Gasoline	4	0	0	4	0.2	56	1,036
Subtotal 1 Administration	4	0	0	4	0.2	56	1,036

Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 2000 includes - 1 Jeep Cherokee. Passenger Cars MY 2001 includes - 1 Ford Taurus.

1 Cloisters

Diesel	0	0	0	0	0.0	1	20
Gasoline	5	0	0	5	0.3	73	1,459
Subtotal 1 Cloisters	5	0	0	5	0.3	74	1,479

Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles Alt. Method includes - Unknown. Light Trucks MY 1999 includes - 1 GMC C1500.

1 Collections

Diesel	13	0	0	13	0.8	181	3,088
Gasoline	11	1	1	11	0.6	156	3,047
Subtotal 1 Collections	24	1	1	24	1.4	337	6,135

Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 1996 to 2004 includes - GMC C-3500. Light Trucks MY 2000 includes - 1 GMC Sierra 1500 and 1 GMC 2500.

1 Facilities

Gasoline	11	1	1	12	0.7	166	3,246
Subtotal 1 Facilities	11	1	1	12	0.7	166	3,246

Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 1987 to 1993 includes - 2 Ford Explorer and 1 GMC Savana Cargo Van.

1 Fire

Diesel	31	0	0	31	1.8	422	6,397
Gasoline	22	1	1	22	1.3	320	6,264
Subtotal 1 Fire	53	2	1	53	3.0	743	12,661

Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles All MYs include - 1 1982 Pierce Fire Engine, 1 1983 Pierce Fire Engine, and 1 1994 Pierce Fire Engine. Light Trucks MY 1995 include - 1 GMC 3500. Light Trucks MY 2000 include - 1 Ford Expedition.

Government Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)		Energy (MMBtu)	Cost (\$)
Light Trucks MY 2001 include - Ford F250. Light Trucks MY 2003 include - Ford F250.							
<i>1 Harbor</i>							
Diesel	0	0	0	0	0.0	1	21
Gasoline	19	1	1	20	1.1	282	5,532
Subtotal 1 Harbor	19	1	1	20	1.1	284	5,553
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles Alt. Method include - Unknown. Light Trucks MY 1994 include - 1 Ford F350. Light Trucks MY 2001 include - 1 Dodge Ram 2500 (3/4 Ton). Light Trucks MY 2003 include - 1 Dodge 1/2 Ton.							
<i>1 Parks & Recreation</i>							
Diesel	6	0	0	6	0.3	75	1,142
Gasoline	16	1	0	16	0.9	234	4,640
Subtotal 1 Parks & Recreation	21	1	1	22	1.2	309	5,782
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 1996 to 2004 include - 1 Dodge Ram Van 2500. Light Trucks MY 1999 include - 1 GMC Savana Cargo Van. Light Trucks MY 2001 include - 1 Chevy Silverado. Light Trucks MY 2002 include - 1 Chevy Silverado. Light Trucks MY 2003 include - 1 Chevy Silverado.							
<i>1 Police</i>							
Gasoline	119	4	8	120	6.8	1,747	34,029
Subtotal 1 Police	119	4	8	120	6.8	1,747	34,029
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 2001 include - 1 Dodge Durango and 1 Jeep Cherokee. Light Trucks MY 2004 include - 2 Dodge 1/2 Ton. Passenger Cars MY 1999 include - 2 Ford Crown Victoria. Passenger Cars MY 2005 include - 2 Ford Crown Victoria and 1 Toyota Camry LE.							
<i>1 Public Services</i>							
Gasoline	14	0	0	14	0.8	202	3,923
Subtotal 1 Public Services	14	0	0	14	0.8	202	3,923
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Passenger Cars MY 2003 include - 1 Ford Taurus.							
<i>1 Streets</i>							
Diesel	5	0	0	5	0.3	71	1,068
Gasoline	25	2	2	26	1.5	373	7,325
Subtotal 1 Streets	31	2	2	31	1.8	444	8,393
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles All MYs include - 1 Pac Roller and 1 Caterpillar Grader. Light Trucks MY 1987 to 1993 include - 1 1990 GMC 21/2 Ton and 1 1991 GMC 21/2 Ton. Light Trucks MY 2000 include - GMC C-6500. Light Trucks MY 2003 include - 1 John Deere Tractor. Light Trucks MY 2004 include - 1 Chevrolet C-3500.							

Government Greenhouse Gas Emissions in 2005

Detailed Report

	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes) (%)		Energy (MMBtu)	Cost (\$)
1 Vehicle Maintenance							
Diesel	0	0	0	0	0.0	1	11
Gasoline	1	0	0	1	0.1	17	333
Subtotal 1 Vehicle Maintenance	1	0	0	1	0.1	18	344
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles Alt. Method include - Unknown. Light Trucks MY 2000 include - GMC 1500.							
1 Water							
Diesel	1	0	0	1	0.1	15	229
Gasoline	38	2	2	39	2.2	561	11,055
Subtotal 1 Water	39	2	2	40	2.3	576	11,284
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 1996 to 2004 include - 1 Dodge Ram 2500 (3/4 Ton). Light Trucks MY 1995 include - 1 GMC C-3500. Light Trucks MY 2004 include - 2 Chevrolet C-3500.							
1 WWTP							
Diesel	5	0	0	5	0.3	67	1,021
Gasoline	4	1	0	4	0.2	62	1,191
Subtotal 1 WWTP	9	1	0	9	0.5	129	2,212
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Light Trucks MY 1996 to 2004 include - 1 Dodge Ram 2500 (3/4 Ton). Light Trucks MY 1994 include - 1 Ford F150.							
Subtotal Vehicle Fleet	350	15	17	355	20.2	5,085	96,077
Employee Commute							
San Luis Obsipo APCD, CA							
3 Employee Commute							
Diesel	35	0	0	35	2.0	476	0
Gasoline	370	27	31	379	21.6	5,444	0
Subtotal 3 Employee Commute	405	27	31	414	23.6	5,919	0
Subtotal Employee Commute	405	27	31	414	23.6	5,919	0

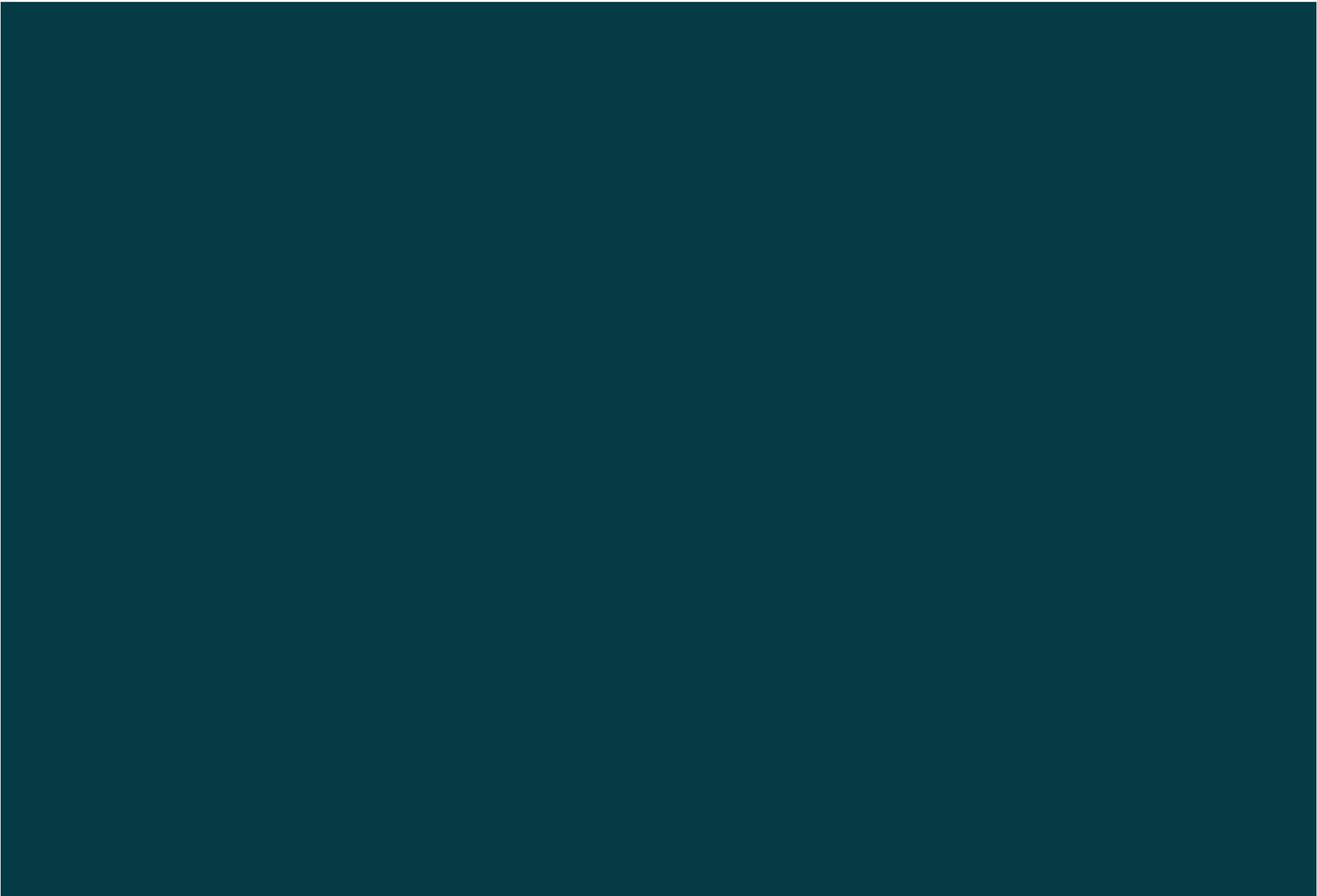
Government Greenhouse Gas Emissions in 2005

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	CO ₂ (tonnes)	N ₂ O (kg)	CH ₄ (kg)	Equiv CO ₂ (tonnes)	(%)	Energy (MMBtu)	Cost (\$)
Transit Fleet							
San Luis Obsipo APCD, CA							
<i>1 Dial-A-Ride</i>							
Gasoline	93	6	16	95	5.4	1,362	26,763
<i>Subtotal 1 Dial-A-Ride</i>	93	6	16	95	5.4	1,362	26,763
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles MY 2005 includes - 1 Ford E-450 (Eldorado Aerotech).							
<i>1 Trolley</i>							
Gasoline	18	1	2	18	1.0	264	5,436
<i>Subtotal 1 Trolley</i>	18	1	2	18	1.0	264	5,436
Fuel records were provided by Cindy Jacinth (cjacinth@morro-bay.ca.us). Fuel records provided total fuel consumption by department. Fuel consumption was spread evenly between all vehicles in each department. Heavy Duty Vehicles MY 1985 to 1986 include - 1 1985 P-30. Heavy Duty Vehicles MY 1999 include - 1 Ford Molly Trolley. Heavy Duty Vehicles MY 2003 include - 1 Ford F-53 (Molly Trolley).							
Subtotal Transit Fleet	110	7	18	113	6.4	1,626	32,199
Total	1,732	63	119	1,754	100.0	25,013	128,276



**APPENDIX C:
DETAILED METHODOLOGY FOR
COMMUNITY-WIDE INVENTORY**



APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

Detailed Methodology for Community-Wide Inventory

This appendix provides the detailed methodology and data sources used for calculating GHG emissions in each sector of the community-wide inventory.

OVERVIEW OF INVENTORY CONTENTS AND APPROACH

The community inventory methodology is based on guidance from ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP) (October 2009) and the Association of Environmental Professionals California Community-wide GHG Baseline Inventory Protocol (AEP Protocol) (June 2011). The community inventory identifies and quantifies emissions from the residential, commercial/industrial, transportation, off-road, and solid waste sectors. Emissions are calculated by multiplying activity data—such as kilowatt hours or gallons of gasoline consumed—by emissions factors, which provide the quantity of emissions per unit of activity. Activity data is typically available from electric and gas utilities, planning and transportation agencies and air quality regulatory agencies. Emissions factors are drawn from a variety of sources, including the California Climate Action Registry, the Local Governments Operations Protocol (LGOP) version 1.1 (May 2010), and air quality models produced by the California Air Resources Board.

In this inventory, all GHG emissions are converted into carbon dioxide equivalent units, or CO₂e, per guidance in the LGOP version 1.1, AEP Protocol, and IEAP. The LGOP provides standard factors to convert various greenhouse gases into carbon dioxide equivalent units; these factors are known as Global Warming Potential factors, representing the ratio of the heat-trapping ability of each greenhouse gas relative to that of carbon dioxide.

The following sections describe the specific data sources and methodology for calculating GHG emissions in each community sector.

RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SECTORS

All residential and commercial/industrial sector emissions are the result of electricity consumption and the on-site combustion of natural gas. Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal Gas Co.) provided residential electricity and natural gas consumption data. Specifically, data was provided by:

- Jillian Rich, Program Manager with PG&E Green Communities and Innovator Pilots (jillian.rich@pge.com), and John Joseph, PG&E GHG Data Requests

APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

- Paulo Morais, Energy Programs Supervisor with Southern California Gas Company, Customer Programs (pmorias@semprautilities.com)

The raw data received from PG&E and SoCal Gas Co. is summarized in **Tables 1** and **2** below. This raw data was input into the CACP2009 software in kWh and therms. PG&E provided a 2005 carbon dioxide (CO₂) coefficient for electricity use and SoCal Gas Co. provided a carbon dioxide (CO₂) coefficient for natural gas (see “electricity and natural gas coefficients” section). Emissions coefficients for methane (CH₄) and nitrogen dioxide (N₂O) emissions were provided by the California LGOP version 1.1 and were converted into carbon dioxide equivalents and added to the CO₂ emissions to obtain carbon dioxide equivalent (CO₂e) emissions.

All commercial/industrial sector emissions are the result of electricity consumption and the on-site combustion of natural gas. Commercial and industrial electricity were combined into one section by PG&E due to the California 15/15 Rule. The 15/15 Rule was adopted by the California Public Utilities Commission (CPUC) 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 be made up of at least 15 customers. 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. As a result, PG&E aggregated commercial and industrial energy consumption into one report, whereas SoCal Gas Co. separated commercial and industrial gas usage (shown in the chart below) into two reports. It would have been misleading to present an “Industrial” category for only natural gas emissions; therefore, the SoCal Gas Co. emissions were aggregated with commercial as well.

TABLE 1: RESIDENTIAL ENERGY USE

2005 Residential Energy Emissions	Scope	Input Data Metric Tons	Metric Tons CO ₂ e per year
PG&E Electricity	2	24,057,118kWh	5,380
SoCal Gas Co. Natural Gas	1	2,013,283 Therms	10,710

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TABLE 2: COMMERCIAL/INDUSTRIAL ENERGY USE

2005 Commercial / Industrial Energy Emissions	Scope	Input Data	Metric Tons CO ₂ e per year
PG&E Commercial + Industrial Electricity	2	29,121,092 kWh	6,513
SoCal Gas Co. Commercial + Industrial Natural Gas	1	925,510 Therms	4,929

To make the Inventory more accurate and representative of the city’s real impact on climate change, tailored coefficient sets were obtained from PG&E and the LGOP version 1.1. Sources and coefficient values are summarized in the table below.

TABLE 3: ELECTRICITY COEFFICIENT SETS

Coefficient Set	Unit	Value	Source
Average Grid Electricity Set	Lbs/ MWh	489 CO ₂ 0.011 N ₂ O 0.03 CH ₄	Jillian Rich, Program Manager with PG&E Green Communities and Innovator Pilots (jillian.rich@pge.com), and John Joseph, PG&E GHG Data Requests and LGOP version 1.1

TABLE 4: NATURAL GAS COEFFICIENT SETS

Coefficient Set	Unit	Value	Source
Fuel CO ₂ (Natural Gas) Set	kg/MMBtu	53.06 CO ₂	Coefficient set provided by LGOP version 1.1
RCI Average Set – Residential	kg/MMBtu	0.0001 N ₂ O 0.005 CH ₄	Coefficient set provided by LGOP version 1.1
RCI Average Set – Commercial + Industrial	kg/MMBtu	0.0001 N ₂ O 0.005 CH ₄	Coefficient set provided by LGOP version 1.1

TRANSPORTATION SECTOR

On-road transportation emissions were derived from local jurisdiction vehicle miles traveled (VMT) data and regional vehicle and travel characteristics. The transportation analysis,

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conducted by Fehr & Peers, utilized the San Luis Obispo Council of Governments (SLOCOG) Regional Travel Demand model to develop transportation-related GHG emissions data and VMT for trips that have an origin and/or destination in the city.

The SLOCOG Travel Demand Model was recently updated and validated to reflect 2010 conditions and to comply with the Regional Transportation Plan (RTP) guidelines on implementation of Senate Bill 375 (SB 375). The update included expanding the times of day, calibration of multiple modes, and reflecting the auto and of non-auto RTP transportation system, all beneficial when quantifying potential GHG reduction strategies. A 2005 land use scenario was developed by extrapolating 2035 and 2010. Similarly, a 2020 land use scenario was developed by interpolating between 2010 and 2035. See *Summary for the San Luis Obispo Council of Governments Model Improvement Project to Meet the Requirements of California Transportation Commission Guidelines for Regional Transportation Plans in Response to SB375* (February, 2012) for details on model calibration and validation.

Using the model, Fehr & Peers allocated vehicle trips and VMT to each of the cities in San Luis Obispo County and the unincorporated county by weighting trips based on their origin and destination. The VMT summarized for land use with each of the incorporated cities and unincorporated county includes:

- a) All of the VMT associated with trips made completely internally within each jurisdiction;
- b) Half of the VMT generated by jobs and residences located within each jurisdiction but that travels to/from external destinations (this is consistent with the recent SB 375 Regional Targets Advisory Committee (RTAC) decision that the two generators of an inter-jurisdictional trip should each be assigned half of the responsibility for the trip and its VMT); and
- c) None of the responsibility for travel passing completely through the jurisdiction with neither an origin point, or a destination within the city (also consistent with RTAC decision).

The gateways exiting the model area were included in the VMT calculation. This means that a jurisdiction will be held responsible for some VMT occurring outside of the model borders. For example, if a household in Pismo Beach travels across the Santa Maria Bridge to Santa Barbara, or through San Luis Obispo City to reach King City. To capture the effects of congestion, the model VMT for each time period were summarized by speed for each time period and then aggregated to daily. The VMT results are summarized in **Table 5** for the baseline year (2005) and **Table 6** for 2020.

APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

TABLE 5: VEHICLE MILES TRAVELED PER JURISDICTION, 2005

Vehicle Miles Traveled per Jurisdiction, 2005	Vehicle Miles Traveled (VMT)	
	Average Weekday Daily	Average Annual ¹
Arroyo Grande	231,019	80,163,593
Atascadero	375,925	130,445,975
Grover Beach	116,140	40,300,580
Morro Bay	140,915	48,897,505
Paso Robles	424,515	147,306,705
Pismo Beach	324,400	112,566,800
San Luis Obispo	2,280,295	791,262,365
Unincorporated County	2,635,017	914,350,899
Total	6,528,226	2,265,294,422

¹ Average Annual VMT was calculated by applying a multiplier of 347 to average weekday daily VMT to account for the total number of weekdays in one year based on the recommendation from Caltrans.

TABLE 6: VEHICLE MILES TRAVELED PER JURISDICTION, 2020

Vehicle Miles Traveled per Jurisdiction, 2020	Vehicle Miles Traveled (VMT)	
	Average Weekday Daily	Average Annual ¹
Arroyo Grande	267,068	92,672,596
Atascadero	501,605	174,056,935
Grover Beach	153,407	53,232,378
Morro Bay	167,302	58,053,794
Paso Robles	559,372	194,102,084
Pismo Beach	498,453	172,963,018
San Luis Obispo	3,298,712	1,144,653,064
Unincorporated County	3,378,180	1,172,228,460
Total	8,824,099	3,061,962,329

¹ Average Annual VMT was calculated by applying a multiplier of 347 to average weekday daily VMT to account for the total number of weekdays in one year based on the recommendation from Caltrans.

APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

The EMFAC2011 model developed by the California Air Resources Board was then used to calculate emissions from the VMT figures above. EMFAC defaults for San Luis Obispo County include regionally-specific information on the mix of vehicle classes and model years, as well as ambient conditions and travel speeds that determine fuel efficiency. Types of emissions accounted for include: running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak. The model estimates carbon dioxide, methane, and nitrous oxide emissions from these factors and inputted vehicle activity data.

WASTE SECTOR

Emissions from the waste sector are an estimate of methane generation from the decomposition of landfilled solid waste in the base year (2005). The methane commitment method embedded in CACP2009 is based on the EPA's Waste Reduction Model (WARM) for calculating lifecycle emissions from waste generated within the jurisdictional boundary of the city in 2005. The analysis does not use the waste-in-place method, which calculates emissions from all waste generated in 2005 and all waste already existing in the landfill before the baseline year.

The waste sector takes into account the waste sent to landfills from city residents, businesses, and institutions in 2005. It does not calculate emissions from the total amount of waste sent to county landfills (Cold Canyon and Chicago Grade) in 2005 since those landfills accept waste from the unincorporated county and incorporated cities.

Solid waste tonnage data per jurisdiction was provided by:

- "2005 Disposal Report" by quarter, prepared by the San Luis Obispo Integrated Waste Management Board on 3/6/06. Document provided by Peter Cron, San Luis Obispo County Integrated Waste Management Authority (pcron@iwma.com).

Since the composition of waste sent to landfill in 2005 is unknown for the city, the following statewide average waste composition study was utilized:

- CIWMB 2004 Statewide Waste Characterization Study, <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097>.

The Waste Characterization Study's distribution of waste by type was then converted into the five categories included in the CACP2009 software, which resulted in the following waste characterization:

APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

- Paper Products: 21.0%
- Food Waste: 14.6%
- Plant Debris: 6.9%
- Wood/Textiles: 21.8%
- All other waste: 35.7%

The CACP2009 software does not have the ability to assign an individual methane recovery factor to each landfill; therefore, we took a weighted average (60%) based on the portion of waste in each landfill. The methane recovery factors of the landfills are well documented by the San Luis Obispo Air Pollution Control District based on the system operations at that time. **Table 7** includes methane recovery factors for the Chicago Grade and Cold Canyon landfills. Emissions factors were obtained from the LGOP version 1.1.

TABLE 7: COMMUNITY GENERATED WASTE, 2005

Methane recovery and indicator inputs, 2005	Methane Recovery	Total gas generated (mmcf/yr)	Total gas transferred (mmcf/yr)	Data Source	Waste Tonnage from city, 2005 (tons)
Chicago Grade	60%	157.47	94.48	APCD 2005 Inventory	31,097
Cold Canyon	60%	700.00	420.00	APCD 2005 Inventory	26

OFF-ROAD VEHICLES AND EQUIPMENT SECTOR

Off-road emissions were obtained from the California Air Resources Board's OFFROAD2007 model. The model was run using default equipment population, usage, and efficiency data for San Luis Obispo County. Emissions outputs were scaled to the local jurisdiction level by indicators identified in **Table 8**. Results were converted from short tons per day to metric tons per year. Methane and nitrous oxide emissions were converted to carbon dioxide equivalent units based on the Global Warming Potential factors from LGOP version 1.1.

APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

TABLE 8: COUNTY-WIDE EMISSIONS INDICATORS

Equipment Type	Allocation Indicator	Source
Agricultural Equipment	Acres of cropland	San Luis Obispo County, GIS shape files
Construction and Mining Equipment	Construction and mining jobs	U.S. Census Bureau, Center for Economic Studies, On the Map Tool
Industrial Equipment	Industrial jobs	U.S. Census Bureau, Center for Economic Studies, On the Map Tool
Lawn and Garden Equipment	Households	Economics Research Associates. (July 2006). SLOCOG Long Range Socio-Economic Projections. 2005 baseline data
Light Commercial Equipment	Service and commercial jobs	U.S. Census Bureau, Center for Economic Studies, On the Map Tool

The OFFROAD2007 software calculates emissions from other sources of off-road equipment as well, including recreational vehicles and watercrafts; however these emissions were not included because there was no feasible methodology for separating these emissions per jurisdiction within the county. Population is proven to not be an accurate indicator of consumption rates. To remain consistent with protocol and practice, emissions must be separated in a spatial manner, similar to how highway emissions are determined by road segment length within each jurisdiction. It should also be noted that many location-sources of off-road emissions, such as recreational vehicle emissions, occur in state parks or beaches outside of the jurisdiction of each city or the county.

2020 FORECAST

The GHG emissions forecast provides a “business-as-usual estimate,” or scenario, of how emissions will change in the year 2020 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32.

The 2020 forecast calculates business-as-usual growth based on population and job growth rates obtained from the San Luis Obispo Council of Governments report, "San Luis Obispo County 2040 Population, Housing & Employment Forecast" (August 2011). Mid-range estimates

APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

of growth were used in both instances (**Figures ES-5** and **6-1**). Specifically population growth rates were applied to residential, waste, off-road, and wastewater sectors; job growth rates were applied to the commercial/industrial sector. For the transportation sector, Fehr & Peers provided VMT estimates for the year 2020 as shown in **Table 6** above.

It should be noted that these forecasts do not take into consideration any planned or actual efficiency or conservation measures after 2005. For example, the State Renewable Energy portfolio has advanced significantly since 2005, but the forecast calculates 2020 energy emissions by assuming constant emissions factors.



**APPENDIX D:
DETAILED METHODOLOGY FOR CITY
GOVERNMENT OPERATIONS INVENTORY**



APPENDIX D: DETAILED METHODOLOGY FOR CITY GOVERNMENT OPERATIONS INVENTORY

Detailed Methodology for Government Operations GHG Emissions Inventory

The municipal operations inventory follows the LGOP version 1.1, which was adopted in 2010 by CARB and serves as the national standard for quantifying and reporting GHG emissions from local government operations.

BUILDING SECTOR

The building sector includes all emissions from natural gas and electricity consumed in City-owned and - operated buildings and facilities. Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal Gas Co.) provided municipal electricity and natural gas consumption data respectively. Specifically, data was provided by:

- Jillian Rich, Program Manager with PG&E Green Communities and Innovator Pilots (jillian.rich@pge.com), and John Joseph, PG&E GHG Data Requests
- Paulo Morais, Energy Programs Supervisor with Southern California Gas Company, Customer Programs (pmorias@semprautilities.com)

This raw data was input into the CACP2009 software in kWh and therms. PG&E provided a 2005 carbon dioxide (CO₂) coefficient for electricity use and SoCal Gas Co. provided a carbon dioxide (CO₂) coefficient for natural gas. Emissions coefficients for methane (CH₄) and nitrogen dioxide (N₂O) emissions were provided by the California LGOP version 1.1 and were converted into carbon dioxide equivalents and added to the CO₂ emissions to obtain carbon dioxide equivalent (CO_{2e}) emissions (see **Appendix C, Tables 3 and 4**).

VEHICLE FLEET SECTOR

The vehicle fleet sector includes gasoline and diesel vehicles from the following City departments:

- Public Services
- Fire
- Parks
- Police
- Administration
- Harbor
- Water
- Wastewater

APPENDIX D: DETAILED METHODOLOGY FOR CITY GOVERNMENT OPERATIONS INVENTORY

Gasoline and diesel consumption for calendar year 2005 was obtained from fuel billing statements provided by the Cindy Jacinth, Public Services (CJacinth@morro-bay.ca.us). Specific sources of data within each organization are outlined in the notes of **Appendix B**. Emissions were calculated using the EMFAC software for the San Luis Obispo region, consistent with the community methodology described in **Appendix C**.

EMPLOYEE COMMUTE SECTOR

Employees were surveyed in June 2010 using an online survey instrument. The questions, attached as **Appendix E**, asked employees about their current commuting patterns. Of those questions, we used the following for our analysis:

- What is your approximate one-way distance to work (in miles)? Please indicate the most direct distance to work, discounting midway destinations that would be taken whether or not you drove to work each day (i.e. dropping off children at school).
- Please indicate the type of transportation you take to work each day in your average work week. Please note that there are two types of carpooling.
 - ◇ Drive alone
 - ◇ Carpool with fellow City employees
 - ◇ Carpool with drivers not employed by the City
 - ◇ Vanpool
 - ◇ Public transit
 - ◇ Motorcycle
 - ◇ Bicycle
 - ◇ Walk
 - ◇ Telecommute
 - ◇ Other
- What type of vehicle do you drive?
- What type of fuel does your vehicle use?
- If you carpool with fellow City employees, how many City employees ride with you? If you carpool with a different number each day, please indicate the average.

Approximately 63 employees responded to the survey with usable information, meaning that all essential questions were answered. Answers with mileage left blank or with highly inconsistent

APPENDIX D: DETAILED METHODOLOGY FOR CITY GOVERNMENT OPERATIONS INVENTORY

data (ex: saying they walked three days to work, biked two, and drove five) were omitted. In addition, if a respondent did not describe their 'other' category of transportation, the entry was omitted.

To perform this analysis, we took the following steps:

- 1) Separate entries by what type of vehicle they own and operate (compact, midsize car, full-size car, small truck, medium-small truck, large truck, motorcycle or "don't drive"). Within each new group, separate the entries by diesel, gasoline or hybrid.
- 2) For each group of entries with the same vehicle type and technology, multiply the number of miles to work by 2 (to get round-trip estimate) and then by the number of 'drive alone' days for each entry. Multiply the number of miles to work by the number of 'carpool' days (half of the 'drive alone' emissions). Note: If a respondent entered that they motorcycle to work, but own a car as well, the motorcycle miles were moved to the motorcycle category). Adjust for hybrids (see below).
- 3) Add all miles per vehicle type and technology and multiply by 52.18 work weeks/year.
- 4) Calculate the multiplier to adjust survey response data to the entire 2005 employee population. In 2005, there were 110 employees. This, divided by the 63 survey entries, gives us our multiplier of 1.75.
- 5) Multiply the mileage per vehicle per technology type by the multiplier.
- 6) Divide the number of hybrid miles by 2.2 and add the difference to the 'passenger car' category. This is to account for the large increase in hybrid sales between 2005 and 2009 (Source: Hybridcars.com sales statistics).
- 7) Multiply the number of biodiesel by 30% and add the remainder to the 'passenger car' diesel category. This is to account for the increase in biodiesel consumption between 2005 and 2009 (Source: DOE sales statistics).
- 8) Manipulate the vehicle classes to fit the CACP2009 software categories.
- 9) Enter final miles into the CACP2009 software per vehicle type and fuel.

APPENDIX D: DETAILED METHODOLOGY FOR CITY GOVERNMENT OPERATIONS INVENTORY

TABLE 1: 2010 EMPLOYEE COMMUTE SURVEY

Vehicle Group	2009 Survey results		Adjusted for 2005	
	Annual VMT	Fuel Type	Annual VMT	Fuel Type
Light Truck/SUV/Pickup	66,341.65	Gasoline	116,097.89	Gasoline
	0.00	Diesel	0.00	Diesel
Large Truck	29,732.16	Gasoline	52,031.29	Gasoline
	36,891.26	Diesel	64,559.71	Diesel
Passenger Vehicle	223,627.83	Gasoline	387,459.99	Gasoline
	0.00	Diesel	0.00	Diesel
	0.00	Biodiesel	0.00	Biodiesel
Motorcycle	0.00	Gasoline	0.00	Gasoline
Total	356,592.90		620,148.88	

The CACP2009 software does not provide a method of calculating emissions from hybrid cars. As a result, these emissions were divided by 2.20 based on the difference between average fuel economy of a 2005 Toyota Prius and the average fuel economy included in the 2005 San Luis Obispo region EMFAC data and then entered into the CACP2009 software under passenger vehicle (Source: www.fueleconomy.gov).

STREETLIGHT SECTOR

PG&E provided electricity usage from streetlights in kWh for 2005. The total kWh were entered into the CACP2009 software using the electricity coefficients identified in **Appendix C**.

WATER/ SEWAGE SECTOR

This sector calculates emissions from energy consumption at City-owned and operated water and wastewater facilities and point-source emissions that arise from wastewater treatment processes. PG&E and SoCal Gas Co. provided the electricity and natural consumption data for each of the water and wastewater facilities. Operational data provided by the Wastewater Treatment Plant Manager was utilized to determine total methane and nitrous oxide emissions using ICLEI's Wastewater Emissions Data tool. Both of these sources are outlined in **Appendix B**. The City of Morro Bay and the Cayucos Community Services District (CSD) co-own the

APPENDIX D: DETAILED METHODOLOGY FOR CITY GOVERNMENT OPERATIONS INVENTORY

wastewater treatment plant. Because the treatment plant serves residents and businesses outside the City of Morro Bay all emissions should not be attributed to the City per the Local Government Operations Protocol. Emissions were attributed in proportion to the percentage of ownership. The City of Morro Bay owns 60% of the treatment plant and; therefore, 60% of the emissions associated with the treatment of wastewater were attributed to the City. These totals were entered into the CACP2009 software with the electricity and natural gas coefficients presented in **Appendix C**.

WASTE SECTOR

Morro Bay Garbage Service reported solid waste tonnage produced by City operations. The City produced 298.3 metric tons of waste in 2005 that was sent to managed landfill. The waste composition was unknown for the city; therefore, the California averages provided by the 2004 California Integrated Waste Management Board Waste Characterization Report were used. A weighted average methane recovery factor of 60% was used in this analysis, as outlined in **Appendix C**.



**APPENDIX E:
CITY EMPLOYEE COMMUTE SURVEY, 2009**



APPENDIX E: CITY EMPLOYEE COMMUTE SURVEY, 2010

City Employee Commute Survey, 2010

- 1) What is your approximate on-way distance to work (in miles)? Please indicate the most direct distance to work, discounting midway destinations that would be taken whether or not you drove to work each day (i.e. dropping off children at school).

- 2) Please indicate the type of transportation you take to work each day in your average work week. Please note that there are two types of carpooling.

	Day 1	Day 2	Day 3	Day 4	Day 5
Drive Alone	<input type="checkbox"/>				
Carpool with fellow City employees	<input type="checkbox"/>				
Carpool with other drivers not employed by the City	<input type="checkbox"/>				
Vanpool	<input type="checkbox"/>				
Public transit	<input type="checkbox"/>				
Motorcycle	<input type="checkbox"/>				
Bicycle	<input type="checkbox"/>				
Walk	<input type="checkbox"/>				
Telecommute	<input type="checkbox"/>				
Other	<input type="checkbox"/>				

- 3) What type of vehicle do you drive?

- Compact/Sub-Compact car (Civic, Corolla, Focus, Neon, Cavalier, Jetta or similar)
- Mid-size car (Accord, Camry, Passat, Monte Carlo, Sable, Sebring or similar)
- Full-size car (Impala, Intrepid, Taurus, Crown Victoria, Bonneville, Town Car or similar)
- Small Truck/SUV/Pickup (RAV4, Chev S10, Pickup (4 cylinder), PT Cruiser or similar)
- Medium-Small Truck/SUV/Pickup (Minivan, Sonoma Pickup Truck or similar)
- Medium-Large Truck/SUV/Pickup (Durango, Safari Cargo Van, Ford F150 or similar)
- Large Truck/SUV/Pickup (Suburban, Expedition, Navigator, Ford E250/350/450 or similar)
- Motorcycle
- I don't drive alone or drive a carpool

APPENDIX E: CITY EMPLOYEE COMMUTE SURVEY, 2008

4) What type of fuel does your vehicle from question 3 use?

- Gasoline
- Diesel
- Biodiesel
- Hybrid
- Electric
- I don't drive to work or drive a carpool
- Other (Specify): _____

5) If you carpool or vanpool with fellow City employees, how many City employees ride with you? If you carpool with a different number each day, please indicate the average. If 'not applicable', please enter "0".

Enter # of people: _____

APPENDIX B

TECHNICAL APPENDIX

GHG Measure Quantification Details

Several factors including GHG reduction potential as well as economic impacts were key factors in evaluating and selecting GHG emissions reduction measures for Morro Bay' CAP. This appendix displays pages from the measure evaluation toolbox which detail the methodology, information sources, and assumptions for the GHG reduction potential and cost and savings estimates included in the CAP.

This appendix also contains details regarding the quantification of existing local measures and State reductions which were included in the adjusted forecast as described in Chapter 2 of the CAP.

About the CAP Measure Methods and Calculations

The GHG emission reduction potential of a given measure is quantified following standardized methods for estimating emissions detailed in the California Air Pollution Control Officers Association's (CAPCOA) report Quantifying Greenhouse Gas Mitigation Measures (August 2010). The calculations utilize emissions factors and results from the Morro Bay' GHG Emissions Inventory, as well as assumptions made by the City about the degree of implementation in the year 2020.

Costs and savings directly associated with the implementation of each measure were estimated for the City, as well as for residents and businesses, where feasible. Cost estimates generally include initial capital costs (e.g., purchase and installation of technology, program development, etc.) needed to produce the emission reductions estimated by the GHG analysis in 2020, and are based on current (2013) prices. Savings include reduced costs associated with electricity, natural gas, and fuel usage, as well as the reduced need for maintenance, and are also based on current (2013) prices. Costs and savings were estimated using information specific to the region—when available—or for similar cities in the region, State of California, or United States, prioritized in that order. There are numerous factors that will affect the actual costs incurred if the measures are implemented. Because of the uncertainties and variability associated with costs and savings, they are reported as ranges in Chapters 3 and 4 of the CAP.

City Government Energy Efficiency Retrofits and Upgrades

Calculation Methodology and Equations

Key Assumptions for Calculations:

Target percentage of energy savings	10%	Percent
Staff time needed for this measure	0.08	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Municipal Electricity Energy Savings (kWh)=Em x P x 0.95		
	Municipal Natural Gas Savings (therms)=NGm x P x 0.05		
	Where:		
	Em=	2,175,677	Municipal electricity usage (GHG Emissions Inventory)
	NGm=	36,264	Municipal natural gas usage (GHG Emissions Inventory)
	P=	10%	Target percentage of energy savings (applied 95% electricity, 5% natural gas)
Resource Savings	206,689	Municipal electricity saved (kWh/year)	
	181	Municipal natural gas saved (therms/year)	
GHG Emission Reduction Calculations	GHG Savings (MT CO2e)=(Se/1,000 x 0.133)+(Sg/10 x 53.2/1,000)		
	Where:		
	Se=	electricity savings	
	Sg=	natural gas savings	
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)	
	10	= conversion factor for therm to MMBtu	
	0.133	= average projected emissions factor for electricity in 2020 in MT CO2e/MWh	
	53.20	= average emissions factor for natural gas (kg CO2e/MMBtu)	
GHG Emission Reduction	28	MT CO2e	
Municipal Cost and Savings Calculations	Staff time needed to apply for funding and implement the upgrades.		
	FTE =	0.08	Estimated staff time per year to develop new program
	\$/FTE=	\$100,000	FTE cost
	Cost of staff time =	\$8,000	Dollars
	Total Savings = kWh reduced/year x \$/kWh + therms reduced/year x \$/therm		
	Where:		
	\$/kWh =	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	\$/Therm =	\$0.92	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
Municipal Cost and Savings	Municipal Cost =	Varies	Dollars (costs will vary based on the level of implementation and financial rebates)
	Municipal Savings =	\$39,438	Dollars

Notes

Actual energy and greenhouse gas emissions savings proposed upgrades. A study of building commissioning found whole-building energy savings of 15% at a cost of \$0.27 per square foot (LBNL). An estimate of LEED for Existing Buildings found the program reduced energy use by 20% (SPUR).

Implementation Resources: PG&E webpage for local governments -

<http://www.pge.com/mybusiness/energysavingsrebates/incentivesbyindustry/government/local/>

References

1. 2005 California End Use Survey <http://www.energy.ca.gov/ceus/>
2. Lawrence Berkeley National Laboratory. 2004. Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States (page 1). www.ga.wa.gov/eas/bcx/Cx_Cost Effectiveness.pdf
3. SPUR - San Francisco Commercial Energy Ordinance http://www.spur.org/publications/library/report/critical_cooling/option4

City Government Energy Efficient Public Realm Lighting

Calculation Methodology and Equations

Key Assumptions for Calculations:

Number of LED street lights installed by 2020	25	Street Lights
Number of LED traffic signals installed by 2020	10	Traffic Signals
Number of LED or CFL other outdoor lights installed by 2020	50	Other Outdoor Lights
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Total electricity saved (kWh) = $(N \times (W_i - W_e) \times (h/C_f))$		
	Where Street Lights:		
	$N_{street} =$	25	Number of street lights installed lights
	$W_i =$	200	Average estimated power rating in watts of high pressure sodium street light (Department of Energy [DOE] 2004. National Lighting Inventory and Energy Consumption Estimate)
	$W_e =$	50	Average power rating in watts of LED street lighting (DOE and PG&E 2008. LED Street Lighting)
	$h =$	4,100	Number of hours per year operating
	$C_f =$	1,000	Conversion factor for W to kW
	Where Traffic Signals:		
	$N_{traffic} =$	10	Number of traffic installed lights
	$W_i =$	150	Average estimated power rating in watts of incandescent traffic signal light. (U.S.Department of Energy, 2004 in Stockton Climate Action Plan).
	$W_e =$	15	Average power rating in watts of LED traffic signal light (CAPCOA 2010)
	$h =$	8,760	Number of hours per year operating (24 hours a day)
	$C_f =$	1,000	Conversion factor for W to kW
	Where Other Private Outdoor Lighting (in Public Realm):		
	$N_{other} =$	50	Number of other outdoor installed lights
$W_i =$	200	Average estimated power rating in watts of public realm lighting (Department of Energy [DOE] 2004. National Lighting Inventory and Energy Consumption Estimate)	
$W_e =$	50	Average power rating in watts of LED public realm lighting (DOE 2004)	
$h =$	3,650	Number of hours per year operating	
$C_f =$	1,000	Conversion factor for W to kW	
Resource Savings	15,375	Electricity saved from LED street lights (kWh)	
	11,826	Electricity saved from LED traffic signals (kWh)	
	27,375	Electricity saved from LED "other" public realm lighting (kWh)	
	54,576	Total electricity saved (kWh)	
GHG Emission Reduction Calculations	GHG Savings (MT CO ₂ e) = $(Se/1,000 \times 0.133)$		
	Where:		
	$Se =$	electricity savings	
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)	
GHG Emission Reduction	0.133	= average projected emissions factor for electricity in 2020 in MT CO ₂ e/MWh	
	7	MT CO ₂ e/year	
	Total energy savings = kWh reduced/year * \$/kWh		
	Where:		
	$\$/kWh =$	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Total annual energy cost savings =	\$10,369	Dollars per year
	Maintenance savings per fixture =	\$17	Annual maintenance savings/fixture (Palo Alto)
	Some staff time may be needed to implement the program.		
	FTE =	0.05	Estimated staff time per year to develop new program

Municipal Costs and Savings Calculations	\$/FTE=	\$100,000	FTE cost
	Cost of staff time =	\$5,000	Dollars
	Total Capital Cost = [Number of units installed x cost per unit] – [Available rebates]		
	Where Streetlights:		
	Number of units installed =	25	Units
	Cost per unit installed =	\$350	Dollars/unit (Energy Solutions 2008; PNNL 2010)
	Total cost=	\$8,750	Dollars
	Available rebates =	\$125	Dollars/unit (\$125 for 200 watt unit replaced - PG&E)
	Net cost =	\$5,625	Dollars (total cost - available rebates)
	Where Traffic Signals:		
	Number of units installed =	10	Units
	Cost per unit installed =	\$193	Dollars/unit (assuming a standard three 12" (red, yellow, and green) balls per signal (Western Pacific Signal 2011; eLightBulbs 2011))
	Cost installation =	\$1,930	Dollars
	Available rebates =	\$100	Dollars (\$100 for 150 watt unit replaced - PG&E)
	Net cost =	\$930	Dollars (total cost - available rebates)
	Where Other Private Outdoor Lighting (in Public Realm):		
	Number of units installed =	50	Units
Cost per unit installed =	\$300	Dollars/unit (Energy Solutions 2008; PNNL 2010)	
Cost installation =	\$15,000	Dollars	
Available rebates =	\$100	Dollars (\$100 for 150 watt unit replaced - PG&E)	
Net cost =	\$10,000	Dollars (total cost - available rebates)	
Municipal Costs and Savings	Municipal Cost =	\$21,555	Dollars
	Municipal Savings =	\$10,854	Dollars

Notes

Lamp wattage varies. Stationary source outdoor lights range from 83W to 407 W (DOE, page 48). LED lamps are typically under 100 W (DOE and PG&E).

References

1. PG&E Streetlight program - <http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/streetlightprogram.shtml>
2. DOE National Lighting Inventory and Energy Consumption Estimate http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lmc_vol1_final.pdf
3. DOE and PG&E LED Street Lighting study - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_sf-streetlighting.pdf
4. PG&E LED Streetlight Rebates - <http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/incentives/index.shtml>
5. Western Pacific Signal 2011; eLightBulbs 2011; Energy Solutions 2008; PNNL 2010 from Stockton Draft CAP - <http://www.stocktongov.com/files/ClimateActionPlanDraftFeb2012.pdf>
6. Palo Alto - Demonstration Assessment of Light-Emitting Diode (LED) Roadway Lighting on Residential and Commercial Streets - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_palo-alto.pdf

Renewable Energy Systems on City Property

Calculation Methodology and Equations

Key Assumptions for Calculations:

kW of municipal solar PV installations by 2020	50	kW
Number of solar hot water heaters	2	Systems
Staff time needed for this measure	0.10	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Municipal Electricity Energy Savings (kWh)=(kW × 1,900) + (Msw × Ee)		
	Where:		
	Msi=	50	kW of solar installations by 2020
	Msw=	0.2	# of solar electric water heater installations by 2020
	Mswg=	1.8	# of solar natural gas water heater installations by 2020
	Ee=	2,945	average expected municipal solar water heater savings in kWh per year (California Solar Initiative (CSI 2) Thermal Program Cal Solar statistics)
	Eg=	139	average expected municipal solar water heater savings in therms per year (CSI 2 - 2012 Thermal Program Cal Solar statistics)
	Conversion factor=	1,900	conversion factor from kW to kWh per year (Solar Energy Industries Association [SEIA] Solar Radiation Conversion Map)
Resource Savings	250	Municipal natural gas saved (therms/year)	
	95,589	Municipal electricity saved (kWh/year)	
GHG Emission Reduction Calculations	GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000)		
	Where:		
	Se=	electricity savings	
	Sg=	natural gas savings	
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)	
	10	= conversion factor for therm to MMBtu	
	0.133	= average projected emissions factor for electricity in 2020 in MT CO2e/MWh	
53.20	= average emissions factor for natural gas (kg CO2e/MMBtu)		
GHG Emission Reductions	14	MT CO2e	
Municipal Costs and Savings Calculations	Municipal cost savings = [Electricity Savings × \$/kWh] + [Natural Gas Savings × \$/therms]		
	Where:		
	Commercial \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Commercial \$/therm=	\$0.81	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Staff time to obtain grant funding and implement project		
	FTE =	0.1	Estimated staff time to develop new program
	\$/FTE	\$100,000	Dollars per year
	Total Staff Cost=	\$10,000	Dollars per year
	Total Capital Cost = Total Cost of Solar Units (bulk purchase + installation) + Total Staff Cost - Available Rebates		
	Where:		

	Commercial solar installation cost =	\$4.38	Commercial Solar Installations per watt (Green Tech Media)
	Total solar PV installation cost =	\$219,000	Average capital cost per kW (CSI statistics)
	Available rebates/incentives =	\$150,000	Rebates and incentives may vary based on funding received and current programs offered
	Solar water heater cost =	\$4,650	Dollars (Incremental installed cost of solar hot water heater (National Renewable Energy Lab, August 2012))
	Available rebates =	\$2,175	Dollars (available Rebate for replacing natural gas heater with solar (Go Solar CA))
	Cost of solar hot water heater with rebate =	\$2,475	Dollars (cost of solar hot water heater installation minus rebate)
	Total cost of solar water heaters =	\$4,950	Dollars
Municipal Costs and Savings	Municipal Cost =	\$83,950	Dollars
	Municipal Savings =	\$17,982	Dollars

Notes

Municipal installation size assumptions are the averages for PV installations in California. The installation size uses the CSI rating, which accounts for a design factor, and is a more accurate reflection of energy generated by the installation. Municipal solar water heater savings is an average of the expected savings for all the projects that have applied for the CSI-Thermal rebate in California (Cal Solar). The model assumes that solar water heaters are installed in combination with both electric and natural gas water heaters. The model assumes that 90% of the systems installed offset natural gas water heaters; 10% offset electric water heaters.

References

1. California Solar Initiative (CSI) - <http://www.californiasolarstatistics.ca.gov/>
2. California Solar Initiative CSI-Thermal Program - <http://www.gosolarcalifornia.ca.gov/solarwater/index.php>
3. CEC Planning and Permitting Resources For Renewable Energy Systems -http://www.energy.ca.gov/localgovernment/planning_resources/
4. SEIA Solar Radiation Conversion Map - <http://www.getsolar.com/blog/what-can-one-kilowatt-of-solar-do-for-you/13483/>
5. <http://www.greentechmedia.com/research/ussmi>
6. National Renewable Energy Lab, August 2012 - <http://www.nrel.gov/solar/>
7. Go Solar CA - <http://www.gosolarcalifornia.ca.gov/>

Zero and Low Emission City Fleet Vehicles

Calculation Methodology and Equations

Key Assumptions for Calculations:

Number of municipal vehicles replaced by 2020	5	Vehicles
Average Miles Driven Per Year	7,500	Miles
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Fuel savings (gallons) = $V \times M (1/F_i - 1/F_e)$		
	Where:		
	Number of vehicles replaced (V) =	5	Vehicles
	Average miles driven per year (M) =	7,500	Miles per year
	Average fuel economy of replaced vehicles (F _i) =	20	Miles per gallon
	Average fuel economy of newer (more efficient) vehicles (F _e) =	50	Miles per gallon
Resource Savings	Fuel Savings =	1,125	Gallons of gasoline fuel
GHG Emission Reduction Calculations	GHG reduced (MT CO ₂ e) = Fuel savings (gallons gasoline) x 8.81 / 1,000		
		8.81	= GHG emission from gasoline (kg CO ₂ /gallon)
		1,000	= Conversion from kg to metric tons
GHG Emission Reduction	Total GHG Savings	10	MT CO ₂ e
Municipal Costs and Savings	Energy cost per mile of regular gasoline vehicle =	\$0.1468	Dollars per mile (standard car. Ex, Toyota Corolla) (RechargeIT)
	Energy cost per mile of hybrid vehicle =	\$0.0690	Dollars per mile (Electric vehicles. Ex, Toyota Prius Plug-in Hybrid, RechargeIT)
	Difference in energy cost per mile =	\$0.0778	Dollars per mile
	Estimate average miles driven per year =	7,500	Miles per year
	Difference in purchase price for hybrid above similar non-hybrid vehicle =	\$4,315	Dollars (US DOE)
Municipal Costs and Savings	Municipal Costs =	\$21,575	Dollars (Assumes no staff time needed above that required for purchasing regular gasoline vehicles.)
	Municipal Savings =	\$1,751	Dollars

Notes

For additional information on costs/savings and vehicle rebates and other incentives, please visit:
 DriveClean.ca.gov - <http://www.driveclean.ca.gov/>
 Plug-in Electric Vehicle Collaborative - <http://www.pevcollaborative.org/>

References

1. RechargeIT Driving Experiment: Demonstration of energy efficiency for electric vehicles. Google, org, 2007. <http://www.google.org/recharge/>
2. US Department of Energy (DOE)- [fueleconomy.gov](http://www.fueleconomy.gov)

Municipal Tree Planting Program

Calculation Methodology and Equations

Note: There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed.

Key Assumptions for Calculations:

Target number of trees planted on City-owned property	500	Trees
Capital cost per tree (\$0 if to be paid for through grant funding)	\$60	Dollars per Tree
Staff time needed for this measure	0.08	Full Time Equivalent (FTE)

Calculations:

GHG Emission Reduction Calculations	GHG Emissions Reductions = Number of Trees Planted x Carbon Sequestration Rate		
	0.0121	= Average carbon sequestration (MT CO ₂ /Tree)	
	500	= Number of Trees Planted	
GHG Emission Reduction	Annual GHG emissions reduced =	6	MT CO ₂ e
Municipal Costs and Savings Calculations	Capital cost = (cost per tree x number of trees planted)		
	Where:		
	Cost per tree=	\$60	Dollars/tree (McPherson, et al)
	Number of trees planted=	500	Trees/year
	Capital cost to City=	\$30,000	Dollars
	Maintenance cost = maintenance cost per tree x number of trees planted		
	Where:		
	Maintenance cost=	\$34	Dollars/tree (McPherson, et al)
	Maintenance costs =	\$17,000	Dollars
	Staff time needed to develop policy/ordinance and apply for funding.		
	FTE =	0.08	Estimated staff time per year
\$/FTE =	\$100,000	FTE cost per year	
Staff time cost =	\$8,000	Dollars	
Municipal Costs and Savings	Municipal Cost =	\$55,000	Dollars
	Municipal Savings =	\$0	Dollars

Notes

Carbon sequestration rate from CAPCOA Quantifying GHG Mitigation Measures Report. There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed. Account for net new trees only.

References

1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010) - pg. 403
2. McPherson, et al as cited in Stockton Draft CAP - <http://www.stocktongov.com/government/boardcom/clim.html>

Energy Efficiency Outreach and Incentive Programs

Calculation Methodology and Equations

Note: This measure should use conservative assumptions to avoid double counting with other energy measures.

Key Assumptions for Calculations:

Percent of households participating by 2020	35%	Percent
Percent of businesses participating by 2020	35%	Percent
Targeted percent residential energy savings	4%	Percent
Targeted percent commercial energy savings	4%	Percent
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Residential Electricity Savings (kWh) = $R_p \times R_s \times 95\% \times R_e$ Residential Natural Gas Savings (therms) = $R_p \times R_s \times 5\% \times R_n$ Commercial Electricity Savings (kWh) = $C_p \times C_s \times 95\% \times C_e$ Commercial Natural Gas Savings (kWh) = $C_p \times C_s \times 5\% \times C_n$		
	Where:		
	Rp=	35%	Percent of residences participating in rebate and programs by 2020
	Cp=	35%	Percent of businesses participating in rebate and incentive programs by 2020
	Rs=	4%	Percent residential energy savings (applied 95% electricity, 5% natural gas)
	Cs=	4%	Percent commercial energy savings (applied 95% electricity, 5% natural gas)
	Re=	23,960,695	2020 residential electricity usage (kWh)
	Rn=	2,000,271	2020 residential natural gas usage (therms)
	Ce=	33,862,892	2020 commercial electricity use (kWh)
Cn=	1,073,871	2020 commercial natural gas usage (therms)	
Resource Savings	318,677	Residential electricity saved (kWh)	
	1,400	Residential natural gas saved (therms)	
	450,376	Commercial electricity saved (kWh)	
	752	Commercial natural gas saved (therms)	
GHG Emission Reduction Calculations	GHG Savings (MT CO ₂ e) = $(S_e/1,000 \times 0.133) + (S_g/10 \times 53.2/1,000)$		
	Where:		
	Se=	Residential or commercial electricity savings	
	Sg=	Residential or commercial natural gas savings	
	1,000	= Conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)	
	10	= Conversion factor for therm to MMBtu	
0.133	= Average projected emissions factor for electricity in 2020 in MT CO ₂ e/MWh		
53.20	= Average emissions factor for natural gas (kg CO ₂ e/MMBtu)		
GHG Emission Reduction	50	Residential Reduction (MT CO ₂ e)	
	64	Commercial Reduction (MT CO ₂ e)	
	114	Total Reduction (MT CO ₂ e) in 2020	
Municipal Costs and Savings Calculations	Staff time to participate in and promote existing programs.		
	FTE =	0.05	Estimated staff time per year
	\$/FTE=	\$100,000	FTE cost per year
Municipal Costs and Savings	Municipal Cost =	\$5,000	Dollars
	Municipal Savings =	\$0	Dollars

Total savings = [Electricity Savings x \$/kWh] + [Natural Gas Savings x \$/therms]			
Where:			
Residential \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast	
Residential \$/therm=	\$0.92	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast	
Commercial \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast	
Commercial \$/therm=	\$0.81	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast	
Total residential savings=	\$61,837	Dollars per year	
Total commercial savings=	\$84,379	Dollars per year	
Households =	6,348	Total number of households projected in 2020	
Households participating =	2,222	Households participating by 2020	
Commercial units =	1,178	Total number of projected commercial units in 2020	
Commercial units participating =	412	Commercial units participating by 2020	
Community Cost and Savings	Residential Cost =	Varies	Dollars per household
	Commercial Cost =	Varies	Dollars per business
	Residential Savings =	\$28	Dollars per household
	Commercial Savings =	\$205	Dollars per business

Notes

Assumes that of the total percent reduction in energy use, 95% applies to electricity and 5% applies to natural gas.

References

1. Pacific Gas and Electricity Company. 2012. Energy Overview Tableau Reports.
2. Rincon Consultants. November 2012. Cities Greenhouse Gas Emissions Inventories.
3. California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast

Energy Audit and Retrofit Program

Calculation Methodology and Equations

Key Assumptions for Calculations:

Number of households audited by 2020	500	Units
Number of businesses audited by 2020	200	Units
Target percentage of energy savings	20%	Percent
Staff time needed for this measure	0.06	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Residential Square Feet (Rsf) = $Ru \times 1,545$		
	Residential Electricity Energy Savings (kWh) = $E \times 0.40 \times Rsf \times 3.5$		
	Residential Natural Gas Savings (therms) = $E \times 0.40 \times Rsf \times 0.3$		
	Ru=	500	# residential units audited by 2020
	Average residential unit size=	1,545	Square feet/dwelling unit (California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS])
	Audit to retrofit conversion rate=	40%	Percentage of units that receive an audit that complete energy efficiency installation (Energy Savvy)
	Rsf=	309,000	# square feet of residential space retrofitted by 2020
	E=	20%	Target percentage of energy savings
	Residential electricity use intensity=	3.5	kWh/square foot/year (Average electric use intensity for residential buildings in kWh/square foot/year [RASS]).
	Residential natural gas use intensity=	0.3	Therms/square foot/year (Average natural gas usage intensity for residential buildings in therms/square foot/year [RASS]).
	Commercial Square Feet (Csf) = $Cu \times 4,500$		
	Commercial Electricity Energy Savings (kWh) = $E \times 0.40 \times Csf \times 12.95$		
	Commercial Natural Gas Savings (therms) = $E \times 0.40 \times Csf \times 0.3$		
	Where:		
Cu=	200	# of commercial units or buildings audited by 2020	
Average commercial unit size=	4,500	Average commercial unit/business size in square feet	
Audit to retrofit conversion rate=	40%	Percentage of units that receive an audit that complete energy efficiency installation (Energy Savvy)	
Csf=	360,000	Square feet of commercial space upgraded by 2020	
E=	20%	Target percentage of energy savings	
Commercial electricity use intensity=	12.95	kWh/square foot/year (Average electric use intensity for commercial buildings in kWh/square feet/year (California Energy Commission [CEC] 2005 California End Use Survey [CEUS], page 184)).	
Commercial natural gas use intensity=	0.3	therms/square foot/year (Average natural gas usage intensity for commercial buildings in therms/square feet/year (CEC 2005 CEUS, page 184)).	
Resource Savings	219,384	Residential electricity saved (kWh)	
	21,624	Residential natural gas saved (therms)	
	932,760	Commercial electricity saved (kWh)	
	25,199	Commercial natural gas saved (therms)	
GHG Emission Reduction Calculations	GHG Savings (MT CO ₂ e) = $(Se/1,000 \times 0.133) + (Sg/10 \times 53.20/1,000)$		
	Where:		
	Se=	electricity savings	
	Sg=	natural gas savings	
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons	
	10	= conversion factor for therm to MMBtu	
	0.133	= average projected 2020 electricity emissions factor (MT CO ₂ e/MWh)	
53.20	= average emissions factor for natural gas (kg CO ₂ e/MMBtu)		
GHG Emission Reduction	144	Residential Reduction (MT CO ₂ e) in 2020	
	258	Commercial Reduction (MT CO ₂ e) in 2020	

Municipal Cost and Savings Calculations	Staff time developing and administering program.		
	FTE =	0.06	Staff time needed for this measure
	\$/FTE=	\$100,000	Cost associated with staff time
Municipal Cost and Savings	Municipal Cost=	\$6,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Total savings = [Electricity Savings x \$/kWh] + [Natural Gas Savings x \$/therms]		
	Where:		
	Residential \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Residential \$/therm=	\$0.92	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Commercial \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Commercial \$/therm=	\$0.81	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	\$61,577	Residential Savings (\$/year)	
	\$193,905	Commercial Savings (\$/year)	
	Total Cost of residential retrofit =	\$3,000	Cost per home (average ACEEE)
	Available residential rebates =	\$2,000	Energy Upgrade California offers rebates ranging from \$2,000-\$4,000 (\$2,500 rebate for 25% energy savings).
	Total cost of commercial retrofit =	\$4,545	Cost per commercial unit (\$1.01 per square foot - AECOM 2010; Gregerson 1997)
Available commercial rebates =	\$2,273	PG&E offers \$0.09/kWh (PG&E Customized Retrofit Incentives) and SCE offers \$1.00/therm (SCE Financial	
Community Costs and Savings	Residential Cost =	\$1,000	Dollars per household
	Commercial Cost =	\$2,273	Dollars per business
	Residential Savings =	\$123	Dollars per household
	Commercial Savings =	\$970	Dollars per business

Notes

This is based on average energy consumption. Programs that emphasize audits and retrofits to buildings constructed prior to Title 24 (1980), will see greater reductions.

Audit to retrofit conversion rates and energy savings vary significantly by program. In a study of 16 audit programs around the country, audit to retrofit conversion rates ranged from 30% to 50% (Energy Savvy). In a study of 7 residential audit programs between 2000 and 2004 in California, expected savings ranged from 50 kWh per audit to 800 kWh per audit (NEEBPG). This represents between 1% and 15% of energy use (NEEBPG).

References

1. Energy Savvy - Energy Audit Programs That Work <http://www.energysavvy.com/blog/2010/09/14/energy-audit-programs-that-work/>
2. NEEBPG - Residential Audit Programs Best Practices Report http://www.eebestpractices.com/pdf/BP_R7.PDF
3. California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS] - <http://www.energy.ca.gov/appliances/rass/>
4. PG&E Energy House Calls - http://www.energyhousecalls.com/?WT.mc_id=GSEHC154&WT.srch=1&gclid=CJ6xi8_jmLMCFQsqnQodsAEAiA
5. Energy Upgrade California - <http://www.pge.com/myhome/saveenergymoney/energysavingprograms/euca.shtml>
6. Energy Information Administration, 1995 Commercial Buildings Energy Consumption Survey - http://www.eia.gov/emeu/consumptionbriefs/cbecs/pbawebiste/retailserv/retserv_howlarge.htm
7. CONSOL. August 2008. Meeting AB 32 -- Cost-Effective Green House Gas Reductions in the Residential Sector, available at: <http://www.cbia.org/go/cbia/?LinkServID=D3BFD657-F8E2-4F63-97B404B55FD856B5&showMeta=0>
8. PG&E Third Party Screen and Certification of Home Improvement Contractors - <http://www.egia.org/Academy/rockymountainexchange2011/docs/JaneKruse.pdf>
9. PG&E Customized Retrofit Incentives - <http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ief/>
10. SCE Financial Incentives for Energy Efficiency - <http://www.socalgas.com/documents/business/EECIPFactSheet.pdf>
11. U.S. Department of Energy (DOE). 2011a. Home Energy Saver. Available: <http://hes.lbl.gov/consumer>. Accessed: July 6, 2011.
12. American Council for an Energy-Efficient Economy (ACEEE), Berkeley RECO Case Study - <http://aceee.org/sector/local-policy/case-studies/berkeley-california-residential-energy>

Income-Qualified Energy Efficient Weatherization Programs

Calculation Methodology and Equations

Key Assumptions for Calculations:

Residential units upgraded by 2020	20	Units
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Residential Square Feet (Rsf) = $Ru \times 1,545$	
	Residential Electricity Energy Savings (kWh) = $E \times Rsf \times 3.5$	
	Residential Natural Gas Savings (therms) = $E \times Rsf \times 0.3$	
	Ru =	20 Residential units upgraded by 2020
	Average residential unit size =	1,545 Square feet/dwelling unit California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS])
	Rsf =	30,900 Square feet of residential space upgraded by 2020
	E =	35% Average first-year weatherization energy savings (Oak Ridge National Laboratory (ORNL) 2010 Weatherization Assistance Program Technical Memorandum: Background Data and Statistics. Page 5.)
Residential electricity use intensity =	3.5499 kWh/square foot/year (Average electric use intensity for residential buildings in kWh/square foot/year [RASS]).	
Residential natural gas use intensity =	0.3 Therms/square foot/year (Average natural gas usage intensity for residential buildings in therms/square foot/year [RASS]).	
Resource Savings	38,392	Residential electricity saved (kWh)
	3,784	Residential natural gas saved (therms)
GHG Emission Reduction Calculations	GHG Savings (MT CO ₂ e) = $(Se/1,000 \times 0.133) + (Sg/10 \times 53.2/1,000)$	
	Where:	
	Se =	electricity savings
	Sg =	natural gas savings
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)
	10	= conversion factor for therm to MMBtu
	0.133	= average projected emissions factor for electricity in 2020 in MT CO ₂ e/MWh
53.20	= average emissions factor for natural gas (kg CO ₂ e/MMBtu)	
GHG Emission Reduction	25	MT CO ₂ e
Municipal Costs and Savings Calculations	Staff time coordinating with CAPSLO and local utilities, and conducting outreach.	
	FTE =	0.05 Staff time needed for this measures
	\$/FTE =	\$100,000 Dollars per year
Municipal Costs and Savings	Municipal Cost =	\$5,000 Dollars
	Municipal Savings =	\$0 Dollars
Community Costs and Savings Calculations	Residential cost savings = [Electricity Savings x \$/kWh] + [Natural Gas Savings x \$/therms]	
	Where:	
	Residential \$/kWh =	\$0.19 California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Residential \$/therm =	\$0.92 California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
Total Community Savings =	\$10,776 Residential Savings	
Community Cost and Savings	Community Cost =	\$0 Dollars per household
	Community Savings =	\$539 Dollars per household

Notes

The first-year energy savings for LIHEAP households is approximately 34.5% or \$437 (ORNL). The average energy savings per low-income housing unit for Weatherization Assistance is estimated by the State of California Department of Community Services and Development (CSD) to be \$418 per year.

PG&E and SoCalGas contract with CAPSLO to provide weatherization services to the region as part of the statewide Energy Savings Assistance Program (ESAP). <http://www.cpuc.ca.gov/PUC/energy/Low+Income/liee.htm>
For low-income households: no-cost weatherization under Energy Savings Assistance Program. For middle-income households: free weatherization under PG&E's Middle Income Direct Install program.

References

1. CSD - Helps Low-Income Families Manage and Reduce Energy Costs <http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20%282008%29.pdf>
2. California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS] - <http://www.energy.ca.gov/appliances/rass/>
3. ORNL 2010 Weatherization Assistance Program Technical Memorandum: Background Data and Statistics (page 5) - http://weatherization.ornl.gov/pdfs/ORNL_TM-2010-66.pdf
4. California Energy Commission (CEC) 2005 California End Use Survey - <http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF>
5. California Flex Your Power - <http://www.fypower.org/feature/lowincome/>
6. PG&E Direct Install -<http://www.staplesenergy.com/residential-case-studies/pge-middle-income-direct-install-program>

Incentives for Exceeding Title 24 Building Energy Efficiency Standards

Calculation Methodology and Equations

Key Assumptions for Calculations:

New or remodeled residences exceeding State standards	75	Units
New non-residential buildings exceeding State standards	35	Units
Target percentage of energy savings above State standards	20%	Percent
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Residential Square Feet (Rsf) = $R_u \times 1,545$		
	Residential Electricity Energy Savings (kWh) = $E \times E_{ec} \times R_{sf} \times (1 - CSP) \times 3.5$		
	Residential Natural Gas Savings (therms) = $E \times E_{gc} \times R_{sf} \times (1 - CSP) \times 0.3$		
	Ru=	75	# of new residential units exceeding State standards by 2020
	Average residential unit size=	1,545	Square feet/dwelling unit (California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey (RASS))
	Rsf=	115,875	# square feet of residential space that exceed State standards by 2020
	E=	20%	Target percentage of energy savings above State standards
	Eec=	32.8%	Percent of single family electricity use covered by Title 24 (Statewide Energy Efficiency Collaborative [SEEC] 2011 Greenhouse Gas Forecasting Assistant, page 7)
	Egc=	85.7%	Percent of single family natural gas use covered by Title 24 (SEEC 2011 Greenhouse Gas Forecasting Assistant, page 7)
	CSP=	25%	Percent single family residential energy savings above current State standards (CEC 2013 Building Efficiency Standards, slide 11)
	Residential electricity use intensity=	3.5	kWh/square foot/year (Average electric use intensity for residential buildings in kWh/square foot/year [RASS]).
	Residential natural gas use intensity=	0.3	Therms/square foot/year (Average natural gas usage intensity for residential buildings in therms/square foot/year [RASS]).
	Commercial Electricity Energy Savings (kWh) = $E \times E_{gc} \times (1 - CSP) \times 12.95 \times C_{sf}$		
	Commercial Natural Gas Savings (therms) = $E \times E_{gc} \times (1 - CSP) \times 0.3 \times C_{sf}$		
	Where:		
	Cu=	35	# of commercial units or buildings audited by 2020
	Average commercial unit size=	4,500	Average square feet for all commercial buildings (Energy Information Administration)
	Csf=	157,500	# of new square feet of commercial space that exceeds State standards by 2020
	E=	20%	Target percentage of energy savings above State standards
	Eec=	64%	Percent of commercial electricity use covered by Title 24 (SEEC 2011 Greenhouse Gas Forecasting Assistant, page 9)
Egc=	70%	Percent of commercial natural gas use covered by Title 24 (SEEC 2011 Greenhouse Gas Forecasting Assistant, page 9)	
CSP=	30%	Percent non-residential energy savings above current State standards (CEC 2013 Building Efficiency Standards, slide 17)	
Commercial electricity use intensity=	12.954999	kWh/square foot/year (Average electric use intensity for commercial buildings in kWh/square feet/year (California Energy Commission [CEC] 2005 California End Use Survey [CEUS]))	

	Commercial natural gas use intensity=	0.34999	therms/square foot/year (Average natural gas usage intensity for commercial buildings in therms/square feet/year (CEC 2005 CEUS))
Resource Savings	20,238	Residential electricity saved (kWh)	
	5,212	Residential natural gas saved (therms)	
	182,821	Commercial electricity saved (kWh)	
	5,402	Commercial natural gas saved (therms)	
GHG Emission Reduction Calculations	GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000)		
	Where:		
	Se=	electricity savings	
	Sg=	natural gas savings	
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)	
	10	= conversion factor for therm to MMBtu	
	0.13	= average projected emissions factor for electricity in 2020 in MT CO2e/MWh	
53.20	= average emissions factor for natural gas (kg CO2e/MMBtu)		
GHG Emission Reduction	30	Residential Reduction (MT CO2e/year)	
	53	Commercial Reduction (MT CO2e/year)	
Municipal Costs and Savings Calculations	Staff time developing new materials, identifying and adopting incentives.		
	FTE =	0.05	Estimated staff time per year to develop new program
	\$/FTE=	\$100,000	FTE cost
Municipal Costs and Savings	Municipal Cost=	\$5,000	Dollars per year
	Municipal Savings =	\$0	Dollars per year
Community Costs and Savings Calculations	Total savings = [Electricity Savings x \$/kWh] + [Natural Gas Savings x \$/therms]		
	Where:		
	Residential \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Residential \$/therm=	\$0.92	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Commercial \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Commercial \$/therm=	\$0.81	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Total residential savings =	\$8,640	Residential Savings (\$/year)
	Total commercial savings =	\$38,380	Commercial Savings (\$/year)
Community Costs and Savings	Average residential Cost =	\$0.91	Residential average cost to implement (sqft) - Projected PG&E
	Average commercial Cost =	\$1.25	Commercial average cost to implement (sq ft) - Projected PG&E
	Residential Cost =	\$1,406	Dollars per household
	Commercial Cost =	\$5,625	Dollars per business
Community Costs and Savings	Residential Savings =	\$115	Dollars per household
	Commercial Savings =	\$1,097	Dollars per business

Notes

Title 24 covers only 64% of commercial electricity use and 70% of natural gas use (SEEC, page 7). 2013 Title 24 updates are expected to reduce non-residential energy use by 30% (CEC).

Title 24 covers only 32.8% of single family residential electricity use and 85.7% of natural gas use (SEEC, page 7). 2013 Title 24 updates are expected to reduce single family residential energy use by 25% and multifamily residential by 14% (CEC).

References

- 2005 California End Use Survey <http://www.energy.ca.gov/ceus/>
- CEC 2013 Building Efficiency Standards, slide 17 - http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2012-05-31_2013_standards_adoption_hearing_presentation.pdf
- SEEC 2011 Greenhouse Gas Forecasting Assistant, page 7 - <http://californiaseec.org/documents/forecasting-tools/seec-forecast-assistant-documentation>
- http://www.energy.ca.gov/title24/2008standards/ordinances/san_luis_obispo/CZ5_Cost-Effectiveness_Report-Final.pdf

Small-Scale On-Site Solar Photovoltaic (PV) Incentive Program

Calculation Methodology and Equations

Key Assumptions for Calculations:

Number of commercial solar PV installations (between 2013-2020)	20	Systems
Number of residential solar PV installations (between 2013-2020)	80	Systems
Number of residential solar water heaters installed by 2020*	80	Systems
Staff time needed for this measure	0.04	Full Time Equivalent (FTE)

*Approximately 0.013 installations per household as a result of the Solar Water Heating program established under Assembly Bill 1470, the Solar Thermal Heating Act of 2007.

Calculations:

Resource Savings Calculations	Commercial Electricity Energy Savings (kWh)= Csi × Acsi × 1,900	
	Residential Electricity Energy Savings (kWh)= (Rsi × Arsi × 1,900) + (Rsw × Ee)	
	Residential Natural Gas Energy Savings (therms) = Rswg × Eg	
	Where:	
	Csi =	20 # of commercial solar installations by 2020
	Rsi =	80 # of residential solar installations by 2020
	Rsw =	8 # of residential solar electric water heater installations by 2020 (assumes 10% electric)
	Rswg =	72 # of residential solar natural gas water heater installations by 2020 (assumes 90% natural gas)
	Acsi =	33.8 average commercial solar installation size in kW (Cal Solar Initiative [CSI 1])
	Arsi =	4.6 average residential solar installation size in kW (CSI 1)
Resource Savings	722,760	Residential electricity saved (kWh)
	10,008	Residential natural gas saved (therms)
	1,284,400	Commercial electricity saved (kWh)
GHG Emission Reduction Calculations	GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000)	
	Where:	
	Se=	electricity savings
	Sg=	natural gas savings
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)
	10	= conversion factor for therm to MMBtu
	0.133	= average projected emissions factor for electricity in 2020 in MT CO2e/MWh
GHG Emission Reduction	53.20	= average emissions factor for natural gas (kg CO2e/MMBtu)
	320	MT CO2e
Municipal Costs and Savings Calculations	Staff time developing new materials and performing marketing and outreach activities.	
	FTE =	0.04 Estimated staff time per year to develop new program
	\$/FTE	\$100,000 Dollars per year
Municipal Costs and Savings	Municipal Cost =	\$4,000 Dollars per year
	Municipal Savings =	\$0 Dollars per year
	Commercial cost savings = [Electricity Savings × \$/kWh]	
	Residential cost savings = [Electricity Savings × \$/kWh] + [Natural Gas Savings × \$/therms]	
	Where:	
Residential \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast

Community Costs and Savings Calculations	Commercial \$/kWh=	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Residential \$/therm=	\$0.92	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Total residential savings =	\$146,532	Dollars
	Total commercial savings =	\$238,898	Dollars
	Commercial solar installed cost =	\$4.38	Commercial Solar Installations per watt (Green Tech Media)
	Residential solar installed cost =	\$5.46	Residential Solar Installations per watt (Green Tech Media)
	Total cost of installed commercial solar =	\$2,960,880	Dollars
	Total cost of installed residential solar =	\$2,009,280	Dollars
	Residential solar water heater cost =	\$4,650	Dollars (Incremental installed cost of solar hot water heater (National Renewable Energy Lab, August 2012))
	Available rebates =	\$2,175	Dollars (available Rebate for replacing natural gas heater with solar (Go Solar CA))
	Cost of solar hot water heater with rebate =	\$2,475	Dollars (cost of solar hot water heater installation minus rebate)
	Total cost of solar water heaters =	\$198,000	Dollars
Community Cost and Savings	Residential Cost =	\$13,796	Dollars per household
	Commercial Cost =	\$148,044	Dollars per business
	Residential Savings =	\$916	Dollars per household
	Commercial Savings =	\$11,945	Dollars per business

Notes

Commercial and residential installation size assumptions are the averages for San Luis Obispo County PV installations for completed and PBI projects (Cal Solar). The installation size uses the CSI rating, which accounts for a design factor, and is a more accurate reflection of energy generated by the installation. Solar water heater savings is an average of the expected savings for all the projects that have applied for the CSI-Thermal rebate in San Luis Obispo County (CSI 2).

The model assumes that solar water heaters are installed in combination with both electric and natural gas water heaters. The model assumes that 90% of the systems installed offset natural gas water heaters; 10% offset electric water heaters.

Installed cost of conventional natural gas system is \$1,350 and installed cost of residential solar water heaters: \$6,000 (National Renewable Energy Lab).

References

1. Cal Solar - <http://www.californiasolarstatistics.ca.gov/>
2. California Solar Initiative CSI-Thermal Program - <http://www.gosolarcalifornia.ca.gov/solarwater/index.php>
3. CEC Planning and Permitting Resources For Renewable Energy Systems - http://www.energy.ca.gov/localgovernment/planning_resources/
4. SEIA Solar Radiation Conversion Map - <http://www.getsolar.com/blog/what-can-one-kilowatt-of-solar-do-for-you/13483/>
5. <http://www.nrel.gov/docs/fy11osti/48986.pdf>
6. <http://www.greentechmedia.com/research/ussmi>
7. National Renewable Energy Lab, August 2012 - <http://www.nrel.gov/solar/>
8. Go Solar CA - <http://www.gosolarcalifornia.ca.gov/>

Income-Qualified Solar PV Program

Calculation Methodology and Equations

Key Assumptions for Calculations:

Number of low-income residential solar PV installations by 2020	20	Systems
Number of low-income residential solar water heaters installed by 2020	20	Systems
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	Residential Electricity Energy Savings (kWh) = (Rsi × Arsi × 1,900) + (Rsw × Ee)		
	Residential Natural Gas Energy Savings (therms) = Rswg × Eg		
	Rsi =	20	# of low-income residential solar PV installations
	Rsw =	2	# of low-income residential solar electric water heater installations by 2020 (assumes 10% electric)
	Rswg =	18	# of residential solar natural gas water heater installations by 2020 (assumes 90% natural gas)
	Arsi =	4.6	average residential solar installation size in kW (Cal Solar Initiative [CSI 1])
	Ee =	2,945	average expected residential solar water heater savings in kWh per year (California Solar Initiative (CSI 2) Thermal Program Cal Solar statistics)
Eg =	139	average expected residential solar water heater savings in therms per year (CSI 2 - 2012 Thermal Program Cal Solar statistics)	
Conversion factor =	1,900	conversion factor from kW to kWh per year (Solar Energy Industries Association [SEIA] Solar Radiation Conversion Map)	
Resource Savings	180,690	Residential electricity saved (kWh)	
	2,502	Residential natural gas saved (therms)	
GHG Emission Reduction Calculations	GHG Savings (MT CO ₂ e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000)		
	Where:		
	Se =	electricity savings	
	Sg =	natural gas savings	
	1,000	= conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation)	
	10	= conversion factor for therm to MMBtu	
0.13	= average projected emissions factor for electricity in 2020 in MT CO ₂ e/MWh		
53.20	= average emissions factor for natural gas (kg CO ₂ e/MMBtu)		
GHG Emission Reductions	37	MT CO ₂ e	
Municipal Costs and Savings Calculations	Staff time for collaboration and outreach.		
	FTE =	0.05	Estimated staff time per year to develop new program
	\$/FTE =	\$100,000	Dollars per year
Municipal Costs and Savings	Municipal Cost =	\$5,000	Dollars per year
	Municipal Savings =	\$0	Dollars per year
Community Costs and Savings Calculations	Residential savings = [Electricity Savings × \$/kWh] + [Natural Gas Savings × \$/therms]		
	Where:		
	Residential \$/kWh =	\$0.19	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
	Residential \$/therm =	\$0.92	California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast
Total residential savings =	\$36,633	Dollars	

Community Costs and Savings	Community Cost =	\$0	Dollars per household (Assumes to be paid for through programs.)
	Community Savings =	\$916	Dollars per household

Notes

Residential installation size assumptions are the averages for San Luis Obispo County PV installations for completed projects (Cal Solar 1). The installation size uses the CSI rating, which accounts for a design factor, and is a more accurate reflection of energy generated by the installation. Solar water heater savings is an average of the expected savings for all the projects that have applied for the CSI-Thermal rebate in San Luis Obispo County (Cal Solar 2).
The model assumes that solar water heaters are installed in combination with both electric and natural gas water heaters. The model assumes that 90% of the systems installed offset natural gas water heaters; 10% offset electric water heaters.

References

1. California Solar Initiative (CSI) - <http://www.californiasolarstatistics.ca.gov/>
2. California Solar Initiative CSI-Thermal Program - <http://www.gosolarcalifornia.ca.gov/solarwater/index.php>
3. CEC Planning and Permitting Resources For Renewable Energy Systems - http://www.energy.ca.gov/localgovernment/planning_resources/
4. SEIA Solar Radiation Conversion Map - <http://www.getsolar.com/blog/what-can-one-kilowatt-of-solar-do-for-you/13483/>

Bicycle Network

Calculation Methodology and Equations

Key Assumptions for Calculations:

Miles of new bike lane by 2020	6	Miles
Staff time needed for this measure	0.1	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	VMT Reduction = (A*B)+(A*C)		
	City Area =	5.303	Square Miles
	Forecast VMT (2020) =	58,053,794	VMT in 2020
	Decrease in VMT (B) =	1.0%	Estimated VMT reduction factor for incorporating bike lanes into street design (CAPCOA) (Assumes 1% decrease in VMT per mile of new bike lane per square mile area. Maximum reduction capped at 1% to avoid double counting from alternative travel related VMT reductions.)
	VMT reduction for installing bicycle racks (C)=	0.06%	Percent - (CAPCOA, SDT-6)
Resource Savings	Total VMT Reduction =	617,112	VMT per year
GHG Emission Reduction Calculations	GHG Savings = VMT Reduction × Cef		
	Where: Cef =	0.000374	Composite emission factor; MT CO2 per VMT (EMFAC 2011)
GHG Emission Reduction	Total GHG Savings =	231	MT CO2e
Municipal Costs and Savings Calculations	Staff time required for developing policies and acquiring grant funding for bicycle infrastructure. There would be minimal additional costs associated with staff time needed for plan checks; however, this cost will be absorbed through development/permitting fees.		
	FTE =	0.10	Estimated staff time per year to develop new program
	\$/FTE=	100,000	Dollars per year
Municipal Costs and Savings	Municipal Cost =	\$10,000	Dollars (Assumes that grant funding would be used to implement bicycle infrastructure. Minimal costs would occur as a result of incorporating multi-modal improvements into pavement resurfacing, restriping, and signalization operations (less than \$5,000).)
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Community VMT Reduced=	617,112	Dollars per year
	Community operating cost per mile =	\$0.56	Dollars
	Average round trip length =	17.82	Miles (Fehr & Peers)
	Round trips switching from driving to biking =	34,630	Round trips
	Cost per mile of new bicycle lane =	\$40,000	Dollars per mile (Assumes \$40,000 per mile average. Actual cost would depend on the type of bicycle lane being installed - see notes below)
	Total cost of new bicycle lanes =	\$240,000	Dollars

	Cost of bicycle parking =	\$0	Dollar (Bicycle parking standards for non-residential development went into effect January 1, 2001 as part of California Green Building Standards Code, and are therefore now a cost associated with doing business-as-usual)
Community Costs and Savings	Community Cost =	\$0	Dollars per person (Assumes cost of bike lanes would be incurred by the City through grant funding and private developers.)
	Community Savings =	\$10	Dollars per trip (Savings varies depending on how many bicycle trips are made by a single person.)

Notes

Calculation methodology derived from CAPCOA measures SDT-5 and SDT-6

The following is provided for informational purposes:

Cost of infrastructure development is highly variable. Cost estimates for bicycle infrastructure: Class I Bike Path - approximately \$1,000,000 per mile; Class II Bike Lanes - \$10,000 - \$1,000,000 per mile (depending on level of roadway improvement required); Class III Bike Routes - \$2,000 - \$60,000 per mile (depending on the level of treatment; route signage only would be lower end, signage and shoulder striping, pavement markings, signal actuation would be higher end). The cost per mile of sidewalk is approximately \$250,000.

References and Links

1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010):
<http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
2. Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions (2009).
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf
3. Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions. (p.13)
<http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf>
4. US Department of Transportation, <http://www.nhtsa.gov/people/injury/pedbimot/bike/Safe-Routes-2002/safe.html#8>
5. SLO COG RTP - http://www.slocog.org/cm/Programs_and_Projects/2010_Regional_Transportation_Plan.html

Pedestrian Network

Calculation Methodology and Equations

Key Assumptions for Calculations:

Miles of new sidewalk added by 2020	6	Miles
Staff time needed for this measure	0.2	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	VMT Reduction = Forecast VMT x A x B		
	City Area =	5.303	Square Miles
	Forecast VMT (2020) =	58,053,794	VMT
	Percent VMT reduction from pedestrian network improvements (A) =	0.5%	Percent reduction in VMT (CAPCOA SDT-1)
	Percent VMT reduction from traffic calming improvements (B) =	0.25%	Percent reduction in VMT (CAPCOA SDT-2)
Resource Savings	Total VMT Reduction =	435,403	VMT per year
GHG Emission Reduction Calculations	GHG Savings = VMT Reduction x Cef		
	Where: Cef =	0.000374	Composite emission factor; MT CO2 per VMT (EMFAC 2011)
GHG Emission Reduction	Total GHG Savings =	163	MT CO2e
Municipal Costs and Savings Calculations	Staff time required for review and approval of projects and acquiring grant funding for pedestrian infrastructure.		
	FTE =	0.2	Estimated staff time per year to develop new program
	\$/FTE=	100,000	Dollars per year
Municipal Costs and Savings	Municipal Cost =	\$20,000	Dollars (Assumes that grant funding would be used to implement pedestrian infrastructure. Minimal costs would occur as a result of incorporating multi-modal improvements into pavement resurfacing, restriping, and signalization operations (less than \$5,000).)
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Community VMT Reduced=	435,403	Dollars per year
	Community operating cost per mile =	\$0.56	Dollars
	Cost per mile of new sidewalk =	\$250,000	Dollars per mile
	Total cost of new bicycle lanes =	\$1,500,000	Dollars
Community Costs and Savings	Community Cost =	\$0	Dollars per person (Assumes cost would be incurred by the City through grant funding and the private developer.)
	Community Savings =	Varies	Dollars per person (Varies based on number of trips made by foot and distance travelled. Savings of \$0.555 per mile.)

Notes

Calculation methodology derived from CAPCOA measure SDT-1

References

- CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010):
<http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
- Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions (2009).
http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf
- Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions. (p.13)
<http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf>

Transportation Demand Management Incentives

Calculation Methodology and Equations

Key Assumptions for Calculations:

Percent of employees participating	4%	Percent
Staff time needed for this measure	0.04	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	VMT Reduction = Forecast Employee Commute VMT x A		
	Where:		
	Forecast Annual VMT (2020) =	58,053,794	VMT in 2020
	Forecast Annual Employee Commute VMT (2020)=	9,811,091	Employee commute VMT in 2020 (16.9% of total VMT, Fehr & Peers)
	Percent of Employees Participating (A) =	4%	Percent of employees to participate in the TDM program
Resource Savings	VMT Reduction =	431,688	VMT in 2020
GHG Emission Reduction Calculations	GHG Reduction = VMT Reduction x Cef		
	Where:		
	Cef =	0.000374	Composite emission factor; MT CO ₂ per VMT (EMFAC 2011)
GHG Emission Reduction	Total GHG Savings =	161	MT CO ₂ e
Municipal Costs and Savings Calculations	Annual staffing costs associated with coordination and marketing.		
	FTE =	0.04	Estimated cost of staff time
	\$/FTE =	\$100,000	Total annual cost per FTE
Municipal Costs and Savings	Municipal Cost =	\$4,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Cost and Savings Calculations	Private VMT Reduced =	431,688	VMT
	Private vehicle operating cost per mile =	\$0.56	Dollars per mile
	Total community savings =	\$239,587	Dollars
	Total employees =	4,000	Employees (projected in 2020)
	Employees participating in TDM =	176	Employees
Community Costs and Savings	Community Cost =	\$0	Dollars per employee
	Community Savings =	\$1,361	Dollars per employee

Notes

Calculation methodology derived from CAPCOA measures TRT-7, page 240.

References

- CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
- Fehr & Peers calculation of countywide VMT associated with employee commute from the San Luis Obispo Council of Governments Regional Traffic Model 2.0, November 2012.

Parking Supply Management

Calculation Methodology and Equations

Key Assumptions for Calculations:

Implementation Year	2015	Year
Net reduction in parking spaces	500	Parking Spaces
New parking spaces by 2020 forecast under existing regulations	2,500	Parking Spaces
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

Resource Savings Calculations	VMT Reduction = VMT Growth x (((N - O)/O) x 0.5)		
	Baseline VMT (2005) =	48,897,505	Annual Vehicle Miles Traveled (VMT)
	Forecast VMT (2020) =	58,053,794	Annual VMT
	VMT Growth =	3,052,096	VMT generated by forecast development between implementation year and 2020
	N =	2,000	Parking spaces forecast under proposed regulations. (Placeholder value assumes 1,000,000 square feet of new development and 3.5 spaces per 1,000 square feet)
	O =	2,500	Parking forecast under existing regulations. (Placeholder value assumes 1,000,000 square feet of forecast development and 4 spaces per 1,000 square feet)
	P =	0.5	Estimated ratio of reduction in parking supply to reduction in vehicle trips (CAPCOA PDT-1)
	Percent change =	-20%	Percent change in new parking supply
Resource Savings	Annual VMT Reduction =	305,210	Annual reduction in VMT (CAPCOA PDT-1)
GHG Emission Reduction Calculations	GHG Savings = VMT Reduction x Cef		
	Where:		
	2020 Composite Emissions Factor Cef =	0.000374	Composite emission factor; MT CO2 per VMT (EMFAC 2011)
GHG Emission Reduction	Total GHG Savings =	114	MT CO2e
Municipal Costs and Savings Calculations	Staff time to develop policy and establish in-lieu fees.		
	FTE =	0.05	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
Municipal Costs and Savings	Municipal Cost =	\$5,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Private costs and savings of increasing transit service, scaled to City population. Change in private costs = (A*B)+((D*E)/G)		
	Private VMT Reduced (A) =	305,210	VMT
	Private vehicle operating cost per mile (B) =	\$0.56	Dollars per mile
	Private Savings from avoided driving (C) =	\$169,391	Dollars
	Reduction in required parking spaces (D) =	500	Reduction in required parking spaces

	Surface parking construction costs (Excludes cost of land) =	\$10,000	Dollars per space (U.S. parking structure construction costs are reported to average about \$15,000 per space in 2008. Adjusted to reflect cost of ground floor spaces.) (Victoria Transport Policy Institute)
	Total cost savings from reduced parking construction (F) =	\$5,000,000	Dollars (This is a savings for the project applicant/developer, not the general public.)
Community Costs and Savings	Community Cost =	\$0	Dollars per parking space reduced
	Community Savings =	\$339	Dollars per parking space reduced (Excludes savings to private developers.)

Notes

Calculation methodology derived from CAPCOA measure PDT-1.

References

1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010): <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
2. Nelson\Nygaard (2005). Crediting Low-Traffic Developments (p. 16): <http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf>
3. SF Bay Area Metropolitan Transportation Commission Parking Code Guidance - http://www.mtc.ca.gov/planning/smart_growth/parking/6-12/Parking_Code_Guidance_June_2012.pdf
4. Victoria Transport Policy Institute - www.vtpi.org/tca/tca0504.pdf

Electric Vehicle Network and Alternative Fueling Stations

Calculation Methodology and Equations

Key Assumptions for Calculations

Percent Adoption of Electric Vehicles Based on Implementation of Comprehensive EV Network	4%	Percent
Staff time needed for this measure	0.1	Full Time Equivalent

Calculations:

GHG Emission Reduction Calculations	GHG reduction = (City Forecast VMT x B) x D		
	City Forecast VMT (2020) =	58,053,794	VMT
	Estimated percent of drivers switching to EV's by 2020 (B) =	4%	Percent
	VMT driven by those shifting to EV's (C) =	2,322,152	VMT
	Default composite emissions factor =	0.000374	MT CO2e per VMT
	Emissions factor for plug-in electric vehicle =	0.000045	MT CO2e per VMT (US DOE)
	Emissions-per mile difference between average car and EV (D) =	0.000329	MT CO2e per VMT
GHG Emission Reduction	Total GHG Savings =	763	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed for EV Readiness streamlining and coordination with APCD and Central Coast Clean Cities Coalition. (A specific program of investments has not yet been identified by APCD and the Central Coast Clean Cities Coalition. It is expected that localities would seek outside funds to support investments in EV charging stations and alternative fuel stations.)		
	FTE =	0.1	Estimated staff time to develop new program
	\$/FTE =	\$100,000	Total annual cost per FTE
Municipal Costs and Savings	Municipal Cost =	\$10,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Cost of EV charging station =	\$8,000	Dollars (Average total cost for commercial charging station including hardware and installation for AC Level 2, 7.5 kW, 240V Charger) (Ready Set Charge California)
Community Costs and Savings	Community Cost =	\$0	Dollars per charging station (Assumes cost of EV charging stations would be incurred by private developer. Developer costs may be covered by applicable grants.)
	Community Savings =	\$0	Dollars per charging station

Notes

References

1. Argonne National Laboratory. 2009. Multi-Path Transportation Futures Study: Vehicle Characterization and Scenario Analyses. ANL/ESD/09-5. Table 3-11a, p. 53.).
2. "Electric Vehicle Infrastructure, A Guide for Local Governments in Washington State: Model Ordinance, Model Development Regulations, and Guidance Related to Electric Vehicle Infrastructure and Batteries per RCW 47.80.090 and 43.31.970." http://www.psrc.org/assets/4325/EVI_full_report.pdf
3. RechargeIT Driving Experiment: Demonstration of energy efficiency for electric vehicles. Google, org, 2007. <http://www.google.org/recharge/>
4. Ready, Set, Charge California - A Guide to EV Ready Communities - <http://www.rmi.org/Content/Files/Readysetcharge.pdf>

Smart Growth

Calculation Methodology and Equations

Note: The reduction potential for this measure was calculated by Fehr & Peers using the Regional Travel Model.

Key Assumptions for Calculations:

Percent of new residential units located within 1/4 mile of transit by 2020	95%	Percent
Percent of new jobs located within 1/4 mile of transit by 2020	100%	Percent
Density: Percentage change from base density	8%	Percent
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

* 10% capture of retail leakage assumed since no target was given in General Plan Program LU-18.4

Calculations:

Resource Savings Calculations	Calculated by Fehr & Peers using the SLOCOG Regional Travel Model		
	VMT (2020)	58,053,794	VMT
	Percent VMT Reduction	6%	Percent
Resource Savings	Annual VMT Reduction =	3,483,228	Vehicle miles traveled
GHG Emission Reduction Calculations	GHG Savings = VMT Reduction × Cef		
	Where: Cef =	0.000374	Composite emission factor; MT CO2 per VMT (EMFAC 2011)
GHG Emissions Reduction	Total GHG Savings =	1,301	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to identify incentives and update codes and regulations.		
	FTE =	0.05	Estimated staff time to develop new program
	\$/FTE =	\$100,000	Total annual cost per FTE
Municipal Costs and Savings	Municipal Cost =	\$5,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Private developers will gain from a wider choice of potential development opportunities, costs of which would vary based on the incentives provided.		
	Private VMT reduced =	3,483,228	VMT
	Private vehicle operating cost per mile =	\$0.56	Private vehicle operating cost per mile
	Private savings from avoided driving =	\$1,933,191	Private savings from avoided driving.
Community Costs and Savings	Community Cost =	Varies	Dollars per unit
	Community Savings =	\$2,034,938	Dollars per unit

Notes

Morro Bay General Plan:

Program LU-18.4: The attraction of more diversified products and services in order to halt the present leakage to San Luis Obispo of both local and visitor dollars.
 POLICY LIJ-36: The concept of mixed uses should be considered for application throughout the City's commercial areas in order to create a more vibrant community as well as offer opportunities for unique forms of housing.

References

- CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
- Nelson\Nygaard, 2005. Crediting Low-Traffic Developments (p.12). Journal of the American Planning Association: <http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf>
- Boarnet, Marlon and Handy, Susan. 2010. "Draft Policy Brief on the Impacts of Residential Density Based on a Review of Empirical Literature."
- Criterion Planner/Engineers and Fehr & Peers Associates (2001). Index 4D Method. A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes. Technical Memorandum prepared for US EPA, October 2001.
- TCRP Report 95, Transit Oriented Development Traveler Response to Transportation System Changes, Transit Oriented Development. (p 17-35) http://www.fta.dot.gov/documents/Transit_Oriented_Development_-_Traveler_Response_to_Transportation_System_Changes_TCRP_Report_95.pdf
- ICLEI CAPP version 1.5 - Transit Oriented Development tab

Construction Vehicles and Equipment

Calculation Methodology and Equations

Key Assumptions for Calculations:

Percentage of construction equipment replaced with electric equipment	3%	Percent
Percentage of construction equipment replaced with alternatively fueled equipment	3%	Percent
Limit idling time to 3 minutes	Yes	Yes or No
Staff time needed for this measure	0.05	Full Time Equivalent (FTE)

Calculations:

GHG Emission Reduction Calculations	GHG Emissions Reduced = Reduction from Replacement with Electric Equipment + Reduction from Alternative Fuels + Reduction from Reduced Idling Time		
	1 - GHG Reduced from Replacement with Electric Equipment = (Forecast Construction Emissions x Percent Equipment Replaced x Percent Diesel Equipment x Diesel Reduction) + (Forecast Construction Emissions x Percent Equipment Replaced x Percent Gasoline Equipment x Gasoline Reduction)		
	2 - GHG Emissions Reduced from Alternative Fuels = (Forecast Construction Emissions x Percent Equipment Replaced x Percent Diesel Equipment X Diesel Reduction) + (Forecast Construction Emissions x Percent Equipment Replaced x Percent Gasoline Equipment x Gasoline Reduction)		
	3 - Reduction from Reduced Idling Time = Remaining GHG Emissions x 0.40%		
	Forecast (2020) construction GHG emissions=	1,980	MT CO2e
	Construction emissions from diesel equipment=	99%	Percent
	Construction emissions from gasoline equipment=	1%	Percent
	GHG Reduction from Replacing Diesel Equipment with Electric Equipment =	72.9%	Percent (CAPCOA C-2, page 421)
	GHG Reduction from Replacing Gasoline Equipment with Electric Equipment =	72.4%	Percent (CAPCOA C-2, page 421)
	GHG Reduction from Replacement with Electric =	43	MT CO2e
	Emission Reduction Due to Fuel Switch from Diesel to Compressed Natural Gas =	18%	Percent (CAPCOA C-1, page 415)
	Emission Reduction Due to Fuel Switch from Gasoline to Compressed Natural Gas =	20%	Percent (CAPCOA C-1, page 415)
	GHG Reduction from use of alternative fuels =	11	MT CO2e
	Limit Idling Time to 3 Minutes =	1	"1" = Yes, "0" = No
Reduction from Reducing Idling Time from 5 to 3 Minutes =	40%	Percent (CAPCOA, C-3)	
Remaining Emissions (After Reduction from Equipment Replacement and Alternative Fuels) =	1,926	MT CO2e	
GHG Reduction from limiting idling time =	770	MT CO2e	
GHG Emission Reduction	Total GHG Reduction =	824	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to develop efficient construction equipment codes and standards.		
	FTE =	0.05	Estimated staff time needed
	\$/FTE =	\$100,000	FTE cost per year
Municipal Costs and Savings	Municipal Cost =	\$5,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings	Community Cost =	Varies	Dollars (Varies based on vehicle/equipment replacement type.)
	Community Savings =	Varies	Dollars (Varies based on vehicle/equipment replacement type.)

Notes

Off-Road GHG Emissions were calculated from County-wide data from OFF-ROAD 2007. Construction GHG Emissions were disaggregated based on the City's percentage of construction and mining jobs.
Emissions reduction percentages from switching from diesel to compressed natural gas and from gasoline to compressed natural gas were calculated using the averages for all construction equipment type and horsepower categories for 2020 Tables in CAPCOA, C-1.

References

1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010): C-1, C-2, C-3
2. California Air Resources Board (ARB). Off-road Emissions Inventory. OFFROAD2007

Off-Road Equipment Upgrades, Retrofits, and Replacements

Calculation Methodology and Equations

Key Assumptions for Calculations:

Is this measure selected in conjunction with Measure 5a - Construction Equipment Efficiency?	Yes	Yes or No
Percentage of off-road equipment replaced with electric equipment	1%	Percent
Percentage of off-road equipment replaced with alternative fuels	1%	Percent
Staff time needed for this measure	0.1	Full Time Equivalent (FTE)

Calculations:

GHG Emission Reduction Calculations	GHG Emissions Reduced = Reduction from Replacement with Electric Equipment + Reduction from Alternative Fuels 1 - GHG Reduced from Replacement with Electric Equipment = Forecast Construction Emissions x Percent Equipment Replaced x (Percent Diesel Equipment x Diesel Reduction) x (Percent Gasoline Equipment x Gasoline Reduction) 2 - GHG Emissions Reduced from Alternative Fuels = Forecast Construction Emissions x Percent Equipment Replaced x (Percent Diesel Equipment X Diesel Reduction) x (Percent Gasoline Equipment x Gasoline Reduction)		
	Total Forecast (2020) Off-Road GHG Emissions =	2,914	MT CO2e
	Forecast (2020) Off-Road GHG Emissions from Construction Equipment =	1,980	MT CO2e
	Percentage GHG Emissions from Diesel Equipment =	90%	Percent
	Percentage GHG Emissions from Gasoline Equipment =	8%	Percent
	Percentage GHG Emissions from Compressed Natural Gas =	2%	Percent
	GHG Reduction from Replacing Diesel Equipment with Electric Equipment =	72.9%	Percent (CAPCOA C-2, page 421)
	GHG Reduction from Replacing Gasoline Equipment with Electric Equipment =	72.4%	Percent (CAPCOA C-2, page 421)
	GHG Reduction from Purchase of Electric Equipment =	7	MT CO2e
	Emission Reduction Due to Fuel Switch from Diesel to Compressed Natural Gas =	18%	Percent (CAPCOA C-1, page 415)
	Emission Reduction Due to Fuel Switch from Gasoline to Compressed Natural Gas =	20%	Percent (CAPCOA C-1, page 415)
	GHG Reduction from Use of Alternative Fuels =	2	MT CO2e
GHG Emission Reduction	Total GHG Reduction =	8	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to conduct outreach and promotional activities.		
	FTE =	0.1	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
Municipal Costs and Savings	Municipal Cost =	\$8,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings	Community Cost =	\$0	Dollars (Assumes equipment replacement and upgrades would be funded through the Carl Moyer program.)
	Community Savings =	Varies	Dollars (Varies based on vehicle/equipment replacement type.)

Notes

If used in conjunction with measure 5a, emissions reductions associated with upgrading construction equipment are removed to avoid double-counting. Off-Road GHG Emissions were calculated from County-wide data from OFF-ROAD 2007. Emissions reduction percentages from switching from diesel to compressed natural gas and from gasoline to compressed natural gas were calculated using the averages for all

References

1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010): C-1, C-2, C-3
2. California Air Resources Board (ARB). Off-road Emissions Inventory. OFFROAD2007

Solid Waste Diversion Rate

Calculation Methodology and Equations

Key Assumptions for Example Calculations:

Target additional diversion rate (2020)	25%	Percent
Estimated staff time needed for this measure	0.1	Full Time Employee (FTE)

Calculations:

	Tons Diverted = Future Year Landfilled Tonnage x Future Year Diversion Rate		
	1 - Future Year Landfilled Tonnage = (1 + CAGR) ¹⁵ x Baseline Year Landfilled Solid Waste		
Resource Savings Calculations	Baseline Year (2005) Landfilled Solid Waste (Community-Wide) =	9,235	Tons
	Baseline Year (2005) GHG Emissions from Landfilled Solid Waste =	2,695	MT CO2e
	Projected (2020) GHG Emissions from Landfilled Solid Waste =	2,523	MT CO2e
	Compound Annual Growth Rate (CAGR) =	-0.04%	Percent
	Total City Future Year (2020) Solid Waste Tonnage =	8,644	Tons
	Paper Products =	21.0%	Percent
	Food Waste =	14.6%	Percent
	Plant Debris =	6.9%	Percent
	Wood/Textiles =	21.8%	Percent
	All Other Waste =	35.7%	Percent
	Future Year Paper Products =	1,815	Tons
	Future Year Food Waste =	1,262	Tons
	Future Year Plant Debris =	596	Tons
	Future Year Wood/Textiles =	1,884	Tons
	Future Year All Other Waste =	3,086	Tons
	Paper Products Diverted =	454	Tons
	Food Waste Diverted =	315	Tons
Plant Debris Diverted =	149	Tons	
Wood/Textiles Diverted =	471	Tons	
All Other Waste Diverted =	771	Tons	
Resource Savings	Future Year Total Waste Diverted =	2,161	Tons
GHG Emission Reduction Calculations	Total MT CO2e Diverted = (2.138)(Paper Products)(0.9072) + (1.120)(Food Waste)(0.9072) + (0.686)(Plant Debris)(0.9072) + (0.605)(Wood/Textiles)(0.9072) + (0.00)(All Other Waste)(0.9072)		
	1 - Emission Reduction Per Waste Category = Emissions Factor for Category x Future Year Category Tonnage Diverted x 0.9072 x (1 - Emissions captured at landfill)		
	0.9072 = Conversion from short tons to metric tons		
	Emission Factor - Paper Products =	2.138	MT CO2e / MT waste
	Emission Factor - Food Waste =	1.210	MT CO2e / MT waste
	Emissions Factor - Plant Debris =	0.686	MT CO2e / MT waste
	Emission Factor - Wood/Textiles =	0.605	MT CO2e / MT waste
	Emission Factor - All Other Waste =	0.000	MT CO2e / MT waste
	Emissions from Paper Products =	880	MT CO2e

	Emissions from Food Waste =	346	MT CO2e
	Emissions from Plant Debris =	93	MT CO2e
	Emissions from Wood/Textiles =	259	MT CO2e
	Emissions from All Other Waste =	0	MT CO2e
	Emissions captured at landfill =	60%	Percent
GHG Emission Reduction	Total GHG Emissions Reductions =	631	MT CO2e
Municipal Costs and Savings Calculations	Cost may include additional staff time.		
	FTE =	0.1	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
Municipal Costs and Savings	Municipal Costs =	\$10,000	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings	Community Costs =	\$0	Dollars
	Community Savings =	\$0	Dollars

Notes

All cities are assumed to have a baseline year diversion rate of 50%. This diversion has already been accounted for in the baseline year landfilled solid waste tonnage.

CAGR growth rates were calculated based on population growth.

ICLEI's CACP software incorporates emission factors for the diversion of certain materials from the waste stream, derived from the EPA WARM model.

GHG Emissions Calculations assume a landfill methane recovery rate of 60%.

References

1. DRAFT City of Stockton Climate Action Plan (February 2012) - pg. C-77,C-78
2. Hayward Climate Action Plan (October, 2009) - pg. 170
3. County of San Bernardino Greenhouse Gas Emissions Reduction Plan (September 2011) - pg. 91
4. EPA's Waste Reduction Model (WARM), available at: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html
5. ICLEI's Clean Air Climate Protection (CACP) Software (for members), available at: <http://www.icleiusa.org/action-center/tools/cacp-software>

Tree Planting Program

Calculation Methodology and Equations

Note: There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed.

Key Assumptions for Calculations:

Target number of trees planted (net new trees)	500	Trees
City subsidy of tree cost and planting	25%	Percent Subsidized by City
Cost per tree	\$60	Dollars per Tree
Staff time needed for this measure	0.08	Full Time Equivalent (FTE)

Calculations:

GHG Emission Reduction Calculations	GHG Emissions Reduction=Number of Trees Planted x Carbon Sequestration Rate		
	0.0121	= Average carbon sequestration rate (MT CO ₂ /Tree)	
	500	= Number of Trees Planted	
GHG Emission Reduction	Total GHG Emissions Reduced =	6	MT CO ₂ e
Municipal Costs and Savings Calculations	Cost per tree =	\$60	Dollars/tree (McPherson, et al)
	City subsidy of tree cost and planting =	25%	Percent subsidized
	City cost per tree =	\$15	Dollars per tree
	Total capital cost=	\$7,500	Dollars
	FTE =	0.08	Estimated staff time to develop program
	\$/FTE	\$100,000	FTE cost per year
	Cost of staff time =	\$8,000	Dollars
Municipal Costs and Savings	Municipal Cost =	\$15,500	Dollars
	Municipal Savings =	\$0	Dollars
Community Costs and Savings Calculations	Capital cost = (cost per tree x number of trees planted x percentage of city subsidy)		
	Where:		
	Community cost per tree =	\$45	Dollars/tree
	Number of trees planted =	500	Trees
	Total tree capital cost (for community)=	\$22,500	Dollars
	Maintenance cost = maintenance cost per tree x number of trees planted. (Assumes community covers all maintenance costs.)		
	Maintenance cost=	\$34	Dollars/tree (McPherson, et al)
Total maintenance cost (for community) =	\$17,000	Dollars	
Community Costs and Savings	Community Cost =	\$79	Dollars per tree
	Community Savings =	\$0	Dollars per tree

Notes

Carbon sequestration rate from CAPCOA Quantifying GHG Mitigation Measures Report p. 403. There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed. Account for net new trees only.

References

1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010) - pg. 403
2. McPherson, et al as cited in Stockton Draft CAP - <http://www.stocktongov.com/government/boardcom/clim.html>

Climate Change Vulnerability

Calculation Methodology and Equations

Key Assumptions for Calculations:

Staff time needed for this measure	0.02	Full Time Equivalent (FTE)
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Calculations:

GHG Emission Reduction	Annual GHG emissions reduced =	N/A	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to to participate in meetings and planning activities and incorporate new adaptation measures into City documents as appropriate.		
	FTE =	0.02	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
	Staff time cost =	\$2,000	Dollars
Municipal Costs and Savings	Municipal Cost =	\$2,000	Dollars
	Municipal Savings =	\$0	Dollars

Notes

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References

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Public Health and Emergency Preparedness

Calculation Methodology and Equations

Key Assumptions for Calculations:

Staff time needed for this measure	0.08	Full Time Equivalent (FTE)
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Calculations:

GHG Emission Reduction	Annual GHG emissions reduced =	N/A	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to time to coordinate with other agencies and community-based organizations. Additional staff time needed for community education and outreach related to this measure.		
	FTE =	0.08	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
	Staff time cost =	\$8,000	Dollars
Municipal Costs and Savings	Municipal Cost =	\$8,000	Dollars
	Municipal Savings =	\$0	Dollars

Notes

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References

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Water Management

Calculation Methodology and Equations

Key Assumptions for Calculations:

Staff time needed for this measure	0.02	Full Time Equivalent (FTE)
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Calculations:

GHG Emission Reduction	Annual GHG emissions reduced =	N/A	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to time to collaborate with other jurisdictions. Costs of seeking grant funding is business-as-usual.		
	FTE =	0.02	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
	Staff time cost =	\$2,000	Dollars
Municipal Costs and Savings	Municipal Cost =	\$2,000	Dollars
	Municipal Savings =	\$0	Dollars

Notes

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References

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Infrastructure

Calculation Methodology and Equations

Key Assumptions for Calculations:

Staff time needed for this measure	0.08	Full Time Equivalent (FTE)
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Calculations:

GHG Emission Reduction	Annual GHG emissions reduced =	N/A	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to time to complete a climate assessment and incorporate climate change consideration in infrastructure planningl.		
	FTE =	0.08	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
	Staff time cost =	\$8,000	Dollars
Municipal Costs and Savings	Municipal Cost =	\$8,000	Dollars
	Municipal Savings =	\$0	Dollars

Notes

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References

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Coastal Resource Protection

Calculation Methodology and Equations

Key Assumptions for Calculations:

Staff time needed for this measure	0.10	Full Time Equivalent (FTE)
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Calculations:

GHG Emission Reduction	Annual GHG emissions reduced =	N/A	MT CO2e
Municipal Costs and Savings Calculations	Staff time needed to time to monitor and study beach profiles and resource vulnerability and implement policies/programs to plan for future beach changes.		
	FTE =	0.10	Estimated staff time per year
	\$/FTE =	\$100,000	FTE cost per year
	Staff time cost =	\$10,000	Dollars
Municipal Costs and Savings	Municipal Cost =	\$10,000	Dollars
	Municipal Savings =	\$0	Dollars

Notes

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References

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Existing Local Measures – Quantification Details

Emissions Category	Measure Title	Detailed Description	Actual Measure or Commitment	Emissions Reduction in 2020 (MTCO2e)	Measure Source	GHG Calculation Source	Incremental Reduction (%) - Including Range	Activity Data	Assumptions	Data Sources/ Notes
Energy (Community)	Green Building Incentive Program	The Green Building Incentive Program enhances the public welfare and assure that further commercial, residential and civic development is consistent with the City's desire to create a more sustainable community by incorporating green building measures into the design, construction and maintenance of buildings. Applicants achieving LEED or GreenPoint Rated certification, upon documentation by the appropriate third-party organization, shall receive a building and plan check fee rebate per Schedule A below. Additional optional green building incentives are available for exceeding Title 24, graywater systems, renewable generation, and a green roof.	Unknown commitment	Not quantified	Morro Bay website					
Energy (Community)	Solar Energy Installations (Commercial)	Since 2005, 18 kW of solar photovoltaic and hot water systems have been installed on residential properties in Morro Bay. The California Solar Initiative (CSI) is the solar rebate program for California consumers that are customers of the investor-owned utilities. The CSI program is a key component of the Go Solar California campaign for California. The City also participates in the CaliforniaFIRST AB 811 Solar and Energy Efficiency Financing Program	18 kW of solar installed	-5	California Solar Initiative	CAPCOA AE-2	0%-100%	34,200 kWh	Use 1,900 to convert CEC rating to kWh	Solar Capacity from CA Solar (CEC PTC Rating); Conversion factor from US DOE

Emissions Category	Measure Title	Detailed Description	Actual Measure or Commitment	Emissions Reduction in 2020 (MTCO2e)	Measure Source	GHG Calculation Source	Incremental Reduction (%) - Including Range	Activity Data	Assumptions	Data Sources/ Notes
		(commercial and multi-family residential financing only).								
Energy (Community)	Solar Energy Installations (Residential)	Since 2005, 150 kW of solar photovoltaic and hot water systems have been installed on residential properties in Morro Bay. Many of these installations utilized rebates offered through the California Solar Initiative (CSI), a solar rebate program for California consumers that are customers of the investor-owned utilities, such as PG&E. The CSI program is a key component of the Go Solar California campaign for California. The City also participates in the CaliforniaFIRST AB 811 Solar and Energy Efficiency Financing Program (multi-family residential financing only).	150 kW of solar installed	-39	California Solar Initiative	CAPCOA AE-2	0%-100%	285,000 kWh	Use 1,900 to convert CEC rating to kWh	Solar Capacity from CA Solar (CEC PTC Rating); Conversion factor from US DOE
Energy (Municipal)	Municipal Building Energy Efficiency Improvements	The resolution includes T8 lamps, exit signs, HVAC upgrades, walk way lighting, thermostats, and refrigerators.	The suite of measures is expected to reduce energy use by 208,546 kWh per year.	-28	City memo	CAPCOA BE, LE	Varies by measure	208,546 kWh		
Transportation and Land Use	Increase Density and Diversity of Land Uses - Mixed use and infill policies	The General Plan defines specific areas in the downtown core for new mixed use and infill development.	The General Plan defines specific areas in the downtown core for new mixed use and infill development.	Not quantified, evaluated as part of the regional transportation model	General Plan	CAPCOA LUT-1	A 1% increase in density results in a -0.7 reduction in VMT	7,312 VMT		The SLOCOG 2010 travel demand model used to estimate 2005 baseline and 2020 vehicle miles traveled (VMT) uses a 2010 base year and its VMT are calculated and calibrated to 2009-2011 traffic counts. As such, year 2020 VMT estimates included

Emissions Category	Measure Title	Detailed Description	Actual Measure or Commitment	Emissions Reduction in 2020 (MTCO2e)	Measure Source	GHG Calculation Source	Incremental Reduction (%) - Including Range	Activity Data	Assumptions	Data Sources/ Notes
										SLOCOG travel demand forecast model "4-Ds" adjustments for the built environment (land use Density, Design, Diversity, and access to Destinations). Thus, applying additional reductions off-model would double count reductions.
Transportation and Land Use	Bicycle and Pedestrian Network Improvements - North Main Street Bike Lane and Street Improvement Project	The project includes the construction of 20 new handicap ramps and 900 feet of sidewalk and resurfacing of two miles of street with bike lanes.	2 new miles of bike lanes	-29	Capital Improvement Program	CAPCOA SDT-5	1% increase in share of workers commuting by bike for each additional mile of bike lane per square mile	78,491 VMT	Assumes 1% bike mode share. Average reduction in trip length is 20 miles (round trip). Average working days per year is 260.	
Transportation (Municipal)	Utilize Electric or Hybrid Vehicles	The City Parks Department purchased a 2008 Electric Vehicle (ZX40ST AD) and a Ford Hybrid Escape (2009) for the replacement of two gasoline powered trucks. Harbor purchased a 2006 Ford Escape Hybrid.	3 vehicles purchased	-2	City memo	CAPCOA VT-3	0.4%-20.3%	NA	Assumes replaced vehicles 21 MPG; light truck MY 1984-1993	Local Government Operations Protocol 1.1
Waste (Community)	Green Waste Diversion	The City collects greenwaste	Unknown commitment	Not quantified		CAPCOA SW-1	BMP			
Waste (Community)	Construction and Demolition Debris Diversion	As of 2010, the California Green Building Standards Code (CalGreen) requires that 50% of non-hazardous construction and demolition	50% diversion of construction and demolition debris	-155	California Green Building Standards Code	CAPCOA p. 43; SW-2	Varies		According to the California 2008 Statewide Waste	California 2008 Statewide Waste Characterization Study

Emissions Category	Measure Title	Detailed Description	Actual Measure or Commitment	Emissions Reduction in 2020 (MTCO _{2e})	Measure Source	GHG Calculation Source	Incremental Reduction (%) - Including Range	Activity Data	Assumptions	Data Sources/ Notes
		debris be recycled or reused.							Characterization Study, construction and demolition debris makes up 29% of the waste stream and 40% of that is non-hazardous and recyclable.	
Water	Water Conservation Programs to Meet SB X7-7 Target	Implementation of programs identified in the City's 2010 Urban Water Master Plan to reduce per capita water consumption by 20% consistent with SBx7-7.	44,868,720 gallons	-8	2010 Urban Water Management Plan	CAPCOA WSW-2	Varies	44,868,720 gallons	Assumes 1,300 kWh/million gallons electricity required to supply, treat, and distribute water. Assumes 0.133 MT CO _{2e} /MWh electricity	Urban Water Management Plan (June, 2011), CAPCOA WSW-2 (pg. 337), California Energy Commission Refining Estimates of Water-Related Energy Use in California (December 2006)

State Measures - Quantification Details

Measure Title	2020 Reduction (MT CO ₂ e)	Assumptions
Clean Car Standards, AB 1493 (Pavley I)	3,690	CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016. Reductions in GHG emissions from the Pavley I standard were calculated using CARB's EMFAC2011 model for San Luis Obispo County. To account for this standard, EMFAC2011 integrates the reductions into the mobile source emissions portion of its model (CARB, 2013).
Low Carbon Fuel Standard	On-Road: 2,410 Off-Road: 324	The Low Carbon Fuel Standard (LCFS) requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. Reductions in GHG emissions from LCFS were calculated using CARB's EMFAC2011 model for San Luis Obispo County. To account for this standard, EMFAC2011 integrates the reductions into the mobile source emissions portion of its model (CARB, 2013).
Title 24	228	The California Energy Commission (CEC) estimates that the 2008 standards reduce consumption by 10 percent for residential buildings and 5 percent for commercial buildings, relative to the previous standards. For projects implemented after January 1, 2014, the CEC estimates that the 2013 Title 24 energy efficiency standards will reduce consumption by 25 percent for residential buildings and 30 percent for commercial buildings, relative to the 2008 standards. These percentage savings relate to heating, cooling, lighting, and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses. Therefore, these percentage savings were applied to the percentage of energy use covered by Title 24. The calculations and 2020 GHG emissions forecast assume that all growth in the residential and commercial/industrial sectors is from new construction (CEC, 2008; Statewide Energy Efficiency Collaborative, 2011).
Renewable Portfolio Standard	5,219	PG&E must have a renewable portfolio of 33% by 2020. In order to calculate future emissions that take into account the Renewable Portfolio Standard, PG&E's 2020 emissions factor was applied (PG&E, 2011).

APPENDIX C

CAP CONSISTENCY WORKSHEET

CAP Consistency Worksheet

The City of Morro Bay CAP was developed to comprehensively analyze and mitigate the significant effects of GHG emissions consistent with CEQA Guidelines Section 15183.5(b) and to support the State's efforts to reduce GHG emissions under Executive Order S-3-05 and AB 32 (see CAP Chapter 1, Sections 1.1 and 1.4). Pursuant to CEQA Guidelines Sections 15064(h)(3) and 15130(d), if a project is consistent and complies with the requirements of an adopted plan, such as a CAP, that includes the attributes specified in CEQA Guidelines Section 15183.5(h), the lead agency may determine that the project's GHG impacts are less than significant with no further analysis required. This appendix sets forth a CAP consistency worksheet that an applicant may use to demonstrate project compliance with the CAP. This checklist should be filled out for each new project, subject to discretionary review of the City of Morro Bay.

To determine project consistency and compliance with the CAP, the applicant should complete Sections A and B below, providing project-level details in the space provided. Generally, only projects that are consistent with the General Plan land use designations, and SLOCOG population and employment projections, upon which the GHG emissions modeling and CAP is based, can apply for a determination of consistency with the CAP. In addition, all mandatory actions identified in Section B must be incorporated as binding and enforceable components of the project for it to be found consistent with the CAP. If an action is not applicable to the proposed project, please identify and explain.

At this time, the voluntary actions are not required for project consistency with the CAP; however, if a project does include voluntary actions identified in Section B, project-level details should be described to help the City track implementation of voluntary CAP actions that would contribute to Morro Bay's achievement of its GHG emissions reduction target.

If the project cannot meet one or more of the mandatory actions, substitutions (preferably starting with the voluntary actions) may be allowed if the applicant can demonstrate how substituted actions would achieve equivalent reductions to the City's satisfaction. The applicant would also be required to demonstrate that the project would not substantially interfere with implementation of the mandatory CAP actions.

If it is determined that a proposed project is not consistent with the CAP, further analysis would be required and the applicant would be required to demonstrate that the proposed project's GHG emissions fall below the APCD's adopted GHG significance thresholds (see CAP Chapter 1, Section 1.8.3, and **Table 1-2**). The project would also be required to demonstrate that it would not substantially interfere with implementation of the CAP.

A. PROJECT INFORMATION

Date:	
Project Name:	
Project Address:	
Project Type:	
Project Size:	
Land Use Designation(s):	
Zoning Designation(s):	
Project Service Population (Residents + Employees):	
Brief Project Description:	
Compliance Checklist Prepared By:	

B. CAP COMPLIANCE WORKSHEET

Measure	Project Actions	Mandatory or Voluntary	Project Compliance (Yes/No/NA)	Details of Compliance*
Energy				
Measure E-4: Incentives for Exceeding Title 24 Energy Efficiency Building Standards	Does the project exceed 2013 Title 24 Building Energy Efficiency Standards?	Voluntary		
Measure E-5: Small-Scale On-Site Solar PV Incentive Program	Does the project include installation of small-scale on-site solar PV systems and/or solar hot water heaters? If so, what type and how much renewable energy would be generated?	Voluntary		
Measure E-6: Income-Qualified Solar PV Program	Does the project include installation of small-scale on-site solar PV systems and/or solar hot water heaters on income-qualified housing units? If so, what type and how much renewable energy would be generated?	Voluntary		
Transportation and Land Use				
Measure TL-1: Bicycle Network	For subdivisions and large developments, does the project incorporate bicycle lanes, routes, and/or shared-use paths into street systems to provide a continuous network of routes, facilitated with markings, signage, and bicycle parking?	Mandatory		
	For non-residential development, does the project comply with mandatory California Green Building Standards Code bicycle parking standards?	Mandatory		

Measure	Project Actions	Mandatory or Voluntary	Project Compliance (Yes/No/NA)	Details of Compliance*
	Does the project incorporate bicycle facilities and/or amenities beyond those required?	Voluntary		
Measure TL-2: Pedestrian Network	Does the project provide a pedestrian access network that internally links all uses and connects all existing or planned external streets and pedestrian facilities contiguous with the project site?	Mandatory		
	Does project minimize barriers to pedestrian access and interconnectivity?	Mandatory		
	Does the project implement traffic calming improvements as appropriate (e.g., marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, median islands, mini-circles, tight corner radii, etc.) as required by the General Plan and Zoning Ordinance?	Mandatory		
	Does the project incorporate pedestrian facilities and/or amenities beyond those required?	Voluntary		
Measure TL-4: Parking Supply Management	Does the project include a reduced number of parking spaces or utilize shared parking?	Voluntary		
Measure TL-5: Electric Vehicle Network and Alternative Fueling Stations	Does the project include the installation of electric or other alternative fueling stations?	Voluntary		
Measure TL-6: Smart Growth	Is the project consistent with the City's adopted land use and zoning map?	Mandatory		

Measure	Project Actions	Mandatory or Voluntary	Project Compliance (Yes/No/NA)	Details of Compliance*
	Does the project include any “smart growth” techniques, such as mixed-use, higher density, and/or infill development near existing or planned transit routes, in existing community centers/downtowns, and/or in other designated areas?	Voluntary		
Off-Road				
Measure O-1: Construction Equipment Techniques	Will six percent of construction vehicles and equipment be electrically-powered or use alternative fuels such as compressed natural gas?	Mandatory		
	If the project involves construction or demolition, will the contractor limit idling of construction equipment to three minutes and post signs?	Mandatory		
Tree Planting				
Measure T-1: Tree Planting Program	Does the project include the planting of native and drought-tolerant trees beyond those required as mitigation for tree removal? If so, how many?	Voluntary		

*Please attach additional pages as needed to complete the description and provide project details.