Attachment C
Planning Commission Resolution
No. 13-032

REF120044

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Before the Planning Commission of the County of Monterey

Resolution No. 13-032
Resolution of the Planning Commission to recommend that the Board of Supervisors adopt a Monterey County Municipal Climate Action Plan: Greenhouse Gas Reduction Plan for County Operations (MCAP) (REF120044).

The Municipal Climate Action Plan came on for public hearing before the Monterey County Planning Commission on August 28, 2013. Having considered all the written and documentary evidence, the administrative record, the staff report, oral testimony, and other evidence presented, the Monterey County Planning Commission hereby finds and decides as follows:

RECITALS

WHEREAS, Policy OS-10.15 of the 2010 Monterey County General Plan requires adoption of a Greenhouse Gas Reduction Plan for County operations; and

WHEREAS, Policy OS-10.15 states that the goal of the plan shall be to reduce greenhouse gas emissions associated with County operations by at least 15% less than 2005 emission levels; and

WHEREAS, greenhouse gases have been linked to an effect known as climate change; and

WHEREAS, climate change is of global and local concern as recognized by the County of Monterey in the 2010 General Plan, the State of California in legislation including Assembly Bill 32 (the Global Warming Solutions Act of 2006), the United States Environmental Protection Agency through the Clean Air Act, and major global organizations such as the Intergovernmental Panel on Climate Change; and

WHEREAS, Monterey County contributes relatively small amounts of greenhouse gas emissions considering it is a world-wide issue; however, Monterey County is among the jurisdictions doing its part to reduce its emissions and if each jurisdiction does their part it will lead to significant global reductions, ideally resulting in a decrease in the rate of climate change; and

WHEREAS, Monterey County recognizes the financial benefits of increased energy efficiency and decreased fuel consumption; and

WHEREAS, the Municipal Climate Action Plan would further the goals set by the State of California in Assembly Bill 32; and

WHEREAS, a Monterey County Municipal Climate Action Plan: Greenhouse Gas Reduction Plan for County Operations (MCAP), has been prepared pursuant to General Plan policy OS-10.15 setting forth measures that, if implemented, would result in reductions in greenhouse gas emissions amounting to 15% or more below 2005 levels; and

WHEREAS, the Municipal Climate Action Plan is attached hereto as Exhibit 1 and incorporated herein by reference; and

WHEREAS, the MCAP is categorically exempt pursuant to Sections 15301 and 15302 of the California Environmental Quality Act (CEQA) Guidelines. Section 15301 exempts operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private

structures, facilities, mechanical equipment, or topographical features involving negligible or no expansion of use beyond that existing at the time of the lead agencies determination. Many of the projects discussed in the MCAP have already been evaluated under CEQA and implemented. The majority of the remaining MCAP measures involve upgrades to existing mechanical and electrical facilities (Such as the Public Works Audit Measures, the Natividad Audit Measures, and Building Energy Management Systems) within existing buildings involving no change of use in those buildings. Section 15302 exempts replacement or reconstruction of existing structures and facilities where the new structure will be located in the same location and will have substantially the same purpose. This exemption applies to projects in the MCAP such as replacement of light fixtures. Other projects not falling within these categories include installation of two electrical vehicle charging stations at existing County facilities, the purchase of two electric vehicles for the County fleet, pursuit of renewable energy generation opportunities, and employee outreach and education. The electric vehicle charging stations are already installed and are located within existing paved areas at existing County facilities. The remaining items are operational in nature and do not constitute a "project" under CEQA. All future projects will be evaluated pursuant to the requirements of CEQA irrespective of this program; and

WHEREAS, On August 28, 2013 the Monterey County Planning Commission held a duly noticed public hearing to consider a recommendation to the Board of Supervisors on the Monterey County Municipal Climate Action Plan: Greenhouse Gas Reduction Plan for County Operations (MCAP). At least 10 days before the public hearing, notices of the hearing before the Planning Commission were published in both the Monterey County Weekly and were mailed to interested parties.

DECISION

NOW, THEREFORE, BE IT RESOLVED, that the Planning Commission does hereby recommend that the Board of Supervisors adopt the Monterey County Municipal Climate Action Plan: Greenhouse Gas Reduction Plan for County Operations (MCAP), attached hereto as Exhibit 1.

PASSED AND ADOPTED this 28th day of August, 2013 upon motion of Commissioner Diehl, seconded by Commissioner Getzelman, by the following vote:

AYES: Vandevere, Getzelman, Rochester, Salazar, Mendez, Roberts, Diehl, Hert
NOES: Brown
ABSENT: Padilla
ABSTAIN: None

Wanda A. Hickman

Wanda A. Hickman, Acting Secretary

FINAL

MONTEREY COUNTY MUNICIPAL CLIMATE ACTION PLAN: GREENHOUSE GAS REDUCTION PLAN FOR COUNTY OPERATIONS.

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June 2013

Acknowledgements

This plan was prepared through a collaboration between the Resources Management Agency team lead by Craig Spencer and ICF, with the critical contributions and work of the following County staff:

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and all the Energy Watch staff at AMBAG

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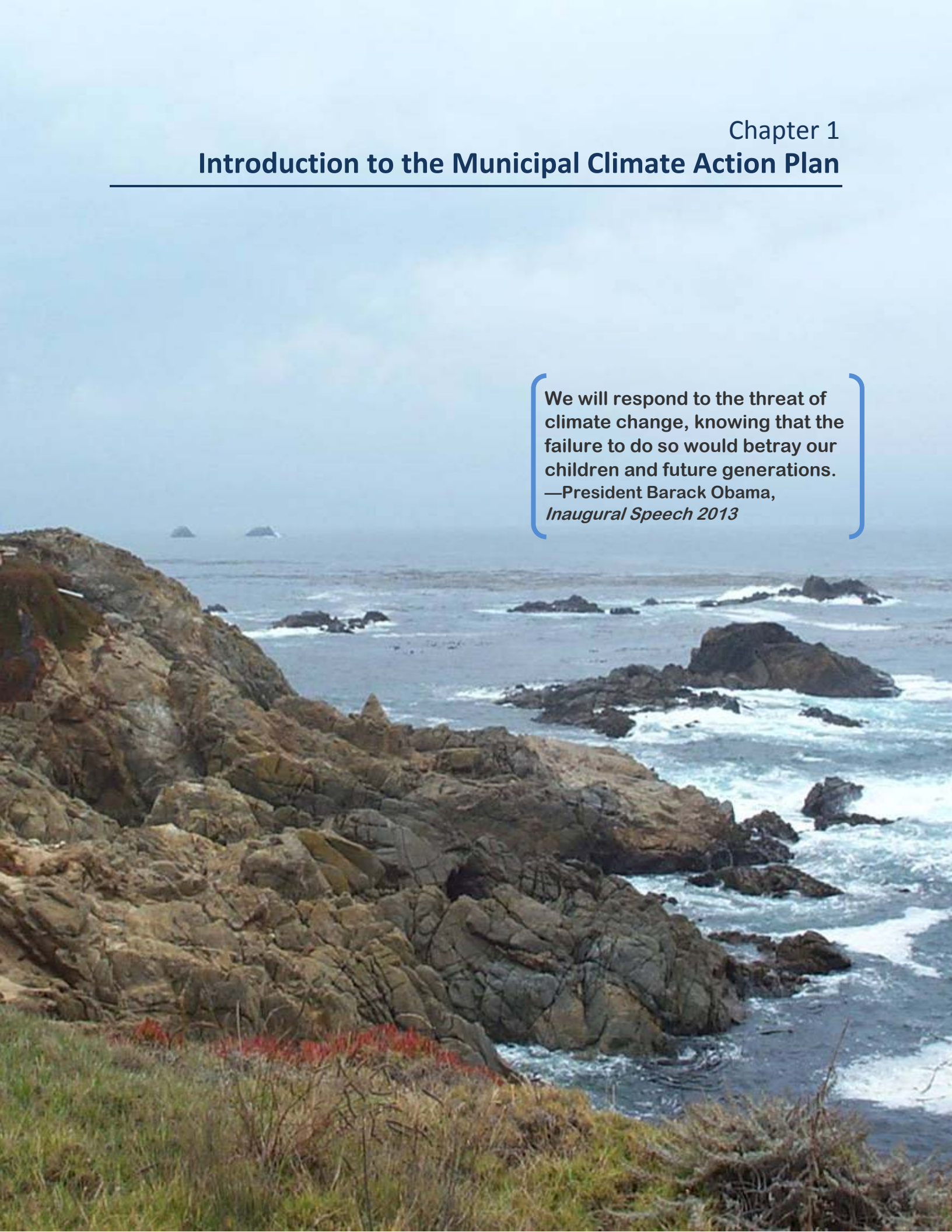
Acronyms and Abbreviations

AB	Assembly Bill
AEE	Alternative Energy and Environment
AMBAG	Association of Monterey Bay Area Governments
BAU	business as usual
BEMS	Building Energy Management Systems
C&D	construction and demolition
CALGreen	California's Green Building Standards Code
CAP	climate action plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCAs	Community Choice Aggregations
CEQA	California Environmental Quality Act
CFPP	Climate Friendly Purchasing Policy
CH_4	methane
CIPs	capital improvement projects
EECBG	Energy Efficiency and Conservation Block Grant
EPA	U.S. Environmental Protection Agency
ESPs	energy service providers
GHG	greenhouse gas
HVAC	Heating, ventilation, and air conditioning
IOUs	investor-owned utilities
IPCC	Intergovernmental Panel on Climate Change
JPA	Joint Powers Authority
LED	Light Emitting Diode
LGOP	Local Government Operations Protocol
MCAP	Municipal Climate Action Plan
MT CO_2e	metric tons of carbon dioxide equivalent
NMC	Natividad Medical Center

PG&E	Pacific Gas and Electric
PV	photovoltaic
RMA	Resource Management Agency
RPS	Renewable Portfolio Standard
SB	Senate Bills
SEEC	Statewide Energy Efficiency Collaborative

Chapter 1

Introduction to the Municipal Climate Action Plan



> We will respond to the threat of climate change, knowing that the failure to do so would betray our children and future generations.
> —President Barack Obama, *Inaugural Speech 2013*

1.1 What Is This Plan?

This document is Monterey County's Municipal Climate Action Plan, or MCAP. This plan:

- Provides a description of the steps being taken by the County to reduce greenhouse gas (GHG) emissions associated with its municipal operations (i.e., the County's day to day activities in providing services to Monterey residents and businesses).
- Describes three potential paths towards the County's goal of reducing GHG emissions to a level that is 15% below the 2005 emissions level before 2020.
- Serves as one component of the County's larger, community-wide climate action plan (CAP), which addresses GHG emissions from the community at large.

In 2006, the California legislature passed Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006, which established a mandate to reduce California's GHG emissions to 1990 levels by 2020 (approximately 10 to 11%[1] below 2006 state levels). The California Air Resources Board (CARB) developed the state's roadmap for reaching this goal, known as the AB 32 Scoping Plan. The Scoping Plan specifically identifies local governments (counties and cities) as key players in achieving the statewide goal to reduce statewide GHG emissions. The AB 32 Scoping Plan recommends that local governments establish GHG reduction goals for both their municipal operations and the community to be consistent with those of the state. Monterey County has prepared this MCAP in response to the AB 32 Scoping Plan recommendation.

What Are Typical County Operational Sources of the Key Greenhouse Gases?

As explained in Chapter 2, key County emissions sources by gas include:

- Carbon dioxide—vehicle emissions, building natural gas use, and electricity provided by fossil-fuel fired power plants,.
- Methane—landfill emissions, electricity consumption, and vehicle emissions.
- Nitrous oxide—vehicle emissions, and electricity consumption.
- High Global Warming Potential Gases—refrigeration and air conditioning in buildings and vehicles.

At the local level, Monterey County adopted a new General Plan on October 26, 2010. The environmental impact report prepared for the 2010 General Plan contains a discussion of potential GHG emissions impacts. Policies were added to the General Plan as mitigation for these potential GHG impacts related to build-out of the General Plan. This MCAP has been prepared pursuant to that mitigation and Policy OS-10.15 of the General Plan to address GHG emissions from County operations.

[1] At the time of the 2008 Scoping Plan, CARB had completed GHG inventories only through 2004 and thus emissions for 2005–2008 could only be estimated. Thus, the recommended target of a 15% reduction below "current" levels (i.e. circa 2006) was based on an *estimate* of emissions and this recommendation is what appears in the Final AB 32 Scoping Plan GHG inventories were subsequently prepared for the years2005–2008 which were lower than prior estimates. The CARB determined that in order to meet AB 32 goal of reaching 1990 emission levels, emissions would have to be reduced by 10% to 12% below 2005–2008 levels, not 15% as was originally estimated. The text of the Scoping Plan was not revised although reduction goals of anywhere between 11% and 15% are considered consistent with CARB's recommendation.

This MCAP is a reference document for County operations and a supporting document to the County's CAP. The reader can move from section to section as needed. It is not necessary to read this document sequentially. The content of each chapter is summarized below.

Chapter 1, *Introduction to the Municipal Climate Action Plan* outlines the purpose and need for the MCAP, and describes the MCAP process.

Chapter 2, *2005 GHG Emissions Inventory and 2020 Emissions Forecast* provides a projection of the GHG emissions that would result from the County's municipal operations in 2020 if the County or the state took no additional action to reduce emissions (i.e., the business as usual or BAU, forecast). This chapter also presents Monterey County's municipal GHG inventory for 2005, the baseline year and an explanation of how the County set its GHG reduction goal (referred to as "target" in this document).

Chapter 3, *GHG Emissions Reduction Plan—Three Scenarios for Reaching the Target* provides an explanation of Monterey County's three potential scenarios for reducing GHG emissions by 2020.

Chapter 4, *GHG Emissions Reduction Plan—Sector View* presents the GHG reductions achieved by the three scenarios by sector and shows total GHG reductions by sectors.

Chapter 5, *MCAP Implementation*—describes how this plan is implemented including prioritization of measures and programs, scheduling, tracking, funding and future updates.

Chapter 6, *References*—includes full citations for reference materials used to prepare this document.

AB 32 Scoping Plan Reductions

The AB 32 scoping plan is a roadmap for achieving AB 32 goals. Reducing statewide emissions to 1990 levels by 2020 is equivalent to cutting "current" (as measured during the period 2004–2008) emissions by 15%. This would require every Californian to reduce their annual GHG emissions by 4 tons. The AB 32 Scoping Plan identifies eight key sectors for meeting this challenge.
Cap-and-Trade: Limit GHG emissions from certain sectors
Electricity and Energy: Improve energy efficiency and use of renewable power
High Global Warming Potential GHGs: Enhance capture technology and reduce refrigerant use
Agriculture: Increase equipment efficiency and enhance methane capture at dairies
Transportation: Improve engine efficiency, reduce carbon content of fuels, and improve the transportation network
Industry: Target the largest emitters through audits and restrictions
Forestry: Provide sequestration credits
Waste and Recycling: Reduce waste and increase recycling
Together, strategies outlined in the AB 32 Scoping Plan will help transform California's economy into one that is more sustainable and less reliant on fossil fuels (CARB 2010).

The AB 32 Scoping Plan can be found at the following link:

http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm

1.2 Local Government Climate Action Planning

There is no law or regulation specifically requiring a local government to inventory GHG emissions and prepare a GHG reduction plan, commonly referred to a CAP in California. However, the AB 32 Scoping Plan recommends their preparation as a means to demonstrate consistency with AB 32 and streamline project level analysis of GHG emissions under CEQA. Many cities and counties across

California have prepared MCAPs and CAPs in response to these recommendations and also for reasons related to energy and financial savings and environmental co-benefits.

1.2.1 AB 32 Scoping Plan (2009)

The AB 32 Scoping Plan is the state's roadmap for achieving the goals of AB 32. Because the state government does not have jurisdictional control over all of the activities that produce GHG emissions in California, the AB 32 Scoping Plan names local governments as essential partners in achieving the statewide goal to reduce GHG emissions to 1990 levels by 2020. The 2008 AB 32 Scoping Plan recommends local governments reduce GHG emissions from municipal operations, as well as the community at large, to a level that is 15% below "current" levels by 2020.[2]. To assist in this directive, CARB has developed tools, best practices guides, as well as the Local Government Operations Plan (LGOP) which aids local governments in quantifying and tracking their progress toward the AB 32 goal.

1.2.2 State California Environmental Quality Act Guidelines (2012)

The State California Environmental Quality Act (CEQA) Guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions that would result from a project. State CEQA Guidelines section 15126.4c includes considerations for lead agencies related to feasible mitigation measures to reduce GHG emissions, which may include, among others, measures in an existing plan or mitigation program. For this reason, if a city or county has completed a CAP, projects that can demonstrate consistency with the CAP can be considered to cause a less-than-significant impact under CEQA. Thus the adoption of a CAP allows for streamlining of project level analysis of GHG emissions under CEQA.

Local governments, such as Monterey County, have the ability, and often the exclusive authority, to impact local decisions such as wastewater treatment, energy efficiency of new construction, land use, and transportation infrastructure. Furthermore, local governments have unique control over their own internal operations and have the authority to implement a variety of energy efficiency, fuel conservation and waste reduction programs that apply to thousands of employees and facilities. Local governments lead by example in their own communities by developing and implementing an MCAP that supports a larger CAP, as Monterey County is doing.

1.3 Municipal Climate Action Planning Process

The climate action planning process includes four main steps (see Figure 1-1).

1. **Inventory and Project GHG Emissions.** The first step in developing a GHG reduction plan is to establish the amount of GHGs currently being emitted on a yearly basis within the boundary of interest (i.e., by all the County municipal operations). Because GHG planning in California is driven by the state's 2020 goal, GHG inventories include, not only an inventory of all GHG emissions in the baseline (current) year, but also a projection or forecast of what

[2] Ibid.

GHG emissions will likely be in 2020 when accounting for growth (i.e., the increased level of service and number of employees).

Monterey County completed a baseline GHG inventory for their municipal operations using a baseline year of 2005 with the assistance of the Association of Monterey Bay Area Governments (AMBAG) Energy Watch Regional Inventory Collaborative in 2009. This initial inventory report is included as Appendix A of this document. In developing the MCAP (this work) Monterey County made slight modifications to the original inventory and created a forecast of their 2020 BAU emissions using best available data on employee growth, service changes and building and fleet needs. The County's municipal GHG inventory and forecast are described in Chapter 2.

2. **Review Opportunities for GHG Reduction and Set a GHG Reduction Target.** The second step in developing a GHG reduction plan is to broadly examine the opportunities for GHG reduction and a timeline on which these could be achieved, then set a GHG reduction target consistent with state recommendations and local concerns.

   Monterey County completed building energy audits in 2011 with the assistance of Energy Efficiency and Conservation Block Grant (EECBG) funding. The County also tracked all capital improvement projects(CIPs) completed since 2005 that resulted in energy efficiency. As a result of the the audit process and information on completed CIPs, the County had a thorough understanding at the outset of the MCAP process of the energy efficiency potential in its buildings and facilities, which are the largest source of GHG emissions. As part of this step, the County also reviewed a comprehensive list of GHG reduction measures common to city and county operations throughout the United States and identified additional measures to pursue as part of the MCAP. The County selected a GHG reduction target of 15% below current levels, confident that sufficient opportunity existed within their control to meet or exceed this goal by 2020. Target setting is described in more detail in Chapter 2.

3. **Select and Quantify GHG Reduction Measures.** The third step is to identify the specific measures that will be taken to reduce GHG emissions. Once selected, GHG reductions resulting from implementation of those measures will be estimated. Reductions are estimated for 2020, and the total reductions achieved in 2020 are compared against the baseline year emissions.

   Monterey County quantified the potential GHG reductions associated with: 1) all retrofits identified in the building energy audits (referred to as "Public Works Audit" and "Natividad Measures"); 2) all retrofits completed as of 2012 with various grant funding (referred to as "AMBAG Energy Watch" or "Public Works SOW"); 3) all measures implemented at the state level such as the Renewable Portfolio Standard or Pavley Vehicle Standards (referred to as "State Measures"); and 4) other measures in the waste, vehicle fleet and employee commute sectors.

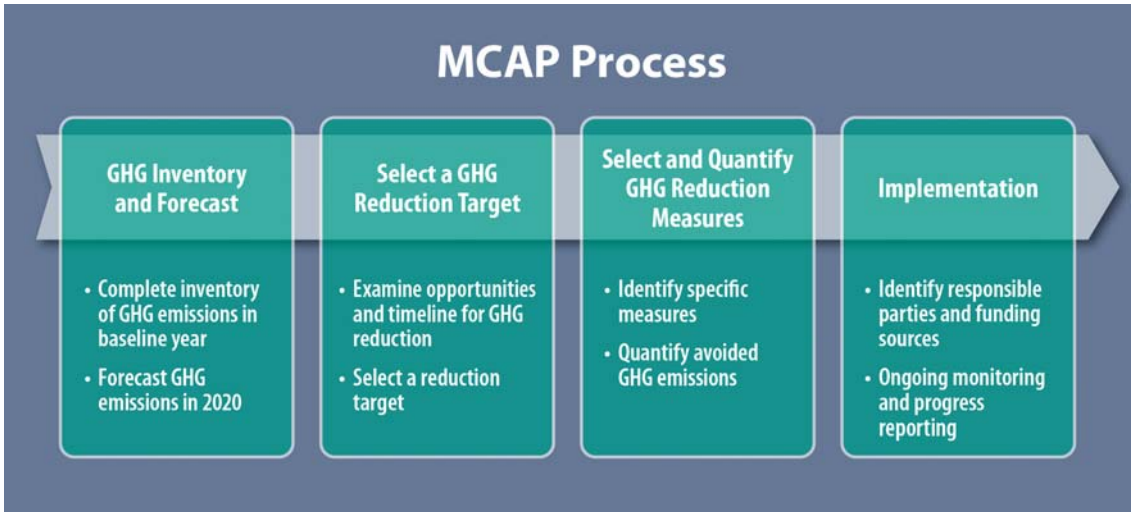
   Following quantification of the GHG reduction measures, the County then built three different combinations of measures (i.e., scenarios or reduction paths) that it felt likely to be complete before 2020 given scheduling and funding concerns. The County used a Microsoft Excel based calculation tool (developed by ICF International, the County's consultant) to select and deselect different measures in order to build their preferred GHG reduction scenarios.

Representatives from several county departments used the calculation tool and provided feedback on measure selection and likelihood of implementation before 2020.

4. **Implementation.** The final step is to implement all GHG reduction measures identified in Step 3 above. Reduction measures usually take the form of policies or programs that a county or city can implement and are usually tailored to complement existing programs. Implementation includes identification of responsible parties for each measure, identification of funding sources, scheduling, and ongoing monitoring and progress reporting.

   Monterey County has included in this MCAP a GHG reduction measure implementation chapter, Chapter 5. The chapter organizes measures according to an implementation timeline with the following categories: Completed (Phase 1), and Phases 2 (2013–2016) and 3 (2017–2020). Measures were placed on the timeline based on known funding sources and plans and with input from responsible parties for each measure. Because this MCAP was largely an assessment of the GHG reduction potential of existing and planned county programs, these actions do not represent *new* projects or programs and are already incorporated into the planning of the responsible department. For long term actions, the County will use Chapter 5 as a process guide for how to implement new actions.

Figure 1-1. The MCAP Planning Process



Chapter 2

2005 GHG Emissions Inventory and 2020 Emissions Forecast

> We know the science, we see the threat, and we know the time for action is now.
> —Arnold Schwarzenegger

2.1 2005 GHG Emissions Inventory

In 2005, the County's municipal operations resulted in the release of 20,230 metric tons of carbon dioxide equivalent (MT CO_2e)—roughly the amount of GHGs released by 3,967 typical U.S. cars in one year. GHG emissions in 2005 are shown in Table 2-1[1] and Figure 2-1. Comparisons with projected emissions in 2020 are shown in Figures 2-3 and 2-4.

In 2005, the largest source of emissions, representing 58% of the inventory, was building energy (11,753 MT CO_2e). GHG emissions in the Buildings and Facilities—Energy Use sector result from the use of electricity or natural gas in County-owned buildings. This sector is often the largest source of GHG emissions in municipal inventories. The second largest source of emissions from County operations was the County's vehicle fleet (5,465 MT CO_2e; 27%). The third largest source, representing 8% of the inventory, was employee commutes (1,635 MT CO_2e).

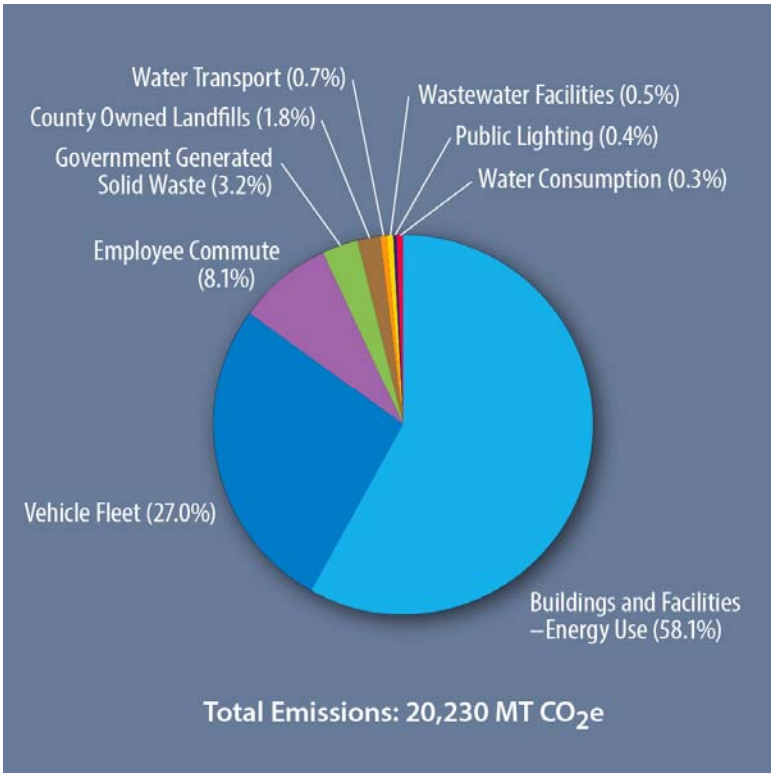
The remaining 7% of GHG emissions were due to powering of streetlights and traffic signals, water consumption, owned landfills, water and wastewater pumping, wastewater treatment, and the generation of waste by County employees. In 2005 the County employed 4,329 people and serviced a population of 106,117.

Table 2-1. Monterey County Municipal Operations—2005 GHG Emissions Inventory

	(MT CO_2e)	Percent
Buildings and Facilities—Energy Use	11,753	58.1
Vehicle Fleet	5,465	27.0
Employee Commute	1,635	8.1
Government Generated Solid Waste	645	3.2
County-owned Landfills	361	1.8
Water Consumption	64	0.3
Water Transport/Pumping	133	0.7
Public Lighting	74	0.4
Wastewater Facilities	100	0.5
Total	20,230	100.0

[1] Monterey County completed their municipal GHG inventory in 2009 with the assistance of AMBAG for a baseline year of 2005. Minor modifications to that inventory were made in development of this MCAP to reflect changes in building/facility operational control and construction of new buildings and to account for landfills not previously captured in the AMBAG inventory.

Figure 2-1. 2005 GHG Emissions Inventory—Sector View



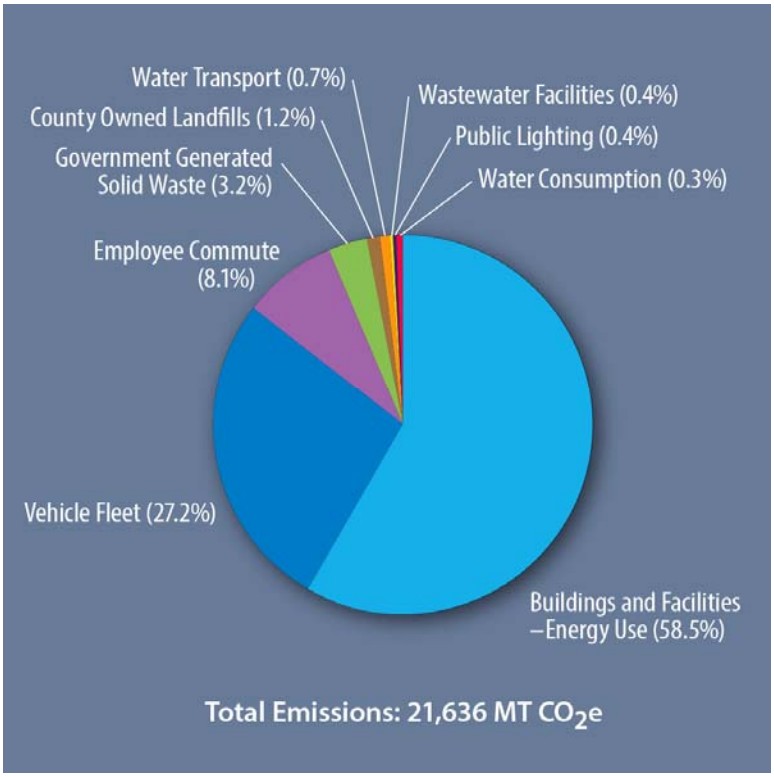
2.2 2020 GHG Emissions Forecast

In 2020, the County municipal operations are projected to result in the release of 21,636 MT CO_2e—an increase of approximately 7% over 2005 levels. The 2020 GHG emissions forecasts represents a BAU scenario which assumes that the County continues to utilize the same types of energy and at the same rate that it does now. This is understood as a worst case scenario since the energy efficiency technology used in buildings and equipment generally increases over time, and it is well known that the county, state, and nation are taking action to improve energy efficiency and reduce GHG emissions. Nevertheless, the BAU scenario is a standard metric used in GHG planning and assumes that government agencies at the federal, state, and local level will take no action to curb emissions. This allows the County to measure its actions against this "no action", future condition.

Table 2-2. Monterey County Municipal Operations—2020 GHG Emissions Forecast

	(MT CO_2e)	Percent
Buildings and Facilities—Energy Use	12,653	58.5
Vehicle Fleet	5,884	27.2
Employee Commute	1,760	8.1
Government Generated Solid Waste	694	3.2
County-owned Landfills	267	1.2
Water Consumption	71	0.3
Water Transport/Pumping	143	0.7
Public Lighting	81	0.4
Wastewater Facilities	83	0.4
Total	21,636	100.0

Figure 2-2. 2020 GHG Emissions Forecast—Sector View

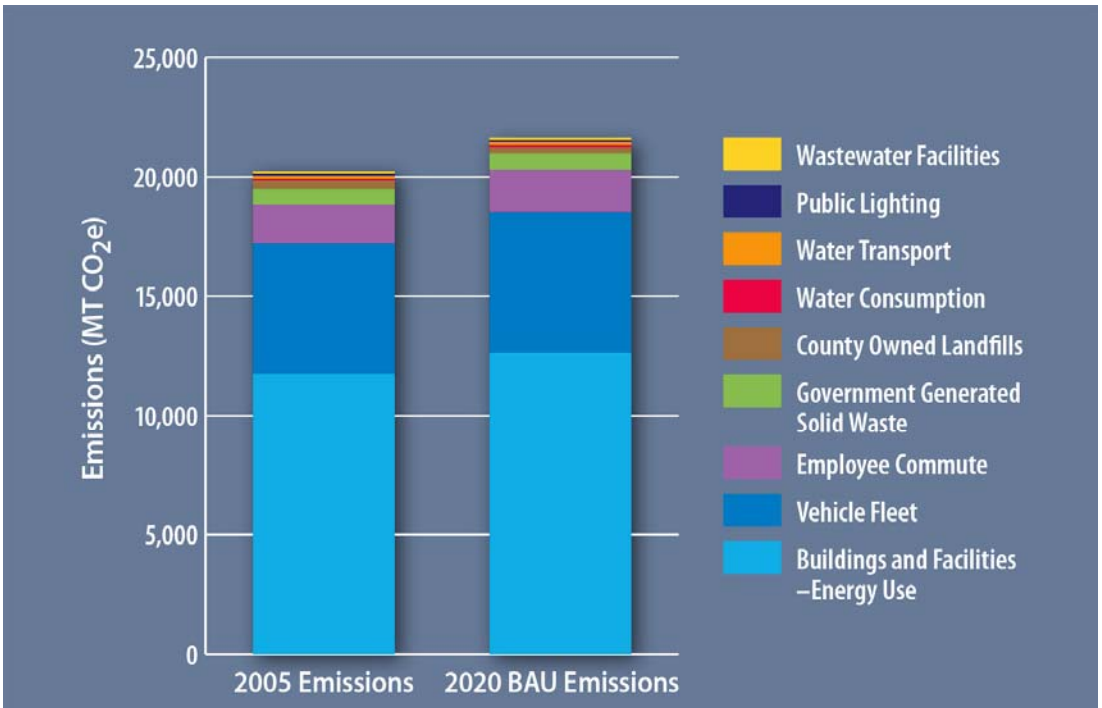


Buildings and Facilities—Energy Use (58%), County Vehicle Fleet (27%), and Employee Commute (8%) are still expected to be the largest sources of emissions in 2020. All sectors except County-Owned Landfills and Wastewater Facilities are expected to experience an increase in emissions between 2005 and 2020. The Buildings and Facilities, Vehicle Fleet, Employee Commute, and Government Generated Solid Waste sectors are projected to increase by between 7% and 8% similar to the anticipated rate of employee growth. Emissions from County-Owned Landfills and Wastewater Facilities are projected to decrease between 2005 and 2020 due to changes in

jurisdictional control. The Pajaro County Sanitation District wastewater pumping facilities will be transferred to the control of the Pajaro Sunny Mesa Community Services District before 2020. GHG emissions due to Water Consumption, Water Transport, and Public Lighting will increase in response to growth in Monterey County's employee population, service population, and housing stock, respectively.

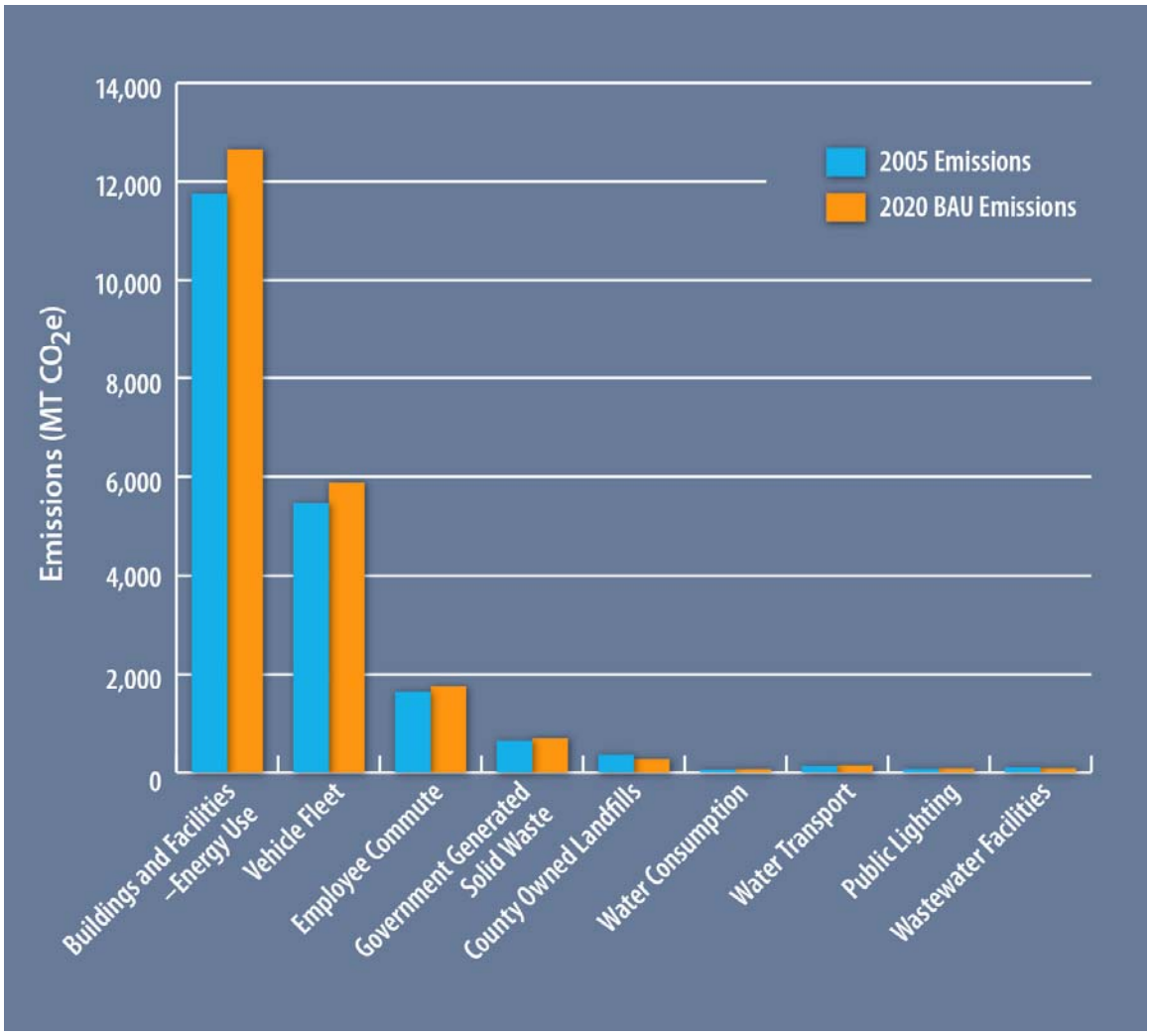
A comparison of the County's 2005 municipal GHG emissions inventory and 2020 BAU GHG emissions forecast are shown in Figures 2-3 and 2-4. Each GHG emissions sector is described in more detail below in Section 2.3.

Figure 2-3. Comparison of 2005 GHG Emissions Inventory and 2020 BAU GHG Emissions Forecast



Sector	2005 Emissions (MT CO_2e)		2020 BAU Emissions (MT CO_2e)		Percent Change
Buildings and Facilities –Energy Use	11,753	58.1%	12,653	58.5%	7.7%
Vehicle Fleet	5,465	27.0%	5,884	27.2%	7.7%
Employee Commute	1,635	8.1%	1,760	8.1%	7.7%
Government Generated Solid Waste	645	3.2%	694	3.2%	7.7%
County Owned Landfills	361	1.8%	267	1.2%	-25.9%
Water Consumption	64	0.3%	71	0.3%	10.0%
Water Transport	133	0.7%	143	0.7%	7.2%
Public Lighting	74	0.4%	81	0.4%	9.3%
Wastewater Facilities	100	0.5%	83	0.4%	-16.9%
Total	20,230	100.0%	21,636	100.0%	7.0%

Figure 2-4. 2005 GHG Emissions Inventory and 2020 BAU GHG Emissions Forecast—Sector Comparisons



2.3 Descriptions of GHG Inventory Sectors

The County's MCAP analyzes and addresses GHG emissions across multiple sectors of County operations. A description of each sector and the inventory and BAU forecast results are provided below. The County's strategies to reduce GHG emissions are described in Chapters 3 and 4.

- **Buildings and Facilities—Energy Use:** Electricity use in County buildings results in *indirect* GHG emissions at the power plants that produce electricity supplied to Monterey County. These plants may be located either inside or outside of the county, and the combustion of the fuel used to produce the electricity occurs in a different location from the user. Natural gas consumption in County buildings by furnaces and other appliances results in *direct* GHG emissions at the location where the natural gas is combusted. Building energy emissions accounted for 558.1% (11,753 MT CO_2e) of total emissions from County-related sources in 2005 and are projected to account for 58.5% (12,653 MT CO_2e) of total County-related emissions in 2020. Forty-eight

percent of these emissions are due to electricity use and 52% due to natural gas use in County-operated buildings.

- **Vehicle Fleet**: Monterey County operates a vehicle fleet with 1,224 vehicles, including gasoline and diesel cars and trucks, and motorcycles. The County also has a 48-piece mobile construction equipment fleet. In 2005 these vehicles consumed approximately 592,560 gallons of gasoline and diesel fuels. GHG emissions associated with the County's vehicle fleet result from combustion of gasoline and diesel in the vehicle and equipment motors. In 2005, Vehicle Fleet emissions accounted for 27% (5,465 MT CO_2e) of total emissions from County-related sources in 2005, and are expected to account for 27.2% (5,884 MT CO_2e) of total County-related emissions in 2020 due to a larger fleet and larger employee population.
- **Employee Commute**: The County employed 4,329 people in 2005, approximately 89% of whom drove alone in a single vehicle for an average of 12 miles each day to reach County offices and facilities, according to an employee commute survey completed in 2009. GHG emissions associated with the Employee Commute sector result from combustion of gasoline and diesel in the motors of employee vehicles. In 2005, Employee Commute emissions accounted for 8.1% (1,635 MT CO_2e) of total emissions from County-related sources in 2005, and are expected to account for 8.1% (1,760 MT CO_2e) of total County-related emissions in 2020.
- **Government Generated Solid Waste**: County employees generate waste through their daily activities and facility operations. Some portion of this waste ultimately is placed in a landfill where it decays and releases methane (CH_4). In 2005, Government Generated Solid Waste emissions accounted for 3.2% (645 MT CO_2e) of total emissions from County-related sources in 2005, and are expected to account for 3.2% (694 MT CO_2e) of total County-related emissions in 2020. Emissions in this sector are projected to increase by 7.7% between 2005 and 2020, as a result of employee growth.
- **County-Owned Landfills**: Although numerous landfills are located in Monterey County, the County has jurisdictional control over and is responsible for the GHG emissions from only one landfill, the San Antonio South Shore Disposal site, which has been closed since 1991. This landfill is operated by the County of Monterey Department of Parks and is tracked by the CARB. GHG emissions from landfills outside of the control of the County are not included in the MCAP.

  Waste that is deposited in landfills continues to decompose and the landfill continues to emit CH_4 long after the landfill stops accepting waste, however, emissions peak and then begin to decline within a few years after waste is deposited. It should be noted that emissions in the County-Owned Landfills sector do not overlap with emissions in the Government Generated Solid Waste sector. The San Antonio South Shore Disposal site was closed in 1991 and did not accept waste (including waste generated by County employees) in 2005. The emissions from this landfill in 2005 were due to waste that was deposited in the landfill prior to 1991.

Building Energy in Monterey County

Monterey County owns and operates numerous buildings and facilities. Electricity and natural gas use at these buildings are the County's largest source of GHG emissions. Consequently, they represent the County's best opportunity to reduce its GHG footprint through energy efficiency and renewable energy. The list of buildings included in this analysis originates from the County's original municipal GHG inventory. There are many buildings of varied sizes that are included in the original inventory and this analysis such as Natividad Medical Center, the Detention Facilities or the Parks Department Offices.

Landfills were included in the County's Community GHG inventory and not in the County's original municipal GHG inventory. The San Antonio South Shore Disposal site has been added to the County's municipal inventory and forecast as part of preparation of the MCAP, as it is a County-owned source of GHG emissions. In 2005, County-Owned Landfill emissions accounted for 1.8% (361 MT CO_2e) of total emissions from County-related sources in 2005, and are projected to account for 1.2% (267 MT CO_2e) of total County-related emissions in 2020. Emissions in this sector are projected to decrease between 2005 and 2020, because no new waste has been added to the San Antonio South Shore Disposal Site since 1991 and CH_4 emissions have been declining since their peak in the mid-1990s at this site.

- **Water Consumption**: GHG emissions in this sector result from the consumption of water in County facilities and the energy required to treat and move water to County buildings. In 2005, County employees, visitors to County buildings, and landscape irrigation needs resulted in consumption of 91.5 MG of water that was pumped from the ground or desalinated at the Sand City Desalination Plant and then transported to County facilities by water services providers. In 2005, Water Consumption emissions accounted for 0.3% (64 MT CO_2e) of total emissions from County-related sources in 2005, and are expected to account for 0.3% (71 MT CO_2e) of total County-related emissions in 2020. GHG emissions from this sector are projected to increase by a larger percentage than would be suggested only by employee growth (10% between 2005 and 2020 as opposed to 7.7%). This is because some water providers in the county are exploring increasing the proportion of water provided from desalination processes in 2020, an energy intensive process.
- **Water Transport**: The County serves as both a consumer of water and a provider of water and water related services. Emissions in the Water Transport sector result from electricity consumption used to power a small number of on-site water pumps that serve County-owned facilities. Emissions in this sector do not overlap with the Water Consumption sector, as this sector only includes activity by County-owned equipment. In 2005, Water Transport emissions accounted for 0.7% (133 MT CO_2e) of total emissions from County-related sources in 2005, and are projected to account for 0.7% (143 MT CO_2e) of total County-related emissions in 2020. Emissions in this sector are projected to increase by 7.2% between 2005 and 2020, in response to population growth.
- **Public Lighting**: The County owns and operates street lights, traffic signals, and outdoor lighting at parks. The electricity used to power public lighting equipment results in indirect GHG emissions at the supplying power plants. Public Lighting emissions in 2020 were partially forecasted using housing growth: the County assumed that the number of park lights and traffic signal controllers would remain constant between 2005 and 2020, while street lighting and other lighting were projected to increase by 15%, similar to growth in housing between 2005 and 2020. In 2005, Public Lighting emissions accounted for 0.4% (74 MT CO_2e) of total emissions from County-related sources in 2005, and are projected to account for 0.4% (81 MT CO_2e) of total County-related emissions in 2020. GHG emissions in this category are projected to increase by 9.3% between 2005 and 2020.
- **Wastewater Facilities**—GHG emissions in the Wastewater Facilities sector result from electricity consumed to power the transfer facilities and from fugitive emissions at the Chualar Wastewater Treatment Plant. *Transport* of wastewater is controlled by County-owned equipment, while *treatment* of wastewater occurs at the Chualar facility (operated by the County) and other facilities operated by the Joint Powers Authority (JPA), not the County.

Fugitive GHG emissions associated with the treatment of wastewater at the JPA-owned facilities are not under the County's control and, therefore, not included in this inventory. In 2005, power consumption of the wastewater transfer equipment and fugitive emissions at the Chualar facility accounted for 0.5% (100 MT CO_2e) of total emissions from County-related sources in 2005, and 0.4% (83 MT CO_2e) of total County-related emissions in 2020. Although wastewater pumping plants will experience a 10% increase in pumping volumes due to population growth, emissions in this sector are projected to decrease by 16.9% between 2005 and 2020 due to the transfer of control of the Pajaro area facilities to the JPA prior to 2020.

2.4 Monterey's Municipal GHG Emissions Inventory in Context

Many jurisdictions in California have completed a municipal GHG inventory. Although every city or county municipal GHG emissions profile will be somewhat unique, Monterey County's emissions are best viewed against municipalities that provide a similar range of services and have similar populations and areas. The table below compares the total municipal GHG emissions from County-related sources in the baseline year as well as GHG emissions per employee and per service population to a small sample of other jurisdictions in California.

Table 2-3. Comparison to Other California Jurisdictions Municipal GHG Emissions

Location	Baseline Municipal Emissions (MT CO_2e)	Employees (People)[a]	Service Area (Square Miles)	Service Population (People)	GHG/ Employee (MT CO_2e/Employee)	GHG/Service Area (MT CO_2e/Sq Mile)	GHG/Service Pop. (MT CO_2e/ Person)
Monterey County (2005)	20,230 [a]	4,329 [b]	3,324 [c]	106,117 [d]	4.7	6.1	0.2
City of San Luis Obispo (2005)	6,580 [e]	370 [e]	13 [f]	44,625 [g]	17.8	506.2	0.1
Santa Barbara County (2008)	134,003 [h]	Not Available	2,735 [i]	132,333 [g]	N/A	49.0	1.0
Marin County (2000)	18,451 [j]	Not Available	520 [k]	68,735 [g]	N/A	35.5	0.3
Contra Costa County (2006)	41,057 [l]	Not Available	716 [m]	157,301 [g]	N/A	57.3	0.3

[a] This work
[b] Craig Spencer, Monterey County, pers. comm.
[c] http://www.co.monterey.ca.us/factfinder/population.htm
[d] Association of Monterey Bay Area Governments 2008
[e] City of San Luis Obispo 2009
[f] http://quickfacts.census.gov/qfd/states/06/0668154.html
[g] Populations listed for the Counties include only unincorporated population. California Department of Finance 2012
[h] Santa Barbara County 2011
[i] http://quickfacts.census.gov/qfd/states/06/06083.html
[j] Marin County 2006
[k] http://quickfacts.census.gov/qfd/states/06/06041.html
[l] Contra Costa County 2007
[m] http://quickfacts.census.gov/qfd/states/06/06013.html

The information in Table 2-3 is presented for illustrative purposes only, as different inventory methods and data availability result in variability between each inventory. Municipalities included in this table represent those for which public and current, relevant data exists, and does not reflect a comprehensive review of all municipal emissions inventories in California. The comparison shows that on a per service population and per service area basis, Monterey County's emissions are lower than those of other comparable municipalities. County-related sources are relatively lower because the County does not serve as an electricity provider, owns and operates only one wastewater treatment plant, and only controls one landfill. In addition, caution is recommended in making such comparisons as the range of services provided by different municipal governments varies significantly between different cities and counties.

Why Reduce Emissions by 15%?

The AB 32 Scoping Plan lays out California's plan for achieving the GHG reductions required by AB 32. Specifically the Scoping Plan describes a list of measures that the state will undertake, and the expected GHG reductions associated with these measures before 2020. Because the state does not have jurisdictional control over many of the activities that produce GHG emissions in California, the AB 32 Scoping Plan articulates a unique role for local governments in achieving the state's GHG reduction goals. The AB 32 Scoping Plan recommends local governments reduce GHG emissions from both their municipal operations and the community at large to a level that is 15% below current levels. The AB 32 Scoping Plan can be found at the following link.

http://www.arb.ca.gov/cc/scopingplan/document/draftscopingplan.htm

2.5 GHG Emissions Reductions Target

In developing its MCAP, the County followed the process described in Chapter 1. The County first completed a GHG inventory and 2020 BAU forecast (described in Sections 2.1 and 2.2 above). The County then examined their own opportunities for reducing GHG emissions relative to recommended GHG reduction targets.

The County has selected a target of 15% below 2005 GHG emissions levels before 2020, consistent with CARB recommendations to local governments in the AB 32 Scoping Plan.[2] This target and the GHG emission reduction values needed for Monterey to reach this target are explained more below.

Table 2-4 shows how the number of required GHG emissions reductions needed for Monterey County to reach the target is calculated. The County's GHG emissions in 2005 were 20,230 MT CO_2e and are projected to be 21,636 MT CO_2e in 2020 under a BAU scenario (Table 2-2 and Figure 2-2). The BAU scenario assumes an absence of any action by the State of California or the County towards reducing GHG emissions. The County's target in 2020 is to have an emissions level that is 15% below 2005 levels, or 17,195 MT CO_2e. The difference between this level and the projected level of emissions in 2020 (4,441 MT CO_2e), is the amount of GHG emissions reductions that the County needs to identify in this plan.

The County has examined its own energy efficiency projects, capital improvement plans, state level GHG reduction efforts as well as a range of other options for reducing the carbon footprint of its own

[2] The 15% recommendation was based on CARB's estimate of 2005–2008 emissions at the time of the scoping plan because at that time CARB had not yet completed actual inventories for those years. In subsequent years, CARB completed the inventories for 2005–2008. In order to meet the AB 32 target of 1990 levels, the state would have to reduce its emissions by 10–12% below 2005–2008 levels. CARB has not updated its recommendations to local governments since the 2008 adoption of the AB 32 Scoping Plan.

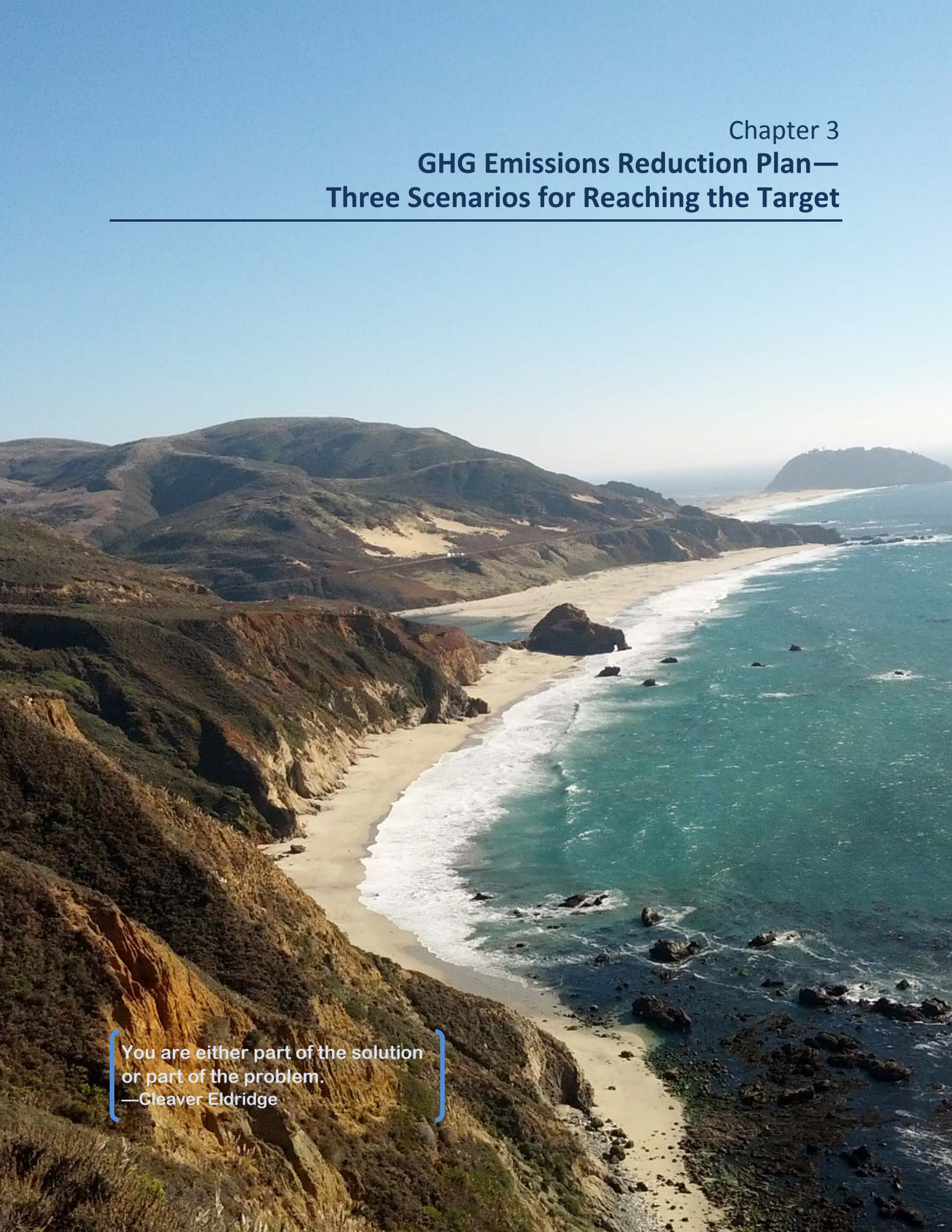
operations. The County calculated the GHG emissions that would be avoided by each of these strategies in 2020, referred to as *reduction measures* in this plan, and used this information to build several viable routes to the 2020 GHG emissions reduction target. Chapters 3 and 4 describe this process.

Table 2-4. How is Monterey County's GHG Reduction Target Calculated?

GHG Emissions		($MT CO_2e$)
A	Projected in 2020 (based on projected growth from 2005 baseline)	21,636
B	Target for 2020—15% below 2005 levels	17,195
Total	Reductions Needed to Reach Target (A minus B)	4,441

Chapter 3

GHG Emissions Reduction Plan—Three Scenarios for Reaching the Target



You are either part of the solution or part of the problem.
—Cleaver Eldridge

3.1 Reduction Measure Selection Process

In developing this MCAP, the County reviewed a wide array of GHG reduction strategies including:

- State level strategies and their ability to impact GHG emissions from Monterey's municipal operations.
- Planned and completed (after 2005) capital improvement projects at Natividad Medical Center (NMC) and their associated GHG benefit.
- Planned and completed (after 2005) capital improvement projects identified through building energy audits conducted by Public Works and their associated GHG benefit.
- Planned and completed (after 2005) capital improvement projects funded through the AMBAG Energy Watch Program.
- Other GHG reduction measures as recommended by the California Air Pollution Control Officers Association (CAPCOA), the Attorney General's Office, ICLEI, and the U.S. Environmental Protection Agency (EPA) or as implemented by other local governments.

Any action in the above list that yielded a GHG savings (e.g. through avoided electricity, natural gas, vehicle fuel, waste or water consumption) after 2005 but before 2020 was added to the "measure pool". The measure pool is a comprehensive list of GHG reduction strategies from which the County could select. Each category of measures in the measure pool is described in Section 3.2 below.

Energy Efficiency in Monterey County

The County has taken many steps to improve energy efficiency. These steps include completing detailed energy audits of 14 County facilities, and the implementation of lighting retrofits, sponsored by the Association of Monterey Bay Area Governments.

Because funding and timing of some of the specific measures are uncertain, the County has built three different reduction scenarios by selecting different combinations of GHG reduction measures from the measure pool. All scenarios are considered feasible by the County. The County can achieve its target to reduce 2020 GHG emissions to a level that is 15% below 2005 levels in all three scenarios. The three reduction scenarios are described in Sections 3.3, 3.4 and 3.5.

A number of County staff were involved in the reduction measure selection process. Measures that have already been completed or implemented by the County and measures that are implemented by the state of California are common to all scenarios, while measures that have not yet been implemented were selected by the County to be included in one or more of the scenarios. Including multiple reduction scenarios in the MCAP ensures that the County is not limited to a single option to meet their target.

3.2 Reduction Measure Pool

This section describes the complete pool of measures from which the County made selections in order to build their three distinct GHG reduction scenarios (see Sections 3.3, 3.4, 3.5). The pool of measures is divided into the following categories based on responsible party and funding source.

1. State Measures (3.2.1)
2. NMC Measures (3.2.2)
3. Public Works Audit Measures (3.2.3)
4. AMBAG Energy Watch Measures (3.2.4)
5. Other Measures (3.2.5)

3.2.1 State Measures

Through legislation, the state of California has established requirements on automobiles (AB 1493—Pavley I and II) and on electricity generation (SB 1078/SB 107—Renewable Portfolio Standard) in California that will reduce the County's GHG emissions by 2020 even without any County action. The state is also depending on the Low Carbon Fuel Standard (Executive Order S-01-07) to provide further GHG reductions from mobile sources. State-level reduction measures will reduce Monterey County's municipal GHG emissions by the amounts shown in Table 3-1.

State Action to Reduce Local GHG Emissions

Actions undertaken by the state government will help Monterey County achieve its emissions reduction target. Legislation enacted at the state level establishes requirements on automobiles, waste generation, electricity sales, and much more. For example, the state requires electric utility companies to increase their procurement of renewable resources by 2020 (the California Renewable Portfolio Standard or RPS). Renewable resources, such as wind and solar power, do not emit any GHGs. By generating a greater amount of the state's energy through renewable resources, electricity provided to the County will be cleaner and less greenhouse gas intensive than if the state hadn't required the renewable standard. California power providers are required to provide 33% of retail sales from qualified renewable sources by 2020. Even though this and other state measures do not require local government action, they will reduce GHGs in Monterey by 2,263 metric tons relative to the 2005 baseline. More information about the state's plan to reduce GHGs can be found at: http://www.arb.ca.gov/cc/cc.htm

Table 3-1. State Reduction Measures

Measure Number	Measure Name	Measure Description	GHG Reductions ($MTCO_2e$)
S-1	Renewable Portfolio Standard (RPS)	Obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. The RPS set forth a longer range target of procuring 33% of retail sales by 2020. SB X 1-2 expands and preempts the RPS to obligate all California electricity retailers in the state (including publicly owned utilities, investor owned utilities, electricity service providers, and community choice aggregators) to obtain at least 33% of their energy from renewable resources by the year 2020.	1,126
S-2	Pavley (AB 1493) and Advanced Clean Cars	Requires CARB to adopt vehicle standards that will lower GHG emissions from new light duty autos to the maximum extent feasible beginning in 2009. Additional strengthening of the Pavley standards (Advanced Clean Cars) has been proposed for vehicle model years 2017–2025. Together, the two standards are expected to increase average fuel economy to roughly 43 miles per gallon by 2020 (and more for years beyond 2020) and reduce GHG emissions from the transportation sector in California by approximately 14%.	344
S-3	Low Carbon Fuel Standard	Mandates the following: (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020, and (2) that a low carbon fuel standard for transportation fuels be established in California.	632
S-4	AB32—Other Vehicle Efficiency Measures	The following AB32 measures are being implemented. • Tire Pressure Program (assures vehicle tire pressure is maintained to manufacturer specifications). • Low Friction Engine Oils (mandates the use of engine oils that meet certain low friction specifications). • Heavy-Duty Vehicle GHG Emission Reduction (requires installation of best available technology and/or CARB approved technology to reduce aerodynamic drag and rolling resistance).	161
Total Reductions in Monterey County from State Measures			2,263
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.			

3.2.2 Natividad Medical Center Measures

In 2011, an energy efficiency audit of NMC in Salinas was completed (Willdan Energy Solutions 2011). The audit and subsequent report, funded by Pacific Gas and Electric (PG&E), identified a number of energy efficiency retrofits to reduce energy consumption at the facility. Financial incentives are provided by PG&E for reducing peak demand electricity and natural gas as a result of

implementing the retrofits. Of the twelve measures highlighted in the audit report, two have been completed (NMC-4 and NMC-6) at the time of writing of this document. The recommended energy efficiency measures range from upgrading boilers to installing lighting upgrades. The full list of NMC energy efficiency measures and their associated GHG reductions are included in Table 3-2 below.

Table 3-2. NMC Audit Report Reduction Measures

Measure Number	Measure Description	GHG Reductions ($MTCO_2e$)	Measure Completed?
NMC-1	Install Direction Expansion Units for Common Room, Lab and building 300. Chiller off at night	57	No
NMC-2	Air Handling Unit Schedule, and boilers off at night	756	No
NMC-3	Install Boiler Isolation Valves	96	No
NMC-4	Isolate the Dietary/Dishwasher Boiler Hot Water Loop from the Domestic Loop	59	Yes
NMC-5	Replace the Heating Hot Water Condensing Boilers	369	No
NMC-6	Convert 3-Way to 2-Way Valves and Implement Chilled Water Temperature Reset	7	Yes
NMC-7	Implement Condenser Water Temperature Reset	0.4	No
NMC-8	Air Balance	7	No
NMC-9	Schedule the Building 151 Packaged Unit to Operate Only During Occupied Hour	36	No
NMC-10	Install Controls for the Kitchen Hood Exhaust	11	No
NMC-11	Exhaust fan Timers (2% Horse Power Fans)	7	No
NMC-12	Lighting Upgrade	106	No
Total from All NMC Measures		1,511	
Total Reductions from Completed Measures		66	
Total Reductions from Remaining Measures		1,445	
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.			

3.2.3 2011 Public Works Audit Report Measures

In 2011, DOE funded an energy audit report that was completed for the County at fourteen of its facilities. The audit report identifies a number of energy conservation measures such as equipment repairs, equipment upgrades, and alterations in building controls. The audits and the implementation of a portion of the measures were funded by the EECBG Program. The measures that have already been implemented were funded by the EECBG Program, while the funding of the remaining measures has not yet been identified. All energy efficiency actions identified in the Public Works Audit Report are listed below in Table 3-3 along with a brief description, project location, associated GHG reductions and status.

Table 3-3. Public Works Audit Report Measures

Measure Number	Measure Description and Location	GHG Reductions ($MTCO_2e$)	Measure Completed?
HVAC Measures			
BE-1	Air balance of rooftop units at Adult Rehab Facility	28	Yes
BE-2	Install Building Energy Management System at Correctional Facility	89	No
BE-3	Replaced Heating units—100% OSA at Correctional Facility	88	Yes
BE-4	Replaced Heating units—recirculating at Correctional Facility	9	No
BE-5	Replace Heating units—receiving wing at Correctional Facility	28	Yes
BE-6	Replace Heating unit-women's dayroom at Correctional Facility	11	No
BE-7	Install Building Energy Management System at New Jail	16	No
BE-8	Retro-commission heating/ventilating units at New Jail	16	Yes
BE-9	ACU-7 retro-commissioning at New Jail	2	Yes
BE-10	Replaced 3-ton AC units at New Jail	6	Yes
BE-11	ACU-1 replacement at New Jail	3	No
BE-12	Expand Building Energy Management System at Public Safety Building	60	No
BE-13	Retro-commission HU-1 through 5 at Public Safety Building	39	Yes
BE-14	Replace AC-1 through AC-5 at Public Safety Building	57	No
BE-15	Replace 5-ton, single-zone units at Public Safety Building	2	No
BE-16	Install Building Energy Management System at Probation Headquarters	9	No
BE-17	Calibrate wireless pneumatic thermostats at Probation Headquarters	4	Yes
BE-18	Install Building Energy Management System at Probation Juvenile Intake	4	No
BE-19	Retro-commission heating/ventilating units at Probation Juvenile Intake	4	Yes
BE-20	Replace baseboard heating valve-Secretary's office at Probation Juvenile Intake	1	No
BE-21	Replace exhaust fans as needed at Probation Juvenile Intake	—	Yes
BE-22	Retro-commissioning heating units at Probation Youth Center	8	Yes
BE-23	Replace 15-year-old packaged AC units at Probation Youth Center	2	No
BE-24	Heating, ventilation, and air conditioning (HVAC) Duct Work at Department of Social & Employment Services Seaside Office	—	No
BE-25	Replace units AC-1, 3, 5 & 6 at Department of Social & Employment Services Seaside Office	2	No
BE-26	Replace older HVAC units at Agricultural Commission Facility	3	No

Measure Number	Measure Description and Location	GHG Reductions ($MTCO_2e$)	Measure Completed?
BE-27	Replace hot water heaters at Animal Shelter	13	No
BE-28	Install Building Energy Management System at Animal Shelter	32	No
BE-29	Install Building Energy Management System at Marina Coastal Offices	4	No
BE-30	Add wireless pneumatic thermostats at Marina Coastal Offices	4	Yes
Indoor Lighting Measures			
BE-31	Interior Lighting retrofits at Adult Rehab Facility	8	No
BE-32	Interior lighting controls at Adult Rehab Facility	1	No
BE-33	Interior lighting retrofits at Correctional Facility	34	No
BE-34	Interior lighting controls at New Jail	2	No
BE-35	Interior lighting retrofits at New Jail	41	No
Outdoor Lighting Measures			
BE-36	Outdoor lighting improvements at Adult Rehab Facility	17	No
BE-37	Outdoor lighting improvements at Correctional Facility	13	No
BE-38	Outdoor lighting improvements at New Jail	8	No
BE-39	Outdoor lighting improvements at Public Safety Building	3	No
BE-40	Outdoor lighting improvements at Probation Facility	3	No
BE-41	Outdoor lighting improvements at Probation Juvenile Intake Facility	2	No
BE-42	Outdoor lighting improvements at Probation Juvenile Detention Facility	0.4	No
BE-43	Outdoor lighting improvements at Probation Youth Center	5	No
BE-44	Outdoor lighting improvements at Department of Social & Employment Services Seaside Office	5	No
BE-45	Outdoor lighting improvements at Agricultural Commission Facility	8	No
BE-46	Outdoor lighting improvements at Animal Shelter	6	No
BE-47	Outdoor lighting improvements at Marina Coastal Offices	3	No
BE-48	Outdoor lighting improvements at Laurel Yard Facility	16	No
Total Reductions from All Public Works Measures		719	
Total Reductions from Completed Public Works Measures		228	
Total Reductions from Remaining Public Works Measures		491	
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.			

3.2.4 AMBAG Energy Watch Program Measures

Between 2006 and 2010, the County identified and implemented a number of lighting and other energy efficiency retrofit projects at County facilities. These projects were sponsored by AMBAG's Energy Watch Program. AMBAG's Energy Watch Program provides energy assessments, retrofit project incentives, and direct installation of energy efficiency fixtures/equipment for municipal

facilities in the Monterey Bay Area (Association of Monterey Bay Area Governments n.d.). Because all of the reduction measures through AMBAG's Energy Watch Program have been completed, the GHG reductions associated with these measures are included in all three reduction scenarios. Table 3-4 lists the facilities where the measures were implemented and the GHG reductions achieved by the measures.


Photo 3-1. HVAC System Retrofits Being Installed at the County Jail

Table 3-4. AMBAG Energy Watch Program Reduction Measures

Measure Number	Location of Measure	GHG Reductions ($MTCO_2e$)
AM-1	Agriculture Center & Corporate Yard Shops	0.03
AM-2	Lake San Antonio (north toll gate)	0.2
AM-3	Monterey County Courthouse	0.05
AM-4	Public Works Yard	0.4
AM-5	Court Building (Marina)	0.3
AM-6	Monterey County King City Court	0.4
AM-7	Social & Employment Services (Seaside District Office)	0.3
AM-8	Lake San Antonio (south toll gate)	0.4
AM-9	Lake San Antonio (north restroom)	0.6
AM-10	Lake San Antonio (south visitor center)	0.6
AM-11	San Lorenzo Park Office & Shop	3
AM-12	Royal Oaks Park	2
AM-13	San Ardo Yard	0.4
AM-14	Probation Youth Center	2
AM-15	Agriculture Center	0.6

Measure Number	Location of Measure	GHG Reductions ($MTCO_2e$)
AM-16	Agriculture Center & Corporate Yard Office	2
AM-17	Lake San Antonio (south camps)	2
AM-18	Lake San Antonio (South Harris creek)	2
AM-19	Public Works (Greenfield)	2
AM-20	Monterey County King City Court	0.6
AM-21	Monterey County King City Court	0.5
AM-22	San Lorenzo Park Museum	4
AM-23	Sheriff and Public Safety Building	1
AM-24	Toro Park	5
AM-25	Lake San Antonio (south shop)	—
AM-26	Lake San Antonio (north shop)	5
AM-27	Social Services	17
AM-28	Social Services	5
AM-29	Monterey County Courthouse	0.9
AM-30	Lake San Antonio (south resort area)	4
AM-31	Monterey County Courthouse	0.9
AM-32	Monterey County Courthouse	1
AM-33	Monterey County Jail Rehab	2
AM-34	Monterey County Jail Rehab	0.8
AM-35	Monterey County Jail Rehabilitation	1
AM-36	Monterey County King City Court	5
AM-37	Probation Headquarters	28
AM-38	Salinas IT Building	32
AM-39	Monterey County Courthouse	8
AM-40	Corporate Yard	40
AM-41	Sherriff/Public Safety	91
AM-42	Monterey County Courts (City of Monterey)	113
AM-43	Heating & Ventilation Upgrade at the County Correctional Facility	228
Total from AMBAG Energy Watch Program Measures		613
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.		

3.2.5 Other Reduction Measures

In addition to the audit reports and AMBAG lighting measures, the County is also considering or has already implemented several other measures to reduce energy consumption and provide renewable energy. These measures are discussed and presented in Table 3-5 below.

Measure LY-1, which entails the installation of a photovoltaic (PV) system at the Laurel Yard facility, has already been completed by the County. Funding for this measure was provided through the

Department of Energy's EECBG Program. The PV system at Laurel Yard reduces the amount of electricity that the County needs to purchase from PG&E and produces renewable energy without emitting GHGs.

The County is considering implementing measure BM-1, the installation of Building Energy Management Systems (BEMS) in all major facilities in the County[1]. BEMS in County facilities would reduce energy consumption through increased automation of lighting and climate controls. According to the Intergovernmental Panel on Climate Change (IPCC), BEMS can improve energy efficiency by 5-20% (Intergovernmental Panel on Climate Change 2007). For this analysis, 12.5%, the mean of the IPCC's range, was assumed. In the Public Works audit report there are a number of measures that call for installing building energy management systems. Energy and GHG savings resulting from these Public Works measures were excluded from the determination of energy savings from the BEMS measure to avoid a double count.

The County is also considering purchasing two electric vehicles for the County fleet, though the funding for this measure is uncertain. By implementing measure EV-1, the County would replace two gasoline fleet vehicles with two electric vehicles.

To further reduce electricity consumption, the County is considering the implementation of measure PL-1, which would replace outdoor lighting fixtures with light fixtures that have a higher level of efficiency. Funding for PL-1 is uncertain at this time.

The County has installed a solar-powered aerator at the Chualar wastewater treatment plant, which eliminates nearly all energy consumption at the facility.

Photo credit: Santa Cruz Westside Electric, Inc. Dba Sandbar.

Photo 3-2. Photovoltaic System at the Laurel Yard Facility, Funded by the Department of Energy's EECBG Program

[1] This analysis assumed BEMS would be installed in the major facilities of the County's original municipal GHG inventory. These facilities include: Environmental Health Center, Seaside Library, Salinas Road Department, Laguna Seca Facilities, Public Defender, Printing and Mail OPS OFC, Parks Department Office, OFC, NMC Office Building, Monterey Courthouse, Marina Court Building, King City Library, King City Courthouse, DSSS (Building One, Office Buildings, and OFC Building), DA Office, County Communication Network Facility, 911 Call Center. Natividad Medical Center was also included in the BEMS analysis. Facilities that will install building energy management systems as part of the Public Works audit report were excluded.

Table 3-5. Other Reduction Measures

Measure Number	Measure Name	Measure Description	GHG Reductions (MT CO_2e)	Measure Completed?
LY-1	Photovoltaic System at Laurel Yard	A 141 Kilowatt power solar photovoltaic system was installed at Laurel Yard. This measure was funded through the Department of Energy's Energy and Conservation Block Grant Program.	43	Yes
BM-1	Building Energy Management Systems at Major Facilities	The County would install building energy management systems at all major[2] County-owned facilities.	1,013	No
EV-1	Electric Vehicles	The County would purchase two electric vehicles for the vehicle fleet to replace the same amount of internal combustion engine cars.	4	No
PL-1	Public Lighting	The County would replace outdoor lighting fixtures with energy efficient fixtures.	20	No
WW-1	Solar Aerator at Chualar Wastewater Treatment Plant	The County has installed a solar-powered aerator at the Chualar wastewater treatment plant. The County receives credit for electricity savings and GHG reductions that result from using the solar aerator.	7	Yes
Total Reductions from Individual Reduction Measures:			1,087	
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.				

[2] Major facilities, for this analysis, were assumed to be all of the facilities listed individually in the County's Municipal GHG Inventory.

3.3 GHG Reduction Plan—Scenario 1

Reduction Scenario 1 includes:

- all state level measures;
- all completed measures at NMC and other facilities;
- all remaining energy efficiency retrofits at NMC; and
- the installation of BEMS.

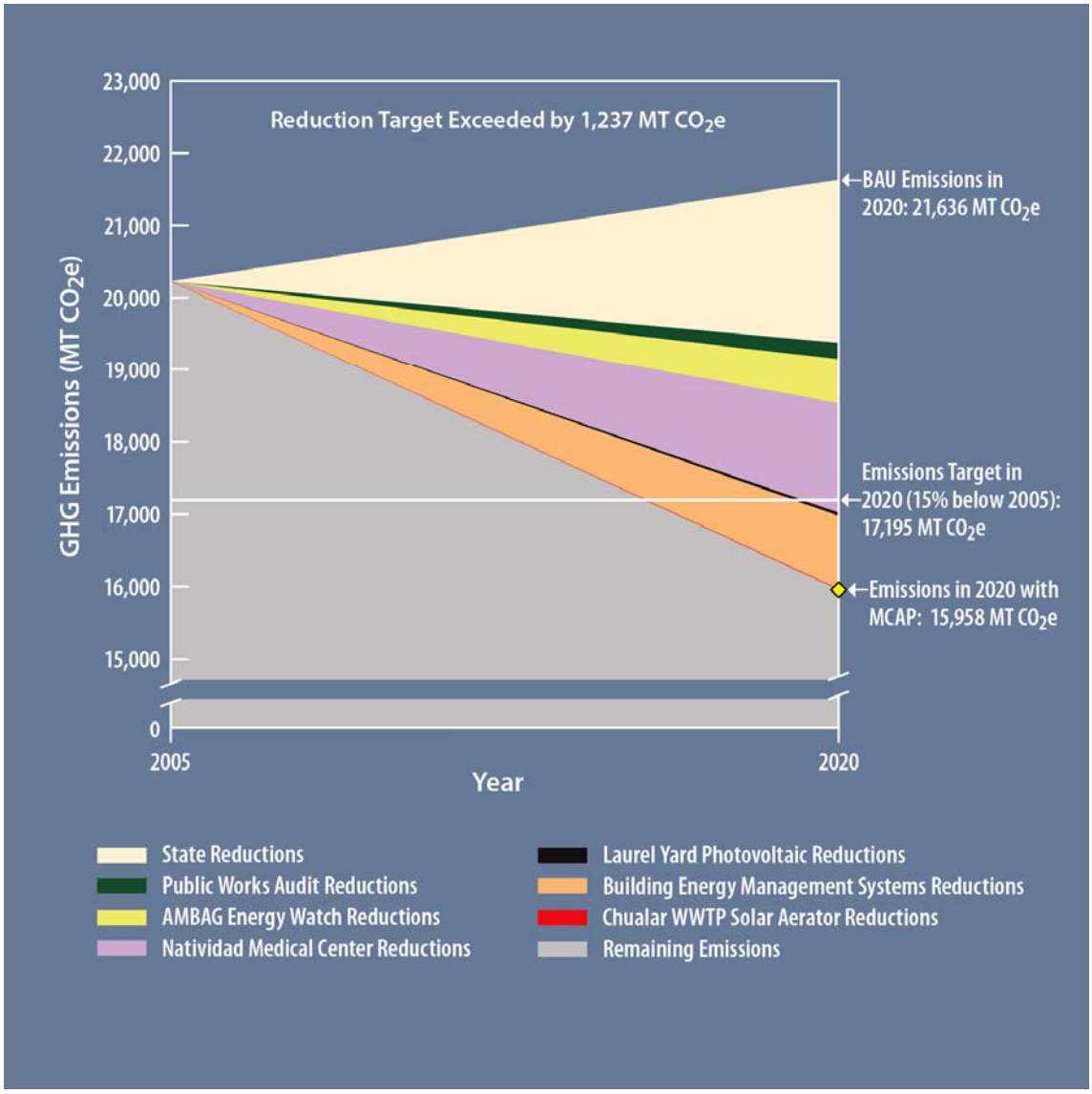
Under Scenario 1, the County could reach the target *without* completing any of the actions identified in the Public Works Audit. This is largely due to the projected energy savings that would be achieved by installing BEMS in the County's larger facilities.

The reduction summary for Scenario 1 is shown in Table 3-6 below. The full list and associated GHG reductions of the individual NMC measures and the BEMS measure are listed in Table 3-2 and Table 3-5, respectively. With full implementation of Scenario 1, the County will exceed the reduction target of 4,441metric tons by 1,237 metric tons and achieve a 21% reduction in GHG emissions as compared to the 2005 emissions level. Figure 3-1 below graphically presents the County's progress towards the 2020 GHG reduction target.

Table 3-6. Reaching the Target—Scenario 1 Summary

GHG Emissions		(MT CO2e)
A	Projected in 2020 (BAU)	21,636
B	Target for 2020—15% below 2005 levels	17,195
Total	Reductions needed to reach target (A minus B)	4,441
	Reductions from required state level actions	2,263
	Remaining NMC measures	1,445
	Building energy management systems	1,013
	All completed measures	957
Total	All Reductions	5,678
	Exceeds reduction target by	1,237
	GHG emissions in 2020 with MCAP (all measures)	15,958
	% Below 2005 levels	21%
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.		

Figure 3-1. Reaching the Target: Scenario 1



3.4 GHG Reduction Plan—Scenario 2

Reduction Scenario 2 includes:

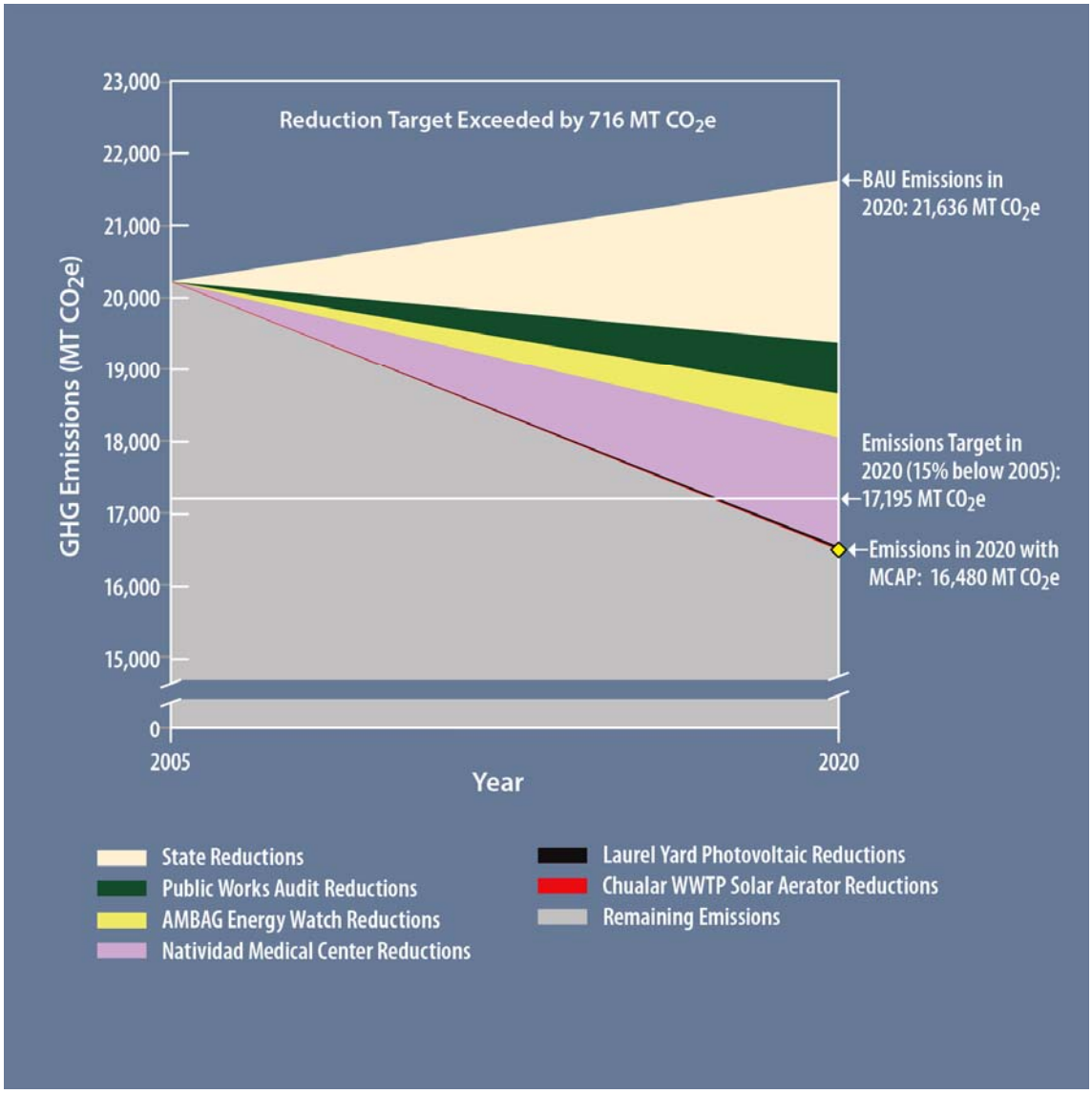
- all state level measures;
- all completed measures at NMC and other facilities;
- all remaining energy efficiency retrofits at NMC;
- and all remaining Public Works audit report measures.

BEMS are not installed in the County's major facilities in Scenario 2. The GHG reductions achieved by the individual NMC measures and Public Works measures are listed in Table 3-2 and Table 3-3, respectively. The reduction summary for Scenario 2 is shown in Table 3-7 below. With full implementation of Scenario 2, the County will exceed the reduction target of 4,441 metric tons by 716 metric tons and achieve a 19% reduction in GHG emissions compared to the 2005 emissions level. Figure 3-2 below graphically presents the County's progress towards the 2020 GHG reduction target.

Table 3-7. Reaching the Target—Scenario 2 Summary

GHG Emissions		($MT CO_2e$)
A	Projected in 2020 (BAU)	21,636
B	Target for 2020—15% below 2005 levels	17,195
Total	Reductions Needed to Reach Target (A minus B)	4,441
	Reductions from required State level actions	2,263
	Remaining NMC Measures	1,445
	Remaining Public Works Audit Report Measures	491
	All Other Completed Measures	957
Total	All Reductions	5,156
	Exceeds Reduction Target by	716
	GHG Emissions in 2020 with MCAP (all measures)	16,480
	% Below 2005 Levels	19%
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.		

Figure 3-2. Reaching the Target: Scenario 2



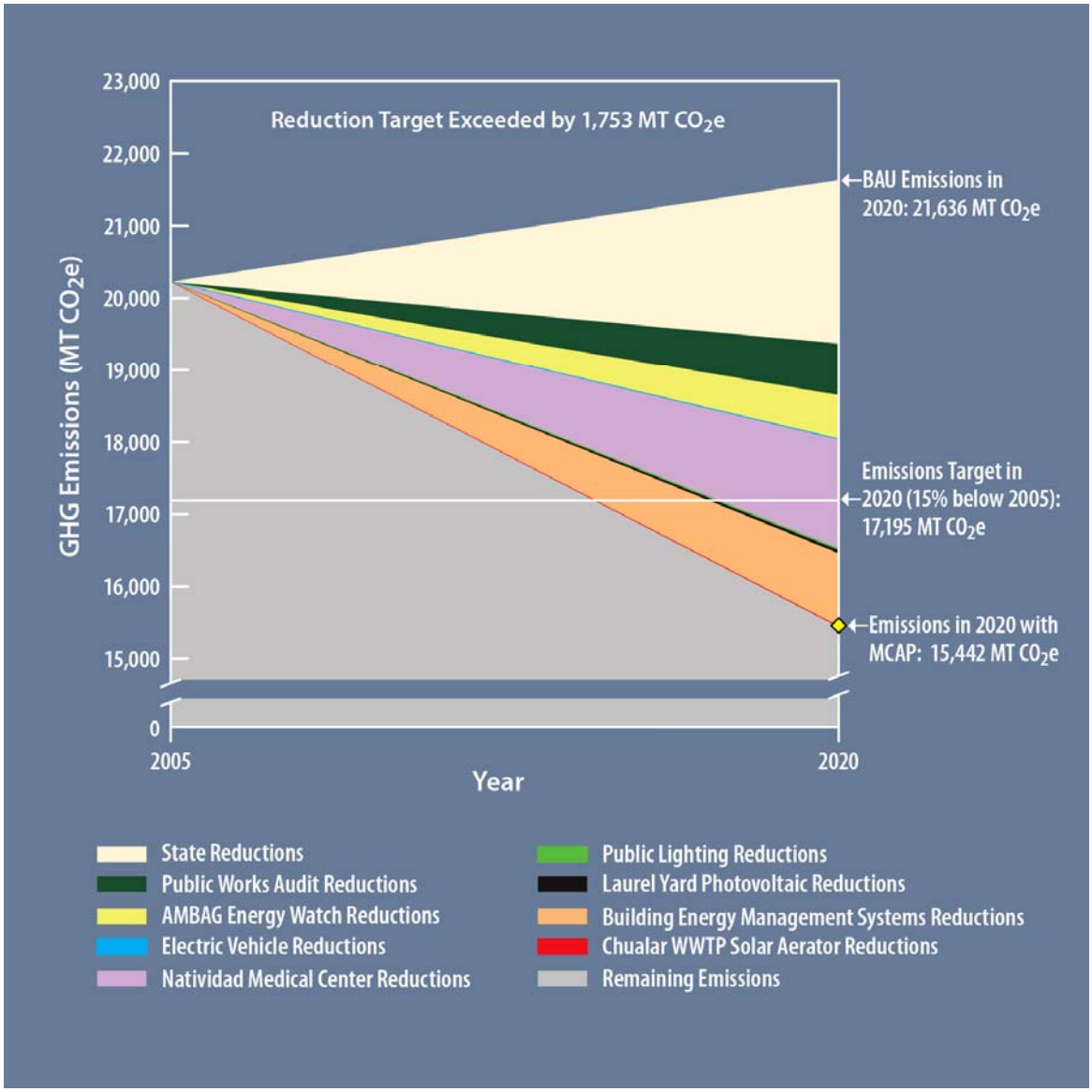
3.5 GHG Reduction Plan—Scenario 3

Reduction Scenario 3 includes all measures in the reduction measure pool. Funding permitting, this scenario is the County's preferred choice, as it would result in the highest level of energy efficiency and the most GHG reductions. The County is confident that it can implement Scenario 3, before 2020. (See Tables 3-2, 3-3, and 3-5). The reduction summary for Scenario 3 is shown in Table 3-8 below. Scenario 3 exceeds the County's 2020 reduction target by 1,753 metric tons and achieves a 24% reduction below 2005 GHG emissions level. Figure 3-3 below graphically presents the County's progress towards the GHG reduction target.

Table 3-8. Reaching the Target—Scenario 3

GHG Emissions		($MTCO_2e$)
A	Projected in 2020 (BAU)	21,636
B	Target for 2020—15% below 2009 levels	17,195
Total	Reductions Needed to Reach Target (A minus B)	4,441
	Reductions from required State level actions	2,263
	Remaining NMC Measures	1,445
	Remaining Public Works Audit Report Measures	491
	Building Energy Management Systems Measure	1,013
	Electric Vehicle Measure	4
	Public Lighting Measure	20
	All Other Completed Measures	957
Total	All Reductions	6,194
	Exceeds Reduction Target by	1,753
	GHG Emissions in 2020 with MCAP (all measures)	15,442
	% Below 2005 Levels	24%
Note: Because of rounding in Microsoft Excel, the totals may not sum exactly.		

Figure 3-3. Reaching the Target: Scenario 3



3.6 What Else is the County Doing?

In addition to the measures described in sections 3.3 through 3.5, the County has implemented several other measures that result in GHG reductions. These measures cannot be quantified due to insufficient data or cannot be counted towards the GHG reduction goal because the measure was started before 2005 or because the measure results in GHG reductions that are outside the boundary of the municipal GHG inventory. Nevertheless, these additional measures, described below, support the County's overall sustainability goals and generally act to reduce GHG emissions.

Climate Friendly Purchasing Policy—The County has in place a Climate Friendly Purchasing Policy (CFPP), where products that have a lower environmental impact are purchased as alternatives to conventional products, so long as there is little or no detriment to product performance or increase in price. Products that have recycled content, low amounts of environmental toxins, Energy Star ratings, or were created wholly or partially from renewable resources are examples of purchases that are included in the CFPP.

County-Sponsored Vanpools—The County sponsors three vanpool routes for use by County employees to commute to work. Two of the vanpool routes originate in the northern and peninsula portions of the county and terminate at the Government Center. The third route originates in the southern portion of the county and terminates at the Quadrangle Building in Salinas. Promotion of the vanpools among employees is done informally through "word-of-mouth" and formally through annual email announcements. GHG reductions from vanpools were not quantified, because the County implemented the vanpools before the 2005 baseline year. The County will consider expanding this program based on employee interest and demand.

LED Traffic Signals—Light fixtures in County-owned traffic signals were replaced with energy efficient Light Emitting Diode (LED) fixtures prior to 2005. LEDs use substantially less electricity than conventional fixtures, which lowers the County's energy consumption and GHG emissions. GHG reductions resulting from this action were not quantified, because, as described above, actions taken before 2005 can't be counted towards the County's GHG reduction target. The GHG benefits of these actions were already captured in the baseline.

Building New County Buildings to Green Building Standards (OS-10.12)—In January of 2013, the County amended the Green Building Standards Code requiring new County construction and large retrofits to meet or exceed CalGreen Tier 1 standards, greatly increasing the energy and water efficiency of County buildings. Projects that the County had already secured funding for but had not yet started construction at the time the policy was adopted were grandfathered into the policy and are not required to meet the standard, since changes to the building plans could potentially change the cost of these planned projects. Therefore, buildings constructed in the very near term, will not be constructed to the new standard. At the time of writing of this document, the County is uncertain which buildings will be constructed to the new standard before 2020 and their sizes. However, this policy ensures that all future County buildings will be constructed to a higher level of energy and water efficiency, ensuring both financial and GHG savings beyond 2020.

Energy Efficiency Outreach for Employees—The County will be providing tips and information about energy conservation to its employees regarding computers off and lights off policies, paper use reductions, water use reductions, the climate friendly purchasing policy, ride-share

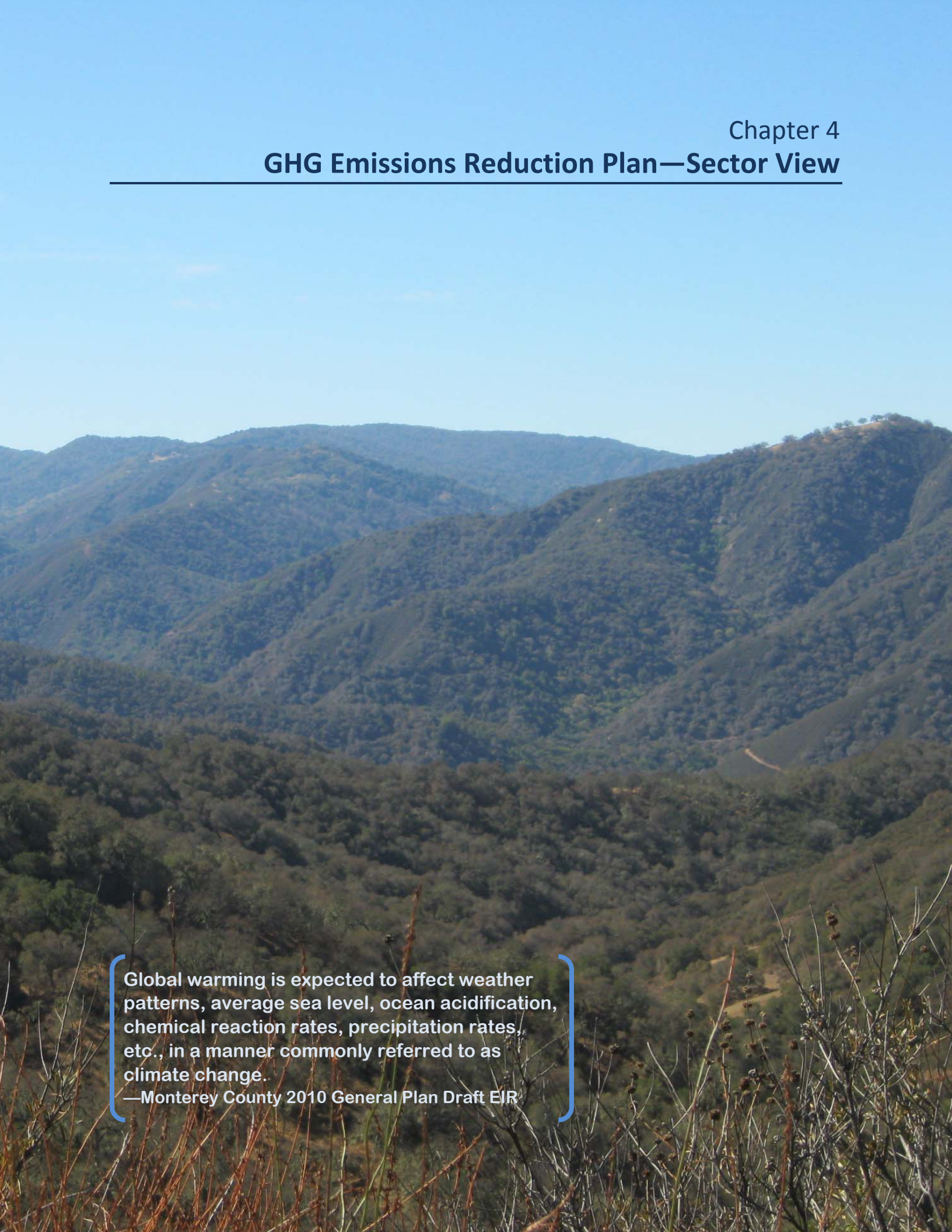
opportunities, and other energy conservation practices in County facilities. The program is expected to start in 2013. The exact amount that outreach alters employee behavior is unknown, but outreach activities undoubtedly support the success of all of the County's efforts to save energy and reduce GHGs.

Cool Roof at the County Jail and Monterey Courthouse—In 2005, the County replaced the existing roofs at the County Jail and Monterey Courthouse with cool roofs. Cool roofs use reflective material that reflects more incoming sunlight than standard roofing material, which results in reduced building cooling needs during the summer. GHG emissions would be reduced due to lower consumption of energy at the facilities with cool roofs. GHG reductions were not included in the MCAP at this time due to gaps in data.

Renewable Energy Generation—The County will explore opportunities to provide onsite renewable energy generation at or near County facilities. The County will explore grant opportunities and monitor cost/benefit analysis of renewable energy projects. Renewable energy generated by the County would produce non-GHG emitting energy that would displace energy that would otherwise be provided by (i.e., purchased from) conventional, GHG-emitting sources.

Chapter 4

GHG Emissions Reduction Plan—Sector View



> Global warming is expected to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, etc., in a manner commonly referred to as climate change.
> —Monterey County 2010 General Plan Draft EIR

4.1 GHG Reductions by Sector

This chapter describes how implementation of the MCAP (all scenarios) will affect GHG emissions in each of the inventory sectors.

The total GHG emissions by sector in 2005 and in 2020 under the County's preferred MCAP Scenario 3 are presented in Figure 4-1. A comparison of the GHG emissions in 2005, in 2020 under a BAU scenario, and in 2020 assuming full implementation of MCAP Scenario 3 are shown for each individual sector in Figure 4-2. Figure 4-1 shows that total GHG emissions after implementation of Scenario 3 are approximately 24% below 2005 levels. Figure 4-2 shows that GHG Emissions in the Buildings and Facilities—Energy Use and Vehicle Fleet sectors are reduced by the largest amount as these sectors provide the greatest opportunities for reductions. GHG reductions do not occur in every sector, as some sectors have limited opportunities for the development of reduction measures and/or the cost of implementing these measures is prohibitive at this time. The County's MCAP prioritizes measures that are the most cost effective and result in the greatest amount of GHG reductions. A description of each sector and its associated reduction measures are included in the sections that follow.

Figure 4-1. GHG Emissions in 2005 and in 2020 With Scenario 3

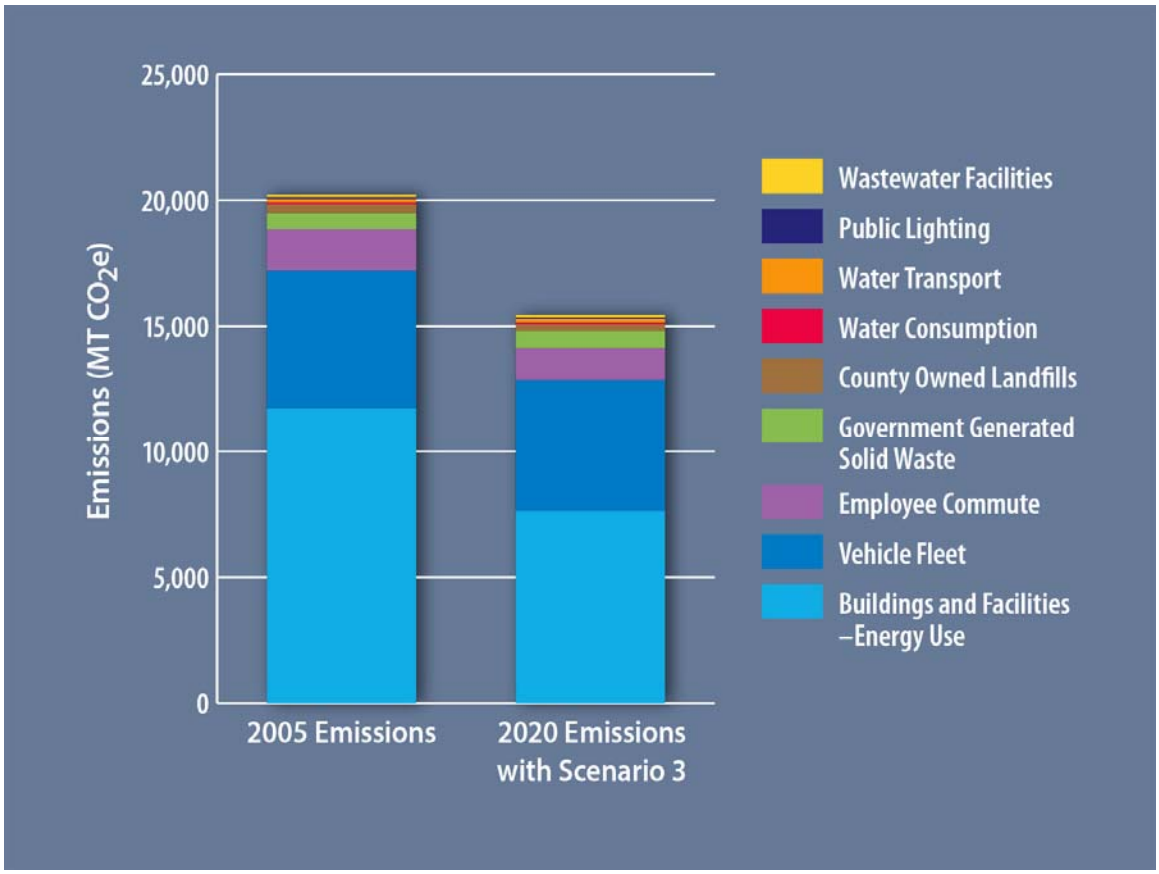
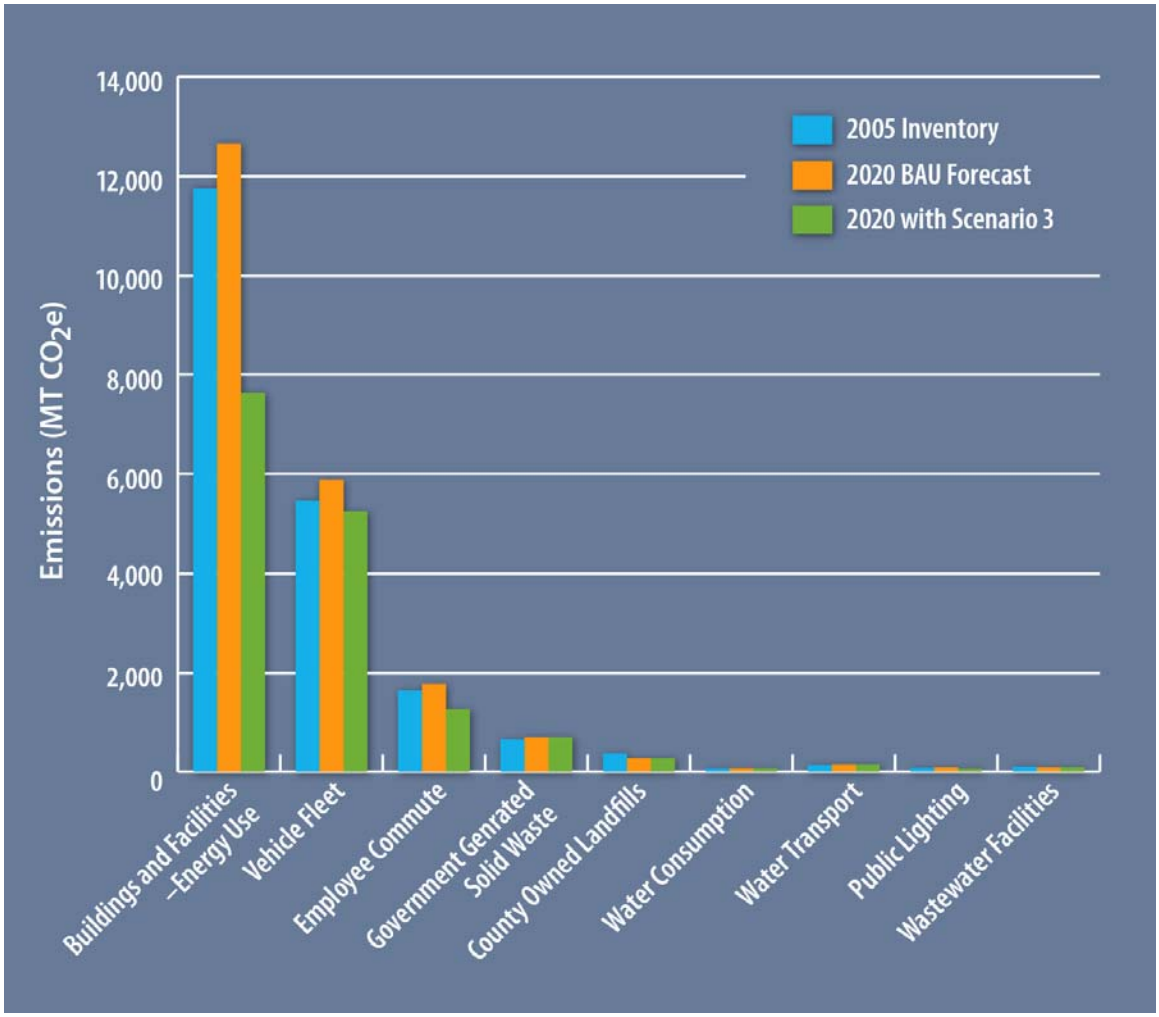


Figure 4-2. GHG Emissions by Sector in 2005, 2020 BAU Scenario and 2020 with Scenario 3



4.2 Buildings and Facilities—Energy Use

Electricity and natural gas use at County-owned facilities are responsible for a major portion of the County's GHG emissions inventory in both 2005 and 2020. Buildings and Facilities—Energy Use emissions are projected to comprise 58% of the County's GHG emissions in 2020 under a BAU scenario and 49% of County emissions with full implementation of MCAP Scenario 3. Because buildings are responsible for such a large portion of the County's GHG emissions, this sector also provides the largest number of opportunities for the County to reduce GHG emissions. The Building and Facilities—Energy Use sector has the highest amount of reduction measures and obtains the highest amount of GHG reductions in this MCAP. Because these measures reduce GHG emissions through energy conservation, they also result in significant financial savings. In October 2011, the County completed energy audits of 14 facilities and completed many of the recommended equipment retrofits in 2012. These are described fully in Chapter 3 and grouped into the following categories based on how the County conducted the energy audit inspections and/or funded the retrofits.

- NMC Measures
- Public Works Measures
- AMBAG Energy Watch Measures

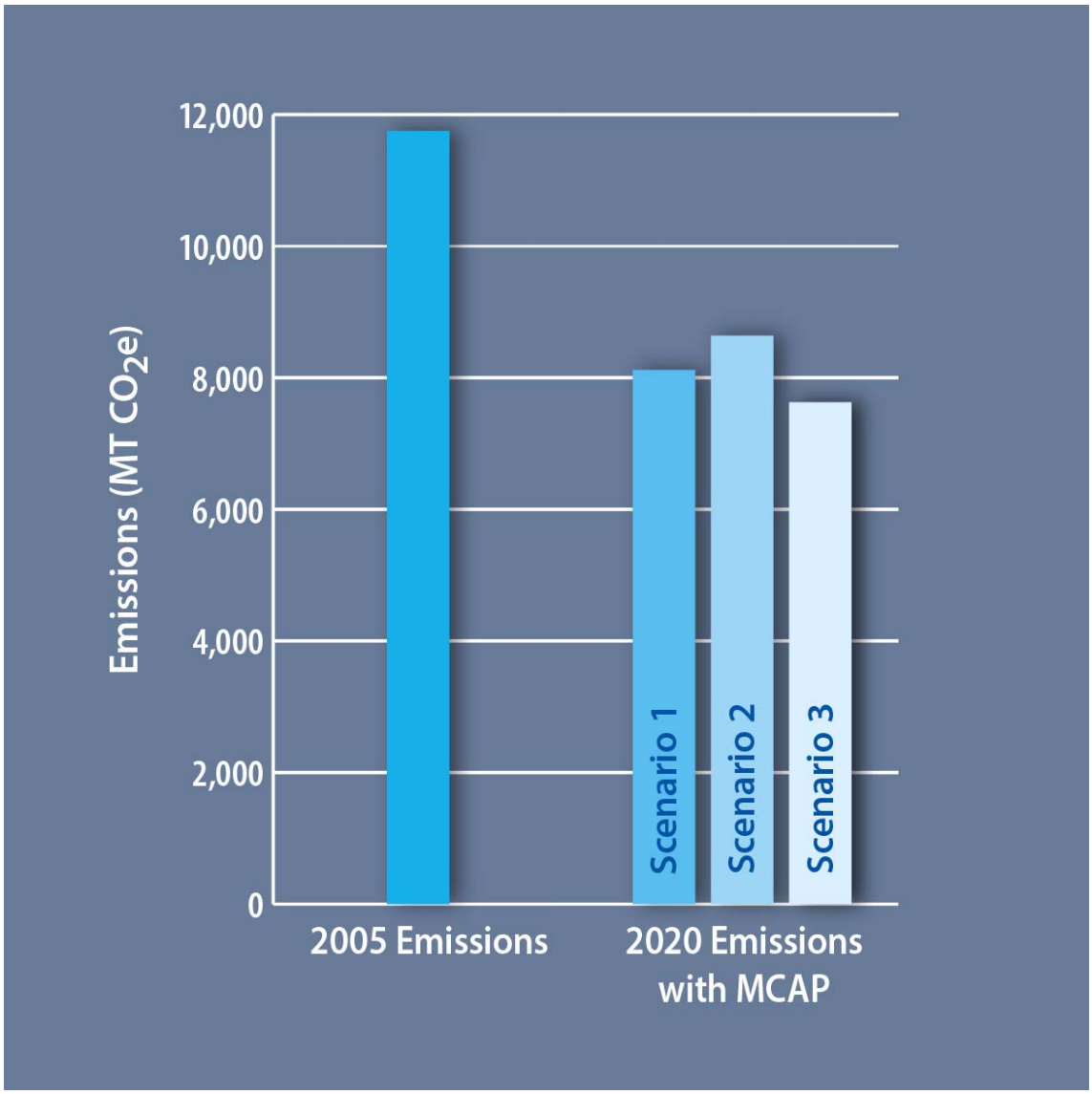
GHG reductions associated with each group of measures and under each implementation scenario are shown in Table 4-1. Figure 4-3 shows the County's Buildings and Facilities—Energy Use sector emissions in 2005 and 2020 for all scenarios.

Photo 4-1. Building Energy Upgrades at the County Jail

Table 4-1. GHG Reduction Measures in the Buildings and Facilities—Energy Use Sector

GHG Emissions			($MT CO_2e$)
2005 Buildings and Facilities—Energy Use Emissions			11,753
2020 Buildings and Facilities—Energy Use BAU Emissions			12,653
GHG Reduction Measures		**Scenario**	**Reductions**
S-1	SB 1078/SB 107/SB X 1-2 (Renewable Portfolio Standard)	All Scenarios	1,126
BE-1 through BE-48	Completed Public Works Audit Report Measures	All Scenarios	228
	Remaining Public Works Audit Report Measures	Scenarios 2 & 3	491
AM-1 through AM-42	AMBAG Energy Watch Program Measures	All Scenarios	613
NMC-1 through NMC-12	Completed NMC Measures	All Scenarios	66
	Remaining NMC Measures	All Scenarios	1,445
LY-1	Photovoltaic System at Laurel Yard	All Scenarios	43
BM-1	Building Energy Management Systems at Major Facilities	Scenarios 1& 3	1,013
Total GHG Reductions in Buildings and Facilities—Energy Use Sector in 2020			
Scenario 1			4,534
Scenario 2			4,012
Scenario 3			5,025

Figure 4-3. GHG Emissions in the Buildings and Facilities—Energy Use Sector 2005 and 2020—All Scenarios



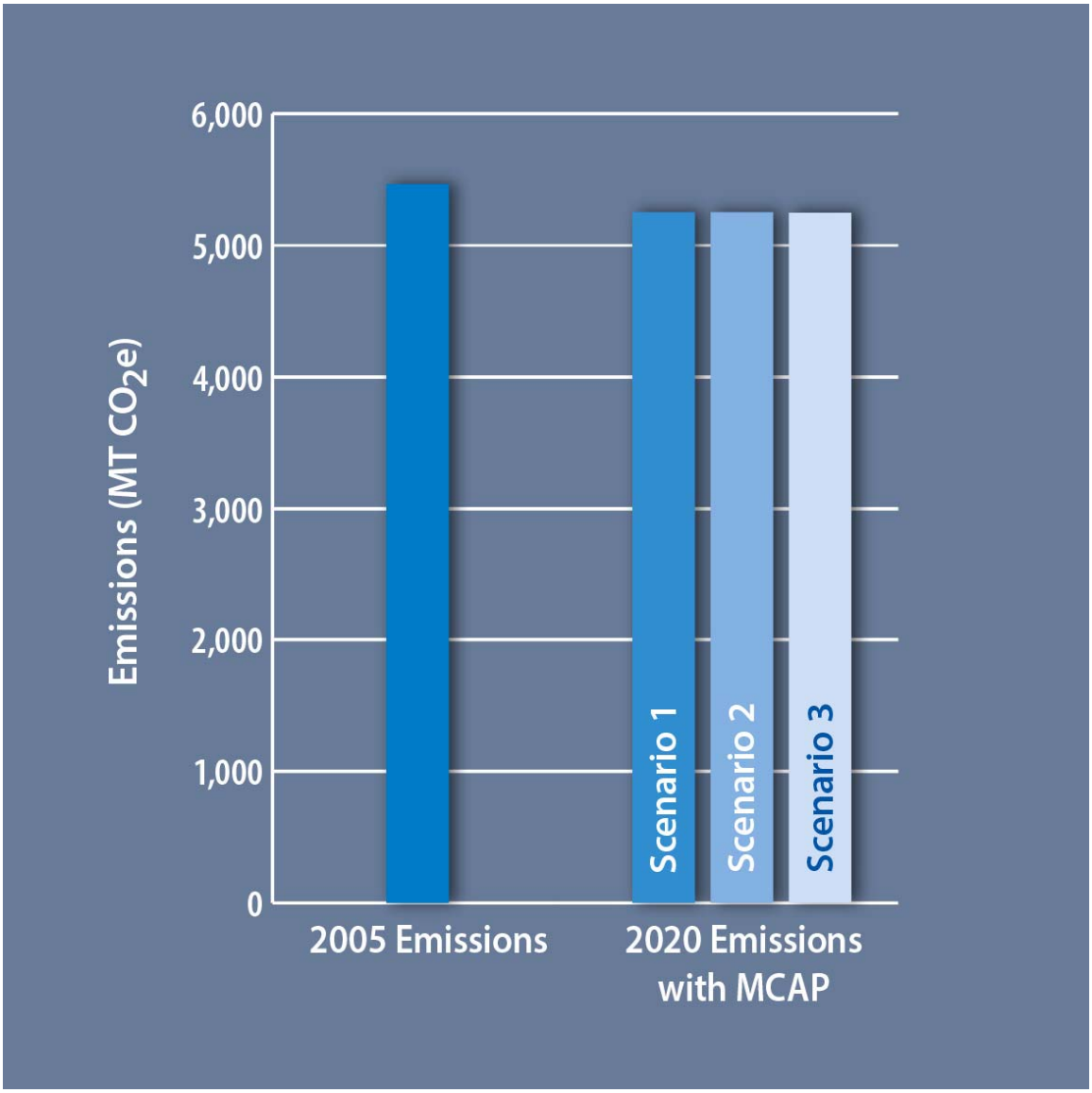
4.3 Vehicle Fleet

The Vehicle Fleet sector is an important part of the County's operations. Fuel consumption in County-operated vehicles represents 27% of total operational GHG emissions under a BAU scenario. The County can reduce GHG emissions in this sector by using alternative fuels for these vehicles, increasing fuel efficiency of gas and diesel vehicles and/or reducing the annual mileage of the County fleet through trip planning. As such, the County's ability to reduce GHG emissions in this sector is constrained by the turnover rate of the County fleet, the purchase price of highly efficient and/or alternatively fueled vehicles and the feasibility of trip reduction. However, the County is seeking to purchase two electric vehicles that will replace two gasoline powered vehicles before 2020, with potentially more to follow beyond 2020. Going forward, the County is committed to making fuel efficiency and GHG emissions a point of consideration, in addition to cost, when replacing fleet vehicles and in operating the fleet. Reduction measures that affect the Vehicle Fleet sector are shown in Table 4-2. Figure 4-4 shows the County's Vehicle Fleet sector emissions in 2005 and 2020 for all scenarios.

Table 4-2. GHG Reduction Measures in the Vehicle Fleet Sector

GHG Emissions			**(MT CO_2e)**
2005 Vehicle Fleet Emissions			5,465
2020 Vehicle Fleet BAU Emissions			5,884
GHG Reduction Measures		**Scenario**	**Reductions**
S-3	Low Carbon Fuel Standard	All Scenarios	510
S-4	Other Vehicle Fuel Efficiency Measures	All Scenarios	122
EV-1	Electric Vehicles	Scenario 3	4
Total GHG Reductions in Vehicle Fleet Sector in 2020			
Scenario 1			632
Scenario 2			632
Scenario 3			636

Figure 4-4. GHG Emissions in the Vehicle Fleet Sector 2005 and 2020—All Scenarios



4.4 Employee Commute

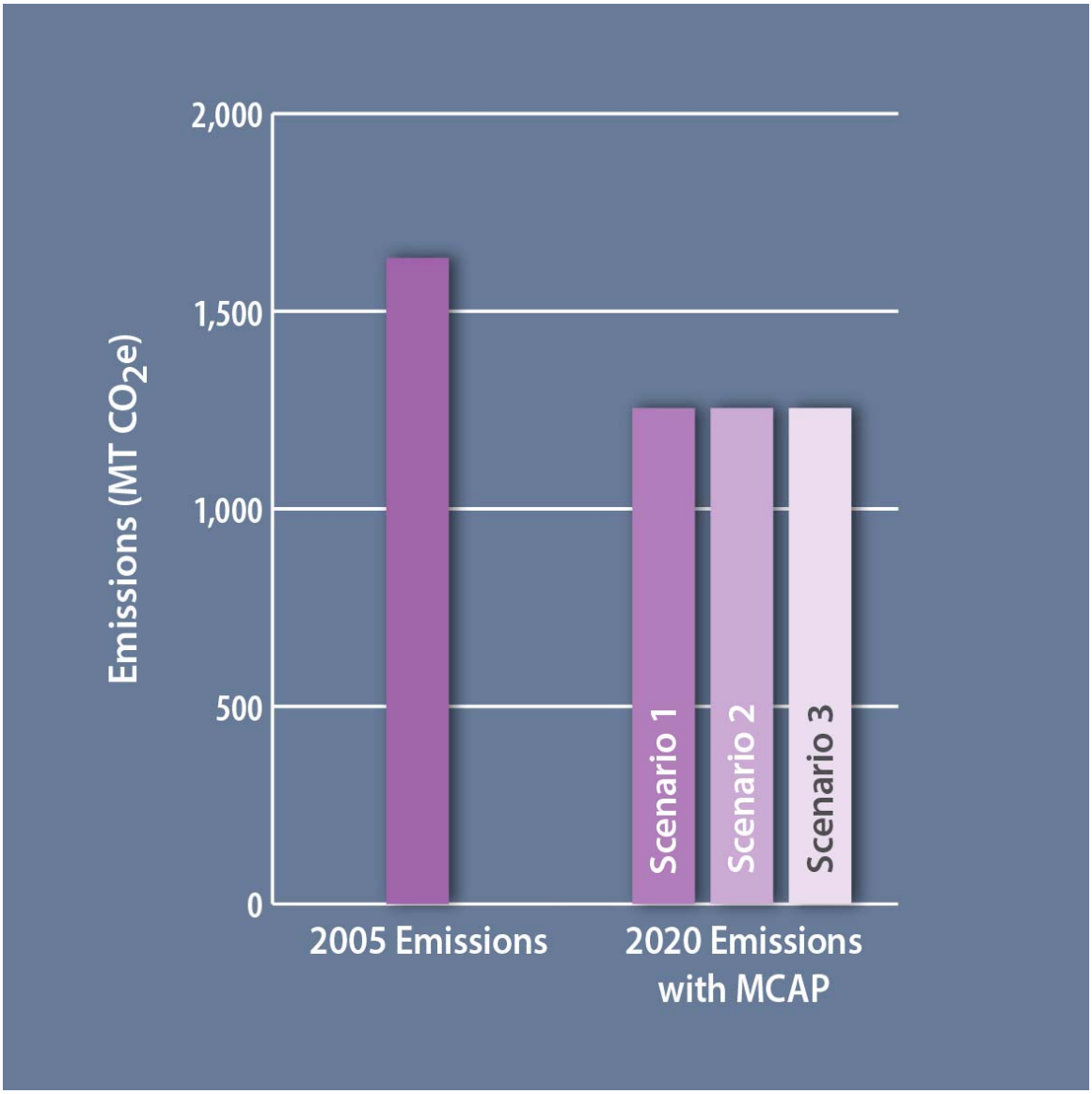
GHG emissions from the Employee Commute sector are projected to represent 8% of the County's total emissions in 2020 under a BAU scenario. The County can reduce GHG emissions in this sector by providing or encouraging alternative commute modes, encouraging or incentivizing the purchase of alternatively fueled vehicles by employees and reducing commuter trips through alternative work schedules. Although the County can take steps to make commuting by vanpool or bus easier or provide electric charging stations for employees at County buildings, the County ultimately does not have control over the commute choices of its employees. Therefore, the GHG emissions reductions in this sector are modest. However, the County will achieve GHG reductions through state-level action affecting employee commute emissions. The personal vehicles of County employees will be affected by the increased fuel economy, reduced carbon content of fuels, and other improvements in vehicle efficiency accomplished through the State measures, even if commute patterns remain the same.

The County currently offers three vanpool routes for its employees to use for commuting purposes. These programs were already active in 2005 baseline year, so GHG emission reductions associated with employees choosing to vanpool instead of drive alone were not quantified as they are part of the baseline. The County does not have plans at this time to increase the number of van pools and does not anticipate a large increase in employees using alternative commute modes before 2020. Therefore, no County-level reduction measures in the Employee Commute sector were quantified. The State measures in this sector are included in all scenarios. These measures are shown in Table 4-3. Figure 4-5 shows the County's Employee Commute sector emissions in 2005 and 2020 for all scenarios.

Table 4-3. GHG Reduction Measures in the Employee Commute Sector

GHG Emissions			($MT CO_2e$)
2005 Employee Commute Emissions			1,635
2020 Employee Commute BAU Emissions			1,760
GHG Reduction Measures—All Scenarios		**Scenario**	**Reductions**
S-2	Pavley I and II	All Scenarios	344
S-3	Low Carbon Fuel Standard	All Scenarios	122
S-4	Other Vehicle Fuel Efficiency Measures	All Scenarios	39
Total GHG Reductions in Employee Commute Sector in 2020			
Scenario 1			505
Scenario 2			505
Scenario 3			505

Figure 4-5. GHG Emissions in the Employee Commute Sector 2005 and 2020—All Scenarios



4.5 Solid Waste Generation

Solid waste generated by County employees, once deposited in a landfill, emits methane, a potent GHG, as the waste decays. GHG emissions from the Solid Waste Generation sector will represent approximately 3% of the County's total emissions in 2020 under a BAU scenario. The County can reduce GHG emissions in this sector by both decreasing the amount of waste generated by employees and increasing the amount of employee waste diverted from landfills. At this time, the County's Environmental Health department has completed waste assessments of certain County facilities, but has not yet established a specific waste reduction or diversion targets. Therefore no discrete GHG reduction measures were quantified in this sector.

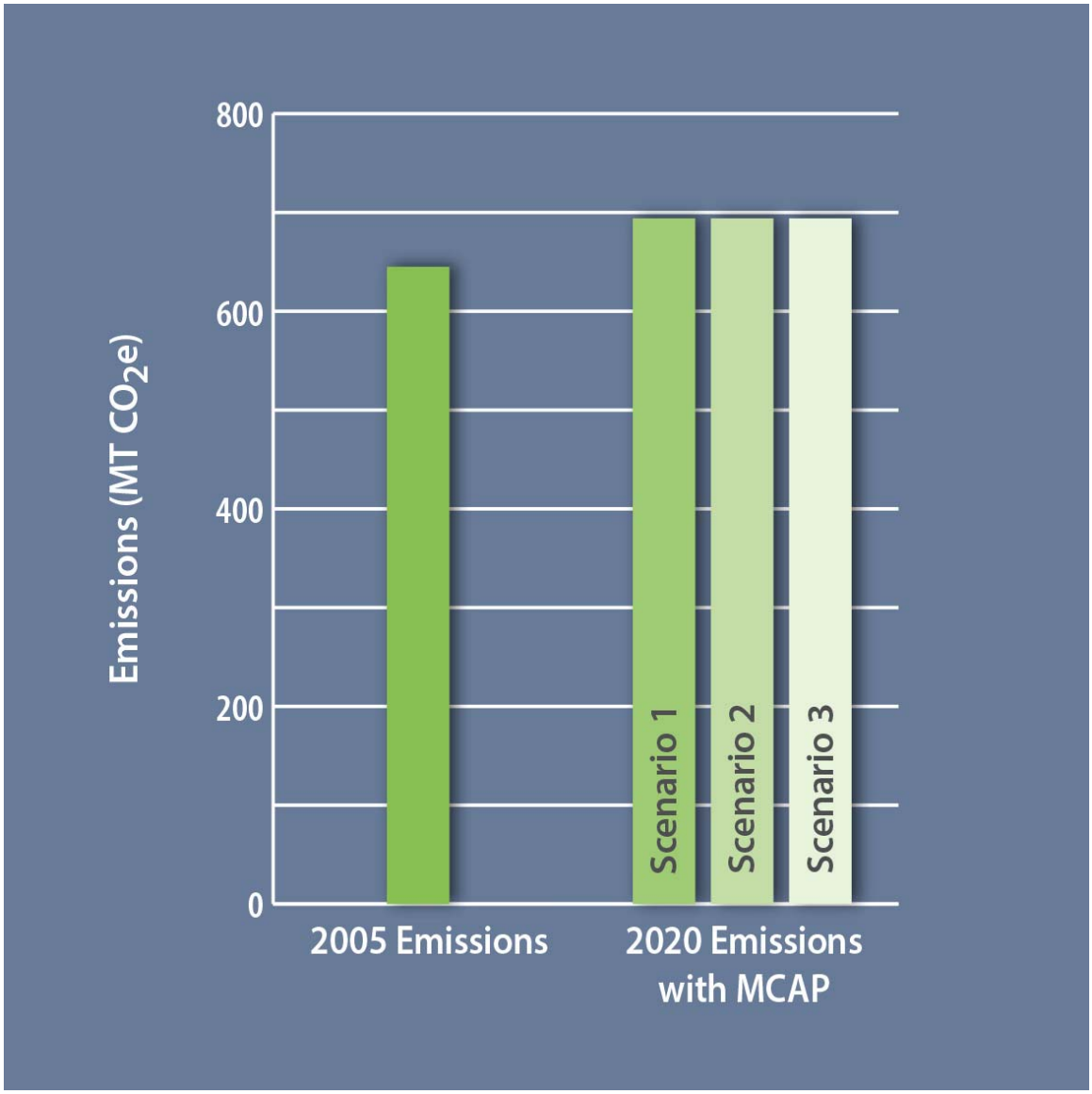
Although it was not possible to quantify them in this report due to data limitations, several County actions will reduce County waste in the future. First, the County will reduce waste and achieve GHG reductions in this sector by complying with California's Green Building Standards Code (CALGreen) construction and demolition (C&D) waste diversion ordinance. As required under the CALGreen C&D ordinance, future county construction projects will divert 50% of construction waste materials used, which would result in GHG reductions. Second, the CFPP, discussed in Chapter 3, will also likely result in waste and GHG reductions through purchase of supplies with a higher recycled content or lower waste potential.

Waste generated in County facilities is currently sent to the Monterey Peninsula landfill or the Salinas Valley Solid Waste Authority landfill. These landfills already had landfill gas capture technology installed in the baseline year and no additional upgrades are required as part of CARB's Landfill Gas Capture Rule. This analysis does not account for any additional GHG benefits due to the landfill methane capture rule. Table 4-4 and Figure 4-6 show GHG emissions in the Solid Waste Generation sector for all scenarios.

Table 4-4. Summary for the Solid Waste Generation Sector

GHG Emissions	($MT CO_2e$)
2005 Solid Waste Generation Emissions	645
2020 Solid Waste Generation BAU Emissions	694
GHG Reduction Measures	
No GHG reduction measures are included for this sector	

Figure 4-6. GHG Emissions in the Solid Waste Generation Sector 2005 and 2020—All Scenarios



4.6 County-Owned Landfills

The County owns and operates one landfill, the San Antonio South Shore Disposal Site[1]. Methane emissions from this landfill were captured in the County's municipal inventory and forecast. In 2020, GHG emissions from this landfill are projected to represent approximately 1% of the County's total emissions. At many landfills in California, methane is prevented from entering the atmosphere by methane capture technology. The San Antonio landfill has been closed since 1991, does not have gas capture equipment installed and has less than 450,000 tons of waste in place, so capture technology is not mandated at this landfill by current State regulations[2]. The County does not have plans to install gas capture technology at the San Antonio landfill. Installation would not be cost effective because of the small amount of emissions associated with the landfill, the low energy generation potential, and the lack of a regulatory requirement. As a result, no additional reduction measures in the County-Owned Landfills sector are included in the MCAP. Table 4-5 and Figure 4-7 show GHG emissions in the County-Owned Landfills sector for all scenarios. GHG emissions go down between 2005 and 2020 because the landfill is no longer receiving waste and the methane emissions of waste in place decline over time after an initial peak within the first few years of disposal.

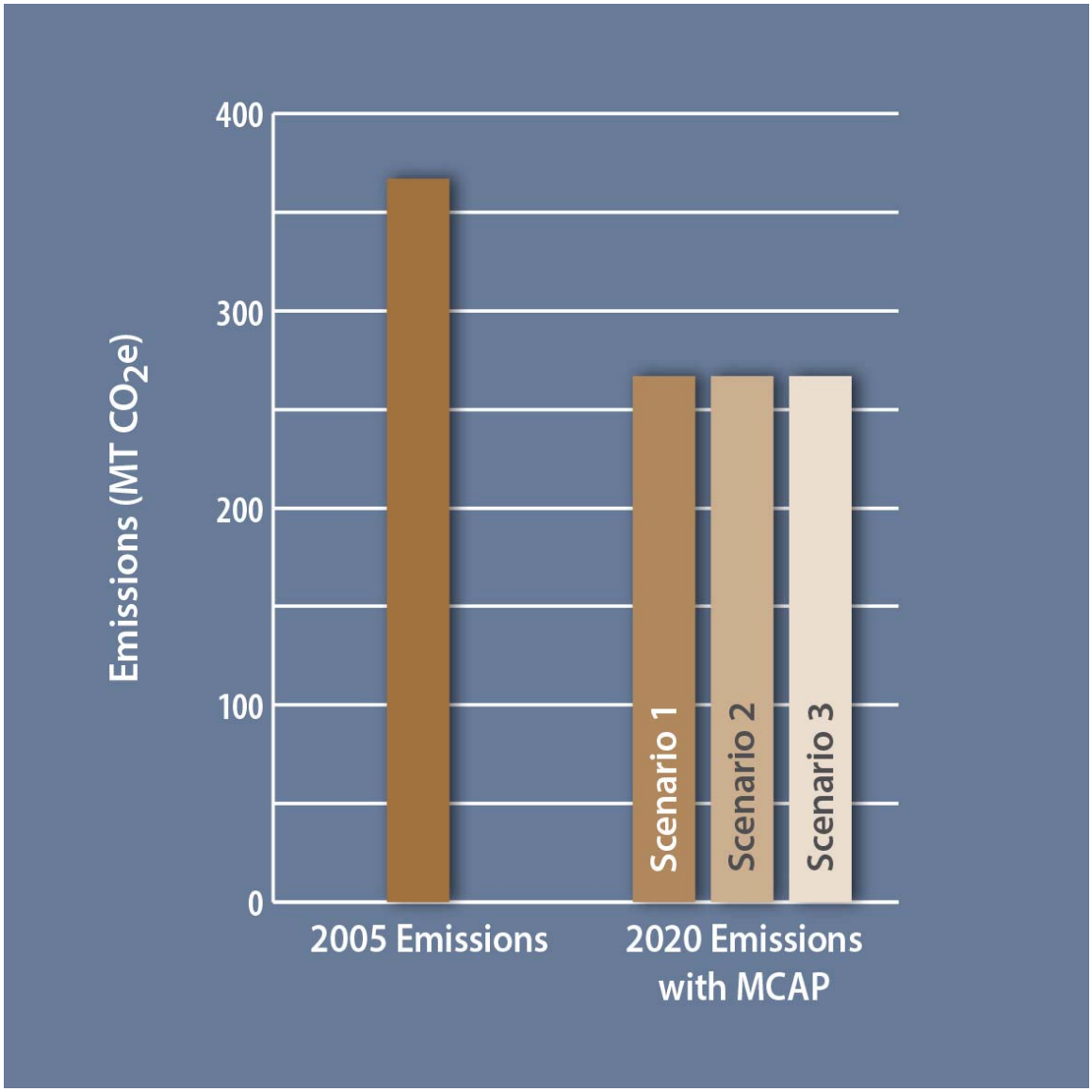
Table 4-5. Summary for the County-Owned Landfills Sector

GHG Emissions	(MT CO_2e)
2005 County-Owned Landfills Emissions	361
2020 County-Owned Landfills BAU Emissions	267
GHG Reduction Measures	
No GHG reduction measures are included for this sector	

[1] Although numerous landfills are located within the geographical borders of Monterey County, San Antonio Shore Disposal Site is the only landfill that is owned, operated, and jurisdictionally controlled by Monterey County.

[2] Effective June 17, 2010, the California Air Resources Board's landfill regulation applies to all landfills that have received mixed solid waste after January 1, 1977. Landfills with over 450,000 tons of waste in place are required to install active gas collection and control systems unless the landfill receives only hazardous waste or receives only construction and demolition waste. Landfills that are closed or inactive with less than 450,000 tons of waste in place are not required to install the active gas collection and control systems. For additional details, the Implementation Guidance Document can be found at the following link: http://www.arb.ca.gov/cc/landfills/docs/guidance0711.pdf.

Figure 4-7. GHG Emissions in the County-Owned Landfills sector 2005 and 2020—All Scenarios



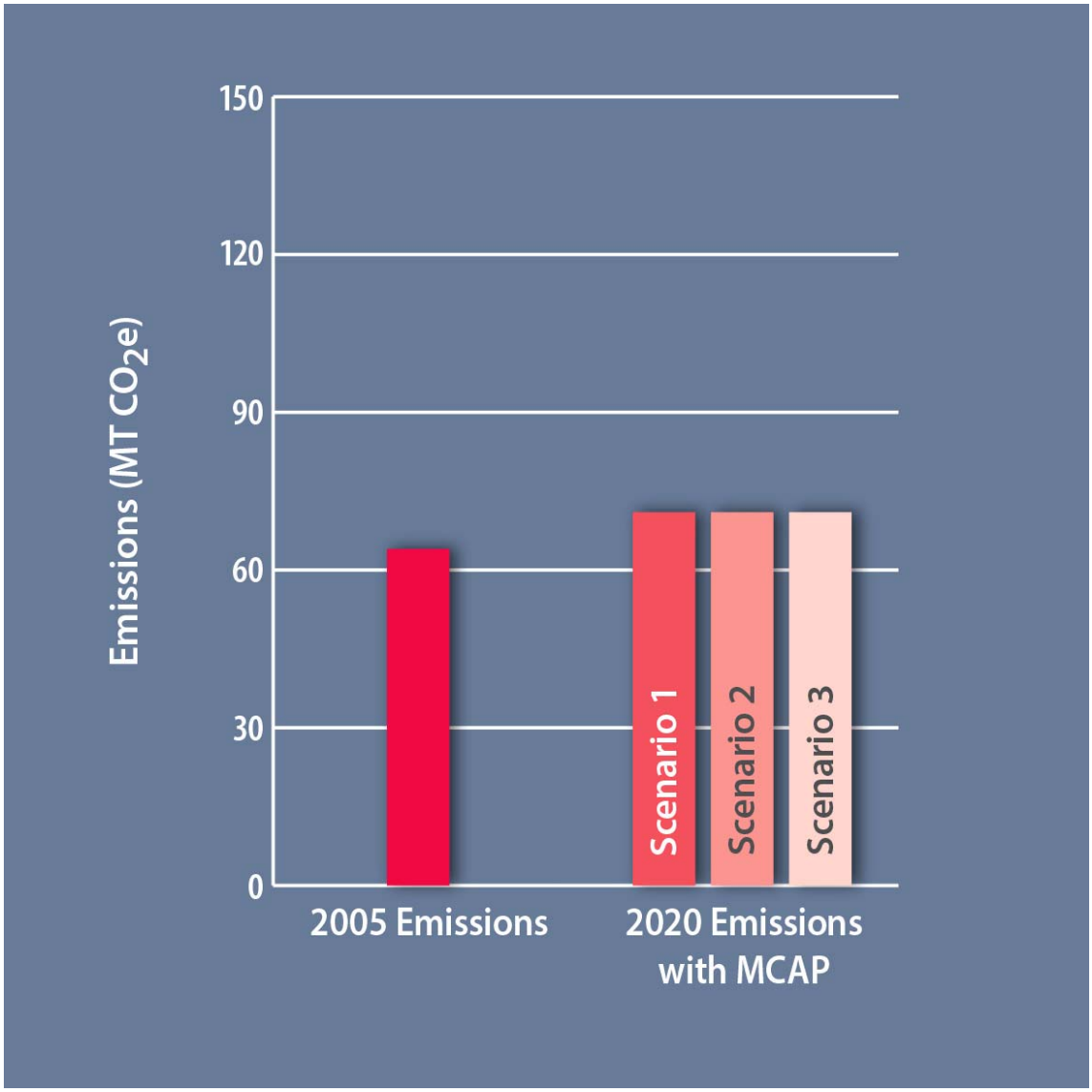
4.7 Water Consumption

Water consumption in County facilities requires electricity to pump and treat water delivered by water services providers. Because of the relatively low energy intensity of the County's water supply, which is local to Monterey County and not imported from outside the County, GHG emissions in the Water Consumption sector represent a small fraction of the County's GHG emissions in 2005 and BAU emissions forecast in 2020. The County can reduce GHG emissions associated with its water consumption by conserving both indoor and outdoor water use. This can be accomplished through installing water efficient fixtures and promoting water conservation among employees. At this time, the County is not planning to retrofit water fixture at any facilities, as it has prioritized energy efficiency (see section 4.2) retrofits, primarily due to the funding availability for this type of retrofit. However, the County is committed to a sustainable regional water supply and recognizes the imperative to be as water conscious as possible in all operations. The County will seek to replace inefficient fixtures and install monitoring and automated devices as is cost effective in the future. Additionally, although not possible to quantify the GHG benefits as part of this MCAP the County will realize water conservation and consequent GHG reductions, through the state's Green Building Standards water requirement for new and remodeled County buildings. Table 4-6 and Figure 4-8 show GHG emissions in the Water Consumption sector for all scenarios.

Table 4-6. Summary for the Water Consumption Sector

GHG Emissions	($MT CO_2e$)
2005 Water Consumption Emissions	64
2020 Water Consumption BAU Emissions	71
GHG Reduction Measures	
No GHG reduction measures are included for this sector.	

Figure 4-8. GHG Emissions in the Water Consumption sector 2005 and 2020—All Scenarios



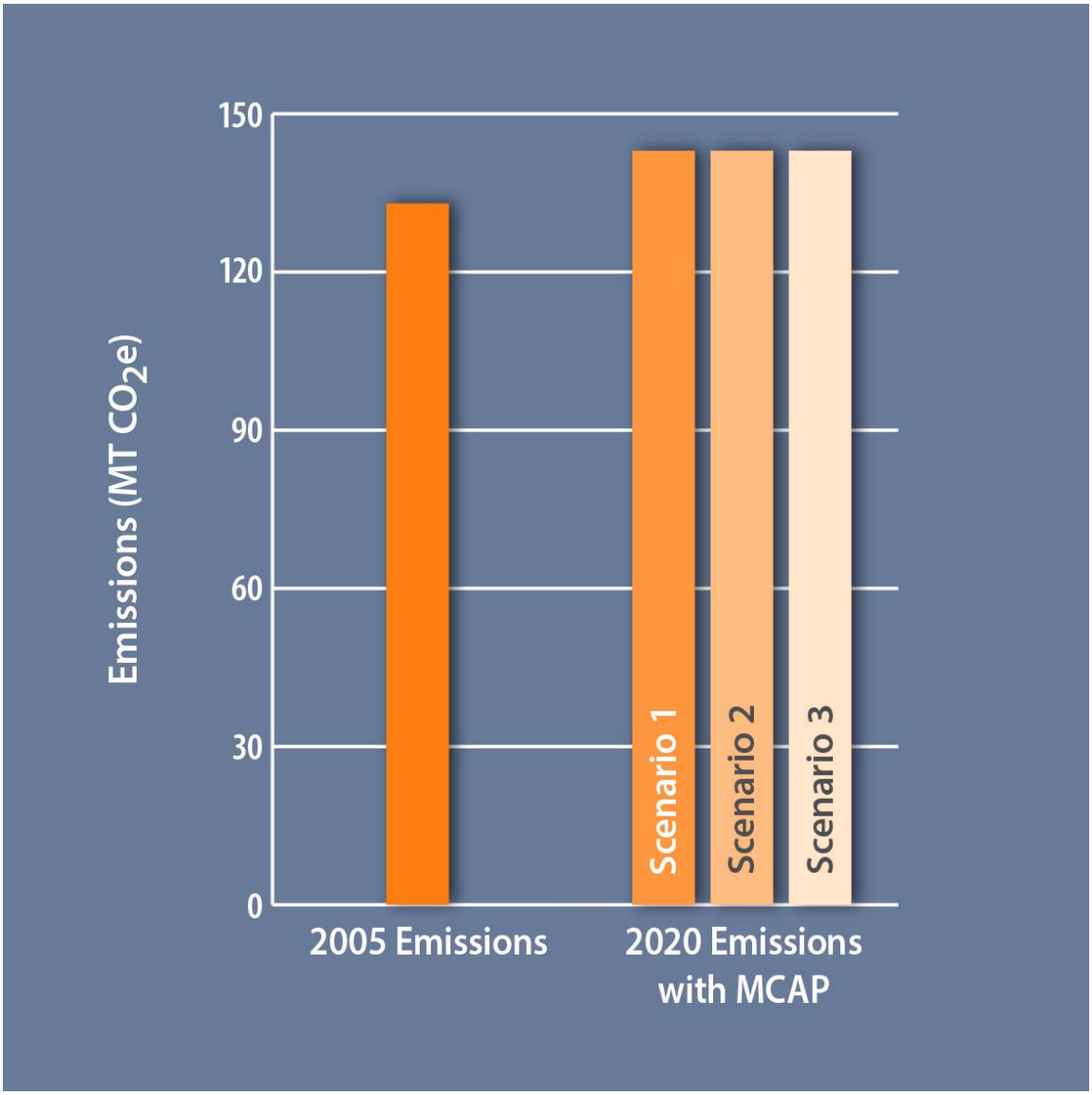
4.8 Water Transport

As discussed in Chapter 2, the County owns and operates water pumping and storage equipment that serve certain County owned facilities. The County uses energy to operate this equipment and provide water to these select facilities. This is in addition to water that the County purchases from the local utility for consumption at most County buildings. GHG emissions from the County's pumping equipment result from indirect electricity emissions as pumps convey water to its end use. GHG emissions in the Water Transport sector are projected to comprise less than 1% of the County's total GHG emissions in 2020. The County can reduce GHG emissions in this sector by reducing electricity consumption through the installation of increased-efficiency pumping equipment. Such action, in advance of the normal turnover time of the existing equipment, would be cost and labor intensive while only obtaining minimal GHG reductions. As a result, no reduction measures in the Water Transport sector are included in the MCAP at this time. GHG emissions in the Water Transport sector will increase in 2020 as the pumping equipment pumps additional water onsite at County facilities to accommodate growth. Table 4-7 and Figure 4-9 show GHG emissions in the Water Transport sector for all scenarios.

Table 4-7. Summary for the Water Transport Sector

GHG Emissions	($MT CO_2e$)
2005 Water Transport Emissions	133
2020 Water Transport BAU Emissions	143
GHG Reduction Measures	
No GHG reduction measures are included for this sector.	

Figure 4-9. GHG Emissions in the Water Transport sector 2005 and 2020—All Scenarios



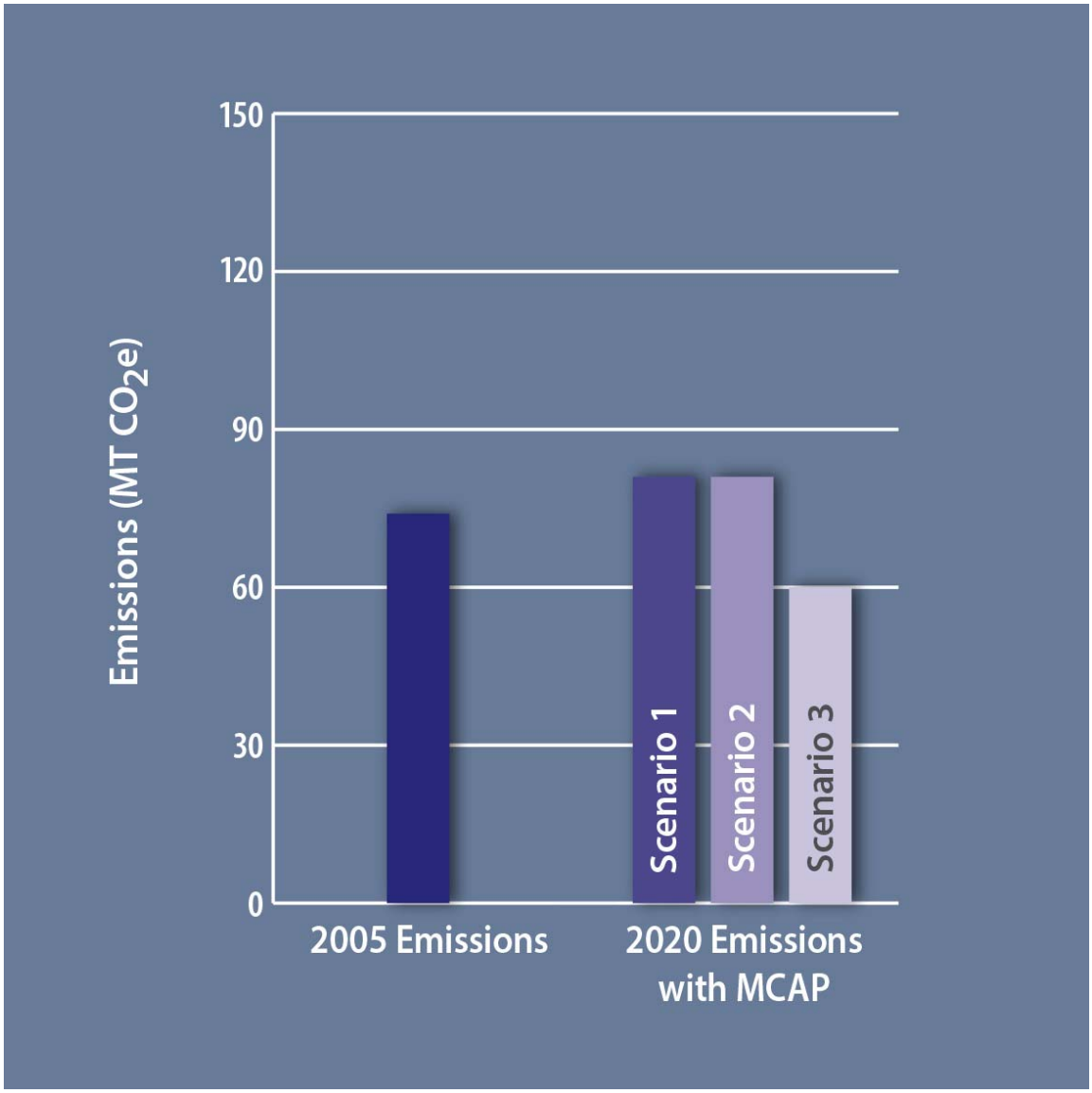
4.9 Public Lighting

The County is responsible for the operation and maintenance of certain types of public lighting. Electricity generation for these lights results in the release of GHGs at supplying power plants. The County can reduce GHG emissions in this sector by replacing light fixtures with more energy efficient technology or altering use patterns of the lights where safety is not compromised. In 2020, under a BAU scenario, GHG emissions from this sector are forecast to represent less than 1% of the County's total GHG emissions. Scenario 3 includes a measure to replace existing lighting fixtures with energy efficient lighting fixtures. Once implemented, this measure would reduce public lighting related emissions by approximately 25%. This reduction measure is shown in Table 4-8. Figure 4-10 shows GHG emissions in the Public Lighting sector for all scenarios.

Table 4-8. GHG Reduction Measures in the Public Lighting Sector

GHG Emissions		($MT CO_2e$)
2005 Public Lighting Emissions		74
2020 Public Lighting BAU Emissions		81
GHG Reduction Measures	Scenario	Reductions
PL-1 Upgrade outdoor lighting fixtures	Scenario 3	20
Total GHG Reductions in Public Lighting Sector in 2020		
Scenario 1		0
Scenario 2		0
Scenario 3		20

Figure 4-10. GHG Emissions in the Public Lighting sector 2005 and 2020—All Scenarios



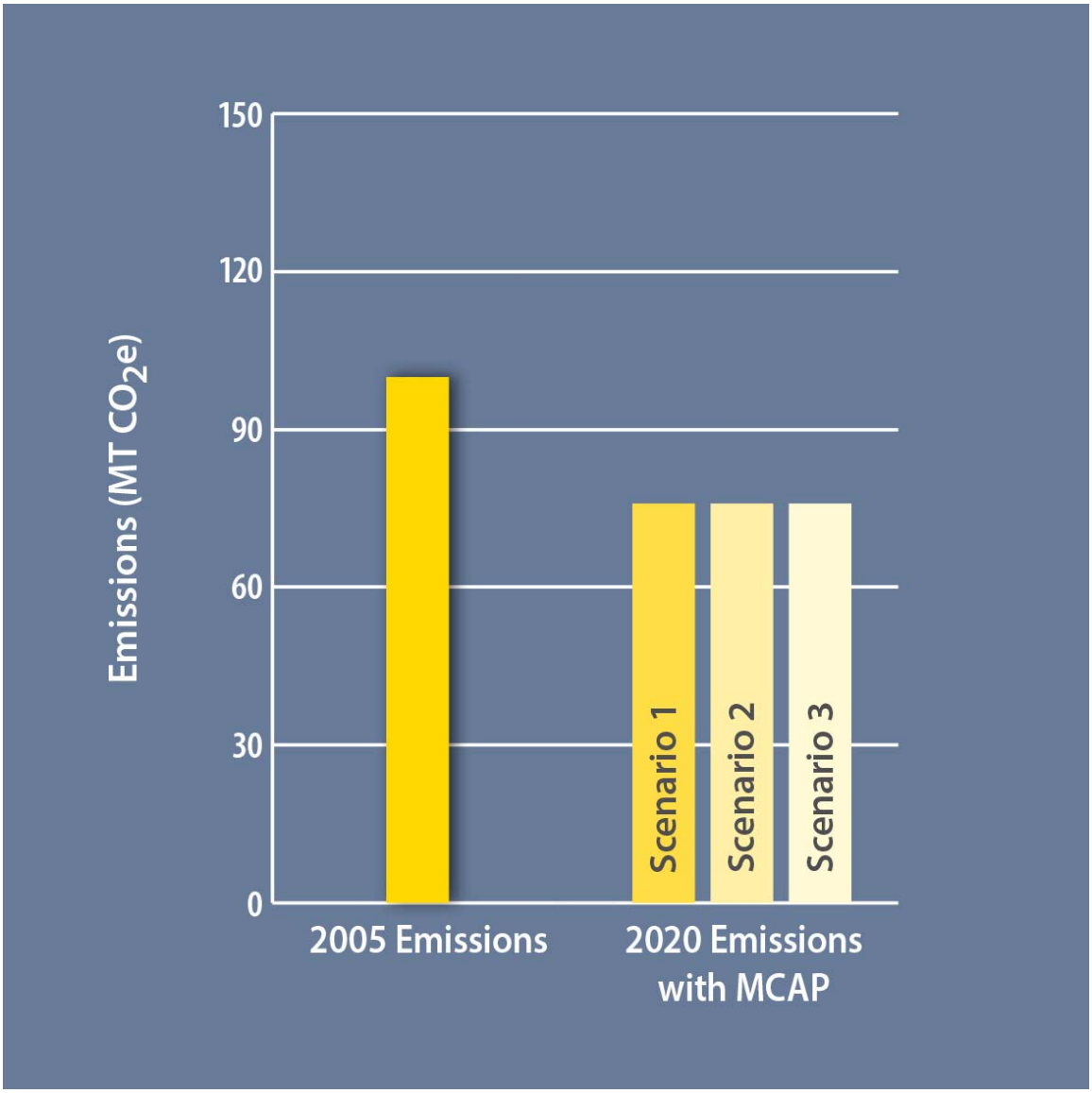
4.10 Wastewater Facilities

Monterey County owns and operates one facility that treats wastewater, and owns and operates pumping facilities that move wastewater to treatment facilities operated by the JPA. This MCAP addresses the indirect GHG emissions due to the powering of the pumping facilities, and the fugitive GHG emissions that arise from the treatment of wastewater at the Chualar Wastewater Treatment Plant. As discussed in Chapter 2, GHG emissions in this sector are projected to decrease by 16.9% between 2005 and 2020, due to the transfer of control of select wastewater pumping facilities to the Pajaro Sunny Mesa Community Services District. Wastewater Facilities emissions in 2020 will represent less than 1% of the County's total emissions. The County can reduce GHG emissions in this sector by reducing electricity consumption through the installation of increased-efficiency or alternative energy-powered pumping equipment. At the Chualar wastewater treatment plant, for example, the County has installed a solar-powered aerator, which eliminates nearly all energy consumption at the facility. The aerator was installed after 2005. Energy reductions achieved by the use of the solar aerator are equal to the energy that the facility would otherwise consume under a BAU scenario. Other improvements to the County-owned wastewater pumping infrastructure are not planned at this time, because such action, in advance of the normal turnover time of the existing equipment, would be cost and labor intensive while only obtaining minimal GHG reductions. The County maintains the pumping equipment at optimum performance to maximize energy efficiency and will consider energy efficiency as key criteria in future equipment purchases. Table 4-9 and Figure 4-11 show GHG emissions in the Wastewater Facilities sector for all scenarios.

Table 4-9. Summary for the Wastewater Facilities Sector

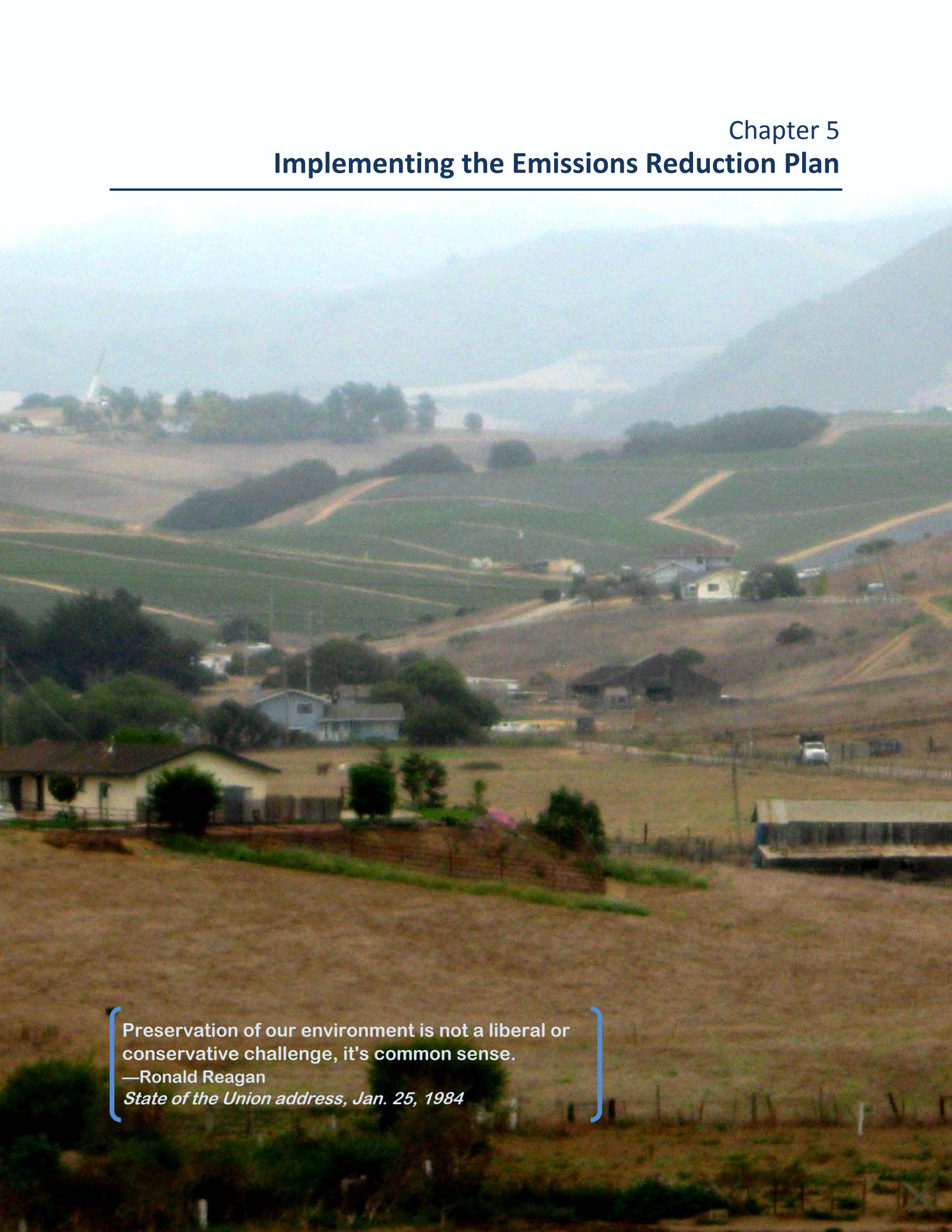
GHG Emissions			(MT CO_2e)
2005 Wastewater Facilities Emissions			100
2020 Wastewater Facilities BAU Emissions			83
GHG Reduction Measures		**Scenario**	**Reductions**
WW-1	Solar Aerator at Chualar Wastewater Treatment Plant	All scenarios	7
Total GHG Reductions in Public Lighting Sector in 2020			
	Scenario 1		7
	Scenario 2		7
	Scenario 3		7

Figure 4-11. GHG Emissions in the Wastewater Facilities sector 2005 and 2020—All Scenarios



Chapter 5

Implementing the Emissions Reduction Plan



Preservation of our environment is not a liberal or conservative challenge, it's common sense.
—Ronald Reagan
State of the Union address, Jan. 25, 1984

5.1 Implementation Timeline

The County's ability to meet the goal of reducing GHG emissions to 15% below 2005 emissions levels will depend on the successful implementation of this MCAP. The Resource Management Agency (RMA) will be responsible for overseeing the implementation of the MCAP and will utilize the existing institutional structure of County operations to implement the MCAP, avoiding the need for additional staff or excessive additional staff workload. The primary "new" tasks associated with the MCAP focus on increased communication among departments and more centralized tracking of information. This chapter describes the County's approach for implementing the MCAP and for generally incorporating GHG emissions into the County's planning and decision making.

The implementation plan outlined below assumes that the County will implement Scenario 3. However, in the event that the County cannot implement ALL measures, this MCAP demonstrates that the County can still meet its goal with several combinations of GHG reduction measures (Scenarios 1 or 2).

The County has divided the Scenario 3 GHG reduction measures into four time periods: Phases 1, 2, 3, and ongoing. The activities within each of these phases are described below and in Figure 5.1. The reporting and tracking of MCAP actions are described in Section 5.2.

5.1.1 Phase 1 (2005–2012)

Phase 1 covers actions completed prior to the writing of this document (before December 2012) and the associated GHG benefits were accounted for under all scenarios. Phase 1 includes the following completed actions.

- Implementation of select measures identified in Public Works energy audits (BE-1 to BE-48).
- Energy audits of NMC facilities.
- Implementation of select measures identified in NMC audits (NMC-1 to NMC-12).
- Implementation of all AMBAG Energy Watch measures (AM-1 to AM-42).
- Laurel Yard Solar Installation.
- Adoption of the Climate Friendly Purchasing Policy.
- Development of this MCAP.
- Report Progress to the Alternative Energy and Environment Committee.

5.1.2 Phase 2 (2013–2016)

Phase 2 actions are those that are likely to be completed during the period 2013–2016 given the County's current understanding of funding. The County may adjust this plan by moving certain actions to Phase 3 and vice versa as needed. In general, the County's strategy is to prioritize measures with high energy savings potential and shorter pay-back period and to complete these measures during Phase 2, funding permitting. These include the remaining Public Works audit measures, the NMC audit measures and the installation of BEMS.

- Securing funding for Phase 2—at the time of writing of this document, the County is exploring a finance mechanism to implement the remaining measures identified during the building energy audits. The mechanism may include power purchase agreements or other financing opportunities that would ultimately be cost neutral to the County. The County typically funds large capital improvement projects (CIPs) with a combination of grants and county funding. The County is exploring all possible grant opportunities. Applications are being prepared and submitted through the RMA.
- On a monthly basis, initiate tracking and reporting of building metrics using PG&E or the EPA's Energy Star Portfolio Manager (Public Works, Facilities Division) and regular outputs to RMA.
- Initiate tracking of completed CIPs in the MCAP (Public Works, Facilities Division) and quarterly updates to RMA.
- On an annual basis, initiate reporting by the RMA of MCAP progress (including building energy use and completed CIPs) to Alternative Energy and Environment (AEE) Committee.
- Implement all remaining Public Works measures (pending funding) and/or implement all remaining NMC audit measures and/or install BEMS in all major facilities.
- Identify likely funding sources for MCAP measures not implemented as part of Phase 2 and begin monitoring, on a monthly basis, for opportunities for preparing grant applications.
- Prioritize MCAP measures not implemented in Phase 2. The following decision making criteria will be used as a guide.
    - Cost/Funding—how much does the measure cost? Is funding already in place for the measure?
    - Greenhouse Gas Reductions—How effective is the measure at reducing greenhouse gases?
    - Other Benefits—does the measure improve water quality or conserve resources? Would it create jobs or enhance community wellbeing?
    - Consistencies with Existing Programs—does the measure compliment or extend existing programs?
    - Impact on the Community—what are the advantages and disadvantages of the measure to the community as a whole?
    - Speed of Implementation—How quickly can the measure be implemented and when would the County begin to see benefits?
    - Implementation Effort—How difficult would it be to develop and implement the program?
- Complete Community-wide CAP, incorporating MCAP, and adopt for purposes of CEQA tiering.
- Conduct a GHG Inventory for the year 2015 and assess progress relative to 2005. Additional years are recommended for the period 2005–2015 (e.g., 2010 or 2011) if data is available.
- Identify potential GHG reduction measures or actions for beyond 2020—Conduct an early visioning exercise with County staff and stakeholders regarding GHG reduction planning for post 2020. This exercise will assess the current state and federal planning efforts, the County's progress thus far, and the County's goals and opportunities for reducing GHG's in the time frame 2020–2035. This initial visioning exercise will frame the 2020 MCAP update (see Phase 3 and Section 5.3 below).

- Report Progress to the Board of Supervisors.

5.1.3 Phase 3 (2017–2020)

- Implement any remaining Public Works audit measures and/or NMC audit measures and/or install BEMS in any facility that does not yet have BEMS.
- Purchase two electric vehicles and install two electric vehicle charging stations. Monitor the miles traveled by electric fleet vehicles and employee feedback on using electric vehicles for County business. Report gasoline savings as part of regular MCAP reporting and public outreach. Monitor cost and incentive programs for purchase of additional electric vehicles.
- Complete public lighting retrofits with more energy efficient technologies.
- Complete a waste audit of County facilities and set a waste reduction goal for the post 2020 period. Work with waste providers for County facilities to incorporate these waste goals into service contracts.
- Complete an assessment of on-site renewable opportunities and available funding. At the time of writing of this document, the County had determined that many on-site renewable projects were cost prohibitive. The County will reassess their options and costs for installing renewable energy onsite on an ongoing basis.
- Complete another employee commute survey with a focus on adding or expanding programs during the post 2020 period.
- Conduct a GHG Inventory for the year 2018 and compare to previous year inventories (2005, 2011, and 2015) and projections.
- Conduct a second visioning exercise for GHG reduction planning post 2020. Continue to identify feasible measures or measures worthy of additional exploration for the County's post 2020 MCAP.
- Report Progress to the Board of Supervisors
- Begin the MCAP 2020.

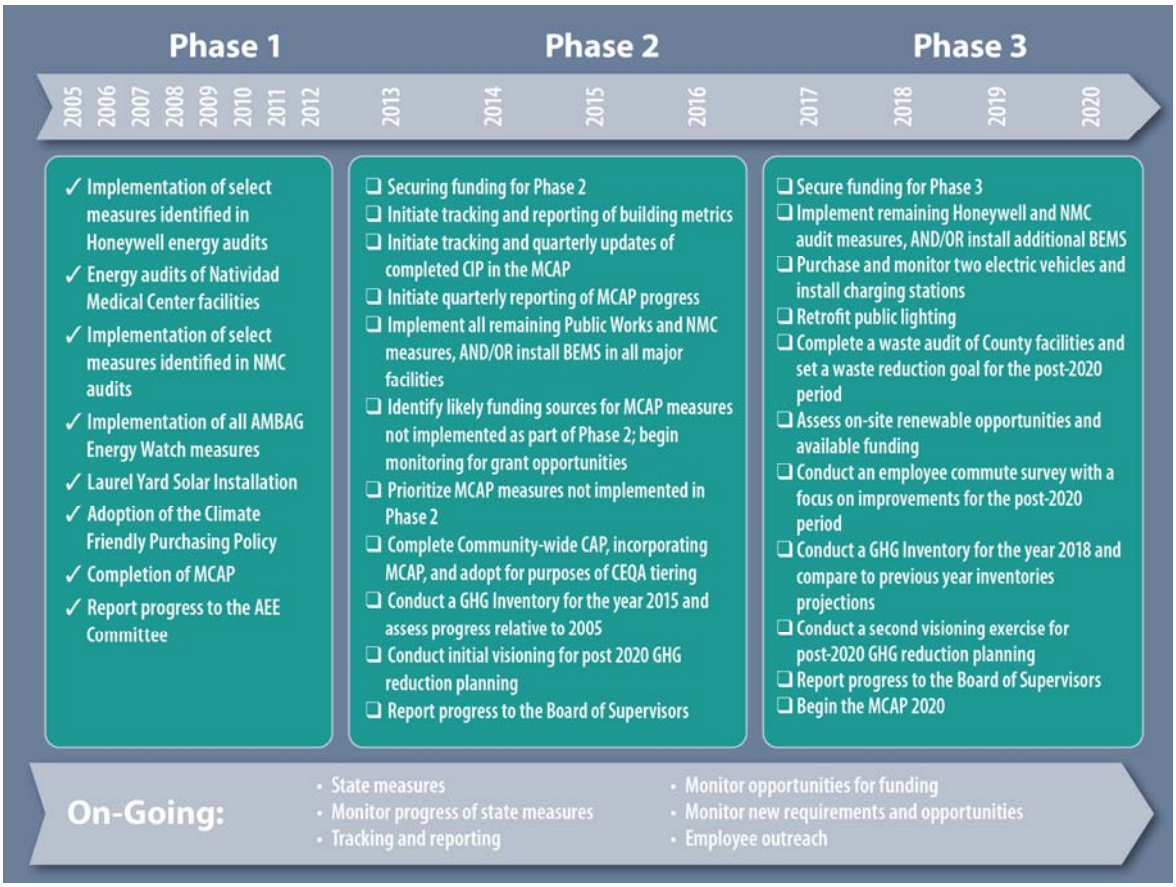
5.1.4 Ongoing (2005–2020)

- **State-level GHG reduction measure implementation—**California electricity providers will continue to respond to the mandates in Senate Bill (SB) 1078 and SB 107, the RPS, increasing procurement of electricity from eligible renewable sources to 33% by 2020. Similarly automakers will respond to AB 1493, the Advanced Clean Cars Program, and the new corporate average fuel economy standards increasing the fuel economy of passenger vehicles sold in California. Compliance with these laws and the continued implementation of actions outlined in the AB 32 Scoping Plan, such as the low carbon fuel standard (Executive Order–S-01-07, implemented by CARB), and the RPS (SB 1078/SB 107, administered by the California Public Utilities Commission) will result in avoided GHG emissions in Monterey County in 2020, even if the County were to take no action. Many of the measures listed in the AB 32 Scoping Plan are already underway and will strengthen or increase activity before 2020.
- **Monitor progress of state-level reduction measures**—this analysis assumes that the State of California is able to accomplish the goals set out in the AB 32 Scoping Plan. For example, this analysis assumes that power providers will be able to provide 33% of retail sales from eligible

renewable sources by 2020. The State may also adopt or implement additional actions not accounted for in this analysis that will yield GHG reductions in Monterey County without any action on the County's part. Because Monterey County is planning to meet its GHG reduction target through a combination of State and County action (Scenarios 1, 2 and 3), they will monitor the State's progress and adjust accordingly.

- **Tracking and Reporting**—Tracking and reporting of certain types of data as well as overall MCAP progress allows for accountability and adaptive management in this plan. Tracking and reporting is described in detail on Section 5.2.
- **Monitor opportunities for funding**—The County has worked closely with AMBAG and the air district in the past to secure funding for energy efficiency and air quality related projects (e.g., lighting retrofits). These agencies will likely provide funding or incentives in the future for electric vehicles and infrastructure and the County is monitoring these opportunities closely. The County will continue to explore other federal and state funding opportunities as they become available.
- **Monitor new requirements and opportunities**—State and federal governments will likely continue to develop policy designed to reduce GHG emissions or strengthen existing policy. Some of this policy may place new requirements on County operations and facilities. To the extent that future legislation results in GHG emissions reductions, the County can incorporate these into this plan. The County will also monitor the development of new technologies as they become financially feasible that allow for additional energy efficiency and/or GHG reduction projects not identified in this first MCAP.
- **Employee Outreach**—The County currently conducts outreach related to energy efficient practices, waste reduction, water conservation and the climate friendly purchasing policy (see Chapter 4). The County also currently conducts outreach recognizing alternative commute modes (see Chapter 4). As part of this MCAP, the County will conduct outreach to County employees and residents on this MCAP through regular updates on the long range planning website, regular reports to the AEE Committee and as part of planned outreach efforts surrounding the communitywide CAP in 2013. Employee engagement and support are keys to the success of this MCAP and subsequent efforts to render the County's operations as carbon neutral as possible. The County hopes to lead by example to the community as a whole in reducing GHGs and considers our employees as liaisons in this effort.

Figure 5-1. MCAP Implementation Timeline



5.2 Tracking and Reporting

Regular monitoring is important to ensure programs are functioning as they were originally intended and also to collect hard data on energy savings following retrofits. The building energy audits completed on County buildings are estimates only of the likely energy savings. Actual savings may differ due to building use patterns, climate conditions or differences in accompanying technology than was assumed at the time of audit. Early identification of effective strategies and potential issues would enable the County to make informed decisions on future priorities, funding, and scheduling. Moreover, monitoring provides concrete data to document the County's progress in reducing GHG emissions and regular updates and reporting allow for mid-course corrections to the MCAP prior to 2020.

For tracking and reporting of the MCAP, the RMA will follow the schedule below.

Monthly

- Collect electricity, natural gas and water consumption at each facility using either PG&E or EPA's Energy Star Portfolio Manager;
- Document progress on Implementation of relevant reduction measures State, Federal, and local;
- Monitor and document opportunities for funding;

- Update the Statewide Energy Efficiency Collaborative (SEEC) tool if necessary; and
- Consider the need for additions, corrections, or deletions to the CAP program based on the items above.

Annually

- Report overall CAP progress to the AEE Committee.

Before the end of each Phase (i.e., 2016 and 2020)

- Report overall CAP progress to the Board of Supervisors (recommended updates to GHG inventory also at end of each phase).

5.3 Planning Beyond 2020

While GHG management in the state of California is currently focused on a 2020 target, Executive Order S-03-05 articulates a GHG reduction goal for California in 2050. Executive Order S-03-05 states that by 2050 California shall reduce their GHG emissions to a level that is 80% below the level in 1990. It is reasonably foreseeable that as California approaches the AB 32 milestone in 2020, focus will shift to the 2050 target. A detailed plan for how the state would meet this target is expected but does not exist at present. CARB has indicated that it intends to start consideration of post-2020 actions in its 2013 update of the AB 32 Scoping Plan; however, there is no indication at present of legislative interest in adopting post-2020 binding state mandates. Executive Order S-03-05 is only binding on state departments and is not binding on local governments or private development, thus it does not have the same force in law as AB32 which does create enforceable mandates for GHG emissions for 2020.

The County is also thinking about how to continue to reduce GHG emissions after 2020. Beginning in Phase 3 (2017) of this plan, the County would commence planning for the post-2020 period. At this point (2017), the County would have implemented the first two phases of the MCAP and would have a better understanding of the effectiveness and efficiency of different reduction strategies and approaches. The new post-2020 reduction plan would include a specific target for GHG reductions after 2020, and as this plan does, account for the likely benefits of state and national level actions. The targets would likely be consistent with broader state and federal reduction targets and with the scientific understanding of the needed reductions by 2050. To pursue GHG reductions after 2020, the County would need to develop and/or adopt a new GHG reduction plan for its municipal operations by January 1, 2020.

Although national and state level programs post 2020 can only be speculated upon at this time, the County is already looking at GHG emissions under its direct control to assess what might be possible after 2020. Assuming that emissions of 15% below 2005 levels (17,195 MT CO_2e) are roughly equivalent to 1990 levels[1], a 2050 County goal consistent with the S-03-05 goals (80% below 1990

[1] Executive Order S-03-05 establishes a goal for the state of California to return to 1990 levels of GHG emissions by 2020. In developing the state's plan for achieving this goal (AB 32 Scoping Plan) CARB first established the 1990 level of GHG emissions for California. CARB determined that 1990 levels were approximately 15% below the "current" (~2006) levels of emissions. CARB understood that conducting a GHG inventory for the year 1990 would be difficult for most local governments due to data availability and thus did not recommend that local governments complete a 1990 inventory. Rather the AB 32 Scoping Plan relies on the approximation that 15% below current

levels) would be to reduce 2050 municipal operation emissions to 3,439 MT CO_2e even as the County's population and level of service continue to grow. This target and the County's BAU emissions are shown in Figure 5-2.

Were the County and state to take no action to curb emissions (i.e., the state does not implement the AB 32 Scoping Plan and the County does not implement the MCAP), the County's GHG emissions in 2020 and 2050 are projected to be 21,636 MT CO_2e and 22,658 MT CO_2e (open circles, Figure 5-2) respectively. This worst case scenario assumes that the County continues to use the same types of energy and at the same rate that it did in 2005. This scenario assumes that buildings, employees and vehicles do not become more efficient or energy conscious in the future. However, as described in this MCAP, the County will likely implement all actions listed in Scenario 3 and the state will implement measures as described in the AB 32 Scoping Plan by 2020. As a result, the County's emissions in 2020 are expected to be 15,442 MT CO_2e (middle bar, Figure 5-2).

In order to achieve this 2050 goal, the County would likely need to complement state and national level programs with aggressive local actions. The discussion below includes several "what-if" options designed to initiate further discussion and brain-storming for how the County could reduce their operational GHG emissions beyond what is outlined in this MCAP. Figure 5-2 shows the reductions associated with the potential local actions discussed here.

Hypothetical Local Action #1: What if the County were able to generate 50% of its 2050 electricity demand on-site or nearby from renewable sources?

Description: In addition to the RPS, the County could install on-site renewable or local renewable energy projects (wind and solar most likely) to supply 50% of the electricity demand of County-owned buildings by 2050. The remaining 50% of electricity would be purchased from the grid, 33% of which (at a minimum) would also come from renewables per the RPS[2]. If the County were to replace 50% of its 2050 electricity demand with renewable energy (11,040 megawatt hours) the County would avoid approximately 1,881 MT CO_2e in emissions annually above what is achieved in the MCAP.

Hypothetical Local Action #2: What if 40% of County employees used alternative modes of transportation in their daily commutes in 2050?

Description: Employee commute is a sector that is not targeted aggressively in the 2020 MCAP and may afford opportunities to reach the 2050 goal. Employee commutes are the third largest source of emissions. Achieving a 40% alternative transportation rate among County employees (i.e., 1,952 employees ride public transportation or in van pools) would require aggressive use of County-subsidized transit passes, increased County-sponsored van pools, and/or more opportunities for telecommuting. If the County were to reach this goal, the County would avoid approximately 288 MT CO_2e in emissions annually above what is achieved in the MCAP.

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levels statewide is equivalent to 1990 levels and recommends that local governments reduce emissions to 15% below "current" levels.

[2] While the RPS will ensure that utilities supplying electricity to Monterey County (PG&E) will obtain 33% of their energy from renewable sources by 2020, the California Public Utilities Commission has not yet established a renewables standard after 2020.

Hypothetical Local Action #3: What if 80% of the County's Vehicle Fleet were electric in 2050?

Description: The County's vehicle fleet is also a significant source of emissions but a sector that was not prioritized in the 2020 MCAP. While electric vehicles may currently be cost prohibitive to the County, it is probable that electric vehicles will be more cost accessible and efficient by 2050 and their use can reduce operational GHG emissions. Electric vehicles could meet many of the County's internal transportation needs. If the County were to replace 80% of its vehicle fleet with electric vehicles by 2050, the County would avoid approximately 3,586 MT CO_2e in emissions annually above what is achieved in the MCAP.

Figure 5-2. Planning for 2050

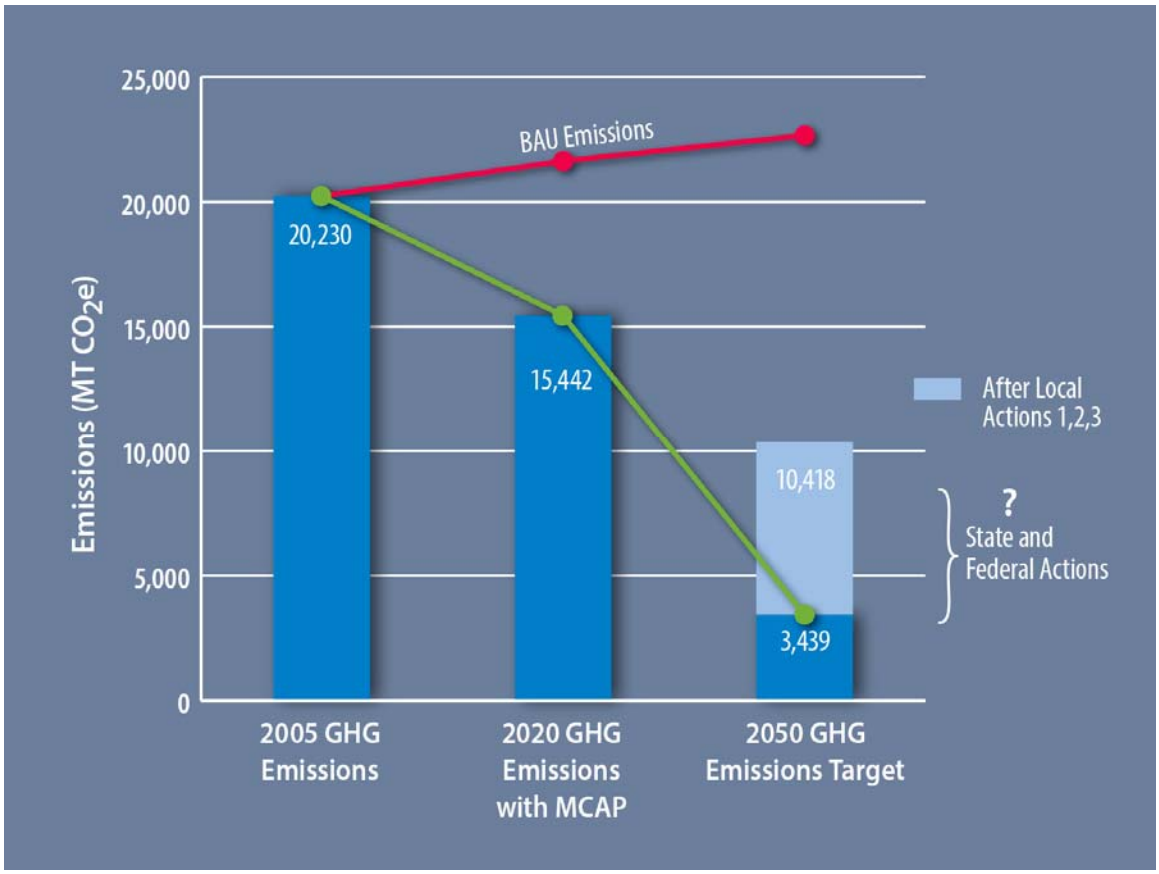

Figure 5-2 shows that if the County accomplished the three "what-if" actions described above (generate 50% of its own electricity demand with on-site renewables, replace 80% of its fleet with all electric vehicles and have 40% of employees commuting by alternate modes); emissions would be further reduced to 10,418 MT CO_2e in 2050. Additional GHG reductions would be needed from state or federal programs to meet a reduction goal of 80% below 1990 levels, were the County to pursue such a goal. State programs such as the continuation of the RPS, the Low Carbon Fuel Standard, other Vehicle Efficiency Standards and other programs would further reduce County emissions below 10,418 MT CO_2e.

Although not accounted for in the 2050 bars of Figure 5-2, the County's efforts to achieve the 2050 emissions goal would be aided by the extension of statewide actions beyond 2020. The size of their benefit in Monterey County cannot yet be estimated. The CARB Scoping Plan outlines the following potential programs post 2020 (California Air Resources Board 2008).

- Using a regional or national cap-and-trade system to further limit emissions from capped sectors (Transportation Fuels and other fuel use, Electricity, Residential/Commercial Natural Gas, and Industry).
- Achieving a 40% fleet-wide passenger vehicle emissions reduction by 2030 (through improved fuel efficiency), approximately double the almost 20% expected in 2020;
- Increasing California's use of renewable energy;
- Reducing the carbon intensity of transportation fuels by 25% (a further decrease from the 10% level set for 2020);
- Increasing energy efficiency and green building efforts so that the savings achieved in the 2020 to 2030 timeframe are approximately double those accomplished in 2020; and
- Continuing to implement sound land use and transportation policies to lower vehicle miles travelled and shift travel modes.

Chapter 6

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6.2 Personal Communications

Spencer, Craig. Monterey County. May 2012—memorandum received by Margaret Williams of ICF International.

Appendix A
Methodology

Appendix A
Methodology

A.1 Inventory and Forecast Methodology

The inventory and forecast emissions presented in this MCAP are based on 2005 inventory emissions that were developed for Monterey County in a previous GHG inventory. The previous inventory included the following sectors: Buildings and Facilities; Public Lighting; Water Transport; Vehicle Fleet; Employee Commute; Government Generated Solid Waste; and Wastewater Facilities. This analysis included the same sectors as the previous inventory and added the Water Consumption and the County Owned Landfills sector. Sections A.1.1 through A.1.9 describe the methodology used to estimate emissions for each sector. Table A-1 summarizes the sectors included in the previous inventory and this analysis, and notes any modifications between the two.

Table A-1. Comparison of Previous Inventory and this Analysis.

Sector	Modification from the Previous Inventory
Building Energy	Salinas Courthouse was removed because this facility will not be under the County's control after 2014. Electricity consumption at the Marina Office Planning Department was reduced by 50% to reflect the building's occupancy.
Vehicle Fleet	No change
Employee Commute	No change
Government Generated Solid Waste	No change
County Owned Landfills	This sector was not included in the previous inventory. It has been included in this analysis to ensure that all of the County's operations are captured in the inventory and MCAP.
Water Consumption	This sector was not included in the previous inventory. It has been included in this analysis to ensure that all of the County's operations are captured in the inventory and MCAP.
Water Transport	No change
Public Lighting	No change
Wastewater Facilities	Fugitive Emissions at Chualar WWTP were added in this analysis.

A.1.1 Buildings and Facilities—Energy Use

Inventory Emissions: Emissions in the Buildings and Facilities—Energy Use sector were largely determined from data in the County's previous inventory. The list of buildings and corresponding electricity and natural gas consumption from the previous inventory was used with minor revisions. The Salinas Courthouse, since it was not under the jurisdiction of the County in 2005, was removed from the list of buildings, and building energy at the Planning Department's Marina office was reduced by 50% to reflect the building's approximate 50% occupancy rate of County employees.

Electricity and natural gas consumption from each building (excluding the two mentioned above) were multiplied by the respective electricity and natural gas emissions factors. To maintain consistency, all natural gas and electricity emission factors used in this analysis were used in the County's previous inventory. The CO_2 electricity emission factor represents the carbon intensity per unit of electricity provided by PG&E in 2005. Emission factors for CH_4 and N_2O represent regional averages for CH_4 and N_2O emissions per unit of electricity. The natural gas emission factors used in this analysis for CO_2, CH_4 and N_2O can be found from the Local Government Operations Protocol. Table A-2 shows the electricity and natural gas emission factors used in this analysis for 2005.

Forecast Emissions: Growth in this emissions sector was assumed to be proportional to the growth in County employees from 2005–2020. For each building, a growth factor of 7.66% was applied to the electricity consumption in 2005 to determine electricity consumption in 2020. This growth factor was developed using the number of County employees in 2005 and the estimate for the number of employees in 2020.The Salinas Courthouse was excluded from the forecast since it will not be under the jurisdiction of the County in 2020. Energy consumption in 2020 was then multiplied by the baseline 2005 electricity and natural gas emissions factors for CO_2, CH_4 and N_2O (Table A-2). Table A-3 shows each facilities' electricity and natural gas consumption in 2005 and 2020.

Table A-2. Electricity and Natural Gas Emission Factors.

Energy Source	GHG	Emission Factor	Region
Electricity (Lbs/MWh)	CO_2	489.2	PG&E Specific
	CH_4	0.029	California Grid Average
	N_2O	0.011	California Grid Average
Natural Gas (kg/MMBtu)	CO_2	53.06	Default Value
	CH_4	0.005	Default Value
	N_2O	0.0001	Default Value
Source: Local Government Operations Protocol 2010			

Table A-3. Buildings and Facilities—Energy Use Data Used in this Inventory and Forecast

Facility	2005 Consumption		2020 Consumption	
	Electricity (kWh)	Natural Gas (therms)	Electricity (kWh)	Natural Gas (therms)
Natividad Medical Center	11,286,374	936,786	12,151,135	1,008,563
Environmental Health Center (1270 Natividad)	NA	NA	599,800	—
Seaside Library	101,400	1,429	109,169	1,538
Salinas Road Department	61,680	3,741	66,406	4,028
Laguna Seca Facilities	433,078	—	466,260	—
Public Safety Building	1,110,154	—	1,195,214	—
Public Defender	142,240	3,899	153,138	4,198
Printing and Mail OPS OFC	2,520	—	2,713	—
Parks Department Office	92,400	25,467	99,480	27,418
OFC	48,569	109	52,290	117
NMC Office Building	651,680	—	701,612	—
Monterey Courthouse	1,203,261	48,408	1,295,455	52,117
Marina Court Building	105,840	4,597	113,949	4,949
King City Library	56,960	—	61,324	—
KCCH	139,440	3,253	150,124	3,502
Health Department Headquarters	576,160	25,942	620,305	27,930
DSSS	209,360	3,532	225,401	3,803
DSS- Building One	49,440	2,580	53,228	2,778
DSS Office Buildings	370,240	4,438	398,608	4,778
DSS OFC Building	117,040	1,473	126,008	1,586
Detention Center	377,280	24,541	406,187	26,421
DA Office	249,600	2,824	268,724	3,040
County Communication Network Facility	1,382,699	2,795	1,488,641	3,009
Children Services	61,028	—	65,704	—
Ag Services	214,400	6,741	230,827	7,257
Adult Detention Facility	3,811,833	—	4,103,895	—
911 Call Center	487,680	—	525,046	—
Minor Facilities	1,994,991	35,100	2,147,847	37,789
Planning Department—Marina Office	95,320	2,100	102,623	2,261
Totals	25,432,667	1,139,755	27,981,116	1,227,083

A.1.2 Vehicle Fleet

Inventory Emissions: Emissions in the Vehicle Fleet sector were determined in the County's previous inventory. These emissions were used without modification in this inventory. Refer to Appendix B for more detail.

Forecast Emissions: To determine Vehicle Fleet emissions in 2020, 2005 emissions were multiplied by the County's expected rate of employee growth. The inventory and forecast data for the Vehicle Fleet sector are shown in Table A-4.

Table A-4. Vehicle Fleet Inventory and Forecast Data

Sector	Year	GHG Emissions (MT CO_2e)	Scaling Factor
Vehicle Fleet	2005	5,465	Employee growth (7.66%)
	2020	5,884	

A.1.3 Employee Commute

Inventory Emissions: Emissions in the Employee Commute sector were determined in the County's previous inventory and used without modification in this inventory. Refer to Appendix B for more detail.

Forecast Emissions: To determine Employee Commute emissions in 2020, 2005 emissions were multiplied by the County's expected rate of employee growth. This assumes that employee commute distances will be similar in 2020 to the commute distances in 2005. The inventory and forecast data for the Employee Commute sector are shown in Table A-5.

Table A-5. Employee Commute Inventory and Forecast Data

Sector	Year	Estimated Vehicle Miles Traveled	GHG Emissions (MT CO_2e)	Scaling Factor
Employee Commute	2005	38,295,860	1,635	Employee growth (7.66%)
	2020	41,229,893	1,760	

A.1.4 Government Generated Solid Waste

Inventory Emissions: Emissions in the Government Generated Solid Waste sector were determined in the County's previous inventory and used without modification in this inventory. Refer to Appendix B for more detail.

Forecast Emissions: To determine Solid Waste emissions in 2020, 2005 emissions were multiplied by the employee growth factor. A 75% methane capture rate was assumed for receiving landfills. . The inventory and forecast data for the Government Generated Solid Waste sector are shown in Table A-6.

Table A-6. Government Generated Solid Waste Inventory and Forecast Data

Sector	Year	Waste Tons	GHG Emissions (MT CO_2e)	Scaling Factor
Government Generated Solid Waste	2005	2,536	645	Employee growth (7.66%)
	2020	2,730	694	

A.1.5 County Owned Landfills

Inventory Emissions: The County's landfill-related GHG emissions were revised in this analysis from the previous inventory. Although there are several landfills within the County's boundaries, the County only has sole jurisdictional control of only one landfill that is subject to CARB landfill methane capture regulations[1], the San Antonio Disposal Site. Landfills included in the previous inventory are not under the County's sole jurisdiction and thus the County does not have the ability to implement actions to control emissions at these landfills. Emissions from the San Antonio landfill were quantified using the ARB's landfill emissions tool and waste data from CalRecycle. Waste data was inputted into the ARB model for each year that the landfill was open (1964–1991). The model then estimates GHGs emitted from the landfill in specific years, including future years. It was assumed that no methane capture technology was utilized at the landfill.

Forecast Emissions: Emissions in 2020 from the San Antonio Disposal Site were determined using the ARB model, discussed above. The model provided GHG emissions by year for the landfill. The inventory and forecast data for the County Owned Landfills sector are shown in Table A-7.

Table A-7. County Owned Landfills Inventory and Forecast Data

Sector	Year	Waste in Place (Tons)	GHG Emissions (MT CO_2e)
County Owned Landfills	2005	25,000	361
	2020	25,000	267

A.1.6 Water Consumption

Inventory Emissions: The Water Consumption sector was not included in the County's previous inventory. To develop the inventory emissions for this sector, a list of water service providers and the amounts of water supplied in 2010 was provided by the County. Using County employee growth, the amounts of water consumed were scaled backwards to the analysis year, 2005. The amount of electricity used in the supply and conveyance, treatment, and distribution of the water was estimated using CAPCOA energy-intensity values. The total amount of electricity was then multiplied by electricity emission factors for CO_2, CH_4, and N_2O (see Table A-2).

Forecast Emissions: Water consumption in 2005 was projected to 2020 using the County's expected rate of employee growth from 2005-2020. 2020 water consumption was then multiplied by the CAPCOA energy intensity factors to yield water-related electricity consumption in 2020. That electricity consumption was then multiplied by electricity emission factors for CO_2, CH_4, and N_2O (see Table A-2). The inventory and forecast data for the Water Consumption sector are shown in Table A-8.

[1] Effective June 17, 2010, the California Air Resources Board's landfill regulation applies to all landfills that have received mixed solid waste after January 1, 1977. Landfills with over 450,000 tons of waste in place are required to install active gas collection and control systems unless the landfill receives only hazardous waste or receives only construction and demolition waste. Landfills that are closed or inactive with less than 450,000 tons of waste in place are not required to install the active gas collection and control systems. For additional details, the Implementation Guidance Document can be found at the following link: http://www.arb.ca.gov/cc/landfills/docs/guidance0711.pdf.

Table A-8. Water Consumption Inventory and Forecast Data

Sector	Year	Water Consumption (Million Gallons)	Water-Related Electricity Consumption (kWh)	GHG Emissions (MT CO_2e)	Scaling Factor
Water Consumption Sector	2005	91,497	287,280	64	Employee growth (7.66%)
	2020	98,508	315,896	71	

A.1.7 Water Transport

Inventory Emissions: Emissions in the Water Transport sector were determined in the County's previous inventory and used without modification in this inventory. Refer to Appendix B for more detail.

Forecast Emissions: The County's 2005 emissions were multiplied by a growth factor of 7.22% (population) to arrive at 2020 emissions. Because the County transports water to some public facilities for sprinkler control and other irrigation uses, it was assumed that this sector would experience growth represented by population growth rather than employee growth. The inventory and forecast data for the Water Transport sector are shown in Table A-9.

Table A-9. Water Transport Inventory and Forecast Data

Emissions Source	Year	GHG Emissions (MT CO_2e)	Scaling Factor
Water Transport	2005	133	Population growth (7.22%)
	2020	143	

A.1.8 Public Lighting

Inventory Emissions: Emissions in the Public Lighting sector were determined in the County's previous inventory and used without modification in this inventory. Refer to Appendix B for more detail.

Forecast Emissions: The Public Lighting sector consists of the following components: park lighting, traffic signal controllers, streetlights, and other lighting, which includes flashers, parking lighting, and security lighting. To estimate 2020 electricity consumption by street lights, it was assumed that 2005 electricity consumption from street lights and other lighting will increase proportional to housing growth, and that 2005 electricity consumption from park lighting and traffic signal controllers would not increase significantly before 2020. Electricity consumption in 2020 was multiplied by the electricity emission factors (Table A-2) to arrive at 2020 emissions. The inventory and forecast data for the Public Lighting sector are shown in Table A-10.

Table A-10. Public Lighting Inventory and Forecast Data

Emissions Source	Year	Electricity (kWh)	GHG Emissions (MT CO_2e)	Scaling Factor
Park Lighting	2005	188,066	18	No change
	2020	188,066	18	
Traffic Signal Controllers	2005	82,153	10	No change
	2020	82,153	10	
Streetlights	2005	46,420	4	Housing growth (14.91%)
	2020	53,340	5	
Other Lighting	2005	16,370	42	Housing growth (14.91%)
	2020	18,810	48	
Total	2005	333,009	74	
	2020	342,369	81	

A.1.9 Wastewater Facilities

Inventory Emissions: Emissions in the Wastewater sector were determined in the County's previous inventory and revised slightly for this analysis. Emissions due to the electricity required to pump wastewater through County infrastructure and facilities was captured in the previous inventory. For this analysis, fugitive emissions from the Chualar Wastewater Treatment Plant were added using the LGOP's methodology for calculating fugitive wastewater emissions.

Forecast Emissions: By 2020, the County expects to no longer have jurisdictional control over the Pajaro facilities; consequently, emissions from these facilities were excluded from 2020 emissions. It was assumed that the County will experience a 10% increase in pumping activity, so pumping emissions in 2005 (excluding Pajaro facilities) were increased by 10% to determine 2020 pumping emissions. Fugitive emissions from Chualar Wastewater Treatment Plant were projected by County population (assumed to correspond to wastewater treatment demand) to determine 2020 fugitive emissions. The inventory and forecast data for the Wastewater Facilities sector are shown in Table A-11.

Table A-11. Wastewater Facilities Inventory and Forecast Data

Emissions Source	Year	GHG Emissions (MT CO_2e)[a]	Scaling Factor
Pumping Emissions	2005	62.97	10% Increase in capacity[a]
	2020	43.49	
Fugitive Emissions	2005	36.65	Population (7.22%)
	2020	39.30	
Total	2005	99.62	
	2020	82.79	

[a] Pajaro Facilities are excluded from 2020 emissions, so emissions decrease between 2005 and 2020 despite the 10% increase in pumping capacity.

A.2 Reduction Measure Methodology

A.2.1 State Measures

A.2.1.1 Renewable Portfolio Standards

To determine County-level GHG reductions that the State will realize through the Renewable Portfolio Standards, the County's net energy consumption in 2020 (21,085,024 kWh, electricity consumption after implementation of the other measures in this MCAP) was multiplied by emission factors developed to reflect the CO_2, CH_4 and N_2O intensity of electricity production in 2020. Electricity savings from all other County measures were subtracted from the County's BAU consumption in 2020 to avoid double counting emissions reductions. The 2020 emission factors were developed using PG&E's renewable mix in 2005 (12% qualified renewable), the emission factors in Table A-2, and the assumed renewable mix in 2020 (33% qualified renewable). The RPS emission factors are shown in Table A-12.

Table A-12. Estimated Emission Factors for PG&E Supplied Electricity with a 33% Renewable Portfolio as Specified by SB 1078

GHG	Emission Factor (Lbs/MWh)[a]
CO_2	372.46
CH_4	0.022
N_2O	0.008

[a] These estimated emission factors were developed by ICF and not provided by PG&E. To develop these emission factors, it was assumed that PG&E would meet but not exceed its 33% 2020 RPS goal.

A.2.1.2 Pavley I and Pavley II

Emissions reductions from the State's Pavley I and Pavley II were determined based on the State's AB 32 Scoping Plan (2008) and inventory, and the County's emissions in the Employee Commute sector. Using the State's inventory and projected reductions in 2020, statewide reduction percentages for the Pavley I and Pavley II measures were developed (reductions of 17.0% and 2.5%, respectively). The same level of reductions was assumed for employee vehicles in Monterey County. Because the County vehicle fleet overturns more slowly than the larger passenger fleet, and County vehicle use patterns that are different than privately owned vehicles, no GHG emissions reduction from the Pavley emissions standards were applied to the County's vehicle fleet.

A.2.1.3 Low Carbon Fuel Standard

Emissions reductions from the State's Low Carbon Fuel Standard were determined based on a statewide LCFS reduction and the County's emissions in the Employee Commute and Vehicle Fleet sectors. The statewide reduction for LCFS, 8.9%, was developed using the State's GHG inventory and projected 2020 reductions and applies to passenger and heavy duty vehicles. The percent reduction from the LCFS in Monterey County was assumed to be equal to the statewide percent reduction. This reduction percent was applied to emissions from vehicles used by employees for commuting and from the County' vehicle fleet.

A.2.1.4 AB 32—Other Vehicle Efficiency Measures

Emissions reductions from the State's AB 32—Other Vehicle Efficiency Measures were determined based on statewide reductions of 0.4%, 1.8%, and 2.2% for the tire pressure, engine oil, and aerodynamics measures, respectively, and the County's emissions in the Employee Commute and Vehicle Fleet sectors. These reduction percentages were developed using the State's GHG inventory and the projected 2020 reductions. The percent reductions from the AB 32 vehicle efficiency measures in Monterey County were assumed to be equal to the statewide percent reductions. The tire pressure and engine oil reductions were applied to passenger vehicle emissions in Vehicle Fleet and Employee Commute sectors. Aerodynamic reductions were applied to heavy duty vehicle emissions in the County's Vehicle Fleet sector.

A.2.2 Public Works Measures

In 2011, the County completed energy audits of numerous buildings and identified a list of energy efficiency retrofits or actions in its facilities (Public Works Audit Report, see Appendix C). Refer to Appendix C for a list of the measures and their associated energy savings. The amounts of kilowatt hours and/or therms reduced by each measure identified in the audit report were multiplied by the electricity and natural gas emission factors for CO_2, CH_4, and N_2O (see Table A-2). The total energy savings from the Public Works measures are shown in Table A-13.

Table A-13. Annual Energy Savings and GHG Reductions from the Public Works Measures

	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reductions (MT CO_2e)
Public Works Measures	1,225,032	83,727	719

A.2.3 Natividad Medical Center Measures

In 2011, the County completed energy audits of the Natividad Medical Center and identified a list of energy efficiency retrofits or actions at this facility (Willdan Energy Solutions 2011). Refer to Appendix D for a list of the measures and their associated energy savings. The amounts of kilowatt hours and/or therms reduced by each measure identified in the audit report were multiplied by the electricity and natural gas emission factors for CO_2, CH_4, and N_2O emission factors (see Table A-2). The total energy savings from the Natividad Medical Center measures are shown in Table A-14.

Table A-14. Annual Energy Savings and GHG Reductions from the Natividad Medical Center Measures

	Electricity Savings (kWh)	Natural Gas Savings (therms)	GHG Reductions (MT CO_2e)
Natividad Medical Center Measures	1,723,745	211,600	1,511

A.2.4 AMBAG Energy Watch Program Measures

Between 2006 and 2010, the County completed lighting and energy efficiency projects with funding through the AMBAG energy watch program. The kilowatt hours and therms savings at County

facilities are shown in Table A-15. The amounts of kilowatt hours and/or therms reduced at each facility were multiplied by the electricity and natural gas emission factors for CO_2, CH_4, and N_2O emission factors (see Table A-2).

Table A-15. Annual Energy Savings from the AMBAG Energy Watch Program Measures

Facility	Electricity Savings (kWh)	GHG Reductions (MT CO_2e)
Agriculture Center & Corporate Yard Shops	124.54	0.03
Lake San Antonio (North Toll Gate)	1,098.84	0.25
Monterey County Courthouse	203.25	0.05
Public Works Yard	1,716.94	0.38
Court Building (Marina)	1,289.60	0.29
Monterey County King City Court	1,612.00	0.36
Social & Employment Services (Seaside District Office)	1,289.60	0.29
Lake San Antonio (South Toll Gate)	1,648.26	0.37
Lake San Antonio (North Restroom)	2,747.10	0.61
Lake San Antonio (South Visitor Center)	2,747.10	0.61
San Lorenzo Park Office & Shop	12,200.06	2.73
Royal Oaks Park	9,690.07	2.17
San Ardo Yard	1,969.89	0.44
Probation Youth Center	7,408.12	1.66
Agriculture Center	2562.93	0.57
Agriculture Center & Corporate Yard Office	8,755.03	1.96
Lake San Antonio (South Camps)	8,241.30	1.84
Lake San Antonio (South Harris Creek)	8,241.30	1.84
Public Works (Greenfield)	8,790.73	1.97
Monterey County King City Court	2,616.03	0.36
Monterey County King City Court	2,170.75	0.36
San Lorenzo Park Museum	19,619.00	4.39
Sheriff and Public Safety Building	4,567.91	1.02
Toro Park	22,490.54	5.03
Lake San Antonio (South Shop)		—
Lake San Antonio (North Shop)	21,976.81	4.92
Social Services	76,946.94	17.21
Social Services	23,075.65	17.21
Monterey County Courthouse	3,942.95	0.05
Lake San Antonio (South Resort Area)	18,117.90	4.05
Monterey County Courthouse	3,963.25	0.05
Monterey County Courthouse	5,040.41	0.05
Monterey County Jail Rehab	7,879.65	1.76
Monterey County Jail Rehab	3,398.38	1.76

Facility	Electricity Savings (kWh)	GHG Reductions (MT CO_2e)
Monterey County Jail Rehab	6,570.19	1.76
Monterey County King City Court	24,241.75	0.36
Probation Headquarters	126,985.57	28.41
Salinas IT Building	142,574.57	31.90
Monterey County Courthouse	36,753.17	0.05
Corporate Yard	180,315.26	40.34
Sherriff/Public Safety	404,634.03	90.52
Monterey County Courts (Monterey)	504,487.09	112.86
County Jail (Therms)	42,774.00	227.54
Totals	1,724,704.46	613.39

A.2.5 Other Reduction Measures

A.2.5.1 Solar Array at Laurel Yard

To determine GHG reductions associated with the Laurel Yard solar array, it was assumed that electricity supplied by the solar array does not result in GHG emissions and would offset an equal amount of conventionally-produced electricity that would have been supplied by GHG-emitting sources. Consequently, the GHG reductions equal the amount of emissions that would be emitted from the conventionally-produced electricity. Electricity generated by the Laurel Yard solar array is consumed by County facilities and not sold to the grid. Solar array electricity generation in kwh was provided by the County and multiplied by CO_2, CH_4, and N_2O electricity emission factors (see Table A-2). Table A-16 shows the annual amount of electricity produced by the solar array.

Table A-16. Annual Energy Savings and GHG Reductions from the Solar Array at Laurel Yard

	Electricity Savings (kWh)	GHG Reductions (MT CO_2e)
Laurel Yard Solar Array	192,004	42.96

A.2.5.2 Building Energy Management Systems

The Public Works measures included installation of BEMS in certain facilities. This measure targets additional facilities not identified in the Public Works Audit that could benefit from BEMS. According to estimates from the IPCC, BEMS result in energy savings from 5-20% (Intergovernmental Panel on Climate Change 2007). This analysis assumed that the County would achieve savings in the middle of the IPCC's estimated range, 12.5% in all facilities not already planning on installing BEMS as part of the Public Works Audit. This estimate was applied to the County's 2020 projected BAU building energy consumption, at each of these facilities. The resulting energy savings were multiplied by electricity and natural gas emission factors for CO_2, CH_4, and N_2O emission factors (see Table A-2). Table A-17 shows the energy savings resulting from the BEMS measure.

Table A-17. Energy Savings Associated with Building Energy Management Systems at County Facilities

BEMS Savings	Electricity (kWh)	Natural Gas (therms)	GHG Reductions (MT CO_2e)
2020 BAU Consumption (all Facilities)	27,981,116	1,227,083	12,653
2020 Consumption Eligible for BEMS Reduction (excluding all other energy efficiency measures)	15,516,251	870,762	8,103
Savings from BEMS (12.5% savings)	1,939,531	108,845	1,013

A.2.5.3 Electric Vehicles

This measure assumes that the County would purchase two electric vehicles and replace two existing vehicles in their fleet (number provided by County). The vehicles to be replaced were assumed to be sedans with a fuel efficiency of 25.5 miles per gallon and that travel approximately 6,829 miles per year. These assumptions were developed using data from the County's previous inventory. Using an electric vehicle efficiency of 3.52 miles per kilowatt hour, the GHG emissions resulting from electricity used per year by the electric vehicles was compared with the GHG emissions from annual fuel consumed by the gasoline vehicles. Electricity was multiplied by CO_2, CH_4, and N_2O electricity emission factors (see Table A-2) and gasoline was multiplied by fuel emission factors from the Climate Registry (The Climate Registry 2012). Table A-18 shows the estimated energy consumed by both vehicle types.

Table A-18. GHG Reductions from the Electric Vehicles Measure

Vehicle Type	Annual Miles Traveled	Vehicle Efficiency	Energy Consumption	GHG Emissions (MT CO_2e)	GHG Reductions (MT CO_2e)
Gasoline Vehicle	6,829[a]	25.5 miles per gallon[a]	268 gallons of gas	2.35[c]	-
Electric Vehicle	6,829[a]	3.52 miles per kWh[b]	1,940 kWh	0.43[d]	1.92[e]

[a] Estimated from County Data

[b] Assumes an electric car that uses 25 kWh per charge and can travel a distance of 88 miles per charge (MJ Business Communication n.d.)

[c] Assumes gasoline emission factors of 8.78 kilograms CO_2/gallon, 0.14 grams CH_4/liter, and 0.022 grams N_2O/liter (The Climate Registry 2012).

[d] Assumes electricity represented by the GHG emission factors found in Table A-1

[e] These are the reductions for one vehicle. The reductions for two vehicles would be 3.84 MT CO_2e.

A.2.5.4 Public Lighting

For the Public Lighting reduction measure, it was assumed that the County would replace its current public lighting with Metal Halide cobra-head streetlights. According to guidance from CAPCOA, such streetlights would result in improved efficiency of 35% (CAPCOA 2010). The electricity savings were

then multiplied by CO_2, CH_4, and N_2O electricity emission factors (see Table A-2). Table A-19 shows the electricity savings resulting from this measure.

Table A-19. Electricity Savings and GHG Reductions from the Public Lighting Measures

	Year	BAU Electricity Consumption (kWh)	MCAP Electricity Consumption (kWh)	Electricity Savings (kWh)	GHG Reductions (MT CO_2e)
Public Lighting (excluding traffic signals)	2005	250,856	250,856	-	-
	2020	260,216	169,140	91,076	20.38

A.2.5.5 Solar Aerator at Chualar Wastewater Treatment Plant

County staff expect the solar aerator at Chualar Wastewater Treatment Plant to offset 100% of electricity demand at the facility. GHG reductions were determined by multiplying the projected 2020 electricity consumption with CO_2, CH_4, and N_2O electricity emission factors (see Table A-2). Table A-20 shows the electricity consumption at Chualar WWTP in 2005 and 2020.

Table A-20. Annual Energy Savings and GHG Reductions from the Solar Aerator at Chualar WWTP

	Year	BAU Electricity Consumption (kWh)	MCAP Electricity Consumption (kWh)	Electricity Savings (kWh)	GHG Reductions (MT CO_2e)
Chualar WWTP	2005	28,874	28,874	-	-
	2020	31,761	0	31,761	7.11

A.3 Post-2020 Action Methodology

The calculations used to derive emissions reductions for the post-2020 actions are not as accurate as those used in the inventory and 2020 reduction analyses. In those analyses, actual data and projections, provided by the County, were used and give an approximate representation of how the County's employees, facilities and population will grow. For the post-2020 actions, reductions were based on emissions in 2050, which were projected using 2020 emissions and a linear extrapolation of the number of employees in 2005 and 2020. As a result, the post-2020 actions do not have the same level of accuracy as do the inventory and 2020 reduction measures.

A.3.1 Hypothetical Local Action #1: What if the County were able to obtain 50% of its 2050 electricity demand from on-site or nearby renewable sources?

Reductions from this action were measured against a 2050 baseline scenario where the County implements Scenario 3 of this MCAP and takes no further action post-2020. Electricity consumption in 2050 was estimated using 2005 consumption and a linear extrapolation of employee growth from

AMBAG's 2005-2035 regional forecast (Association of Monterey Bay Area Governments 2008). It was also assumed that PG&E will continue to obtain 33% (and not more) of their energy from renewable sources in 2050 (see emission factors in Table A-12). Table A-21 shows the County's electricity consumption in 2050, assuming no further action is taken after the MCAP, and the amount of PG&E's electricity to be supplied by renewables is 33%.

Table A-21. 2050 Electricity Consumption and Renewables Target

Target	Amount
2050 Electricity Consumption	22,080,837 kWh[a]
Electricity to be Supplied by Renewables (50%)	11,040,419 kWh
GHG Emissions Reduction	1,881 $MTCO_2e$

[a] Projected from electricity consumption in 2020 (with MCAP) using an 2020-2050 employee growth rate of 4.72%, developed from AMBAG's projections and using a linear extrapolation.

A.3.2 Hypothetical Local Action #2: What if 40% of County employees used alternative modes of transportation in their daily commutes in 2050

Reductions from this action were measured against a 2050 baseline scenario where the County implements Scenario 3 of this MCAP and takes no further action post-2020. Employee Commute emissions in 2050 were estimated using 2005 emissions and a linear extrapolation of employee growth from AMBAG's 2005-2035 regional forecast (Association of Monterey Bay Area Governments 2008). Using emissions per-passenger-mile estimates from the U.S. Department of Transportation for autos, buses, and vanpools, an approximate reduction percentage of bus and vanpool travel over auto travel was determined and applied to vehicle fleet emissions in 2050 (U.S. Department of Transportation 2009). Table A-22 shows the data used to determine reductions from Local Action #2.

Table A-22. Employee Commute Post-2020 Reductions

Emissions Datum	Amount
Pounds per CO_2 per Bus Passenger Mile[a]	0.65
Pounds per CO_2 per Vanpool Passenger Mile[a]	0.22
Average of Bus and Vanpool	0.44
Pounds per CO_2 per Auto Passenger Mile[a]	0.96
Percent Reduction of Bus/Vanpool over Auto	55%
2050 Employee Commute Emissions[b]	1,315
Emissions Reductions (w/ 55% reduction) ($MTCO_2e$)	288

[a] Source: U.S. Department of Transportation 2009

[b] Projected from Employee Commute emissions in 2020 using an 2020-2050 employee growth rate of 4.72%, developed from AMBAG's projections and using a linear extrapolation.

A.3.3 Hypothetical Local Action #3: What if 80% of the County's vehicle fleet were electric in 2050?

Reductions from this action were measured against a 2050 baseline scenario where the County implements Scenario 3 of this MCAP and takes no further action post-2020. Vehicle fleet emissions in 2050 were estimated using 2005 emissions and a linear extrapolation of employee growth from AMBAG's 2005-2035 regional forecast (Association of Monterey Bay Area Governments 2008). Using calculations from measure EV-1 of this MCAP, a CO_2 reduction percentage from using an electric vehicle over using a conventional vehicle was determined. This percentage was then applied to the vehicle fleet emissions. Table A-23 shows the data used to determine reductions from Local Action #3.

Table A-23. Vehicle Fleet Post-2020 Reductions

Emissions Datum	Amount
Non-Electric Vehicle Emissions (See Table A-17) (MT CO_2e)	2.35
Electric Vehicle Emissions (See Table A-17) (MT CO_2e)	0.43
Percent Reduction	82%
2050 Vehicle Fleet Emissions (MT CO_2e)	5,496
Emissions Reductions (w/ 82% reduction) (MT CO_2e)	3,586

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Appendix B

Local Government Operations Greenhouse Gas Emissions Inventory: 2005 Baseline Report

County of Monterey

Local Government Operations Greenhouse Gas Emissions Inventory:

2005 Baseline Report

Completed Fall, 2009
By the
AMBAG Energy Watch Regional Inventory Collaborative, in Accordance with the California Air Resources Board's Local Government Operations Protocol, Version 1.0

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AMBAG energy watch

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Executive Summary

The County of Monterey recognizes that local governments play a leading role in energy efficiency to reduce energy use and global warming emissions both in their own facilities and throughout their communities. Local governments can dramatically reduce the emissions from their government operations by such measures as increasing energy efficiency in facilities and vehicle fleets, utilizing renewable energy sources, sustainable purchasing, waste reduction, and supporting alternative modes of transportation for employees. The co-benefits of these measures may include lower energy bills, improved air quality, and more efficient government operations.

The County of Monterey has begun its efforts to address the causes and effects of climate change with the assistance of the partners in the AMBAG Energy Watch Regional Inventory Collaboration. These partners include the Association of Monterey Bay Area Governments (AMBAG) a membership association composed of the local governments in Monterey, San Benito, and Santa Cruz counties, Pacific Gas and Electric Company (PG&E), ICLEI-Local Governments for Sustainability USA, the support of the California Air Resources Board (CARB). This program was funded by the California utility customers and administered by Pacific Gas and Electric Company, under the auspices of the California Public Utilities Commission.

This greenhouse gas emissions inventory represents completion of an important first step for the County in its effort to address the issue of climate change. It is essential to first quantify emissions to establish:

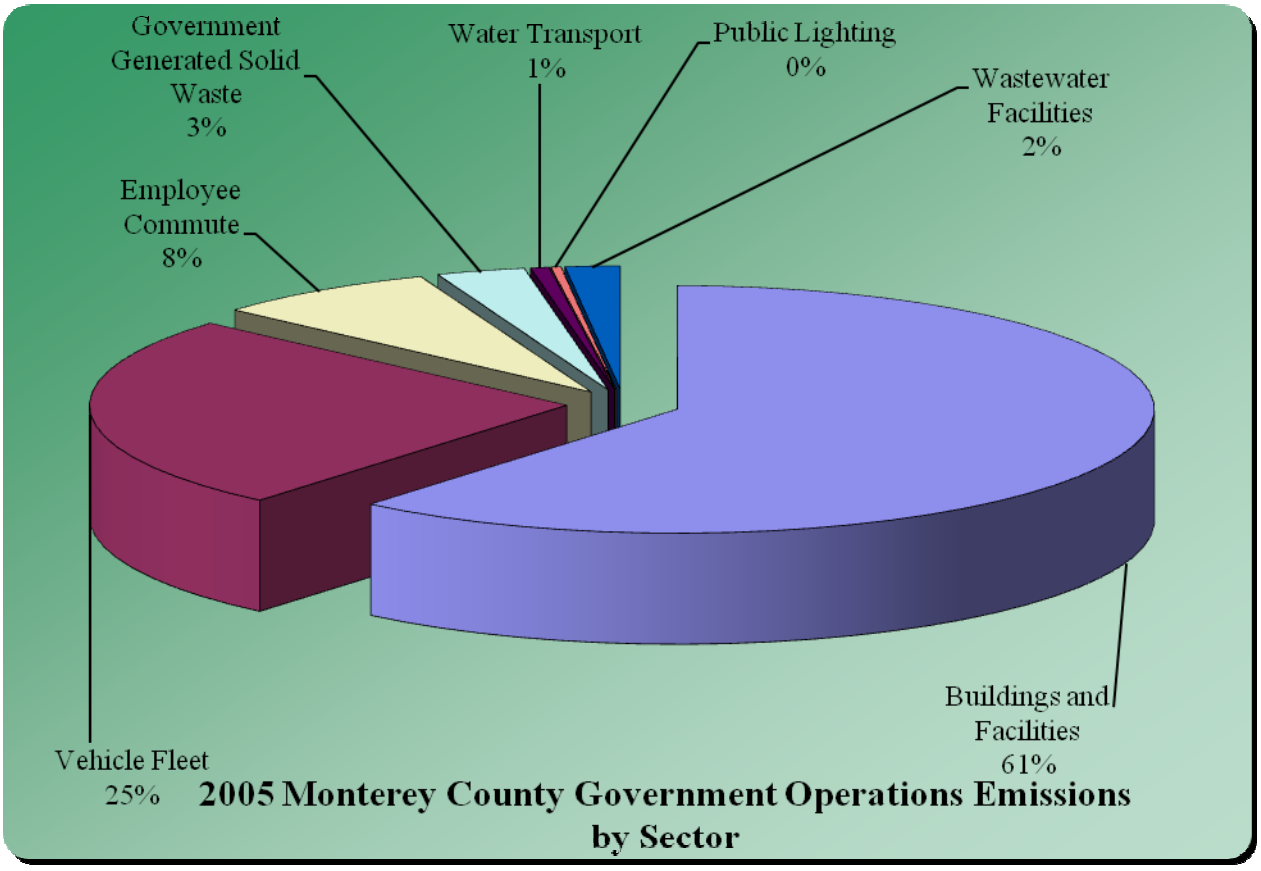
- A baseline emissions inventory, against which to measure future progress.
- An understanding of the scale of emissions from the various sources within government operations.

Presented here are estimates of greenhouse gas emissions in 2005 resulting from Monterey County's government operations. With one exception,[1] all emissions estimates in this report refer to emissions generated from sources over which The County of Monterey has direct operational control, exclusive of physical location.[2] This includes all government-operated facilities, streetlights, and other stationary sources; vehicle fleet and off-road equipment; and waste generated by government operations. The inventory *does not* estimate emissions from the larger community—these will be addressed in the community-scale greenhouse gas emissions inventory. Therefore, this inventory should be considered to be an independent analysis relevant only to The County of Monterey's internal operations.

1 The exception is emissions from employee-owned vehicles that are used by employees during commuting.
2 Facilities, vehicles, or other operations wholly or partially owned by, but not operated by, Monterey County are not included in this inventory. See Appendix A for more details on the boundaries of the inventory.

This inventory is one of the first inventories to use a new national standard developed and adopted by the California Air Resources Board (ARB) in conjunction with ICLEI, the California Climate Action Registry, and The Climate Registry. This standard, called the Local Government Operations Protocol (LGOP), provides standard accounting principles, boundaries, quantification methods, and procedures for reporting greenhouse gas emissions from local government operations. To that end, LGOP represents a strong step forward in standardizing how inventories are conducted and reported, providing a common national framework for all local governments to establish their emissions baseline. This and all emissions inventories represent an estimate of emissions using the best available data and calculation methodologies. Emissions estimates are subject to change as better data and calculation methodologies become available in the future. Regardless, the findings of this inventory analysis provide a solid base against which The County of Monterey can begin planning and taking action to reduce its greenhouse gas emissions.

Figure ES.1 County of Monterey 2005 Government Operations Emissions by Sector



Inventory Results

In 2005, The County of Monterey's direct emissions, emissions from electricity consumption, and select indirect sources totaled 21,461 metric tons of CO_2e.[3] Of the total emissions accounted for in this inventory, emissions from Buildings and Facilities were the largest (61 percent as shown in Figure ES.1 and Table ES.1). The emissions from the County's Vehicle Fleet were the next highest, totaling 25 percent of the emissions calculated in this inventory. The emissions from the County's Employee Commute were also significant, totaling 8 percent of the emissions calculated.

Cumulatively, The County of Monterey spent approximately $5,515,719 on energy for government operations in 2005. Of this total, approximately 66 percent of these energy expenses ($3,850,685) resulted from electricity consumption, and 7 percent ($383,546) from natural gas purchases from Pacific Gas and Electric (PG&E). Fuel purchases (gasoline and diesel) for the vehicle fleet, and mobile equipment totaled $1,498,778, or 27 percent of total costs included in this inventory. Beyond reducing greenhouse gases, any future reductions in municipal energy consumption will have the potential to reduce these costs, enabling The County of Monterey to reallocate limited funds toward other municipal services or create a revolving energy loan fund to support future climate protection activities.

Table ES.1: 2005 Monterey County Government Operations CO2e Emissions by Sector

Sector	Greenhouse Gas Emissions (metric tons CO_2e)
Buildings and Facilities	13,112
Vehicle Fleet	5,465
Employee Commute	1,635
Government Generated Solid Waste	643
Water Transport	133
Public Lighting	74
Wastewater Facilities	398
TOTAL	**21,461**

3 This number represents a "roll-up" of emissions, and is not intended to represent a complete picture of emissions from Monterey County's operations. This roll-up number should not be used for comparison with other local government roll-up numbers without a detailed analysis of the basis for this total.

Introduction

Local governments play a fundamental role in addressing the causes and effects of climate change through their actions at both the community and government operations levels. While local governments cannot solve the problems of climate change by themselves, their policies can dramatically reduce greenhouse gas emissions from a range of sources and can prepare their communities for the potential impacts of climate change.

Within the context of government operations, local governments have direct control over their emissions-generating activities. They can reduce energy consumption in buildings and facilities, reduce fuel consumption by fleet vehicles and equipment, reduce the amount of government-generated solid waste that is sent to a landfill, and increase the amount of energy that is obtained through alternative energy sources. By quantifying the emissions coming from its operations, this report will enable The County of Monterey to choose the most effective approach to reducing its impact on climate change.

1.1 Climate Change Background

A balance of naturally occurring gases dispersed in the Earth's atmosphere determines its climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence suggests that modern human activity is artificially intensifying the greenhouse gas effect, causing global average surface temperatures to rise. This intensification is caused by activities that release carbon dioxide and other greenhouse gases into the atmosphere—most notably the burning of fossil fuels for transportation, electricity, and heat generation.

Rising temperatures affect local and global climate patterns, and these changes have the potential to manifest themselves in a number of ways that might impact Monterey County. Changing temperatures may result in sea level rise, increased forest fires, increased droughts and damaging storms accompanied by flooding and landslides. Reduced snow pack in the Sierra Nevada Mountain Range may lead to water shortages, and the disruption of ecosystems and habitats is likely to occur.

In response to this threat, many communities in the United States are taking responsibility for addressing climate change at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around sustainable land use patterns, transportation demand management, energy efficiency, green building, and waste diversion, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of

emergency services and the mitigation of natural disaster impacts. As the effects of climate change become more common and severe, local government adaptation policies will be fundamental in preserving the welfare of residents and businesses.

1.2 Purpose of Inventory

The objective of this greenhouse gas emissions inventory is to identify the sources and quantities of greenhouse gas emissions resulting from government operations in Monterey County in 2005. This inventory is a necessary first step in addressing greenhouse gas emissions, serving two purposes:

- It creates an emissions baseline against which The County of Monterey can set emissions reductions targets and measure future progress.
- It allows local governments to understand the scale of emissions from the various sources within their operations.

1.3 Climate Change Mitigation Activities in California

In 2005, the State of California responded to growing concerns over the effects of climate change by adopting a comprehensive approach to addressing emissions in the public and private sectors. This approach was officially initiated with the passage of the Global Warming Solutions Act of 2006 (AB 32), which required the state to reduce its greenhouse gas emissions to 1990 levels by 2020. It also required the California Air Resources Board (CARB) to regularly inventory emissions at the state level and to create a plan for reducing these emissions. The bill authorized ARB to adopt and enforce regulations targeted at greenhouse gas emissions reductions in the public and private sectors.

The resulting AB 32 Scoping Plan was adopted by ARB in December 2008. It established the following measures that the State will take to meet the greenhouse gas emissions reduction targets:

- Develop a California cap-and-trade program
- Expand energy efficiency programs
- Establish and seek to achieve reduction targets for transportation-related GHG emissions
- Support implementation of a high-speed rail system
- Expand the use of green building practices
- Increase waste diversion, composting, and commercial recycling toward zero-waste
- Continue water efficiency programs and use cleaner energy sources to move and treat water
- Implement the Million Solar Roofs Programs

- Achieve a statewide renewable energy mix of 33 percent
- Develop and adopt the low-carbon fuel standard
- Implement vehicle efficiency measures for light-, medium-, and heavy-duty vehicles
- Adopt measures to reduce high global warming potential gases
- Reduce methane emissions at landfills
- Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation
- Capture of methane through use of manure digester systems at dairies

Other measures taken by the state have included mandating stronger vehicle emissions standards (AB 1493, 2002), establishing a low-carbon fuel standard (EO # S-01-07, 2007), mandating a climate adaptation plan for the state (S-EO # 13-08, 2008), establishing a Green Collar Job Council, and establishing a renewable energy portfolio standard for power generation or purchase in the state. The state also has made a number of changes that will likely have potentially large effects on local governments:

- SB 97 (2007) required the Office of Planning and Research to create greenhouse gas planning guidelines for the California Environmental Quality Act (CEQA). In addition, ARB is tasked with creating energy-use and transportation thresholds in CEQA reviews, which may require local governments to account for greenhouse gas emissions when reviewing project applications.
- AB 811 (2007) authorized all local governments in California to establish special districts that can be used to finance solar or other renewable energy improvements to homes and businesses in their county.
- SB 732 (2008) established a Strategic Growth Council charged with coordinating policies across state agencies to support a unified vision for land use development in the state. This vision will serve as a reference point for local land use policies.
- SB 375 (2008) mandated the creation of regional sustainable community strategies (SCS) by regional planning agencies. The SCS links regional housing and transportation planning processes in an attempt to meet regional greenhouse gas emissions targets.

1.4 The AMBAG Energy Watch Regional Greenhouse Gas Inventory Collaborative

The AMBAG Energy Watch Regional Inventory Collaborative was established in May, 2009 to provide a foundation for the implementation of the Local Government Operations Protocol (LGOP), the official methodology for reporting emissions to the California Air Resource Board (CARB). The partnership aims to:

- Work together as a region to establish a baseline greenhouse gas inventory for 100% of the jurisdictions within the AMBAG region by December, 2009. Three of these jurisdictions already had reporting systems in place prior to the development of this program.

- Implement a successful collaboration as a region so that we can duplicate this model to complete the Community Protocol, to be developed by CARB in 2010.

- Build capacity within jurisdictions by training staff to gather and condition source data, calculate emissions, and complete the official reporting template for CARB.

- Provide green job training at a very high skill level to graduate students so that they will be better able to serve the region and the state as professionals upon graduation.

- Complete the work in a 3.5 month time period to remain within semester time period constraints of the students completing the work. While aggressive, this time frame was successfully met.

- Complete the work at no charge to any of the participating jurisdictions.

- Take advantage of economies of scale for cost-effectiveness by working with all jurisdictions simultaneously.

Methodology

This greenhouse gas emissions inventory follows the standard methodology outlined in LGOP, which was adopted in 2008 by ARB and serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. By participating in the AMBAG Regional Inventory Collaboration, The County of Monterey has the opportunity to be one of the first in the nation to follow LGOP when inventorying emissions from government operations.

This chapter outlines the basic methodology utilized in the development of this inventory to provide clarity with regards to how the inventory results were reported. Specifically, this section reviews:

- What greenhouse gases were measured in this inventory.
- What general methods were used to estimate emissions.
- How emissions estimates can be reported (the scopes framework, roll-up numbers).
- How emissions estimates were reported in this inventory.

A more detailed account of LGOP and the methodology used in this inventory can be found in Appendices A and B.

2.1 Greenhouse Gases

According to LGOP, local governments should assess emissions of all six internationally recognized greenhouse gases regulated under the Kyoto Protocol. These gases are outlined in Table 2.1, which includes the sources of these gases and their global warming potential (GWP).[4]

Table 2.1 Greenhouse Gases

Gas	Chemical Formula	Activity	Global Warming Potential (CO_2e)
Carbon Dioxide	CO_2	Combustion	1
Methane	CH_4	Combustion, Anaerobic Decomposition of Organic Waste (Landfills, Wastewater), Fuel Handling	21
Nitrous Oxide	N_2O	Combustion, Wastewater Treatment	310
Hydrofluorocarbons	Various	Leaked Refrigerants, Fire Suppressants	12–11,700
Perfluorocarbons	Various	Aluminum Production, Semiconductor Manufacturing, HVAC Equipment Manufacturing	6,500–9,200
Sulfur Hexafluoride	SF_6	Transmission and Distribution of Power	23,900

4 Global warming potential (GWP) is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide.

2.2 Calculating Emissions

LGOP outlines specific methods for quantifying emissions from local government activities. What methods a local government can use to quantify emissions vary largely by how it gathers data, and therefore what data were available. In general, emissions can be quantified in two ways.

1. Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions from a monitoring system. Emissions measured this way may include those emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility. This method is the most accurate way of inventorying emissions from a given source, but is generally available for only a few sources of emissions.

2. Calculation-based methodologies refer to an estimate of emissions calculated based upon some measurable activity data and emission factors. Table 2.2 demonstrates some examples of common emissions calculations in this report. For a detailed explanation of the methods an emissions factors used in this inventory, see Appendix B.

Table 2.2 Basic Emissions Calculations

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kilowatt hours)	CO_2 emitted/kWh	CO_2 emitted
Natural Gas Consumption (therms)	CO_2 emitted/therm	CO_2 emitted
Gasoline/Diesel Consumption (gallons)	CO_2 emitted /gallon	CO_2 emitted
Waste Generated by Government Operations (tons)	CH_4 emitted/ton of waste	CH_4 emitted

2.3 Reporting Emissions

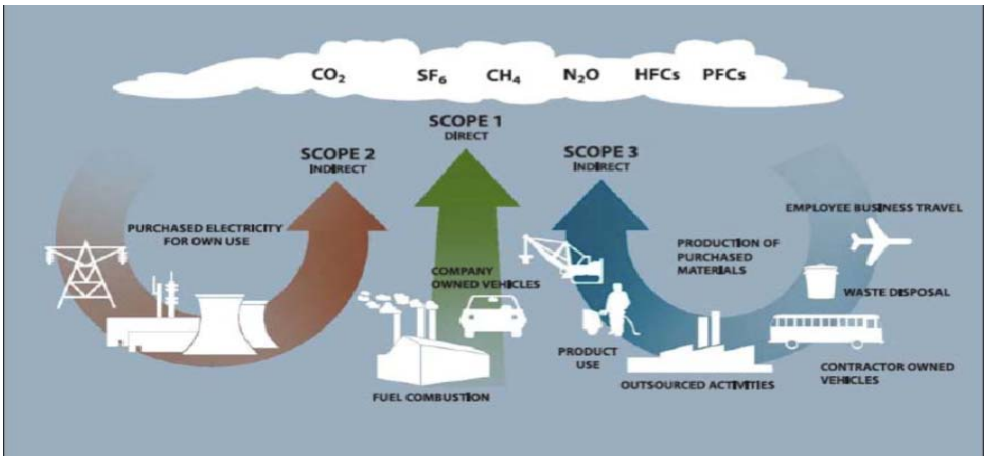
LGOP provides two reporting frameworks: reporting by scope and reporting by sector. This section defines the two reporting frameworks and discusses how they are used in this inventory. It also discusses the concept of "rolling up" emissions into a single number. This can assist local governments in communicating the results of the inventory and using the inventory to formulate emissions reductions policies.

2.3.1 The Scopes Framework

For local government operations, LGOP categorizes emissions according to what degree of control local governments have over the emissions sources. These categorizations (developed by the World Resources Institute and the World Business Council for Sustainable Development) are called *emissions scopes.* The scopes framework helps local governments to:

- Determine which emissions should be inventoried.
- Organize emissions by degree of control and therefore the potential for reduction of these emissions.
- Avoid "double counting" of emissions, i.e., summing up of different emissions sources that may result in reporting these emissions twice.

Figure 2.1 Emissions Scopes



Source: WRI/WBCSD GHG Protocol Corporate Accounting and Reporting Standard (Revised Edition), Chapter 4.

The emissions scopes are defined as follows:

Scope 1: Direct emissions from sources within a local government's operations that it owns and/or controls. This includes stationary combustion to produce electricity, steam, heat, and power equipment; mobile combustion of fuels; process emissions from physical or chemical processing; fugitive emissions that result from production, processing, transmission, storage and use of fuels; leaked refrigerants; and other sources.

Scope 2: Indirect emissions associated with the consumption of electricity, steam, heating, or cooling that are purchased from an outside utility.

Scope 3: All other emissions sources that hold policy relevance to the local government that can be measured and reported. This includes all indirect emissions not covered in Scope 2 that occur as a result of activities within the operations of the local government. Sources over which the local government does not have any financial or operational control over would be accounted for here. Scope 3 emission sources include (but are not limited to) tailpipe emissions from employee commutes, employee business travel, and emissions resulting from the decomposition of government-generated solid waste.

Table 2.3 Inventoried Emission Sources by Scope[5]

Scope 1	Scope 2	Scope 3
Fuel consumed to heat/cool facilities	Purchased electricity consumed by facilities	Solid waste generated by government operations
Fuel consumed for vehicles and mobile equipment	Purchased electricity consumed by electric vehicles	Fuel consumed for employee vehicles used for commuting
Fuel consumed to generate electricity	Purchased steam for heating or cooling facilities	
Leaked refrigerants from facilities and vehicles		
Leaked/deployed fire suppressants		
Wastewater decomposition and treatment at a municipal wastewater treatment plant		
Solid waste in government landfills		

2.3.2 Double Counting and Rolling Up Scopes

Many local governments find it useful for public awareness and policymaking to use a single number (a "roll-up" number) to represent emissions in its reports, target setting, and action plan. A roll-up number allows local governments to determine the relative proportions of emissions from various sectors (e.g., 30 percent of rolled up emissions came from the vehicle fleet). This can help policymakers and staff identify priority actions for reducing emissions from their operations.

For these reasons, this report includes a roll-up number as the basis of the emissions analysis in this inventory. This roll-up number is composed of direct emissions (Scope 1), all emissions from purchased electricity (Scope 2), and indirect emissions from employee commutes and government-generated solid waste (Scope 3).

While this report uses a standard roll-up number, these numbers should be used with caution, as they can be problematic for three reasons:

First, a roll-up number does not represent all emissions from The County of Monterey's operations, only a summation of inventoried emissions using available estimation methods. Reporting a roll-up number can be misleading and encourage citizens, staff, and policymakers to think of this number as the local government's "total" emissions. Therefore, when communicating a roll-up number it is important to represent it only as a sum of inventoried emissions, not as a comprehensive total.

Second, rolling up emissions may not simply involve adding emissions from all sectors, as emissions from different scopes can be double-counted when they are reported as one number. For example, if a local government operates a municipal utility that provides electricity to government facilities, these are emissions from both the power

5 This only represents a list of emissions that were inventoried for the AMBAG Regional Inventory Collaborative. This is not meant to be a complete list of all emissions that can be inventoried in a government operations inventory.

generation and facilities sectors. If these sectors are rolled up into a single number, these emissions are double counted, or reported twice. For these reasons, it is important to be cautious when creating a roll-up number to avoid double counting; the roll-up number used in this report was created specifically to avoid any possible double counting.

Third, local governments often wish to compare their emissions to those of other local governments. But it is very difficult to use a roll-up number as a common measure between local governments, for a number of reasons. First, as of now there is no national or international standard for reporting emissions as a single roll-up number. In addition, local governments provide different services to their citizens, and the scale of the services (and thus the emissions) is highly dependent upon the size of the jurisdiction. For these reasons, comparisons between local government roll-up numbers should not be made without significant analysis of the basis of the roll-up number and the services provided by the local governments being compared.

2.3.3 Emissions Sectors

It is recommended that local governments examine their emissions in the context of the part of their operations (sector) that is responsible for those emissions. This is helpful from a policy perspective, and will assist local governments in formulating sector-specific reduction measures and climate action plans. This inventory uses LGOP sectors as a main reporting framework, including the following sectors:

- Buildings and other facilities
- Streetlights, traffic signals, and other public lighting
- Water delivery facilities
- Wastewater facilities
- Vehicle fleet and mobile equipment
- Government-generated solid waste
- Emissions from employee commutes

Inventory Results

This chapter provides a detailed description of The County of Monterey's emissions from government operations in 2005, rolling up and comparing emissions across sectors and sources as appropriate. This chapter also provides details on the greenhouse gas emissions from each sector, including a breakdown of emissions types and, where possible, an analysis of emissions by department. This information identifies more specific sources of emissions (such as a particular building) that can help staff and policymakers in Monterey County to best target emissions reduction activities in the future.

For a report of emissions by scope, and a detailed description of the methodology and emission factors used in calculating the emissions from Monterey County's operations, please see Appendix B: LGOP Standard Report.

In 2005, Monterey County's direct emissions, emissions from electricity consumption and select indirect sources totaled 21,461 metric tons of CO_2e.[6] In this report, this number is the basis for comparing emissions across sectors and sources (fuel types), and is the aggregate of all emissions estimates used in this inventory.

3.1 Summary by Sector

Reporting emissions by sector provides a useful way to understand the sources of The County of Monterey's emissions. By better understanding the relative scale of emissions from each of the sectors, Monterey County can more effectively focus emissions reductions strategies to achieve the greatest emissions reductions.[7]

As shown in Figure 3.1, Buildings and Facilities was the largest emitter (13,112 metric tons CO_2e) in 2005. Emissions from Vehicle Fleet produced the second highest quantity of emissions, resulting in 5,465metric tons of CO_2e. The County of Monterey's Employee Commute produced 1,635 metric tons of CO_2e of total emissions with the remainder coming from Government Generated Waste, Water Transport, Public Lighting, and Wastewater Facilities.

6 This number represents a roll-up of emissions, and is not intended to represent a complete picture of emissions from Monterey County's operations. This roll-up number should not be used for comparison with other local government roll-up numbers without a detailed analysis of the basis for this total. See section 2.3.2 for more detail.

7 The sectors with the largest scale of emissions do not necessarily represent the best opportunity for emissions reductions. Cost, administration, and other concerns may affect Monterey County's ability to reduce emissions from any one sector.

Figure 3.1 year County of Monterey Government Operations Emissions by Sector

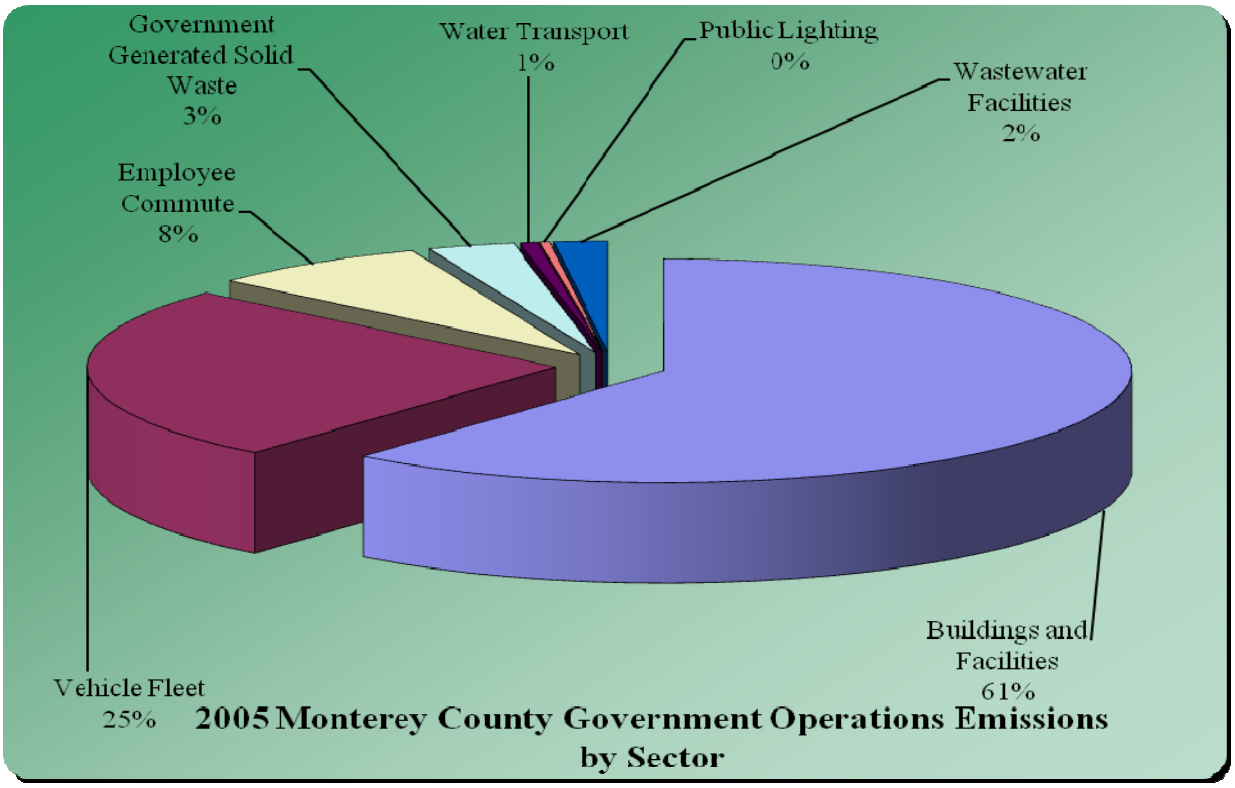


Table 3.1: 2005 Monterey County Government Operations CO2e Emissions by Sector

Sector	Greenhouse Gas Emissions (metric tons CO_2e)
Buildings and Facilities	13,112
Vehicle Fleet	5,465
Employee Commute	1,635
Government Generated Solid Waste	643
Water Transport	133
Public Lighting	74
Wastewater Facilities	398
TOTAL	**21,461**

3.2 Summary by Source

When considering how to reduce emissions, it is helpful to look not only at which sectors are generating emissions, but also at the specific raw resources and materials (gasoline, diesel, electricity, natural gas, solid waste, etc.) whose use and generation directly result in the release of greenhouse gases. This analysis can help target resource management in a way that will successfully reduce greenhouse gas emissions. Table 3.2 and Figure 3.2 provide a summary of Monterey County's government operations 2005 greenhouse gas emissions by fuel type or material.

Figure 3.2 2005 Monterey County Government Operations Emissions by Source

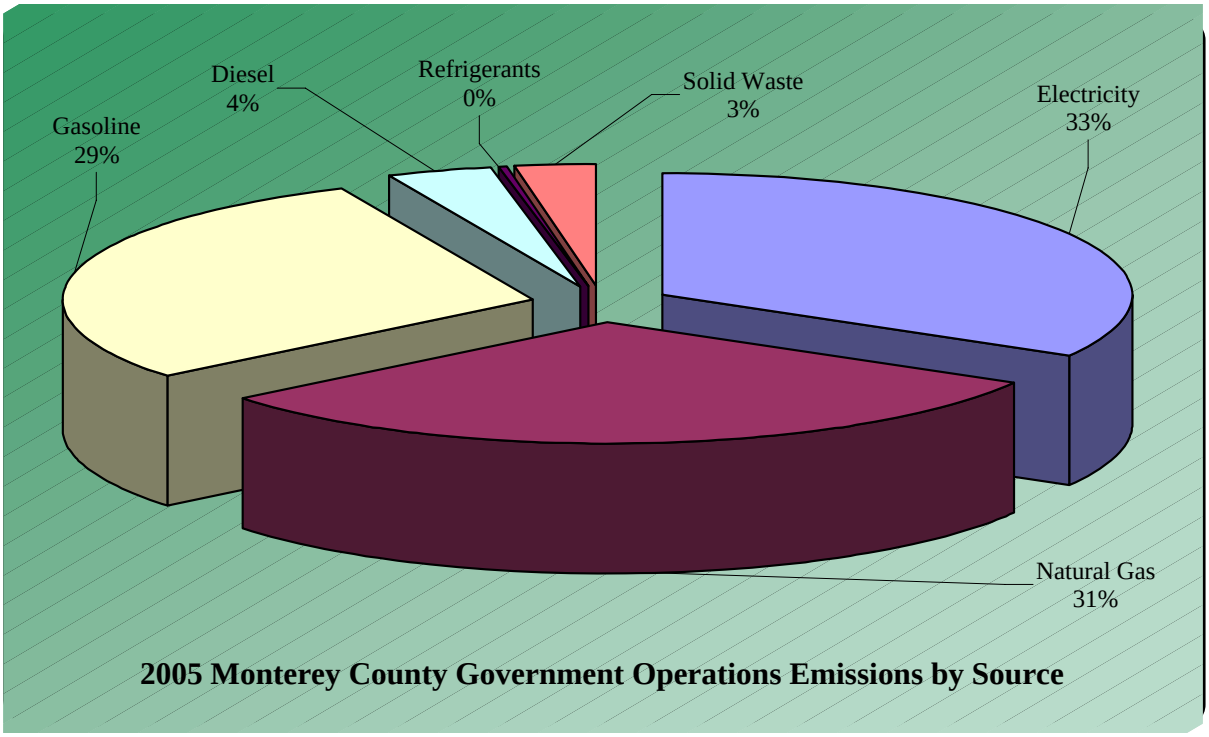


Table 3.2: 2005 Monterey County Government Operations Emissions by Source

Source	Greenhouse Gas Emissions (metric tons CO_2e)
Electricity	6,790
Natural Gas	6,593
Gasoline	6,294
Diesel	806
Refrigerants	335
Solid Waste	643
TOTAL	**21,461**

3.3 Summary of Energy-Related Costs

In addition to tracking energy consumption and generating estimates on emissions per sector, AMBAG has calculated the basic energy costs of various government operations. During 2005, The County of Monterey spent approximately $5,515,719 on energy (e.g., electricity, natural gas, gasoline, and diesel) for its operations. 73 percent of these energy expenses ($4,016,941) are the result of electricity and natural gas purchases from PG&E. The County of Monterey spent approximately $1,498,778 on gasoline and diesel for the municipal fleet (27 percent of total costs). Beyond reducing harmful greenhouse gases, any future reductions in energy use will have the potential to reduce these costs, enabling the County to reallocate limited funds toward other municipal services or create a revolving energy loan fund to support future climate protection activities.

Table 3.3: 2005 Monterey County Energy Costs by Sector

Sector	Cost ($)
Buildings and Facilities	$3,850,302
Vehicle Fleet	$1,498,778
Water Transport	$85,648
Public Lighting	$40,645
Wastewater Facilities	$40,346
TOTAL	**$5,515,719**

3.4 Detailed Sector Analyses

3.4.1 Buildings and Other Facilities

Through their use of energy for heating, cooling, lighting, and other purposes, buildings and other facilities operated by local governments constitute a significant amount of their greenhouse gas emissions. The County of Monterey operates approximately 32 facilities, including Natividad Medical Center, which accounts for a significant portion of the total energy costs and greenhouse gas emissions from the County's Buildings and Facilities Sector. Facility operations contribute to greenhouse gas emissions in two major ways. First, facilities consume electricity and fuels such as natural gas and diesel, and this consumption constitutes the majority of greenhouse gas emissions from facilities. In addition, fire suppression, air conditioning, and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) and other greenhouse gases when these systems leak refrigerants or fire suppressants.

In 2005, the operation of the County of Monterey's facilities produced approximately 13,112 metric tons of CO_2e from the above sources. Table 3.4 shows estimated costs associated with the activities that generated these emissions, and Figure 3.3 depicts 2005 emissions per facility. Of total facility emissions, 52 percent came from the consumption of electricity, 48 percent came from the combustion of natural gas (see Figure 3.4). The County of Monterey spent approximately $4,059,102 in 2005 on the fuels and electricity that were the cause of these emissions.

Figure 3.3: Emissions from Major Facilities

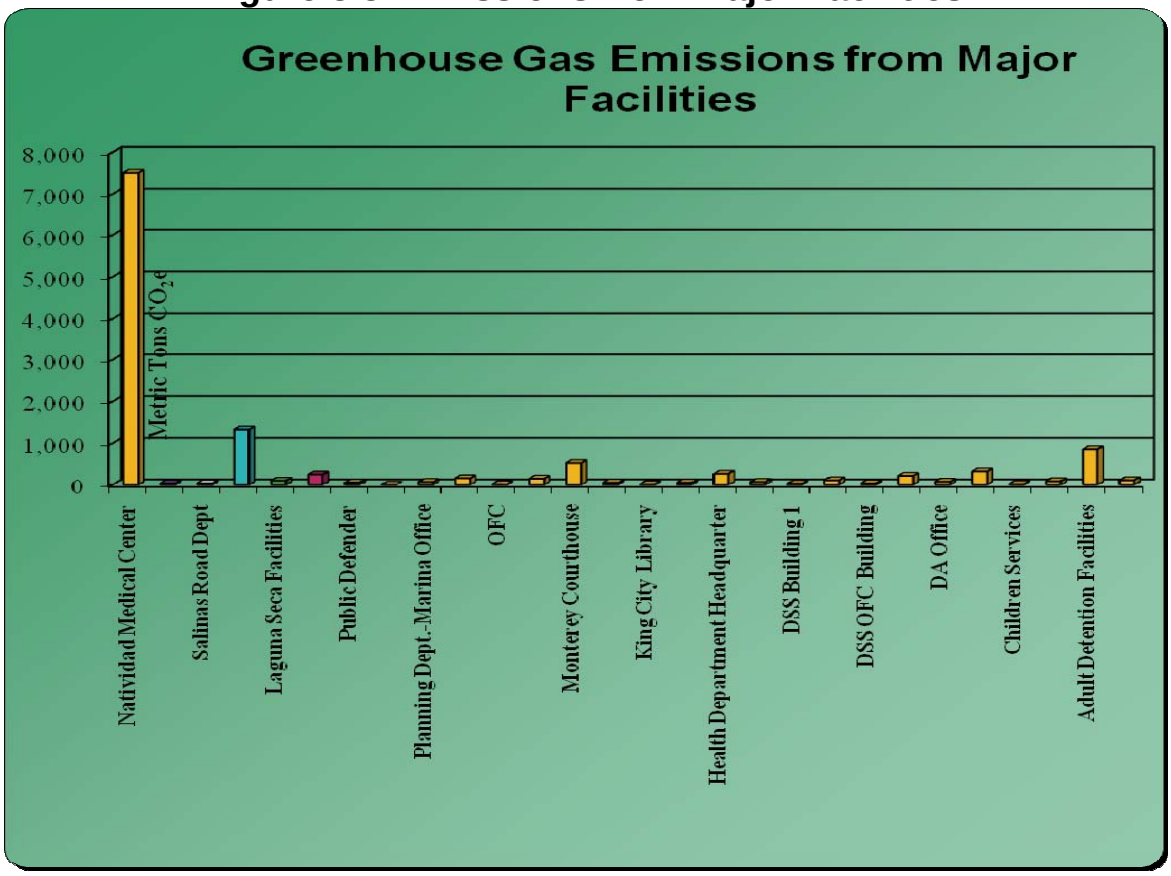


Figure 3.4: Emissions from Major Facilities by Source

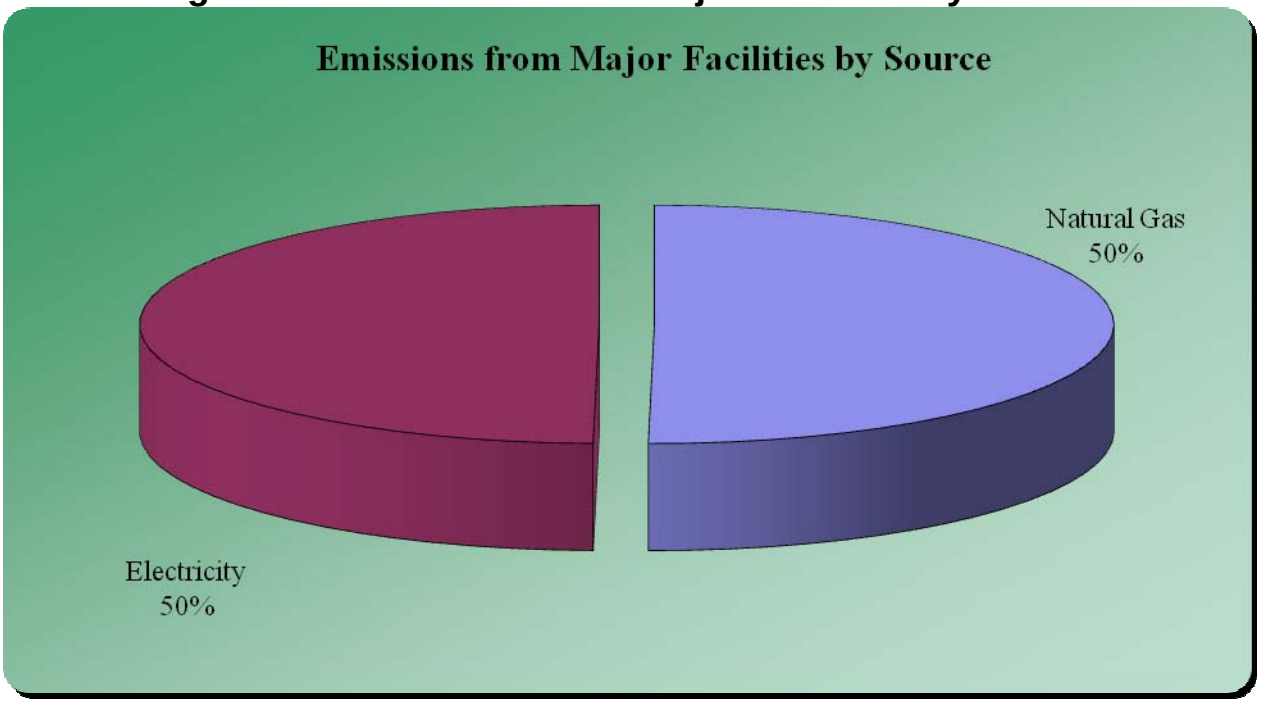


Table 3.4: Energy Use and Emissions from Major Facilities

Facility	Greenhouse Gas Emissions (metric tons CO_2e)	Percent Emissions of Total Facilities	Electricity Use (kWh)	Natural Gas Use (therms)	Cost ($)
Natividad Medical Center	7,508	57%	11,286,374	936,786	$1,203,639
Seaside Library	30	0%	101,400	1,429	$16,592
Salinas Road Dept	34	0%	61,680	3,741	$13,294
Salinas Courthouse	1,327	10%	3,655,551	95,758	$593,482
Laguna Seca Facilities	97	1%	433,078		$56,426
Public Safety Building	248	2%	1,110,154	0	$142,824
Public Defender	53	0%	142,240	3,899	$23,213
Printing and Mail OPS OFC	1	0%	2,520	0	$1,049
Planning Dept.- Marina Office	65	0%	190,640	4,200	$28,756
Parks Department Office	156	1%	92,400	25,467	$44,325
OFC	11	0%	48,569	109	$7,191
NMC office building	146	1%	651,680		$86,334
Monterey Courthouse	527	4%	1,203,261	48,408	$216,140
Marina Court Building	48	0%	105,840	4,597	$19,957
King City Library	13	0%	56,960		$7,584
KCCH	48	0%	139,440	3,253	$23,353
Health Department Headquarter	267	2%	576,160	25,942	$110,774
DSSS	66	1%	209,360	3,532	$30,621
DSS Building 1	25	0%	49,440	2,580	$10,721

DSS Office Buildings	106	1%	370,240	4,438	$57,297
DSS OFC Building	34	0%	117,040	1,473	$19,400
Detention Center	215	2%	377,280	24,541	$78,721
DA Office	71	1%	249,600	2,824	$39,456
County Communication Network Facility	324	2%	1,382,699	2,795	$163,940
Children Services	14	0%	61,028		$9,279
Ag Services	84	1%	214,400	6,741	$38,272
Adult Detention Facilities	853	7%	3,811,833		$397,375
911 Call Center	109	1%	487,680	0	$63,654
Minor Facilities	633	5%	1,994,991	35,100	$346,633
TOTAL	**13,112**	**100%**	**27,188,547**	**1,202,513**	**$3,503,669**

3.4.2 Streetlights, Traffic Signals, and Other Public Lighting

Like most local governments, The County of Monterey operates a range of public lighting, from traffic signals and sidewalk lighting to park lights. Electricity consumed in the operation of this infrastructure is a significant source of greenhouse gas emissions.

In 2005, public lighting in the county consumed a total of 333,009 kilowatt hours of electricity, producing approximately 74 metric tons of CO_2e. Table 3.5 depicts 2005 emissions per lighting type and estimated electricity consumption and costs associated with the activities that generated these emissions. The County of Monterey spent approximately $40,645 in 2005 on the fuels and electricity that were the cause of these emissions.

Table 3.5: Electricity Use and Total Emissions from Public Lighting

Source	Greenhouse Gas Emissions (metric tons CO_2e)	Percent Emissions of Total Public Lighting	Electricity Use (kWh)	Cost of Electricity ($)
Park Lighting	18	25%	188,066	$12,286
Traffic Signal Controllers	10	14%	82,153	$5,337
Streetlight	4	5%	46,420	$2,981
Other Lighting (Flashers, Parking, Security, etc)	42	56%	16,370	$20,041
TOTAL	**74**	**100%**	**333,009**	**$40,645**

3.4.3 Water Transport

This section addresses any equipment used for the distribution of water and stormwater.[8] Typical systems included in this section are water pumps/lifts and sprinkler and other irrigation controls.[9] The County of Monterey operates a range of water transport equipment. Electricity consumption and the on-site combustion of fuels such as natural gas are the most significant sources of greenhouse gas emissions from the operation of the County's water transport equipment.

In 2005, the operation of Monterey County's water transport equipment produced approximately 133 metric tons of CO_2e from the above sources. Table 3.6 depicts 2005 emissions per equipment type and shows estimated activities and costs associated with the operation of this equipment. The County of Monterey spent approximately $85,648 in 2005 on the fuels and electricity that were the cause of these emissions.

8 While equipment that transports water and stormwater may be managed separately in Monterey County's operations, the types of equipment are similar, and therefore the ways to reduce emissions from this equipment, are similar. For this reason, this section groups equipment used for transporting water and stormwater.

9 This section does not include emissions from decomposition or processing of wastewater in wastewater treatment facilities. These emissions are included in Section 3.4.4

Table 3.6: Electricity Use and Total Emissions from Water Transport Equipment

Source	Greenhouse Gas Emissions (metric tons CO_2e)	Percent Emissions of Total Water Transport	Electricity Use (kWh)	Cost of Electricity ($)
Water Delivery Pumps	117	88%	493,197	$74,735
Sprinklers/Irrigation Control	8	6%	37,125	$6,027
Other Water Transport Infrastructure	8	6%	23,529	$4,886
TOTAL	**133**	**100%**	**553,851**	**$85,648**

3.4.4 Wastewater Facilities

Wastewater coming from homes and businesses is rich in organic matter and has a high concentration of nitrogen and carbon (along with other organic elements). As wastewater is collected, treated, and discharged, chemical processes in aerobic and anaerobic conditions lead to the creation and emission of two greenhouse gases: methane and nitrous oxide. Local governments that operate wastewater treatment facilities, including wastewater pumps, treatment plants, septic systems, collection lagoons, and other facilities, must therefore account for the emission of these gases in their overall greenhouse gas emissions inventory.[10]

The County of Monterey owns and operates several Wastewater Facilities, which do not process the wastewater but rather pump it to treatment facilities operated by JPA's not covered by this inventory. In 2005, the operation of these wastewater pumping facilities produced approximately 398 metric tons of CO_2e from the above sources. Figure 3.5 and Table 3.7 break down emissions by facility. Of total wastewater facility emissions, 23 percent came from the San Antonio-North Lockwood facility, 19 percent came from the Hall Road-Watsonville, and 18 percent came from the Salinas Road-Watsonville facility. The County of Monterey spent approximately $40,346 in 2005 on the fuels and electricity that were the cause of these emissions.

10 These emissions should not be confused with the emissions described in Section 3.4.3—those emissions refer to the *transportation* of water and stormwater while this section refers exclusively to the decomposition and treatment of wastewater.

Figure 3.5: Wastewater Facility Emissions

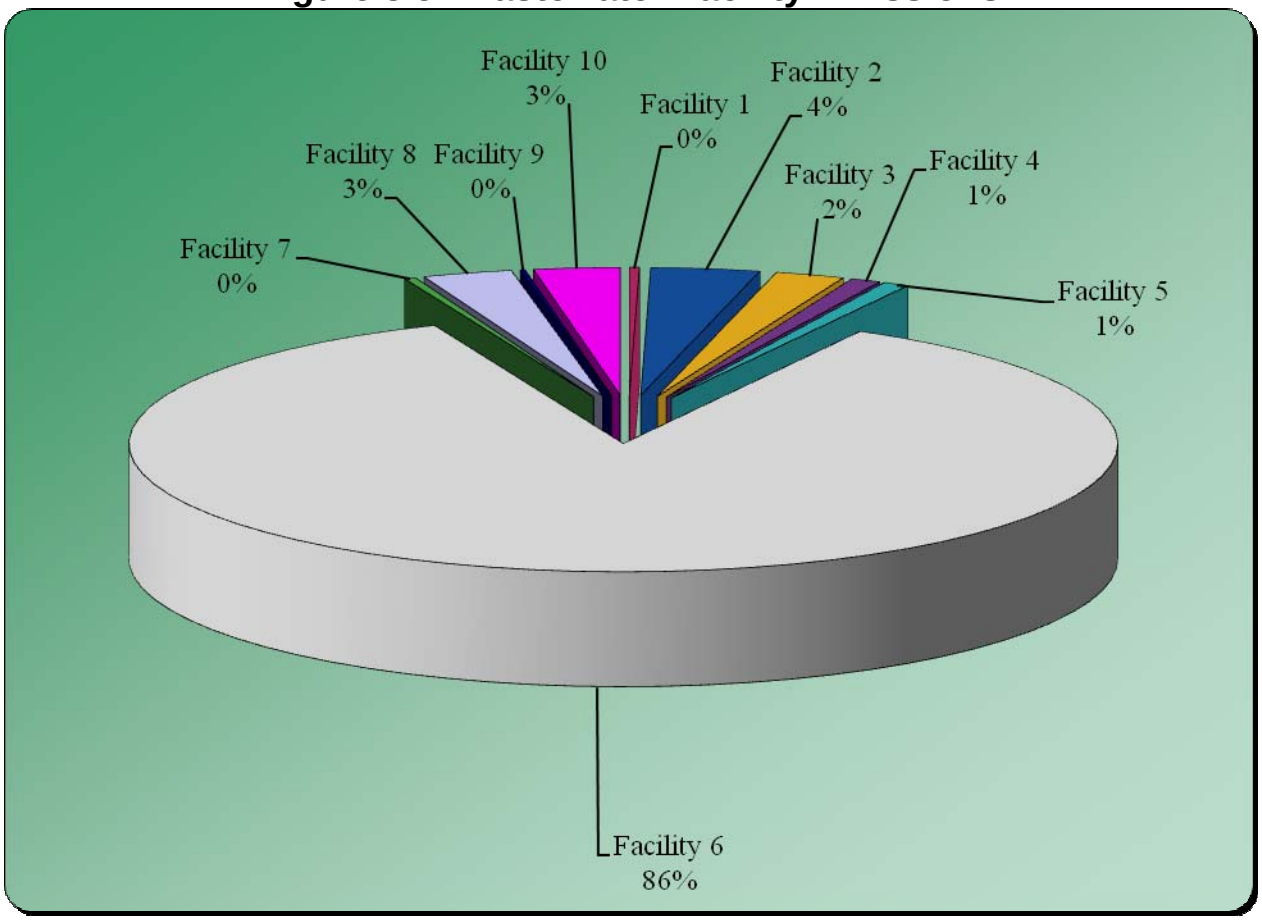


Table 3.7: Wastewater Emissions by Facility

Facility	Facility Location	Greenhouse Gas Emissions (metric tons CO_2e)	Percent Emissions of All Facilities	Methane Emissions (metric tons CH4)	Nitrous Oxide Emissions (metric tons N20)	Electricity Use (kWh)	Natural Gas Use (therms)	Total Energy Cost
Facility 1	12890 Via Linda, Castroville	1.29	2%	0.00	0.00	5486	12	$972
Facility 2	San Antonio-North, Lockwood	14.13	22%	0.00	0.00	63154	0	$10,595
Facility 3	San Antonio-South, Bradley	9.00	14%	0.00	0.00	40210	0	$5,373
Facility 4	Struve Rd, Watsonville	3.89	6%	0.00	0.00	17377	0	$2,702
Facility 5	Campo De Casa Dr, Castroville	3.35	5%	0.00	0.00	14982	0	$2,395
Facility 6	Chualar Sanitation, Chualar	6.46	10%	0.00	0.00	28874	0	$4,590
Facility 7	Del Monte Ave, Castroville	1.42	2%	0.00	0.00	6364	0	$1,082
Facility 8	Hall Rd, Watsonville	11.64	18%	0.00	0.00	52040	0	$6,404
Facility 9	Oak Rd, Watsonville	0.62	1%	0.00	0.00	2760	0	$475
Facility 10	Salinas Rd, Watsonville	11.17	18%	0.00	0.00	49928	0	$5,758
TOTAL		**398**	**100%**	**0.00370463**	**0.001403047**	**281,175**	**12**	**$40,346**

3.4.7 Vehicle Fleet and Mobile Equipment

The majority of local governments use vehicles and other mobile equipment as an integral part of their daily operations—from maintenance trucks used for parks and recreation to police cruisers and fire trucks. These vehicles and equipment burn gasoline, diesel, and other fuels, which results in greenhouse gas emissions. In addition, vehicles with air conditioning or refrigeration equipment use refrigerants that can leak from the vehicle. Emissions from vehicles and mobile equipment compose a significant portion of emissions within most local governments.

In 2005, The County of Monterey operated a vehicle fleet with 1,224 vehicles (i.e.-passenger cars, trucks, vans, patrol cars, motorcycles, etc.) and 48 pieces of mobile construction equipment (i.e.-graders, dozers, backhoes, pavers, cranes, etc.). Monterey County's vehicle fleet performed a number of essential services, from public safety and employee transportation to road maintenance and construction. The County's vehicle fleet was responsible for 25 percent of the total greenhouse gas emissions calculated in this report.

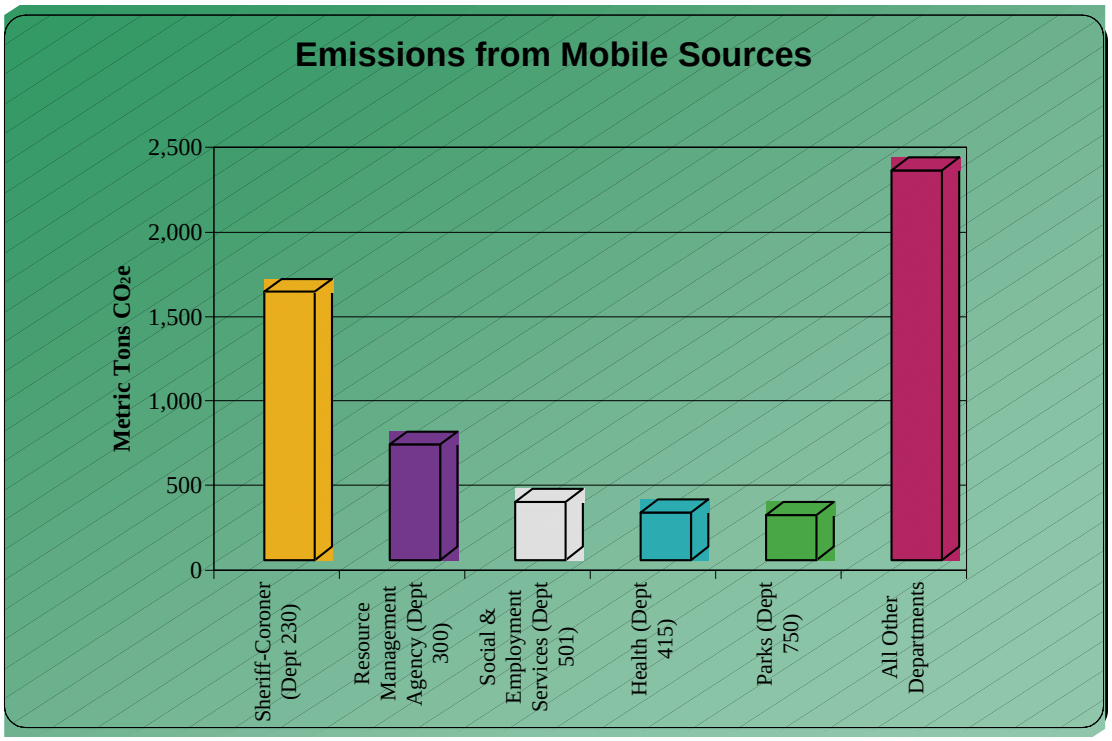
In 2005, The County of Monterey emitted approximately 5,465 metric tons of CO_2e as a result of the combustion of fuels to power the County's vehicle fleet.[11] Table 3.8 shows estimated costs associated with the activities that generated these emissions, and Figure 3.6 depicts 2005 emissions by department. Across departments, the vehicles used by Department 230 (Sheriff-Coroner) were the largest emitters of greenhouse gases, representing 29% percent of total vehicle fleet emissions. Across all government operations, emissions from mobile sources represented 25 percent of all inventoried emissions from The County of Monterey's operations in 2005. Of total mobile emissions, 89 percent came from the consumption of gasoline, 11 percent came from the combustion of diesel, and less than 1 percent came from leaked mobile refrigerants. The County of Monterey spent approximately $1,498,778 in 2005 on the fuels that were the cause of these emissions.

11 Since electric vehicles are charged through facilities using energy provided by utility, it is impossible to distinguish the electricity used for electric vehicles from that of the facilities where they are charged. For this reason, all Scope 2 purchased electricity used to charge electric vehicles operated by Monterey County's is included in the discussion of Scope 2 purchased electricity in the facility where the vehicles are charged.

Table 3.8: Vehicle Fleet and Mobile Equipment Emissions

Function	GHG Emissions (metric tons CO_2e)	Percent of Total Mobile Emissions	Gasoline Consumption (gal)	Diesel Consumption (gal)	Cost ($)
Sheriff-Coroner (Dept 230)	1,589	29%	164,154	10,594	$441,213
Resource Management Agency (Dept 300)	684	13%	54,881	19,765	$189,689
Social & Employment Services (Dept 501)	342	6%	27,187	10,107	$94,788
Health (Dept 415)	279	5%	28,329	2,950	$79,060
Parks (Dept 750)	264	5%	23,183	5,913	$73,793
All Other Departments	2,307	42%	225,750	19,748	$620,235
TOTAL	**5,465**	**100%**	**523,484**	**69,076**	**$1,498,778**

Figure 3.6: Emissions from Mobile Sources



3.4.8 Government-Generated Solid Waste

Many local government operations generate solid waste, much of which is eventually sent to a landfill. Typical sources of waste in local government operations include paper and food waste from offices and facilities, construction waste from public works, and plant debris from parks departments. Organic materials in government-generated solid waste (including paper, food scraps, plant debris, textiles, wood waste, etc.) generate methane as they decay in the anaerobic environment of a landfill. An estimated 75 percent of this methane is routinely captured via landfill gas collection systems;[12] however, a portion escapes into the atmosphere, contributing to the greenhouse effect. As such, estimating emissions from waste generated by government operations is an important component of a comprehensive emissions inventory.

Inventorying emissions from government-generated solid waste is considered optional by LGOP for two reasons. First, the emissions do not result at the point of waste generation (as with fuel combustion), but often in a landfill located outside of Monterey County's jurisdictional boundaries. In addition, the emissions are not generated in the same year that the waste is disposed, but over a lengthy decomposition period. Since inventorying these emissions is considered optional, LGOP does not provide guidance on recommended methods for quantifying these types of emissions. ICLEI therefore devised data collection and calculation methods based upon previous experience and national standards. See Appendix D for more information for more detail on quantifying emissions from government-generated solid waste.

It is estimated that the waste disposed by government facilities in 2005 will cumulatively produce 31 metric tons of methane gas, or 643 metric tons CO_2e. Please see Table 3.9 for a breakdown of emissions per facility.

12 This is a default methane collection rate per LGOP. This rate can vary from 0 to 99 percent based upon the presence and extent of a landfill gas collection system at the landfill/s where the waste is disposed. Most commonly, captured methane gas is flared into the atmosphere, which converts the methane gas to CO_2 and effectively negates the global warming impact of the methane. Increasingly, landfill methane is being used to power gas-fired turbines as a carbon-neutral means of generating electricity.

Table 3.9: Emissions from Government-Generated Solid Waste

Source	Greenhouse Gas Emissions (metric tons CO_2e)	Estimated Landfilled Waste (Tons)
Sheriff's 1410 Natividad	71	280.8
MoCo Probation	60	237.9
Natividad Hospital 1330 Constitution	59	234
Salinas Probation-Juvenile Center	54	214.5
MO CO ADULT REHAB-KITCHEN 1410 NATIVIDAD	36	140.4
Salinas Pub Works (Project Staging Area)	30	117
Fac Con 168 W Alisal St.	28	109.2
Health Department, Salinas	26	101.4
Royal Oaks Park	20	78
Toro Park	20	78
Monterey County Courthouse	18	70.2
Fac Con #A & #B 855 E Laurel	16	62.4
Salinas Probation- Rancho Cielo	15	58.5
Public Works- 625 Division, King City	15	58.5
Social & Employment Services-Seaside	14	54.6
Salinas Pub Works-Envir & Bridge Serv	12	46.8
Health- Animal Control Salinas	12	46.8
Parks- Manzanita Park	12	46.8
All Other Facilities	127	500
TOTAL	**643**	**2,536**

3.4.9 Employee Commute

Fuel combustion from employees commuting to work is another important emissions source from Monterey County's operations. Similar to The County of Monterey's vehicle fleet, personal employee vehicles use gasoline and other fuels which, when burned, generate greenhouse gas emissions. Emissions from employee commutes are considered optional to inventory by LGOP because the vehicles are owned and operated privately by the employees. However, LGOP encourages reporting these emissions because local governments can influence how their employees commute to work through incentives and commuting programs. For this reason, employee commute emissions were included in this report as an area where The County of Monterey could achieve significant reductions in greenhouse gases.

To calculate emissions, The County of Monterey administered a survey to all of its employees regarding their commute patterns and preferences. ICLEI then extrapolated the results of the survey to represent emissions from all employees. See Appendix C for a detailed description of the survey and methods used to calculate emissions.

In 2005, employees commuting in vehicles to and from their jobs at The County of Monterey emitted an estimated 1,635 metric tons of CO_2e. Table 3.10 shows estimated emissions and vehicle miles traveled for all Monterey County employees.

Table 3.10: Emissions from Employee Commutes

	Greenhouse Gas Emissions (metric tons CO_2e)	Estimated Vehicle Miles Traveled to Work	Average Estimated Vehicle Miles Traveled to Work
All Employees (Estimated)	1,635	38,295,680	7,659.14

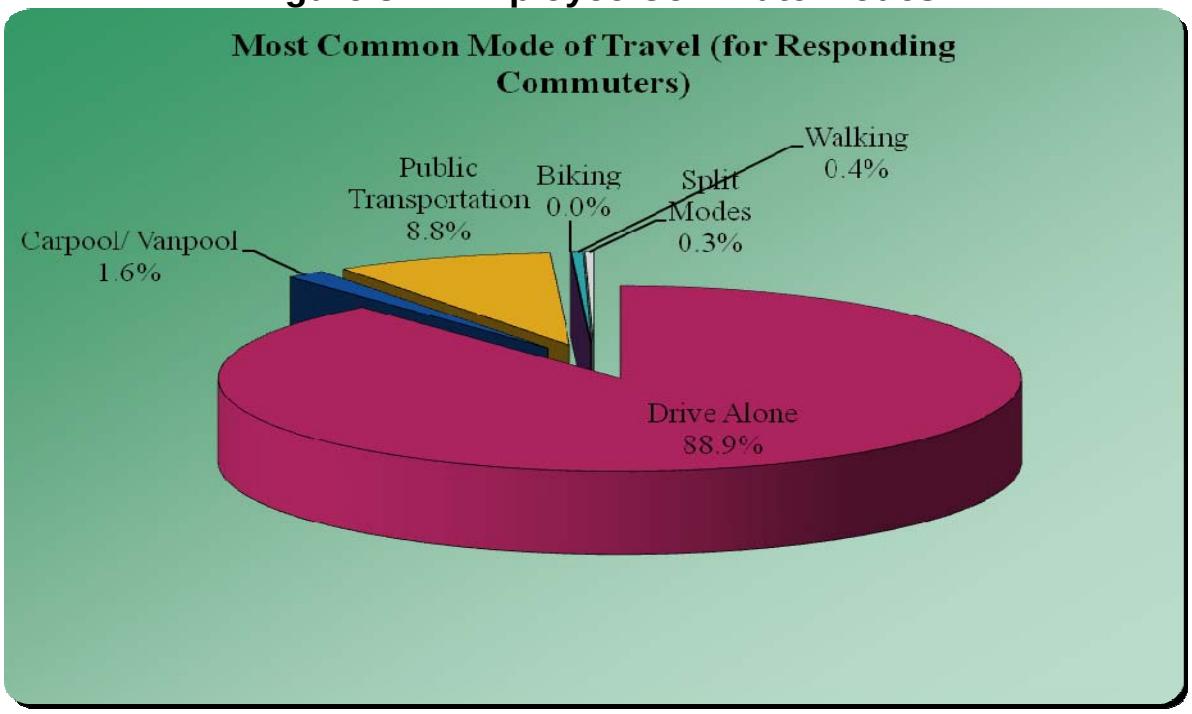
3.4.9.1 Employee Commute Indicators

In addition to estimating greenhouse gas emissions from employee commutes, AMBAG examined other policy-relevant information that was extracted from the employee commute survey—in this way Monterey County staff can develop the most effective policies to reduce emissions from employee commutes. These measures often have co-benefits including increased productivity, reduced commute times and costs, and improvement in the quality of life for employees. No extrapolation was done with the following data; analyses were done using data from survey respondents only.

Commute Modes

In 2005, the majority (88.9 percent) of respondents commuted to work Driving Alone. 11.1 percent of all respondents used some form of alternative transportation (bicycle, public transit, carpool, etc) to commute to work with public transit being the most used form of alternative transportation (8.8 percent of total respondents), followed by carpooling (1.6 percent of total respondents).Less than 1 percent of respondents indicated that they biked or walked to work. See Figure 3.8 for an analysis of the most common commute mode for employees who responded to the survey.

Figure 3.7: Employee Commute Modes



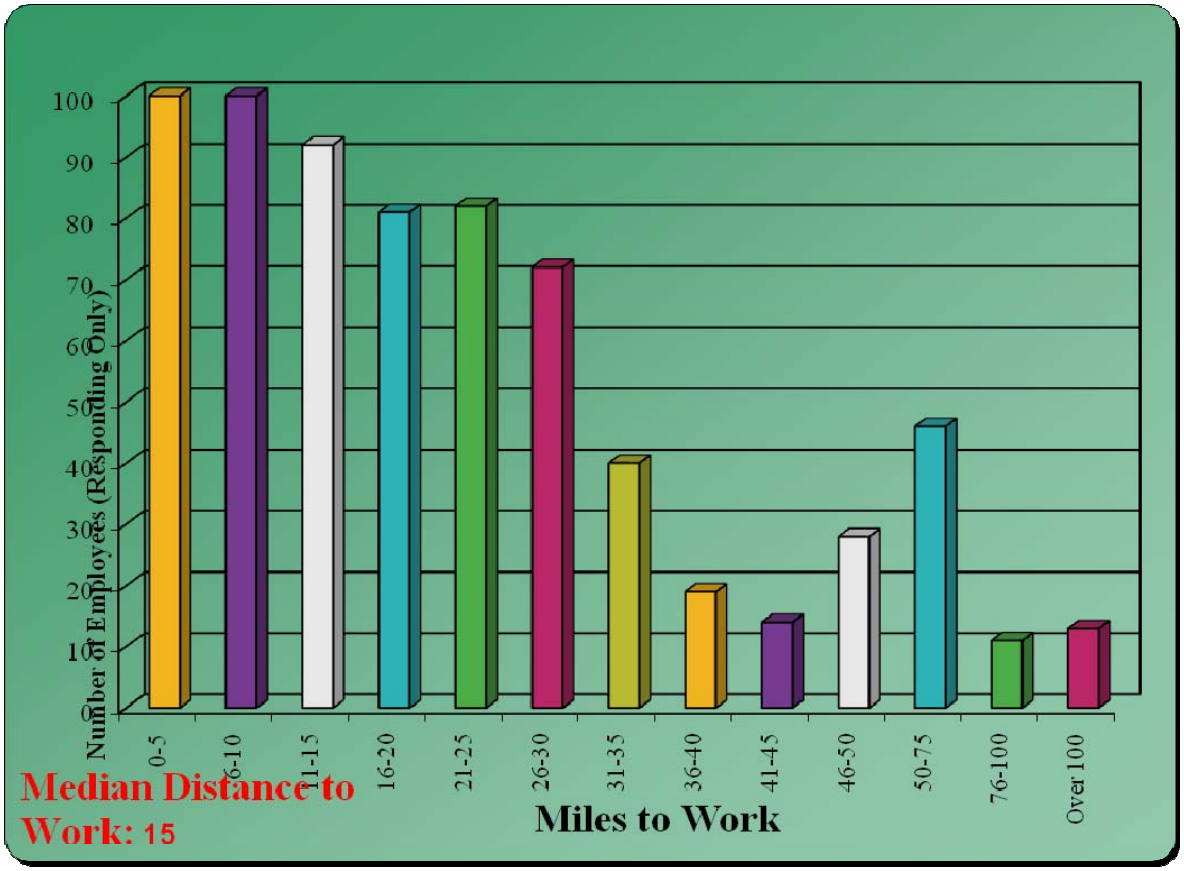
Commute Time and Costs

Table 3.11 shows the median time, cost, and distance of Monterey County's employees' commutes. Figure 3.8 shows that the majority of employees live within 20 miles, suggesting that there may be good opportunities for the County of Monterey to further promote effective carpooling, shuttle programs, public transit, or other alternative transit modes. Encouraging telecommuting, if feasible, is also a viable option for Monterey County. By encouraging employees to take public transit through incentives, The County of Monterey could not only reduce greenhouse gas emissions, but save employees money and time in the process.

Table 3.11: Median Distance and Time to Work and Cost of Employee Commutes

Median Time to Work (daily minutes)	Median Cost of Commute (weekly)	Median Distance To Work (daily miles)
20	$25	12

Figure 3.8: Employee Commute Distance to Work



Conclusion

By committing itself to the AMBAG Regional Inventory Collaborative in order to complete the LGOP, the County of Monterey has taken steps toward reducing its impacts on the environment. Staff and policymakers have chosen to take a leadership role in addressing climate change, and this leadership will allow the County of Monterey to make informed decisions to create and implement innovative approaches to reduce its emissions.

This inventory provides an important foundation for the County of Monterey's comprehensive approach to reducing the greenhouse gas emissions from its operations. Specifically, this inventory serves to:

- Establish a baseline for setting emissions reductions targets.
- Identify the largest sources of emissions from local government operations.

This inventory provides an emissions baseline against which the County of Monterey can set reduction targets and quantify emissions reductions for its municipal operations. A greenhouse gas emissions reduction target represents the percentage by which the County of Monterey plans to reduce total greenhouse gas emissions in its government operations below base year levels by a chosen future target year. A target provides an objective toward which to strive and against which to measure progress.

In selecting a target, it is important to strike a balance. The County of Monterey will want to give itself enough time to implement chosen emissions reduction measures. Near-term targets facilitate additional support and accountability, and help to ensure continued momentum around the County of Monterey's local climate protection efforts. To monitor the effectiveness of its programs, the County of Monterey may want to consider a plan to re-inventory its emissions every five years.

If possible, it is recommended that the County of Monterey consider department-specific targets for each of the departments that generate emissions within its operations. This allows County of Monterey staff to do a more in-depth analysis of what is achievable in each sector in the near, mid and long-term, and also encourages each department head to consider their department's impact on the climate and institute a climate-conscious culture in its operations.

Appendix A:
The Local Government Operations Protocol

This inventory follows the standard outlined in the Local Government Operations Protocol, which was adopted in 2008 by the California Air Resources Board (ARB) and serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. This and the other inventories conducted for the AMBAG Regional Inventory Collaboration are the first to follow LGOP, representing a strong step toward standardizing how inventories are conducted and reported.

A.1 Local Government Operations Protocol

A.1.1 Background

In 2008, ICLEI, ARB, and the California Climate Action Registry (CCAR) released LGOP to serve as a U.S. supplement to the International Emissions Analysis Protocol. The purpose of LGOP is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory. It leads participants through the process of accurately quantifying and reporting emissions, including providing calculation methodologies and reporting guidance. LGOP guidance is divided into three main parts: identifying emissions to be included in the inventory, quantifying emissions using best available estimation methods, and reporting emissions.

The overarching goal of LGOP is to allow local governments to develop emissions inventories using standards that are consistent, comparable, transparent, and recognized nationally, ultimately enabling the measurement of emissions over time. LGOP adopted five overarching accounting and reporting principles toward this end: relevance, completeness, consistency, transparency and accuracy. Methodologies that did not adhere to these principles were either left out of LGOP or included as Scope 3 emissions. LGOP was created solely to standardize how emissions inventories are conducted and reported; as such it represents a currently accepted standard for inventorying emissions but does not contain any legislative or program-specific requirements. Mandates by the State of California or any other legislative body, while possibly using LGOP as a standard, do not currently exist,

and California local governments are not currently required to inventory their emissions. Program-specific requirements, such as ICLEI's Milestones or CCAR's reporting protocol, are addressed in LGOP but should not be confused with LGOP itself.

Also, while LGOP standardizes inventories from government operations, it does not seek to be a wholly accurate inventory of all emissions sources, as certain sources are currently excluded or otherwise impossible to accurately estimate. This and all emissions inventories therefore represent a best estimate of emissions using best available data and calculation methodologies; it does not provide a complete picture of all emissions resulting from Monterey County's operations, and emissions estimates are subject to change as better data and calculation methodologies become available in the future.

A.1.2 Organizational Boundaries

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important first step in the inventory process. The organizational boundary for the inventory determines which aspects of operations are included in the emissions inventory, and which are not. Under LGOP, two control approaches are used for reporting emissions: operational control or financial control. A local government has operational control over an operation if it has full authority to introduce and implement its operating policies at the operation. A local government has financial control if the operation is fully consolidated in financial accounts. If a local government has joint control over an operation, the contractual agreement will have to be examined to see who has authority over operating policies and implementation, and thus the responsibility to report emissions under operational control.[13] Local governments must choose which approach is the most applicable and apply this approach consistently throughout the inventory.

While both control approaches are acceptable, there may be some instances in which the choice may determine whether a source falls inside or outside of a local government's boundary. LGOP strongly encourages local governments to utilize operational control as the organization boundary for a government operations emissions inventory. Operational control is believed to most accurately represent the emissions sources that local governments can most directly influence, and this boundary is consistent with other environmental and air quality reporting program requirements. For this reason, all inventories in the AMBAG Regional Inventory Collaboration are being conducted according to the operational control framework.

13 Please see Local Government Operations Protocol for more detail on defining your organizational boundary: http://www.icleiusa.org/programs/climate/ghg-protocol

A.1.3 Types of Emissions

The greenhouse gases inventoried in this report are described in Section 2.1 As described in LGOP, emissions from each of the greenhouse gases can come in a number of forms:

Stationary or mobile combustion: These are emissions resulting from on-site combustion of fuels (natural gas, diesel, gasoline, etc.) to generate heat, electricity, or to power vehicles and mobile equipment.

Purchased electricity: These are emissions produced by the generation of power from utilities outside of the Monterey County.

Fugitive emissions: Emissions that result from the unintentional release of greenhouse gases into the atmosphere (e.g., leaked refrigerants, methane from waste decomposition, etc.).

Process emissions: Emissions from physical or chemical processing of a material (e.g., wastewater treatment).

A1.4 Quantifying Emissions

Emissions can be quantified two ways:

Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility. This methodology is not generally available for most types of emissions and will only apply to a few local governments that have these monitoring systems.

The majority of the emissions recorded in the inventory can be and will be estimated using **calculation-based methodologies** to calculate their emissions using activity data and emission factors. To calculate emissions, the equation below is used:

Activity Data x Emission Factor = Emissions

Activity data refer to the relevant measurement of energy use or other greenhouse gas–generating processes such as fuel consumption by fuel type, metered annual energy consumption, and annual vehicle mileage by vehicle type. Emissions factors are calculated ratios relating emissions to a proxy measure of activity at an emissions source (e.g., CO_2 generated/kWh consumed). For a list of common emissions calculations see Table 2.2.

The guidelines in LGOP are meant to provide a common method for local governments to quantify and report greenhouse gas emissions by using comparable activity data and emissions factors. However, LGOP recognizes that local governments differ in how they collect data concerning their operations and that many are not able to meet the data needs of a given estimation method. Therefore, LGOP outlines both “recommended” and “alternative” methods

to estimate emissions from a given source. In this system, recommended methods are the preferred method for estimating emissions, as they will result in the most accurate estimate for a given emission source. Alternative methods often require less intensive data collection, but are likely to be less accurate. This approach allows local governments to estimate emissions based on the data currently available to them. It also allows local governments that are unable to meet the recommended methods to begin developing internal systems to collect the data needed to meet these methods.

This inventory has used the recommended activity data and emissions factors wherever possible, using alternative methods where necessary. For details on the methodologies used for each sector, see Appendix B.

A.1.5 Reporting Emissions

A.1.5.1 Significance Thresholds

Within any local government's own operations there will be emission sources that fall within Scope 1 and Scope 2 that are minimal in magnitude and difficult to accurately measure. Within the context of local government operations, emissions from leaked refrigerants, backup generators and other septic tanks may be common sources of these types of emissions. For these small, difficult to quantify emission sources, LGOP specifies that up to 5 percent of total emissions can be reported using estimation methods not outlined in LGOP.[14]

A.1.5.2 Units Used in Reporting Emissions

LGOP requires reporting of individual gas emissions, and this reporting is included in Appendix B. In this narrative report, emissions from all gases released by an emissions source (e.g., stationary combustion of natural gas in facilities) are combined and reported in metric tons of carbon dioxide equivalent (CO_2e). This standard is based on the global warming potential (GWP) of each gas, which is a measure of the amount of warming a greenhouse gas may cause, measured against the amount of warming caused by carbon dioxide. For the GWPs of reported greenhouse gases, see Table 2.1.

A.1.5.3 Information Items

Information items are emissions sources that, for a variety of reasons, are not included as Scope 1, 2, or 3 emissions in the inventory. In order to provide a more complete picture of emissions from Monterey County's operations, however, these emissions should be quantified and reported.

A common emission that is categorized as an information item are carbon dioxide emissions caused by the combustion of biogenic fuels. Local governments will often burn fuels that are of biogenic origin (wood, landfill gas, organic solid waste, biofuels, etc.) to generate power. Common sources of biogenic emissions are the

14 In the context of registering emissions with an independent registry (such as the California Climate Action Registry), emissions that fall under the significance threshold are called *de minimis*. This term, however, is not used in LGOP and was not used in this inventory.

combustion of landfill gas from landfills or biogas from wastewater treatment plants, as well as the incineration of organic municipal solid waste at incinerators.

Carbon dioxide emissions from the combustion of biogenic fuels are not included in Scope 1 based on established international principles. [15] These principles indicate that biogenic fuels (e.g., wood, biodiesel), if left to decompose in the natural environment, would release CO_2 into the atmosphere, where it would then enter back into the natural carbon cycle. Therefore, when wood or another biogenic fuel is combusted, the resulting CO_2 emissions are akin to natural emissions and should therefore not be considered as human activity-generated emissions. The CH_4 and N_2O emissions, however, would not have occurred naturally and are therefore included as Scope 1 emissions.

A.2 Baseline Years

Part of the local government operations emissions inventory process requires selecting a "performance datum" with which to compare current emissions, or a base year. Local governments should examine the range of data they have over time and select a year that has the most accurate and complete data for all key emission sources. It is also preferable to establish a base year several years in the past to be able to account for the emissions benefits of recent actions. A local government's emissions inventory should comprise all greenhouse gas emissions occurring during a selected *calendar* year.

For the AMBAG Regional Inventory Collaboration, 2005 was chosen as the baseline year, since this year is increasingly becoming the standard for such inventories; the 1990 baseline year for California is usually difficult for most local governments to meet and would not produce the most accurate inventory.

After setting a base year and conducting an emissions inventory for that year, local governments should make it a practice to complete a comprehensive emissions inventory on a regular basis to compare to the baseline year. Conducting an emissions inventory at least every five years is recommended.

15 Methane and nitrous oxide emissions from biogenic fuels are considered Scope 1 stationary combustion emissions and are included in the stationary combustion sections for the appropriate facilities.

Appendix B:
LGOP Standard Report

1. Local Government Profile

Jurisdiction Name:	County of Monterey	
Street Address:	168 West Alisal St	
City, State, ZIP, Country:	Salinas, CA	
Website Address:	http://www.co.monterey.ca.us/	
Size (sq. miles):	3,321.95	
Population:	423,048	
Annual Budget:	713,669.68	
Employees (Full Time Equivalent):	5000	
Climate Zone:	CA Climate Zone 3	*
Annual Heating Degree Days:	2413	**
Annual Cooling Degree Days:	274	**
Lead Inventory Contact Name:	Chris Sentieri	
Title:	Intern	
Department:	Resource Management Agency	
Email:	csentieri@csumb.edu	
Phone Number:	831-224-3130 cell, 831-582-9487 home	

* www.energycodes.gov/implement/pdfs/climate_paper_review_draft_rev.pdf (see figure 6, pg. 24)
** www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp#

2. GHG Inventory Details

Reporting Year:	2005
Protocol Used:	Local Government Operations Protocol, Version 1.0 (September 2008)
Control Approach:	Operational Control

GHG Emissions Summary (All Units in Metric Tons Unless Stated Otherwise)

Note: CO_2e totals listed here are summed totals of the estimated emissions of each inventoried gas based upon their global warming potentials (Appendix E of LGOP)

BUILDINGS & OTHER FACILITIES

SCOPE 1

	CO_2e	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Stationary Combustion	6,583.606	6,566.775	0.619	0.012			
Fugitive Emissions							
Total Direct Emissions from Buildings & Facilities	6,583.606	6,566.775	0.619	0.012	0.000	0.000	0.000

SCOPE 2

	CO_2e	CO_2	CH_4	N_2O
Purchased Electricity	6,528.490	6,475.288	0.384	0.146
Purchased Steam				
District Heating & Cooling				
Total Indirect Emissions from Buildings & Facilities	6,528.490	6,475.288	0.384	0.146

STREETLIGHTS AND TRAFFIC SIGNALS

SCOPE 2

	CO_2e	CO_2	CH_4	N_2O
Purchased Electricity	74.495	73.888	0.004	0.002
Total Indirect Emissions from Streetlights and Traffic Signals	74.495	73.888	0.004	0.002

WATER DELIVERY FACILITIES

SCOPE 1

	CO_2e	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Stationary Combustion	9.442	9.418	0.001	0.000			
Total Direct Emissions from Water Delivery Facilities	9.442	9.418	0.001	0.000	0.000	0.000	0.000

SCOPE 2

	CO_2e	CO_2	CH_4	N_2O
Purchased Electricity	123.898	122.888	0.007	0.003
Purchased Steam				
District Heating & Cooling				
Total Indirect Emissions from Water Delivery Facilities	123.898	122.888	0.007	0.003

WASTEWATER FACILITIES

SCOPE 1

	CO_2e	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Stationary Combustion							
Fugitive Emissions							
Process Emissions							
Total Direct Emissions from Wastewater Facilities	0.000	0.000	0.000	0.000	0.000	0.000	0.000

SCOPE 2

	CO_2e	CO_2	CH_4	N_2O
Purchased Electricity	62.899	62.387	0.004	0.001
Purchased Steam				
District Heating & Cooling				
Total Indirect Emissions from Wastewater Facilities	397.913	62.451	15.954	0.001

VEHICLE FLEET

SCOPE 1

	CO_2e	CO_2	CH_4	N_2O	HFCs	PFCs
Mobile Combustion	5,465.423	5,399.691	0.144	0.202		
Fugitive Emissions					#REF!	
Total Direct Emissions from Vehicle Fleet	5,465.423	5,399.691	0.144	0.202	#REF!	0.000

SCOPE 2

	CO_2e	CO_2	CH_4	N_2O
Purchased Electricity for Electric Vehicles				
Total Indirect Emissions from Vehicle Fleet	0.000	0.000	0.000	0.000

WASTE GENERATION

SCOPE 3

	CO_2e
Waste All Facilities	643.182

EMPLOYEE COMMUTE

SCOPE 3

	CO_2e
Mobile Combustion	1,634.942

Total Emissions

	CO_2e	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
SCOPE 1	12,058.471	11,975.884	0.764	0.215	#REF!	0.000	0.000
SCOPE 2	7,124.796	6,734.514	16.349	0.151	0.000	0.000	0.000
SCOPE 3	2,278.124						
INFORMATION ITEMS	0.000						

Local Government Operations Standard Inventory Report

3. Activity Data Disclosure

Every emission source must be accompanied by a reference for the activity data. This worksheet is meant to assist in recording activity data and the methods used to gather those data for government operations. Activity data represent the magnitude of human activity resulting in emissions; data on energy use, fuel consumtion, vehicle miles traveled, and waste generation are all examples of activity data that are used to compute GHGs. Detailed disclosure should be made of the activity data used and at what quantities. This disclosure should also cite the source(s) of the data and the methodology used, including whether that methodology is a recommended method or an alternate method.

Deviations from the primary methodology should be explained in detail. All assumptions and estimations should be cited as such. Local governments may also use this space in the reporting format to discuss the rationale for the inclusion or exclusion of optional inventory components. It is good practice to include appropriate citations (such as website URL, report title, etc) and all contact information that is necessary to verify the source and accuracy of the activity data.

BUILDINGS & OTHER FACILITIES (Chapter 6)

SCOPE 1

Stationary Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Natural Gas	CO_2e	Primary	Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	1,237,613	therms	PG&E
	CO_2	Primary	Known fuel use	1,237,613	therms	PG&E
	CH_4	Primary	Known fuel use	1,237,613	therms	PG&E
	N_2O	Primary	Known fuel use	1,237,613	therms	PG&E
	HFCs					
	PFCs					
	SF_6					

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO_2e	Primary	Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	29,183,838	kWh	PG&E
	CO_2	Primary	Known Electricity Use	29,183,838	kWh	PG&E
	CH_4	Primary	Known Electricity Use	29,183,838	kWh	PG&E
	N_2O	Primary	Known Electricity Use	29,183,838	kWh	PG&E
	HFCs					
	PFCs					
	SF_6					

STREETLIGHTS AND TRAFFIC SIGNALS (Chapter 6.2)

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO_2e	Primary	Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	333,009	kWh	PG&E
	CO_2	Primary	Known Electricity Use	333,009	kWh	PG&E
	CH_4	Primary	Known Electricity Use	333,009	kWh	PG&E
	N_2O	Primary	Known Electricity Use	333,009	kWh	PG&E
	HFCs					
	PFCs					
	SF_6					

WATER DELIVERY FACILITIES (Chapter 6)

SCOPE 1

Stationary Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Natural Gas	CO_2e	Primary	Application of GWP to CH4 and N2O calculations listed below; sum of three	1,775	therms	PG&E
	CO_2	Primary	Known Fuel Use	1,775	therms	PG&E
	CH_4	Primary	Known Fuel Use	1,775	therms	PG&E
	N_2O	Primary	Known Fuel Use	1,775	therms	PG&E
	HFCs					
	PFCs					
	SF_6					

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO_2e		Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	553,851	kWh	PG&E
	CO_2	Primary	Known Electricity Use	553,851	kWh	PG&E
	CH_4	Primary	Known Electricity Use	553,851	kWh	PG&E
	N_2O	Primary	Known Electricity Use	553,851	kWh	PG&E
	HFCs					
	PFCs					
	SF_6					

WASTEWATER FACILITIES (Chapters 6 and 10)

SCOPE 1

Stationary Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Natural Gas	CO_2e			16	therms	PG&E
	CO_2	Primary	Known Fuel Use	16	therms	PG&E
	CH_4	Primary	Known Fuel Use	16	therms	PG&E
	N_2O	Primary	Known Fuel Use	16	therms	PG&E
	HFCs					
	PFCs					
	SF_6					

Generators	CO_2e					
	CO_2	Primary	Known fuel use; estimated run time and fuel efficiency; proxy year data		gallons	Contact name, title
	CH_4	Primary	Known fuel use; estimated run time and fuel efficiency; proxy year data		gallons	Contact name, title
	N_2O	Primary	Known fuel use; estimated run time and fuel efficiency; proxy year data		gallons	Contact name, title
	HFCs					
	PFCs					
	SF_6					

Incomplete Combustion of Digester Gas at a Centralized Wastewater Treatment Plant	CH_4	Primary/Alternate	Daily Digester Gas; Population Served		cubic feet; people	Contact name, title
	CH_4	Primary	Fraction of Methane in biogas		Percent	Contact name, title

Fugitive Emissions

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Septic Systems	CH_4	Primary/Alternate	Daily BOD_5 load; Population Served		kg BOD_5; people	Contact name, title

Process Emissions

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Anaerobic/Facultative Lagoons	CH_4	Primary/Alternate	Population Served	1,444	kg BOD_5; people	Edward Muniz
	CH_4	Primary	Fraction of Overall BOD5 Removal Performance	N/A	Percent	N/A

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Electricity	CO_2e		Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	281,175	kWh	PG&E
	CO_2	Primary	Known Electricity Use	281,175	kWh	PG&E
	CH_4	Primary	Known Electricity Use	281,175	kWh	PG&E
	N_2O	Primary	Known Electricity Use	281,175	kWh	PG&E
	HFCs					
	PFCs					
	SF_6					

VEHICLE FLEET (Chapter 7)

SCOPE 1

Mobile Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Gasoline	CO_2e	Aggregate Fuel Consumption	Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	523,484	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	CO_2	Primary/Alternate	Known Fuel Use; fuel estimates; proxy year data	523,484	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	CH_4	Primary/Alternate	Known Fuel Use; fuel estimates; proxy year data	523,484	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	N_2O	Primary/Alternate	Known Fuel Use; fuel estimates; proxy year data	523,484	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	HFCs					
	PFCs					
	SF_6					
Diesel	CO_2e	Aggregate Fuel Consumption	Application of GWP to CH4 and N2O calculations listed below; sum of three primary GHGs (CO2, CH4 and N2O.)	69,075	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	CO_2	Primary/Alternate	Known Fuel Use; fuel estimates; proxy year data	69,075	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	CH_4	Primary/Alternate	Known Fuel Use; fuel estimates; proxy year data	69,075	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	N_2O	Primary/Alternate	Known Fuel Use; fuel estimates; proxy year data	69,075	gallons	Thomas Abear, Fleet Manager- Public Works Dept
	HFCs					
	PFCs					
	SF_6					

Fugitive Emissions

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Refrigerants	HFC-134a	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use	258	kg	Thomas Abear, Fleet Manager- Public Works Dept
	Refrigerant 2	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use		kg	Contact name, title
	Refrigerant 3	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use		kg	Contact name, title
	Refrigerant 4	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use		kg	Contact name, title
	Refrigerant 5	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use		kg	Contact name, title
	Refrigerant 6	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use		kg	Contact name, title
	Refrigerant 7	Primary/Alternate	Mass Balance Method; Simplified Mass Balance Method; Estimating based upon equipment inventory and use		kg	Contact name, title

WASTE GENERATION (Scope 3)

SCOPE 3

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Generated Waste	CH_4	Primary/Alternate	Known waste weight; Estimated waste weight based upon volume and number of containers	2,536	tons	Waste Management, BFI, Tri-Cities Disposal

EMPLOYEE COMMUTE (Scope 3)

SCOPE 3

Stationary Combustion

Emissions Source Name	GHG	Methodology Type	Methodology Name and Description	Resource Quantity	Fuel Unit	Data Sources and References
Gasoline	CO_2e	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	180,527	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data in posession of Charlie Buck/Elisabeth Russell at AMBAG
	CO_2	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	180,527	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data
	CH_4	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	180,527	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data
	N_2O	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	180,527	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data
	HFCs					
	PFCs					
	SF_6					
Diesel	CO_2e					
	CO_2	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	563	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data
	CH_4	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	563	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data
	N_2O	Primary	Proxy Year Estimated Fuel Use-based upon daily vehicle miles traveled for all repspondents extrapolated to represent all local government employees	563	gallons	Online and paper surveys of all employees; see Appendix C of Narrative report for examples; Data
	HFCs					
	PFCs					
	SF_6					

Local Government Operations Standard Inventory Report

4. Calculation Methodology Disclosure

In addition to activity data, every emission source must be accompanied by the emission factor used, a reference for each emission factor, and the calculation

BUILDINGS & OTHER FACILITIES (Chapter 6)

SCOPE 1

Stationary Combustion

Emissions Source Nam	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Natural Gas	CO_2e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	53.06 kg/MMBtu	LGOP v1 Table G.1
	CH_4	Default	5 g/MMBtu	LGOP v1 Table G.3
	N_2O	Default	0.1 g/MMBtu	LGOP v1 Table G.3
	HFCs			
	PFCs			
	SF_6			
Generators-Diesel; Natural Gas	CO_2e	Default	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	73.15 kg/MMBtu ;53.06 kg/MMBtu	LGOP v1 Table G.1
	CH_4	Default	11 g/MMBtu ;5 g/MMBtu	LGOP v1 Table G.3
	N_2O	Default	.6 g/MMBtu ; 0.1 g/MMBtu	LGOP v1 Table G.3
	HFCs			
	PFCs			
	SF_6			

SCOPE 2

Purchased Electricity

Emissions Source Nam	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH_4	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N_2O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	HFCs			
	PFCs			
	SF_6			

STREETLIGHTS AND TRAFFIC SIGNALS (Chapter 6.2)

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH_4	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N_2O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	HFCs			
	PFCs			
	SF_6			

WATER DELIVERY FACILITIES (Chapter 6)

SCOPE 1

Stationary Combustion

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Natural Gas	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	53.06 kg/MMBtu	LGOP v1 Table G.1
	CH_4	Default	5 g/MMBtu	LGOP v1 Table G.3
	N_2O	Default	0.1 g/MMBtu	LGOP v1 Table G.3
Diesel; Natural Gas	CO_2e			
	CO_2	Default	73.15 kg/MMBtu ;53.06 kg/MMBtu	LGOP v1 Table G.1
	CH_4	Default	11 g/MMBtu ;5 g/MMBtu	LGOP v1 Table G.3
	N_2O	Default	.6 g/MMBtu ; 0.1 g/MMBtu	LGOP v1 Table G.3

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH_4	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N_2O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6

WASTEWATER FACILITIES (Chapters 6 and 10)

SCOPE 1

Stationary Combustion

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Natural Gas	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	53.06 kg/MMBtu	LGOP v1 Table G.1
	CH_4	Default	5 g/MMBtu	LGOP v1 Table G.3
	N_2O	Default	0.1 g/MMBtu	LGOP v1 Table G.3
Generators-Diesel; Natural Gas	CO_2e			
	CO_2	Default	73.15 kg/MMBtu ;53.06 kg/MMBtu	LGOP v1 Table G.1
	CH_4	Default	11 g/MMBtu ;5 g/MMBtu	LGOP v1 Table G.3
	N_2O	Default	.6 g/MMBtu ; 0.1 g/MMBtu	LGOP v1 Table G.3
Incomplete Combustion of Digester Gas at a Centralized Wastewater Treatment Plant	CH_4	Default/Alternate		LGOP v1 Equation 10.1; LGOP v1 Equation 10.2
	CH_4	Default		LGOP v1 Equation 10.1

Process Emissions

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Anaerobic/Facultative Lagoons	CH_4	Default/Alternate		LGOP v1 Equation 10.4
	CH_4	Default		

SCOPE 2

Purchased Electricity

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Electricity	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	489.2 lbs/MWh	PG&E (2005); LGOP v1 Table G.5
	CH_4	Default	0.029 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6
	N_2O	Default	0.011 lbs/MWh	CA Grid Average (2004 proxy); LGOP v1 Table G.6

VEHICLE FLEET (Chapter 7)

SCOPE 1

Mobile Combustion

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Gasoline	CO_2e		Various Global Warming Potentials (GWP)	LGOP v1 Table E.1
	CO_2	Default	8.81 kg/gallon	LGOP v1 Table G.9
	CH_4	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	N_2O	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	HFCs			
	PFCs			
	SF_6			
Diesel	CO_2e			
	CO_2	Default	10.15 kg/gallon	LGOP v1 Table G.9
	CH_4	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	N_2O	Default	Varies by model year	LGOP v1 Table G.10; Table G.12 for other equipment
	HFCs			
	PFCs			
	SF_6			

Fugitive Emissions

Emissions Source Name	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Refrigerants	HFC-134a	None	Various Global Warming Potentials (GWP)	LGOP v1 Table E.1&E.2

WASTE GENERATION (Scope 3)

SCOPE 3

Emissions Source Nam	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Generated Waste	CH_4	Alternate	Varies by waste type	EPA Waste Reduction Model http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html; Public Administration waste charaterization

EMPLOYEE COMMUTE (Scope 3)

SCOPE 3

Stationary Combustion

Emissions Source Nam	GHG	Default/Alternate	Emission Factor	Emission Factor Sources and References
Gasoline	CO_2e			
	CO_2	Default	8.81 kg/gallon	LGOP v1 Table G.9
	CH_4	Default	0.02990 g/mi (cars); .03451 g/mi (trucks)	LGOP v1 Table G.13
	N_2O	Default	.03413 g/mi (cars); .04935 g/mi (trucks)	LGOP v1 Table G.13
	HFCs			
	PFCs			
	SF_6			
Diesel	CO_2e			
	CO_2	Default	10.15 kg/gallon	LGOP v1 Table G.9
	CH_4	Default	0.0005 g/mi (cars); .00098 g/mi (trucks)	LGOP v1 Table G.13
	N_2O	Default	.001 g/mi (cars); .00148 g/mi (trucks)	LGOP v1 Table G.13
	HFCs			
	PFCs			
	SF_6			

Appendix C: Employee Commute

Emissions from employee commutes make up an important optional source of emissions from any local government's operations. The scale of emissions from employee commutes is often large in comparison with many other facets of local government operations, and local governments can affect how their employees get to and from work through a variety of incentives. For this reason, it is recommended estimating emissions from employee commutes as part of a complete government operations greenhouse gas emissions inventory.

To assist in the data collection process, AMBAG provided Monterey County with both an online and a paper copy of an employee commute survey.[16] The questions in the survey were aimed at finding three categories of information:

- **Activity data** to calculate emissions from employee commute (vehicles miles traveled, vehicle type, vehicle model year) both current and in 2005.
- **Indicator data** to help Monterey County understand how much time and money employees spend as they commute, as well as how many employees use alternative modes of transportation to get to work.
- **Policy data** that will serve as guidance for Monterey County as it adopts policies aimed at reducing emissions from employee commutes. These questions asked employees for their interest in alternative modes of transportation as well as what policies would be most effective in allowing them to switch modes of transportation away from driving alone.

This section provides the emissions estimation methodology and both surveys. Individual survey results are in the possession of Monterey County staff.

C.1 Methodology Summary

The methodology for estimating the employee commute emissions portion of the inventory is similar to the mobile emissions methodology outlined in the mobile emissions section of Appendix B. Monterey County administered the employee commute survey to 5000 current employees working for the City, and 986 employees responded to the

16 The paper survey was administered only to employees that do not have access to a computer. The survey asked slightly different questions but was aimed at garnering the same emissions and policy-relevant data as the electronic survey.

survey (a response rate of 19.7 percent). The survey was administered in 2009 and current data was used as a proxy for 2005 data. Both full time and part-time employee data were included.

To calculate emissions, the survey collected the following information:

- The number of days and number of miles employees drive alone to work (one-way) in an average week
- The number of days they carpooled and how often they drove the carpool in an average week
- The vehicle type of their vehicle and the type of fuel consumed

These weekly data were then converted into annual VMT estimates by the following equation:

Number of days driven to work/week x to-work commute distance x 2 x 48 weeks worked/year

Actual CO_2e emissions from respondents' vehicles were calculated by converting vehicle miles traveled per week by responding employees into annual fuel consumption by fuel type (gasoline, diesel). The VMT data collected were converted to fuel consumption estimates using fuel economy of each vehicle type.[17]

ICLEI then extrapolated estimated fuel consumption to represent all 5000 of Monterey County's employees in 2005. This was a simple extrapolation, multiplying the estimated fuel consumption number by the appropriate factor to represent all current employees. For example, if 33.3 percent of employees responded, fuel consumption numbers were tripled to estimate fuel consumption for all employees. This is not a statistical analysis and no uncertainty has been calculated as there is uncertainty not only at the extrapolation point but also in the calculation of actual emissions. Therefore, the resulting calculated emissions should be seen as directional and not as statistically valid.

17 Fuel efficiency estimates from www.fueleconomy.gov, EPA *Green Fleets Guide* and other national sources.

C.2 Electronic Employee Commute Survey

1. Introduction
The purpose of this survey is to gather information on your commute to work so your employer can offer the best transportation options to you while reducing the Monterey County's impact on the environment. The survey should take no more than 15 minutes.

Unless otherwise indicated, all questions refer to a ONE-WAY commute TO WORK only. Please do not include any traveling you do during work hours (meetings, site visits, etc). Any question with an asterisk (*) next to it requires an answer in order to proceed.

Please note that this survey is completely anonymous. We will not collect or report data on any individuals who respond to the survey.

Thank you very much.

2. Workplace
Please provide the following information regarding your workplace. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. What local government do you currently work for?
County of Monterey
County of San Benito
County of Santa Cruz
Capitola
Carmel-by-the-Sea
Del Rey Oaks
Gonzales
Greenfield
Hollister
King City
Los Gatos
Marina
Monterey (City)
Pacific Grove
Salinas
San Juan Bautista
Sand City
Santa Cruz (City)
Scotts Valley
Seaside
Soledad
Watsonville

*2. What department do you work in?

3. Commuter Background Information
Please provide the following information regarding your background. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. What city/town do you live in?

*2. How many miles do you live from your place of work?
(please enter a whole number)

*3. How many minutes does your commute to work typically take?
(please enter a whole number)

*4. In a typical week, how much money do you spend on your ROUND TRIP commute?
(transit fees, gas, tolls, etc-please enter a number)

*5. If you drive to work, what type of vehicle do you usually drive?
Passenger Car
Light Truck/SUV/Pickup/Van
Heavy Truck
Motorcycle/Scooter

*6. What year is your vehicle?
(please enter a four digit year)

*7. What is the make and model of your vehicle?
(Examples: "Toyota Prius","Dodge Dakota").

*8. What type of fuel does your vehicle use?
Gas
Diesel
Biodiesel (B20)
Biodeisel (B99 or B100)
Electric
Other (please specify-if Ethanol please indicate grade)

*9. What is the average fuel efficiency rating of your vehicle (mpg)? It is ok to estimate or guess.

4. Employment Information
Please provide the following information regarding your employment. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. Do you typically travel to work between 6-9 am Monday-Friday?
Yes
No
If No, please specify what time of day you commute:

*2. Does your position allow you to have flexible hours or to telecommute?
Yes
No

*3. Are you a full time employee or part time employee?
Full
Part

5. Part Time Employees
Please provide the following information regarding your part time employment. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. What is the average number of days you work per week?
(please enter a number)

6. Current Daily Commute
Please provide the following information regarding your current daily commute. Click "Next" at the bottom when finished or click "Prev" to go back.

*1. In a typical week, do you drive to work alone at least once?
Yes
No

7. Drive Alone

Click "Next" at the bottom when finished or click "Prev" to go back.

*1. How many DAYS a week do you drive alone to work?
(please enter a number)

*2. How many MILES PER DAY do you drive TO WORK ONLY?
(please enter a number)

8. Carpool
Click "Next" at the bottom when finished or click "Prev" to go back.

*1. In a typical week, do you carpool to work at least once?
Yes
No

9. Carpool
*1. How many DAYS a week do you carpool?
(please enter a number)

*2. How many MILES do you drive TO WORK ONLY when you carpool?
(please enter a number)

3. How many PEOPLE are in your carpool?
(please enter a number)

*4. How many DAYS a week are you the driver of the carpool?
(please enter a number)

10. Public Transit
*1. In a typical week, do you take public transit to work at least once?
Yes
No

11. Public Transit
*1. How many DAYS a week do you take public transit TO WORK?
(please enter a number)

*2. What type of public transit do you take TO WORK?

12. Bike/Walk
*1. In a typical week, do you bike or walk to work at least once?
Yes
No

13. Bike/Walk
1. How many DAYS a week do you bike to work?
(please enter a number)

2. How many DAYS a week do you walk to work?
(please enter a number)

14. Telecommute

1. If you telecommute:
How many DAYS do you telecommute in a typical week?
(please enter a number)
If you do not telecommute, leave this question blank.

15. Commute in Base Year
Please provide the following information regarding your commute in 2005.

*1. Did you work for us in 2005?
Yes
No

16. Commute in Base Year
Please provide the following information regarding your commute in your base year.

*1. In 2005, did you typically commute by the same mode(s) as you do now?
Yes
No

17. Commute in Base Year
Please provide the following information regarding your commute change.

1. Why did you change your commute mode?

18. 2005 Daily Commute
Please provide the following information regarding your 2005 daily commute.

*1. In 2005, did you typically drive to work alone at least once a week?
Yes
No

19. Drive Alone
*1. In 2005, how many DAYS a week did you typically drive alone?
(please enter a number)

*2. In 2005, how many MILES a day did you typically drive TO WORK ONLY?
(please enter a number)

20. Carpool
*1. In 2005, did you carpool at least once in a typical week?
Yes
No

21. Carpool
*1. In 2005, how many DAYS did you typically carpool in a week?
(please enter a number)

*2. In 2005, how many MILES did you typically drive TO WORK when you carpooled?
(please enter a number)

*3. In 2005, how many DAYS in a typical week were you the driver of your carpool?
(please enter a number)

22. Public Transit
*1. In 2005, did you typically take public transit to work at least once a week?
Yes
No

23. Public Transit
*1. In 2005, how many days in a typical week did you take public transit TO WORK?
(please enter a number)

*2. In 2005, what type of public transit did you take TO WORK?

24. Bike/Walk
*1. In 2005, did you typically bike or walk to work at least once a week?
Yes
No

25. Bike/Walk
*1. In 2005, how many DAYS did you typically bike to work in a week?
(please enter a number)

*2. In 2005, how many DAYS did you typically walk to work in a week?
(please enter a number)

26. Telecommute
*1. If you telecommuted in 2005:
How many DAYS in a typical week in 2005 did you telecommute?
(please enter a number)
If you did not telecommute in 2005, leave this question blank.

27. Commute Preference Information
Please answer the following questions regarding your CURRENT commute.

*1. Why have you chosen your current commute mode?

*2. Would you consider taking any of the following transportation modes? (check all that apply):
Public Transportation
Carpooling
Vanpooling
Bicycling
Walking
Other (please specify)

*3. Is there a transit route that you would use to commute by public transit?
Yes
No

*4. If no to question 3, please explain why not.

*5. If you drive alone, which, if any, of the following benefits would encourage you to take alternative forms of transportation? (check all that apply)
Vanpool/carpool incentives
Pre-tax transit checks
Parking cash-out (reimbursement to give up your parking spot)
Improved transit options
Improved walking routes/conditions
Telecommuting option
Free/inexpensive shuttle
Free public transit benefit
Subsidizing bicycle purchase
Improved bike routes/conditions
Better information about my commute options
None of the above
Other (please specify)

28. Comments

*1. If you have other concerns or issues related to your commute, or if something we should know about was not captured in any survey questions, please describe below.

29. Thank You
Thank you for responding to this survey!

C.3 Paper Employee Commute Survey

Monterey County Employee Commute Survey

<Date>:

To all of our employees:

As you may be aware, *<local government name>* is actively working to reduce its impact on the environment and to improve the efficiency with which we use resources. As part of this effort, we are collecting information on our employee's commuting patterns and preferences. This will help us to better understand the impact that we all have on the environment, *and* to provide us with ways to make each of our commutes, as staff of *<local government name>*, easier and less expensive.

Please take 15 minutes to fill out this survey created by ICLEI-Local Governments for Sustainability. Please complete the survey by *<due date>* and return to *<name>* in the *<department>.*

This survey is completely anonymous. We will not be collecting or reporting any individual responses.

If you have any questions regarding the survey, please feel free to contact me at *<phone number>.*

Thank very much,

<Your name>

Monterey County Employee Commute Survey

The purpose of this survey is to gather information on your commute to work so we can offer the best transportation choices to our employees while reducing our impact on the environment. Unless otherwise indicated, a*ll questions refer to a one-way commute to work only*. Please do not include any traveling you do during work hours (e.g. meetings, site visits, etc). *Asterisks (*) indicate questions that require an answer.* ***This survey is completely anonymous-we will not collect or report data on any individuals.***

A. Commuter Background Information

1. About how many miles do you live from work? _____
2. What city/town do you live in?
   _____

* *3.* If you drive to work, what type of vehicle do you usually drive? (check one) *If you don't drive to work, skip to Section B.*

❑ Passenger Car ❑ Light Truck/SUV/Van ❑ Heavy truck
❑ Motorcycle/Scooter ❑ Other_____

* 4. What year was your vehicle manufactured?
   _____

5. What is the make and model of your vehicle (e.g. *Ford F150*)?
   _____

* 6. What type of fuel does your vehicle use? (if biodiesel or ethanol specify grade) _____

7. What is the average fuel efficiency rating of your vehicle (mpg)? (*It is ok to estimate or guess.*)
   ____

B. Estimate Your Current Commute for a typical work week

* 1. Please enter below the number of days per week you use each type of commute mode and the number of miles you travel each day ***to work only*** in a typical week:

Commute Mode	Drive Alone	Carpool	Vanpool	Public Transit	Bike	Walk	Other (specify)
Days per week you travel *to work* by this mode (max 7)							
Miles Traveled *to work per day* in this mode							

2. How much does your ***round trip*** commute cost per week? $_____
3. How many minutes does your commute to work typically take? _____
4. *If you take public transit*, what transit agency do you use? _____

* 5. *If you carpool to work*, how many days in a typical week are you the driver? _____

6. How many days do you telecommute in a typical week? _____

C. Employment Information (check one answer for each question)

1. Your Department: _____

2. Are you a full time or part time employee? ❑ Full ❑ Part

3. Do you typically travel to work between 6-9 am? ❑ Y ❑ N

4. Does your position allow you to have flexible hours or to telecommute? ❑ Y ❑ N

D. Your Commute *in 2005*

*1. Did you work for us in 2005? ❑ Y ❑ N

*2. If yes to Q.1, did you typically commute by the same mode(s) as you do now? ❑ Y ❑ N

*

3. If no to Q.2, please enter the number of miles you traveled (*to work only*) in a typical week in 2005 below*:*

Commute Mode	Drive Alone	Carpool	Vanpool	Public Transit	Bike	Walk	Other
Days per Week (max 7)							
Miles Traveled *to Work* per Day							

If you commute differently now than in 2005, why did you change your commute mode?

_____

E. Commute Preference Information

1. Why have you chosen your current commute mode?

_____

_____

2. Would you consider taking any of the following transportation modes?(check all that apply):

❑ Carpooling ❑ Vanpooling ❑ Bicycling
❑ Public transit ❑ Walking ❑
Other_____

3. Is there a transit route that would allow you to commute by public transit? ❑ Y ❑ N

4. If you drive alone, which, if any, of the following benefits would encourage you to take alternative forms of transportation? (check all that apply)

- ❑ Vanpool/carpool incentives
- ❑ Free/inexpensive shuttle
- ❑ Pre-tax transit checks
- ❑ Free public transit benefit
- ❑ Parking cash-out (reimbursement to give up your parking spot)
- ❑ Subsidized bicycle purchase
- ❑ Improved transit options
- ❑ Improved bike routes/conditions
- ❑ Improved walking routes/conditions
- ❑ Better information about my commute options
- ❑ Telecommuting option
- ❑ Other_____

5. Other comments?

_____

_____

_____

Appendix D: Government-Generated Solid Waste Methodology

Emissions from the waste sector are an estimate of methane generation that will result from the anaerobic decomposition of all organic waste sent to landfill in the base year. It is important to note that although these emissions are attributed to the inventory year in which the waste is generated, the emissions themselves will occur over the 100+ year timeframe that the waste will decompose. This frontloading of emissions is the approach taken by EPA's Waste Reduction Model (WARM). Attributing all future emissions to the year in which the waste was generated incorporates all emissions from actions taken during the inventory year into that year's greenhouse gas release. This facilitates comparisons of the impacts of actions taken between inventory years and between Monterey Countys. It also simplifies the analysis of the impact of actions taken to reduce waste generation or divert it from landfills.

D.1 Estimating Waste Tonnages from Monterey County's Operations

Like most local governments, Monterey County does not directly track the amount of waste generated from its operations. Therefore, to estimate the amount of waste generated, AMBAG worked with Waste Management, the primary hauler of waste for Monterey County in 2005. The amount of waste was estimated by compiling pick-up accounts owned by Monterey County. Garbage trucks do not weigh waste at each pick-up, therefore, it is not possible to directly track disposal figures in mass per facility. Mass of waste generation was estimated using volumetric container size (gallons, yards, etc.) data, along with pick-up frequency and average fill of containers. These data produced a comprehensive annual volumetric figure, which was then converted to mass using standard conversion factors supplied by the California Integrated Waste Management Board (CIWMB). Estimated waste *generation* was converted to final *disposal* (quantity sent to landfill) by applying average waste diversion percentages for each account. Where applicable, self-haul waste (waste brought directly from the local government to landfills) was included as part of this total.

D.2 Emissions Calculation Methods

As some types of waste (e.g., paper, plant debris, food scraps, etc.) generate methane within the anaerobic environment of a landfill and others do not (e.g., metal, glass, etc.), it is important to characterize the various components of the waste stream. Waste characterization for government-generated solid waste was estimated using the CIWMB's 2004 statewide waste characterization study.[18]

Most landfills in the Bay Area capture methane emissions either for energy generation or for flaring. EPA estimates that 60 percent to 80 percent[19] of total methane emissions are recovered at the landfills to which Monterey County sends its waste. Following the recommendation of LGOP, ICLEI adopted a 75 percent methane recovery factor.

Recycling and composting programs are reflected in the emissions calculations as reduced total tonnage of waste going to the landfills. The model, however, does not capture the associated emissions reductions in "upstream" energy use from recycling as part of the inventory.[20] This is in-line with the "end-user" or "tailpipe" approach taken throughout the development of this inventory. It is important to note that, recycling and composting programs can have a significant impact on greenhouse gas emissions when a full lifecycle approach is taken. Manufacturing products with recycled materials avoids emissions from the energy that would have been used during extraction, transporting and processing of virgin material.

D.2.1 Methane Commitment Method

CO_2e emissions from waste disposal were calculated using the methane commitment method outlined in the EPA WARM model. This model has the following general formula:

$CO_2e = W_t * (1-R)A$

Where:

W_t is the quantify of waste type "t"

R is the methane recovery factor,

A is the CO_2e emissions of methane per metric ton of waste at the disposal site (the methane factor)

18 CIWMB Waste Characterization Study-Public Administration Group available at http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asps.
19 AP 42, section 2.4 Municipal Solid Waste, 2.4-6, http://www.epa.gov/ttn/chief/ap42/index.html
20 "Upstream" emissions include emissions that may not occur in your jurisdiction resulting from manufacturing or harvesting virgin materials and transportation of them.

While the WARM model often calculates upstream emissions, as well as carbon sequestration in the landfill, these dimensions of the model were omitted for this particular study for two reasons:

This inventory functions on an end-use analysis, rather than a life-cycle analysis, which would calculate upstream emissions), and this inventory solely identifies emissions sources, and no potential sequestration “sinks.”

Appendix E: Conducting a Monitoring Inventory

The purpose of this appendix is to assist Monterey County staff in conducting a monitoring inventory to measure progress against the baseline established in this inventory report. Conducting such an inventory represents milestone five of the Five- Milestone Process, and allows a local government to assess how well it is progressing toward achieving its emissions reduction targets.

This inventory was conducted by AMBAG in conjunction with Chris Sentieri, Intern and his supervisor Alana Knaster, Deputy Director of the RMA at Monterey County, who served as the lead data gathering coordinator for the inventory. To facilitate a monitoring inventory, AMBAG has documented all of the raw data, data sources, and calculation methods used in this inventory. Future inventories should seek to replicate or improve upon the data and methods used in this inventory. Wherever possible, however, AMBAG recommends institutionalizing internal data collection in order to be able to meet the recommended methods outlined in LGOP.

E.1 ICLEI Tools for Local Governments

ICLEI has created a number of tools for Monterey County to use to assist them in future monitoring inventories. These tools were designed specifically for the AMBAG Regional Inventory Collaboration, and comply with the methods outlined in LGOP. These tools are designed to work in conjunction with LGOP, which is, and will remain, the primary reference document for conducting an emissions inventory. These tools include:

- A “master data workbook” that contains most or all of the raw data (including emails), data sources, emissions calculations, data templates, notes on inclusions and exclusions, and reporting tools (charts and graphs and the excel version of LGOP reporting tool).
- A copy of all electronic raw data, such as finance records or Excel spreadsheets.
- LGOP reporting tool (included in the master data sheet and in Appendix B) that has all activity data, emissions factors, and methods used to calculate emissions for this inventory.

- Sector-specific instructions that discuss the types of emissions, emissions calculations methods, and data required to calculate emissions from each sector, as well as instructions for using the data collection tools and calculators in the master data sheet.
- The appendices in this report include detailed methodologies for calculating emissions from Scope 3 employee commute and government-generated solid waste, as well as two versions of the employee commute survey.

E.2 Relationship to Other Monterey Bay Area Local Government Inventories

While the emissions inventories for the participating local governments were conducted simultaneously using the same tools and inventory protocol (LGOP), a local government operations inventory is based on data specific to each local government's operations. For this reason, data must be collected internally within each local government, and the availability of data (and thus emissions estimation methods) will vary between local governments.

That said, local governments in the Monterey Bay Area may benefit by cooperating during the re-inventorying process. For example, by coordinating inventories, they may be able to hire a team of interns to collectively perform the inventories – saving money in the process (as with this initial inventory process). In addition, local staff may be able to learn from each other during the process or conduct group training sessions if necessary. As a whole, AMBAG Energy Watch provides the basis for a continuing regional platform for climate actions, and It is recommended taking advantage of this opportunity during all climate actions, including conducting future greenhouse gas emissions inventories.

E.3 Improving Emissions Estimates

One of the benefits of a local government operations inventory is that local government staff can identify areas in their current data collection systems where data collection can be improved. For example, a local government may not directly track fuel consumption by each vehicle and instead will rely upon estimates based upon VMT or purchased fuel to calculate emissions. This affects both the accuracy of the emissions estimate and may have other implications for government operations as a whole.

During the inventory process, AMBAG and local government staff identified the following gaps in data that, if resolved, would allow Monterey County to meet the recommended methods outlined in LGOP in future inventories:

- Direct tracking of refrigerants recharged into HVAC and refrigeration equipment
- Direct tracking of fire suppressants recharged into fire suppression equipment
- Miles traveled (ie- Accurate Odometer readings) of individual vehicles
- Fuel consumption by mobile equipment
- Fuel consumption by diesel and other generators

AMBAG encourages staff to review the areas of missing data and establish data collection systems for this data as part of normal operations. In this way, when staff are ready to re-inventory for a future year, they will have the proper data to make a more accurate emissions estimate.

E.4 Conducting the Inventory

It is recommended the following approach for local governments that wish to conduct a monitoring inventory:

Step 1: Identify a Climate Steward

This steward will be responsible for Monterey County's climate actions as a whole and could serve as an ICLEI liaison in all future climate work. In the context of a monitoring inventory, the steward will be responsible for initiating discussions on a new inventory.

Step 2: Determine which Sectors to Inventory

There are many ways to determine which sectors apply to a local government's operations, but the easiest to review will be LGOP Standard Report, which is located both in Appendix B and in the master data sheet. This document clearly delineates which sectors will need to be inventoried within a local government's operations and which LGOP sectors do not apply to a Monterey County.

Step 3: Gather Support: Identify Data Gathering Team and Leads

Coordination and acceptance among all participating departments is an important factor in coordinating a successful inventory. To that end, the inventory coordinator should work with the city/town/county administrator to identify all staff who will need to be part of the inventory. To facilitate this process, AMBAG has documented all people associated with the inventory in the master data sheet—these names are located in the final completed data form for each sector. Once this team has been identified, the inventory coordinator should hold a kickoff meeting with the administrator, all necessary staff, and relevant department heads which clearly communicates the priority of the inventory in relationship to competing demands. At this meeting, the roles of each person, including the inventory coordinator, should be established.

Step 4: Review Types of Emissions and Available Methodologies for Applicable Sectors

Local staff should then review LGOP and the instructions documents provided through this inventory to better understand the types of emissions for each sector (for example, within Mobile Emissions, CO_2 emissions and CH_4/N_2O emissions represent two different data requirements and emissions calculations methodologies). Each emissions type may have more than one possible estimation methodology, and it is important that the inventory coordinator understands all possible methodologies and be able to communicate this to all parties assisting in the data gathering.

Step 5: Review Methodologies Used for the 2005 Inventory to Determine Data to Collect

In order to duplicate or improve upon the methods used in this inventory, local staff should again review the methods used for this inventory—these methods are again located in Appendix B—and within the master data sheet. These methods reflect the data limitations for each local government (as many local governments could not obtain data necessary to meet the recommended methods in LGOP). Wherever possible, these methods should be duplicated or, if it is possible, replaced with the recommended methods outlined in LGOP. Using these methodologies, staff will determine what data needs to be collected and communicate this effectively to the data gathering team.

Step 6: Begin Data Collection

With the exception of electricity and natural gas for stationary sources, all data collection will be internal. To obtain stationary source energy consumption data, staff will need to contact AMBAG to determine who the contact is for PG&E data (other utilities will need to be contacted directly).

Step 7: Use the Data Forms as a Resource During Data Gathering

A number of questions will come up during the data gathering process that may be difficult to answer. AMBAG has attempted to capture all of the questions that arose during the 2005 inventory and how they were addressed through the master data sheet. Within the master data sheet, staff should review the raw data, working data, and completed data forms to review how raw data was converted to final data, and also to review any notes taken by AMBAG staff during the 2005 inventory process.

For example, reviewing the stationary sources PG&E data within the master data sheet will allow local staff to review how individual accounts were separated into each category and which counts may have been excluded from the inventory.

Step 8: Use Emissions Software to Calculate Emissions

AMBAG has provided the staff lead on the 2005 inventory with a backup of the software used to calculate many of the emissions included in this report. Staff should use this (or more current ICLEI software) to calculate emissions by inputting the activity data into the software. AMBAG staff and ICLEI trainings are available to assist local government staff in calculating emissions.

Step 9: Report Emissions

The master data sheet also contains the LGOP Standard Reporting Template, which is the template adopted by ARB as the official reporting template for government operations emissions inventory. This tool, as well as the charts and

graphs tool provided by ICLEI can be used to report emissions from government operations. Also, local government staff should utilize this narrative report as guide for a narrative report if they so choose.

Step 10: Standardize and Compare to Base Year

Conducting a monitoring inventory is meant to serve as a measuring point against the baseline year represented in this report. In order to make a more accurate comparison, it is necessary to standardize emissions from stationary sources based upon heating and cooling degree days (staff can use a ratio of heating /cooling degree days to standardize across years).

In addition, it is important, when comparing emissions across years, to clearly understand where emissions levels may have changed due to a change in methodology or due to excluding an emissions source. For example, if the default method was used to estimate refrigerant leakage in 2005 (this method highly overestimates these emissions), and the recommended method was available in a monitoring year, this would appear as a dramatic reduction in these emissions even though actual leaked refrigerants may be similar to the base year. Changes such as these should not be seen as progress toward or away from an emissions reduction target, but emissions estimates should be adjusted to create as much of an apples-to-apples comparison as possible. If such an adjustment is not possible, staff should clearly note the change in methodology between years when comparing emissions.

Appendix C

Energy Audit Report for County of Monterey

Honeywell

Energy Audit Report for County of Monterey

Pete Baumstark
Honeywell Building Solutions
October 3, 2011

Honeywell

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1. Executive Summary

An energy audit was performed for the County of Monterey. Fourteen of the County buildings were audited. The main categories of energy conservation measures (ECMs) include the following:

- HVAC equipment replacement.
- Heating and ventilating unit replacement
- Rooftop unit retrocommissioning
- Expansion of their HVAC building controls system
- Installation of wireless thermostats
- Interior lighting retrofits
- Exterior lighting retrofits
- Installation of high efficiency water heaters
- Cogeneration
- Addition of electric and gas sub metering
- Repairing/replacement of non-functioning equipment (such as exhaust fans)
- Re-engineering and replacement of some HVAC duct work

Some of these items do not produce energy savings directly (such as installation of sub meters), but they do provide better visibility to facilities staff on energy consumption. Other items (such as re-engineering duct work) may not provide energy savings, but produce greater comfort.

Energy savings (and subsequent CO2 reduction), operations and maintenance (O&M) savings, potential PG&E incentives and budgetary costs were all estimated. Simple payback was determined through energy and O&M savings (potential PG&E incentives were not included in the simple payback calculation). The results are summarized in the table below.

Pricing is budgetary estimates only and not firm contract pricing.

Building Name	CO2 Emissions Reduction (lbs/yr)	EnergySavings/ Avoided Energy Cost ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Budgetary Investment	Simple Payback (years)
Adult Rehab	112,506	$16,195	$19,074	$35,269	$10,842	$179,759	5.1
Correctional Facility	587,696	$47,857	$16,411	$64,268	$52,540	$857,043	13.3
New Jail	-74,116	$128,621	$1,606	$130,227	$18,413	$1,310,274	10.1
Public Safety Building	342,335	$60,955	$7,049	$68,004	$22,775	$538,774	7.9
Probation Headquarters	34,999	$5,165	$600	$5,765	$4,282	$125,532	21.8
Probation Juvenile Intake	25,131	$1,929	$2,312	$4,241	$2,234	$150,989	35.6
Probation Juvenile D Wing	899	$237	$200	$437	$99	$9,864	22.6
Probation Youth Center	32,122	$5,718	$840	$6,558	$2,707	$127,961	19.5
DSES Seaside Office	14,537	$5,037	$4,768	$9,805	$1,066	$182,243	18.6
Agricultural Commission Admin	21,956	$8,330	$1,835	$10,165	$1,692	$222,953	21.9
Agricultural Extension	0	$0	$0	$0	$0	$0	NA
Animal Shelter	120,950	$38,242	$1,426	$39,668	$1,613	$155,998	3.9
Marina Coastal Offices	23,987	$4,129	$14,391	$18,520	$2,515	$91,422	4.9
Laurel Yard Facility	32,955	$10,407	$2,500	$12,907	$3,614	$73,563	5.7
TOTAL	**1,275,956**	**$332,819**	**$73,012**	**$405,831**	**$124,390**	**$4,026,373**	**9.9**

Some things to note:

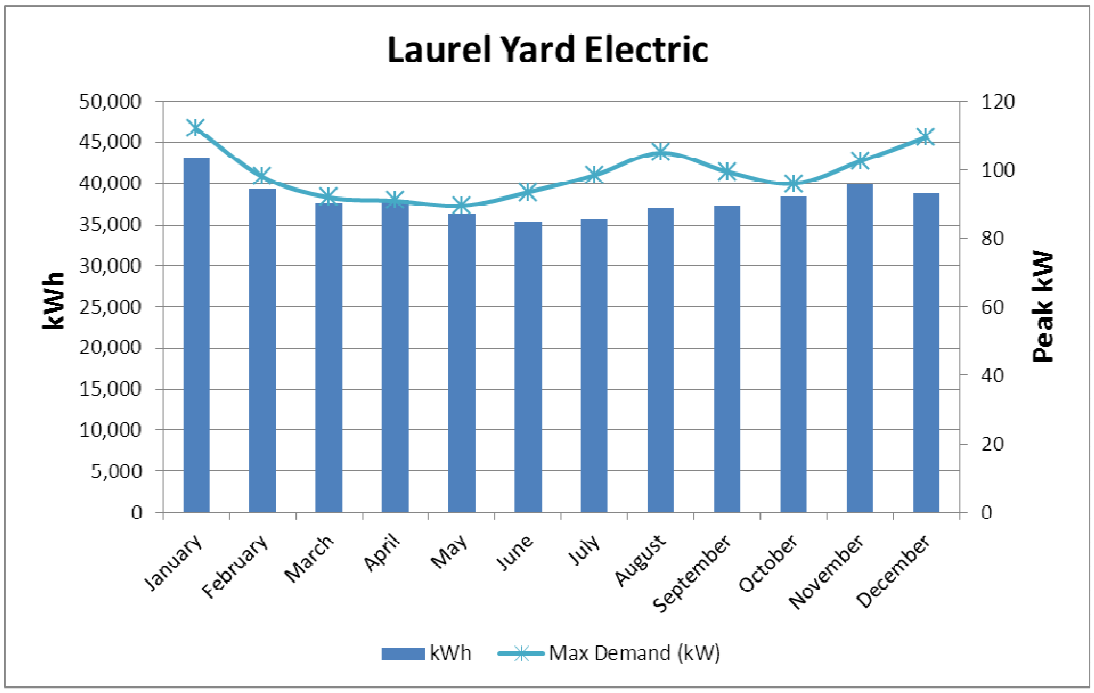
- The New Jail shows a negative CO2 emissions savings. This is due to a proposed cogeneration system at the Jail, which would produce significant energy costs savings, but would produce greater overall CO2 emissions. Also a cogeneration system increases maintenance costs; therefore total O&M cost savings is small compared to the other correctional facility buildings.

- Some facilities show a fairly high simple payback (greater than 20 years). This is in mainly due to the mild climate in Salinas where air conditioning loads are low. Also the Probation Juvenile Intake includes replacement of exhaust fans, which don't produce energy savings, but can increase comfort and indoor air quality.

Further details of the measures are included within this report.

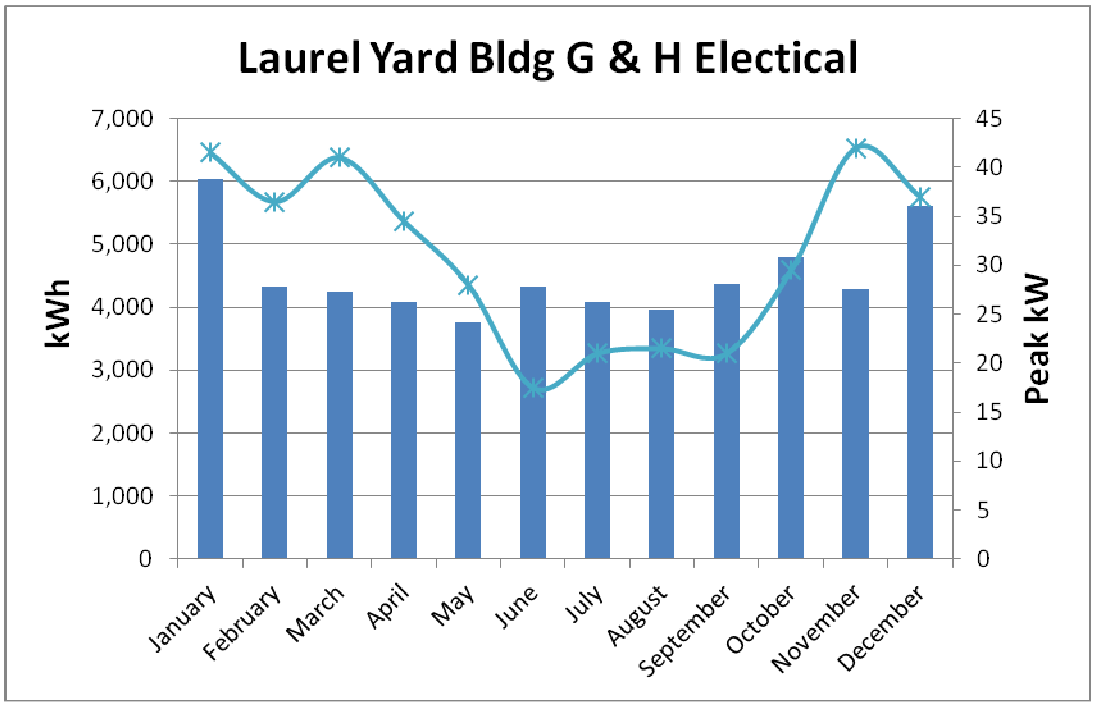
2. Utility Usage and Costs

The utility usage and costs are shown on the following pages for each facility. In most cases the utility usage was obtained over the last two years and averaged, to give a monthly energy use profile. One exception is the Agricultural Commission. Within the past year, there was a new addition to the building which increased energy usage by about 30%. Therefore the graphs and charts for this facility only show history for the past 12 months, which is more representative on the expected usage going forward.



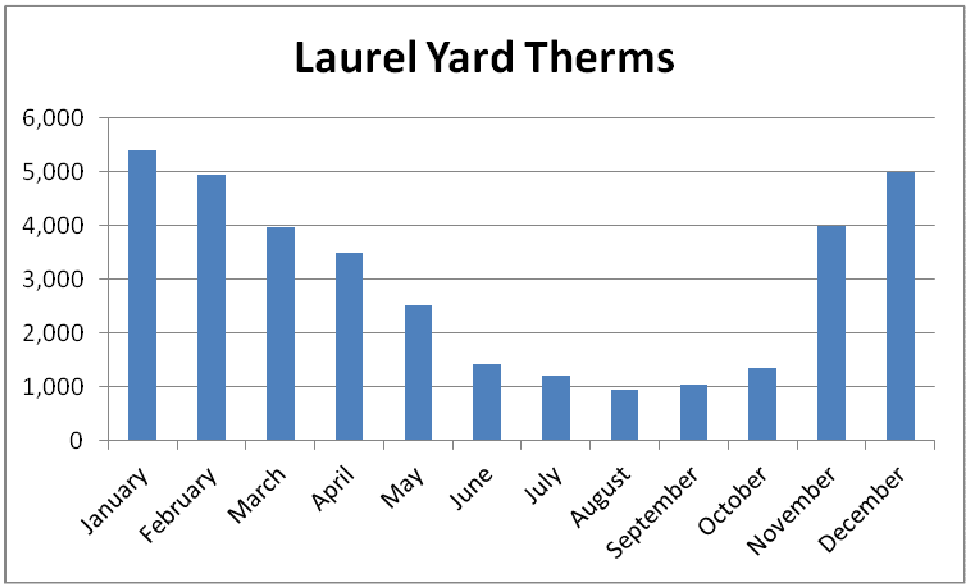
Month	kWh	Max Demand (kW)	Charges
January	43,200	112	$5,025
February	39,360	98	$4,561
March	37,680	92	$4,440
April	38,000	91	$4,538
May	36,320	90	$6,184
June	35,440	94	$6,197
July	35,600	99	$6,303
August	36,960	105	$6,620
September	37,360	100	$6,515
October	38,480	96	$6,442
November	39,920	103	$4,632
December	38,880	110	$4,534
TOTAL	**457,200**	**112**	**$65,991**

Two Year Average



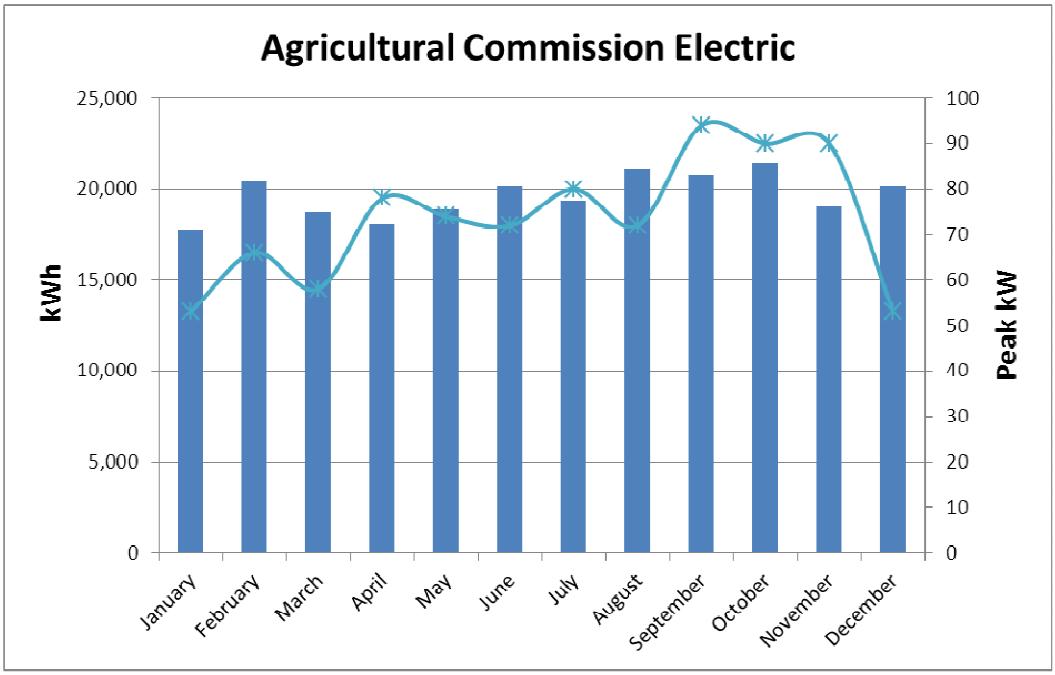
Month	kWh	Max Demand (kW)	Charges
January	6,040	42	$1,205
February	4,320	37	$814
March	4,240	41	$858
April	4,080	35	$829
May	3,760	28	$953
June	4,320	18	$906
July	4,080	21	$914
August	3,960	22	$902
September	4,360	21	$951
October	4,800	30	$1,096
November	4,280	42	$848
December	5,600	37	$948
TOTAL	**53,840**	**42**	**$11,225**

Two Year Average



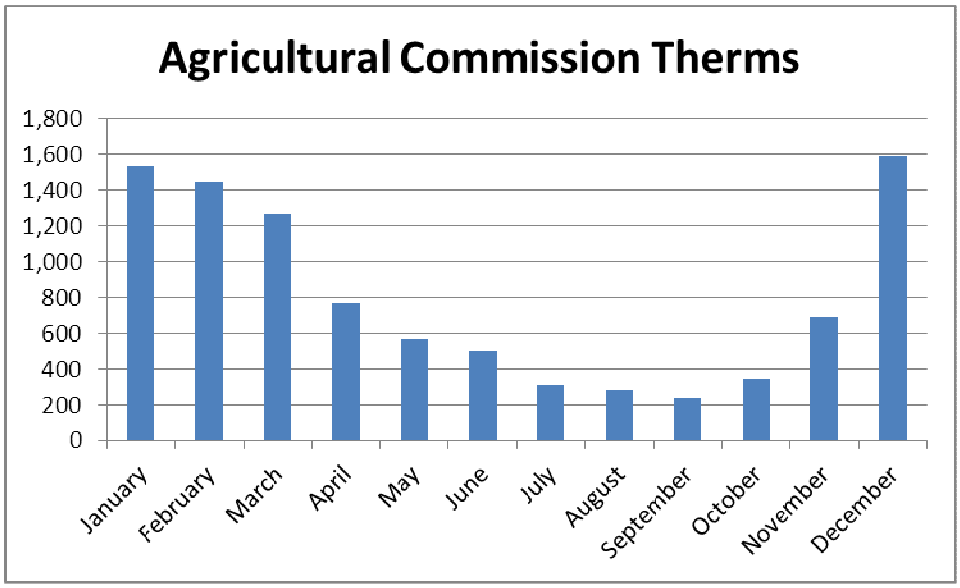
Month	Therms	kBtu	Charges
January	5,389	538,900	$5,003
February	4,954	495,350	$3,993
March	3,967	396,650	$3,728
April	3,501	350,100	$3,105
May	2,518	251,750	$2,184
June	1,414	141,350	$1,216
July	1,202	120,150	$1,071
August	949	94,850	$874
September	1,042	104,200	$923
October	1,361	136,100	$1,225
November	3,993	399,250	$3,776
December	4,993	499,250	$4,488
TOTAL	**35,279**	**3,527,900**	**$31,585**
AVG/Month	**2,940**	**293,992**	**$2,632**

Two Year Average



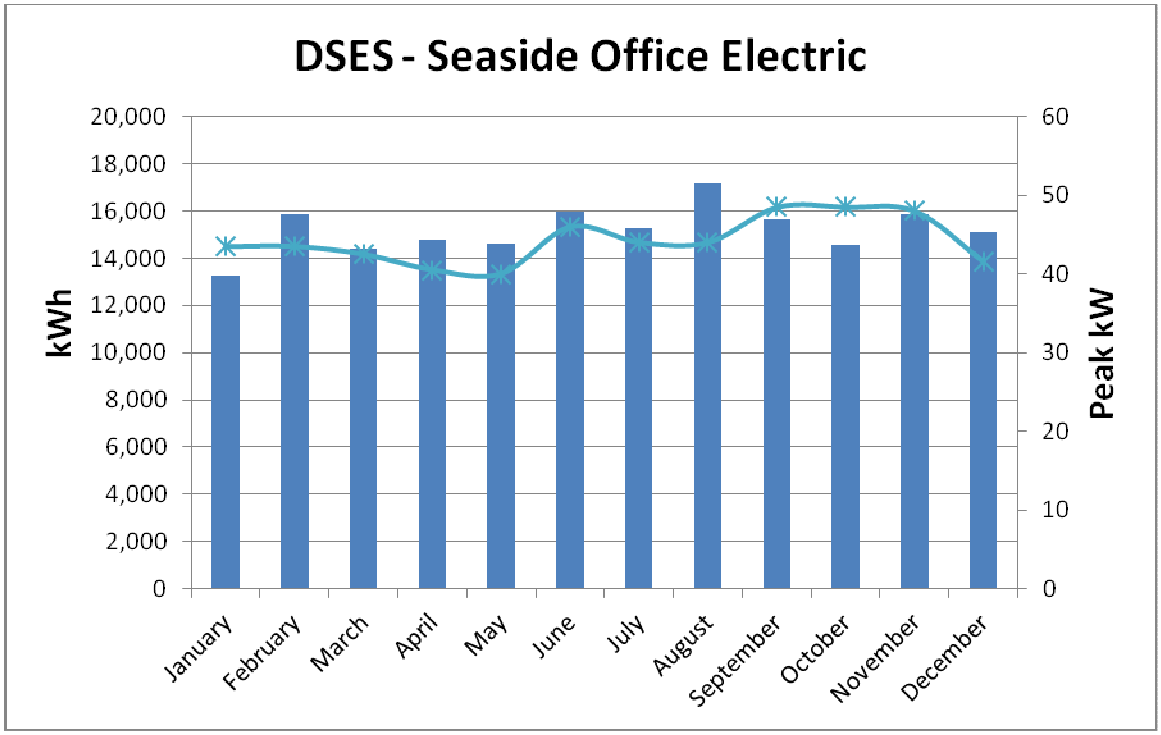
Month	kWh	Max Demand (kW)	Charges
January	17,760	53	$2,494
February	20,480	66	$2,897
March	18,720	58	$2,666
April	18,080	78	$2,747
May	18,880	74	$3,499
June	20,160	72	$3,994
July	19,360	80	$3,925
August	21,120	72	$4,103
September	20,800	94	$4,301
October	21,440	90	$4,346
November	19,040	90	$3,274
December	20,160	53	$2,785
TOTAL	**236,000**	**94**	**$41,031**

Past Year



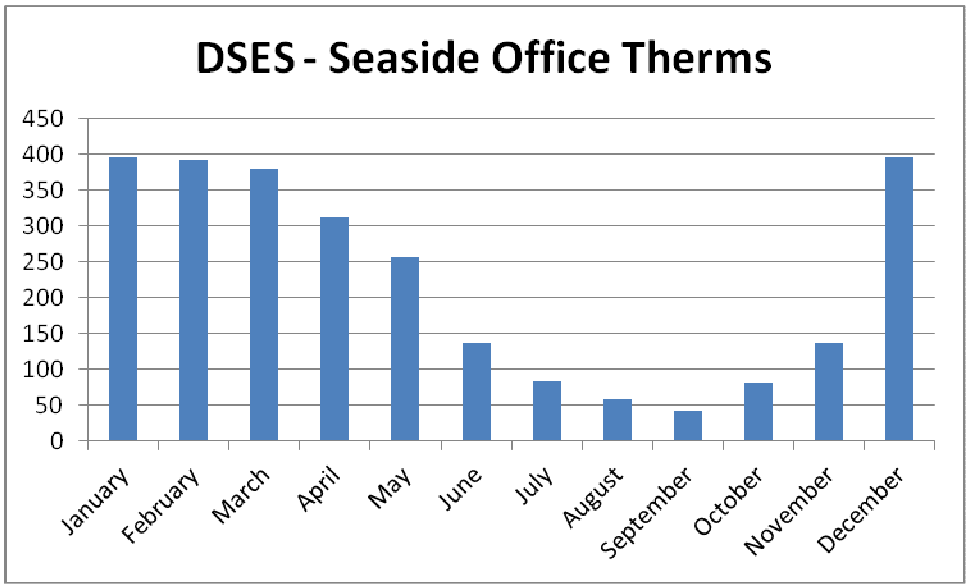
Month	Therms	kBtu	Charges
January	1,533	153,300	$1,611
February	1,448	144,800	$1,613
March	1,268	126,800	$1,310
April	767	76,700	$763
May	566	56,600	$567
June	499	49,900	$493
July	307	30,700	$327
August	283	28,300	$317
September	240	24,000	$275
October	342	34,200	$367
November	685	68,500	$696
December	1,587	158,700	$1,635
TOTAL	**9,525**	**952,500**	**$9,973**
AVG/Month	**794**	**79,375**	**$831**

Past Year



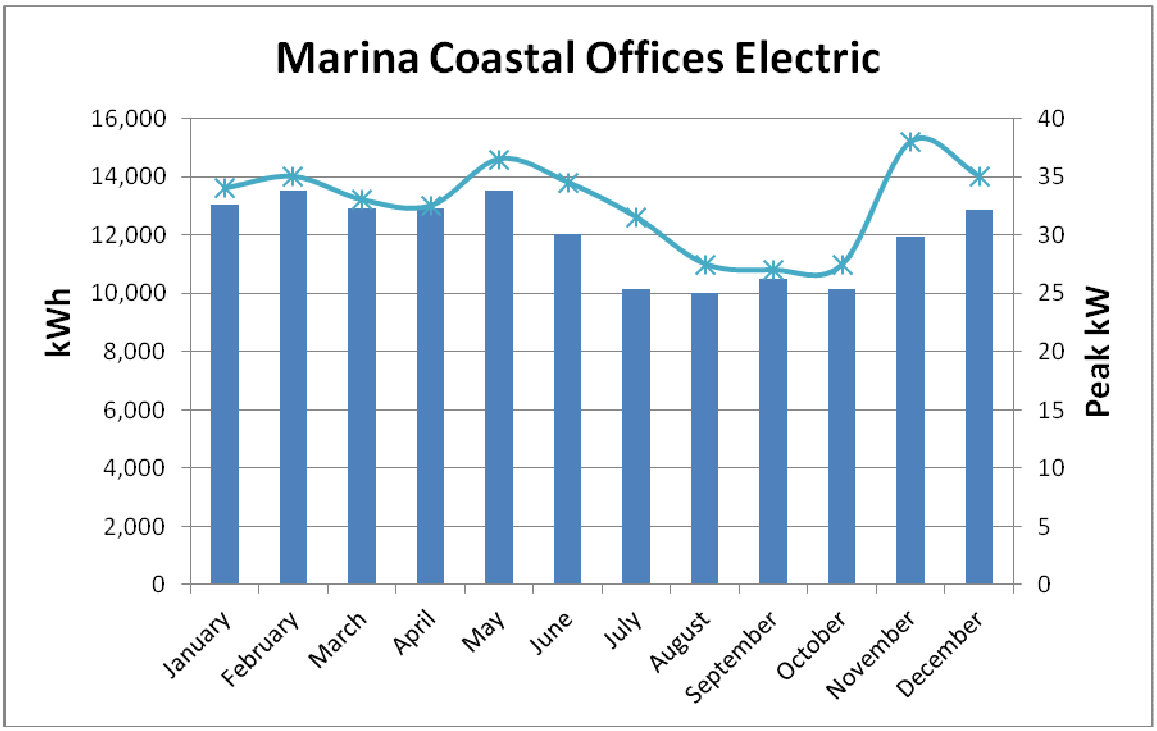
Month	kWh	Max Demand (kW)	Charges
January	13,240	44	$1,796
February	15,880	44	$2,107
March	14,400	43	$1,958
April	14,800	41	$2,002
May	14,640	40	$2,344
June	15,960	46	$2,858
July	15,240	44	$2,717
August	17,160	44	$2,999
September	15,640	49	$2,822
October	14,560	49	$2,668
November	15,880	48	$2,505
December	15,120	42	$1,982
TOTAL	**182,520**	**49**	**$28,760**

Two Year Average



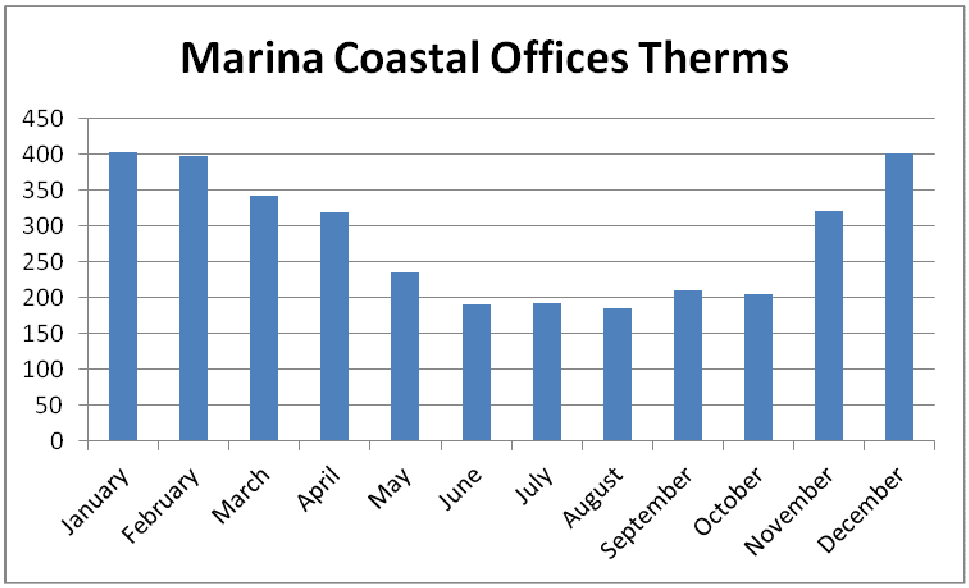
Month	Therms	kBtu	Charges
January	395	39,500	$392
February	393	39,250	$412
March	380	38,000	$356
April	312	31,200	$296
May	256	25,600	$234
June	138	13,750	$124
July	84	8,350	$85
August	58	5,800	$67
September	42	4,150	$51
October	83	8,250	$83
November	138	13,750	$138
December	396	39,550	$387
TOTAL	**2,672**	**267,150**	**$2,625**
AVG/Month	**223**	**22,263**	**$219**

Two Year Average



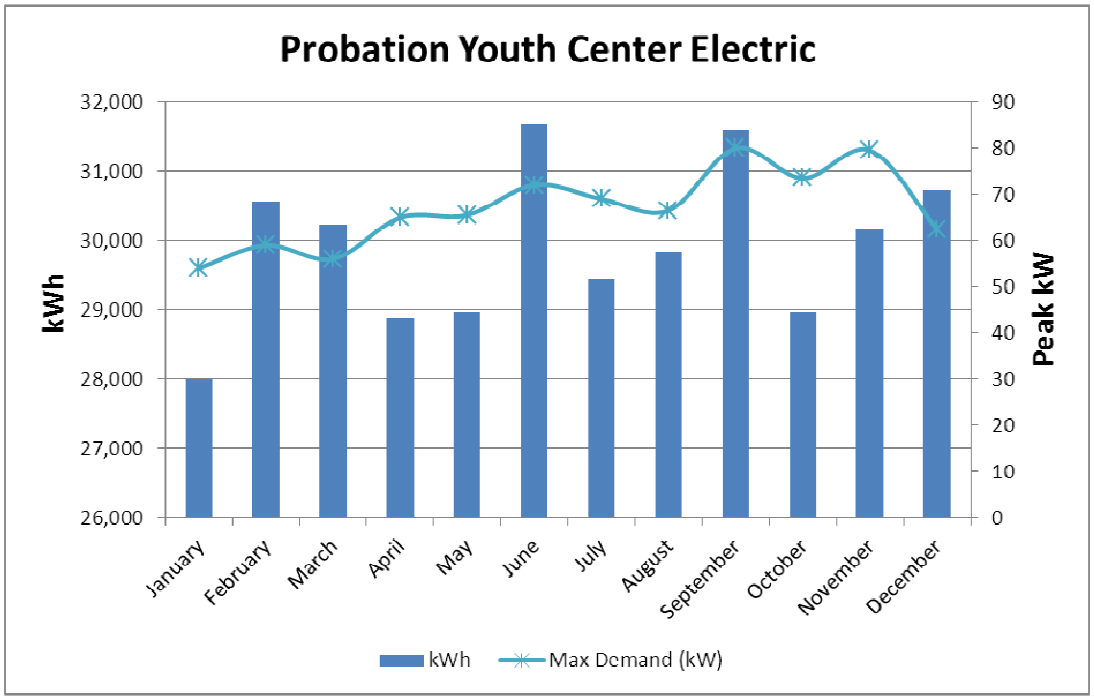
Month	kWh	Max Demand (kW)	Charges
January	13,060	34	$1,733
February	13,520	35	$1,811
March	12,900	33	$1,749
April	12,900	33	$1,967
May	13,540	37	$2,432
June	12,020	35	$2,173
July	10,140	32	$1,875
August	10,020	28	$1,819
September	10,500	27	$1,876
October	10,160	28	$1,688
November	11,960	38	$1,628
December	12,880	35	$1,619
TOTAL	**143,600**	**38**	**$22,370**

Two Year Average



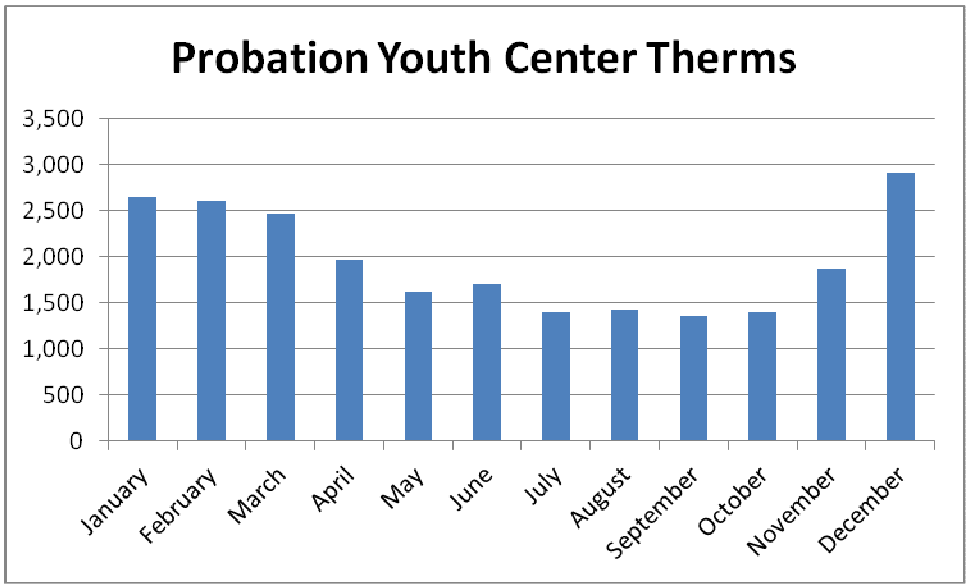
Month	Therms	kBtu	Charges
January	403	40,250	$422
February	397	39,700	$393
March	343	34,300	$334
April	319	31,900	$295
May	235	23,450	$198
June	191	19,050	$173
July	192	19,200	$178
August	186	18,600	$173
September	211	21,050	$190
October	206	20,550	$196
November	320	32,000	$315
December	402	40,200	$404
TOTAL	**3,403**	**340,250**	**$3,271**
AVG/Month	**284**	**28,354**	**$273**

Two Year Average



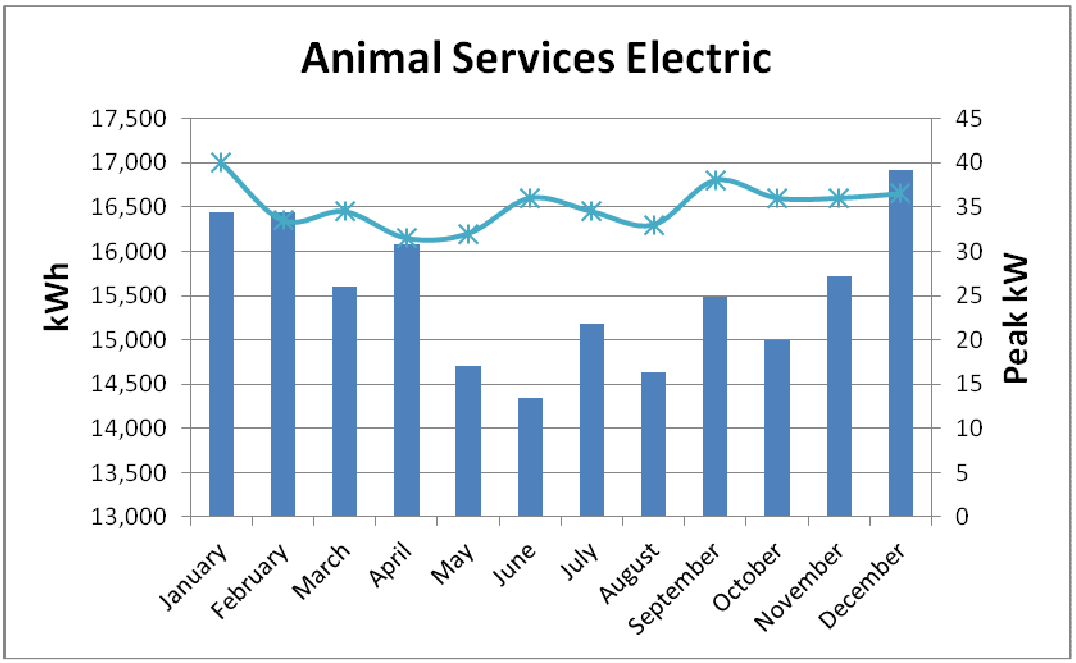
Month	kWh	Max Demand (kW)	Charges
January	28,000	54	$3,082
February	30,560	59	$3,394
March	30,240	56	$3,367
April	28,880	65	$3,378
May	28,960	66	$3,988
June	31,680	72	$5,162
July	29,440	69	$4,889
August	29,840	67	$4,845
September	31,600	80	$5,372
October	28,960	74	$4,965
November	30,160	80	$4,228
December	30,720	63	$3,392
TOTAL	**359,040**	**80**	**$50,063**

Two Year Average



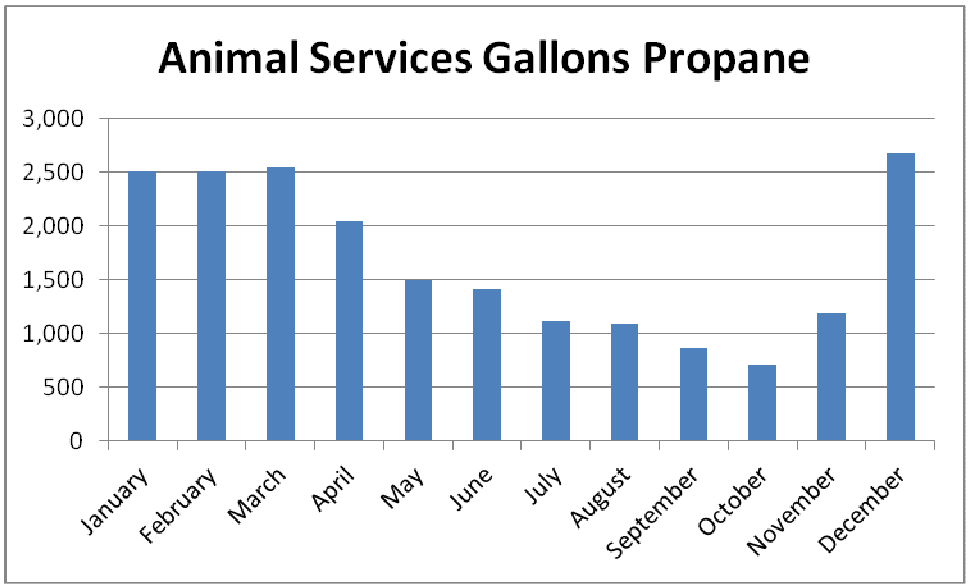
Month	Therms	kBtu	Charges
January	2,654	265,400	$2,575
February	2,600	260,000	$2,656
March	2,467	246,650	$1,843
April	1,969	196,850	$1,830
May	1,620	162,000	$1,433
June	1,700	170,000	$1,372
July	1,397	139,700	$1,195
August	1,422	142,200	$1,244
September	1,351	135,050	$1,170
October	1,400	139,950	$1,201
November	1,864	186,400	$1,704
December	2,907	290,700	$2,778
TOTAL	**23,349**	**2,334,900**	**$21,000**
AVG/Month	**1,946**	**194,575**	**$1,750**

Two Year Average



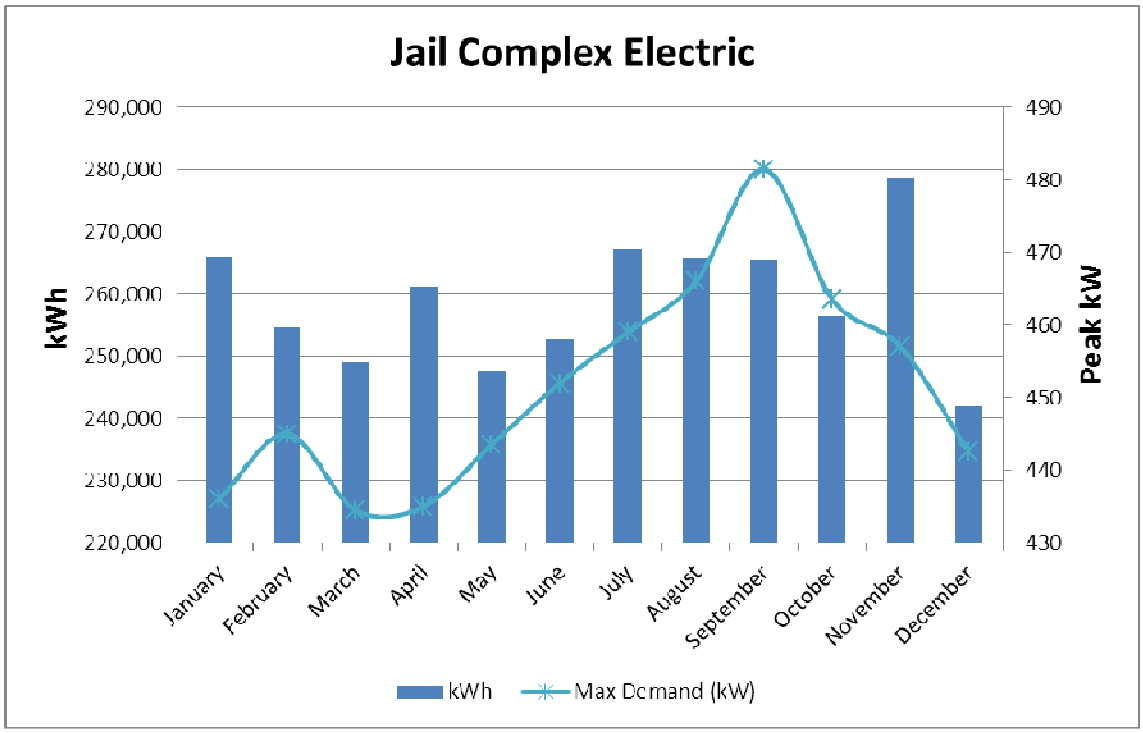
Month	kWh	Max Demand (kW)	Charges
January	16,440	40	$2,253
February	16,440	34	$2,227
March	15,600	35	$2,154
April	16,080	32	$2,339
May	14,700	32	$2,486
June	14,340	36	$2,686
July	15,180	35	$2,781
August	14,640	33	$2,669
September	15,480	38	$2,858
October	15,000	36	$2,758
November	15,720	36	$2,636
December	16,920	37	$2,278
TOTAL	**186,540**	**40**	**$30,126**

Two Year Average



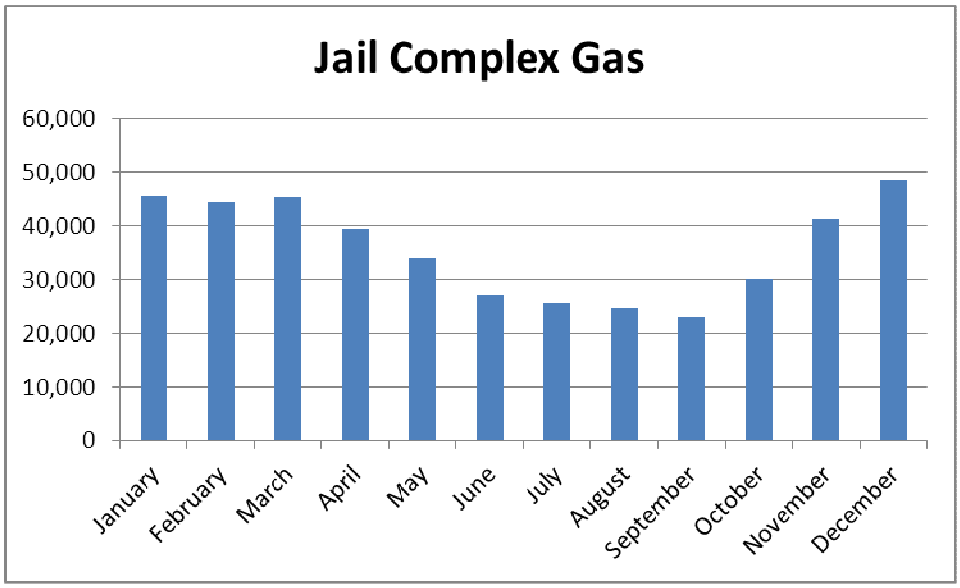
Month	Gallons	kBtu	Charges
January	2,505	229,481	$11,526
February	2,504	229,376	$11,478
March	2,542	232,843	$10,121
April	2,046	187,368	$7,267
May	1,496	136,996	$5,095
June	1,409	129,074	$4,995
July	1,119	102,537	$3,517
August	1,092	99,981	$3,518
September	872	79,829	$3,040
October	712	65,215	$2,730
November	1,184	108,482	$4,168
December	2,679	245,424	$11,709
TOTAL	**20,159**	**1,846,605**	**$79,163**
AVG/Month	**1,680**	**153,884**	**$6,597**

Two Year Average



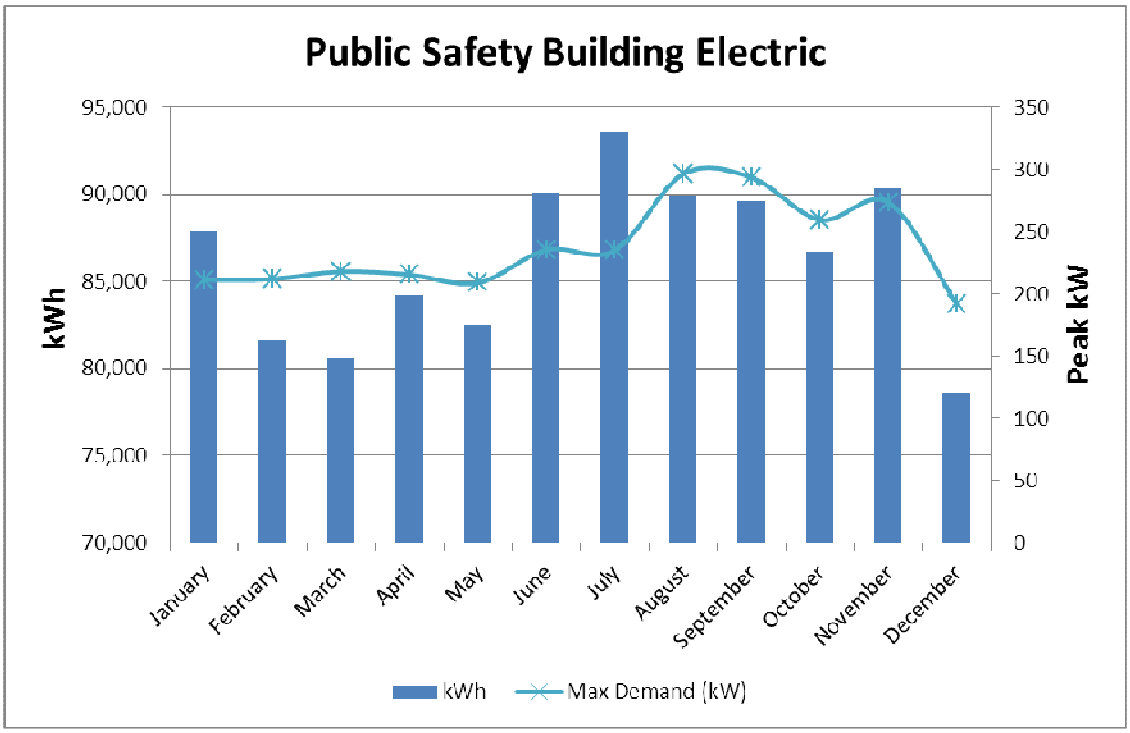
Month	kWh	On Peak kWh	Part Peak kWh	Off Peak kWh	Max Demand (kW)	On Peak Demand (kW)	Part Peak Demand (kW)	Off Peak Demand (kW)	Charges
January	265,880	0	102,441	163,439	436	0	436	424	$25,787
February	254,538	0	102,431	152,107	445	0	445	420	$24,985
March	249,070	0	103,911	145,159	435	0	435	416	$25,049
April	261,281	1,108	101,088	159,086	435	207	435	426	$26,282
May	247,446	48,221	52,031	147,194	444	438	440	415	$34,754
June	252,641	50,200	54,154	148,287	452	452	440	436	$35,750
July	267,083	51,540	54,871	160,673	459	459	439	436	$37,209
August	265,612	51,355	56,074	158,183	466	466	450	447	$37,259
September	265,519	52,271	55,593	157,656	482	482	463	455	$37,628
October	256,388	49,419	53,275	153,695	464	464	436	439	$36,229
November	278,576	2,380	103,691	172,505	457	217	457	431	$27,205
December	242,043	0	99,756	142,287	443	0	443	422	$23,646
TOTAL	**3,106,074**	**306,491**	**939,313**	**1,860,270**	**482**	**482**	**463**	**455**	**$371,782**

Two Year Average



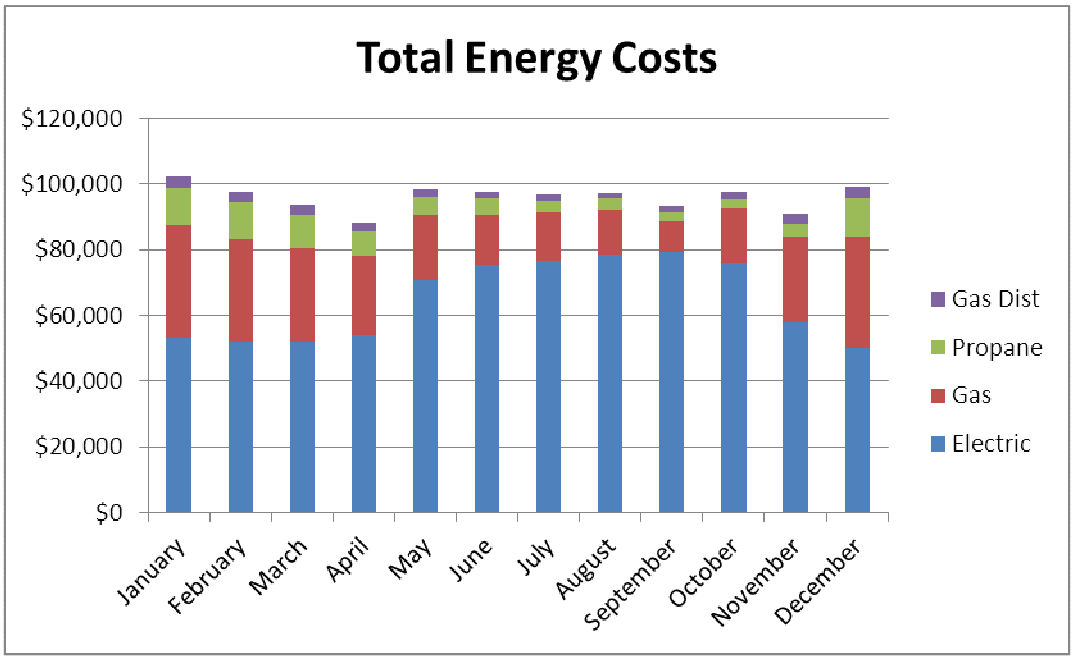
Month	Therms	kBtu	Charges
January	45,680	4,568,000	$24,131
February	44,360	4,436,000	$21,927
March	45,390	4,539,000	$20,943
April	39,290	3,929,000	$17,860
May	33,960	3,396,000	$15,486
June	26,920	2,692,000	$12,007
July	25,530	2,553,000	$12,085
August	24,590	2,459,000	$11,074
September	23,025	2,302,500	$6,616
October	30,000	3,000,000	$13,580
November	41,370	4,137,000	$19,430
December	48,400	4,840,000	$24,259
TOTAL	**428,515**	**42,851,500**	**$199,397**
AVG/Month	**35,710**	**3,570,958**	**$16,616**

Two Year Average



Month	kWh	On Peak kWh	Part Peak kWh	Off Peak kWh	Max Demand (kW)	On Peak Demand (kW)	Part Peak Demand (kW)	Off Peak Demand (kW)	Charges
January	87,840	0	41,311	46,530	212	0	212	165	$9,953
February	81,598	0	39,195	42,404	212	0	212	164	$9,421
March	80,529	0	40,260	40,269	218	0	218	174	$9,641
April	84,184	502	39,247	44,435	216	95	216	174	$9,999
May	82,495	20,364	19,017	43,114	209	204	209	167	$14,065
June	90,052	23,983	21,159	44,910	236	236	233	184	$15,652
July	93,566	24,290	21,255	48,021	235	227	235	187	$15,876
August	89,972	24,459	20,895	44,618	297	297	290	202	$17,161
September	89,602	24,457	20,976	44,169	294	292	276	188	$17,000
October	86,741	22,522	20,044	44,175	260	260	242	172	$15,795
November	90,321	973	40,145	49,203	274	102	274	182	$10,809
December	78,623	0	37,405	41,218	192	0	192	161	$8,828
TOTAL	**1,035,520**	**141,550**	**360,906**	**533,065**	**297**	**297**	**290**	**202**	**$154,200**

Two Year Average



Month	Electric	Gas	Propane	Gas Dist	Total
January	$53,329	$34,134	$11,526	$3,198	$102,187
February	$52,216	$30,993	$11,478	$3,105	$97,792
March	$51,882	$28,512	$10,121	$3,177	$93,693
April	$54,080	$24,150	$7,267	$2,750	$88,247
May	$70,706	$20,101	$5,095	$2,377	$98,279
June	$75,379	$15,384	$4,995	$1,884	$97,642
July	$76,491	$14,940	$3,517	$1,787	$96,735
August	$78,377	$13,748	$3,518	$1,721	$97,364
September	$79,324	$9,226	$3,040	$1,612	$93,202
October	$75,986	$16,653	$2,730	$2,100	$97,468
November	$57,766	$26,059	$4,168	$2,896	$90,889
December	$50,012	$33,951	$11,709	$3,388	$99,060
TOTAL	**$775,548**	**$267,851**	**$79,163**	**$29,996**	**$1,152,558**
AVG/Month	**$64,629**	**$22,321**	**$6,597**	**$2,500**	**$96,046**

Two Year Average

3. Energy Use Intensity (EUI)

A good indication of energy efficiency potential is comparing energy use with similar facilities. The Commercial Buildings Energy Consumption Survey (CBECS) is a national sample survey that collects information on the stock of U.S. commercial buildings, their energy-related building characteristics, and their energy consumption and expenditures.[1] Another benchmarking tool is the California Commercial End-Use Survey (CEUS), which is a comprehensive study of California commercial sector energy use.[2] The following table shows the County of Monterey's electric, gas and propane usage and the average End-Use Intensity (EUI - square foot per year) relative to climate zone, with one exception being the Public Order & Safety facilities (jails, police stations, etc.), where only national average data is available.

Site	kWh / sq ft / yr	Peak W / sq ft	kBtu / sq ft / yr
CBECS Office	16.8	NA	14
CBECS Warehouse	7.5	NA	11
CBECS Public Order & Safety	15.3	NA	29
CEUS Small Office	14.5	4.7	30
CEUS Large Office	15.3	3.8	23
CEUS Warehouse	4.6	1.1	2

Parameter	Laurel Yard	Laurel Yard Bldg G&H	Agricultural Commission	DSES	Marina	Probation Youth Center	Animal Services	Jail, Juve Intake, Prob HQ	Public Safety Building
Building Type	Maintenance, Office	Office	Office	Office	Office	Detention, Office	Detention?	Detention, Office	Office
Floor Area (sq ft)	74,000	10,000	38,278	22,282	13,300	26,818	13,000	274,384	85,125
Electric Use (kWh/yr)	457,200	53,840	236,000	182,520	143,600	359,040	187,440	3,106,074	1,035,520
Peak kW	112	NA	94	49	38	80	38	482	297
Gas (kBtu/yr)	3,527,900	NA	952,500	267,150	340,250	2,334,900		42,851,500	
Propane (kBtu/yr)							1,846,605		
kWh / sq ft / yr	6.2	5.4	6.2	8.2	10.8	13.4	14.4	11.3	12.2
Peak W / sq ft	1.5	NA	2.5	2.2	2.9	3.0	2.9	1.8	3.5
kBtu / sq ft / yr	42.0		24.9	12.0	25.6	87.1	142.0	156.2	

[1] CBECS website http://www.eia.doe.gov/emeu/cbecs/
[2] CEUS website http://www.energy.ca.gov/ceus/

4. Greenhouse Gas Emissions

Consuming electricity, natural gas and propane all produce CO2 emissions. Below are the emissions factors used in this report:

Electricity: 456 lbs/MWh[3]

Natural Gas: 11.7 lbs/therm[4]

Propane: 5.74 kg/gallon[5] (or 12.63 lbs/gallon)

[3] http://www.co.monterey.ca.us/planning/gpu/2007_GPU_DEIR_Sept_2008/Appendices/Appendix_B_Climate__Links.pdf
[4] PG&E 2009 Emission Factors
[5] US Energy Information Administration

5. Climate Data

The Salinas area is a very moderate climate. Shown below are the heating and cooling degree days per year.[6]

Heating Degree Days:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
°C	250	196	201	158	118	73	61	50	45	76	163	251	1646
°F	450	353	362	284	212	131	110	90	81	137	293	452	2963

Cooling Degree Days:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
°C	0	0	0	3	3	8	17	22	30	13	0	0	100
°F	0	0	0	5	5	14	31	40	54	23	0	0	180

Heating Degree Days: The cumulative number of degrees in a month or year by which the mean temperature falls below 18.3°C/65°F.

Cooling Degree Days: The cumulative number of degrees in a month or year by which the mean temperature is above 18.3°C/65°F.

Also some energy savings calculations were determined through use of Total Meteorological Year (TMY) data, which gives 30 year "typical" hourly weather data per geographic location.[7]

[6] **Source:** SALINAS MUNICIPAL AP, MONTEREY COUNTY data derived from NCDC TD 9641 Clim 81 1961-1990 Normals. 30 years between 1961 and 1990

[7] http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/

6. Operation and Maintenance Savings

In determining Operation and Maintenance (O&M) savings, the following assumptions were used.

- For HVAC, County maintenance summaries were inspected. It is estimated that should the recommended measures be implemented, HVAC O&M will reduce by approximately 50%. Also Honeywell spot work records were evaluated. It is estimated Honeywell spot work will reduce by 50% as well.

- Outdoor lighting O&M can be divided into two categories: 1) those with ground or ladder access and 2) pole mounted fixtures requiring a lifting device. It is assumed O&M would be $20 per year per fixture for ladder access and $40 per year per fixture for lift access. This is derived by assuming one hour per fixture for replacing ladder access lamps and two hours per fixture to replace lift access lamps, at $100 per hour labor rate. The life of an HID lamp is approximately 20,000 to 25,000 hours or approximately five years. Therefore $100 x hours / 5 = $20 per hour per year average.

  These are considered conservative assumptions since it does not factor in lamp costs and in some pole mounted lamps may take longer to replace.

  Induction lighting, which has a lamp life of 100,000 hours is recommended for most of the exterior lighting retrofits.

- For interior lighting retrofits (applies to the jail only), it is assumed no significant O&M savings will be realized. This is a conservative assumption.

7. Potential PG&E Incentives

Incentives for electric or natural gas savings may be available from PG&E. For savings measures such as those recommended in this report, PG&E incentive rates through their Non-Residential Retrofit (NRR) program apply. All incentive amounts must be verified and approved by PG&E. In this report, the following NRR incentive rates and guidelines were used in determining potential PG&E incentives:

Natural Gas: $1.00 per therm saved per year

Electric Savings (Lighting): $0.05/kWh saved per year

Electric Savings (HVAC Controls): $0.09/kWh saved per year

Savings realized through replacing older HVAC equipment is typically not eligible for PG&E incentives, if the replacement equipment only meets minimum California Title 24 requirements. Incentives for such equipment is only available should the customer purchase equipment that is more energy efficient than minimum Title 24 (California's energy code).

Per PG&E rules, a customer is eligible for natural gas incentives should they pay gas distribution charges. Although the County purchases natural gas through a supplier independent of PG&E, gas distribution charges are still charged by PG&E. That bill is being paid by the adjoining hospital.

8. HVAC Systems

The Heating, Ventilation and Air Conditioning (HVAC) systems will be discussed for each building.

8.1 Adult Rehab

The building has a center pod with 7 wings. HVAC is almost exclusively through heating/ventilating units (gas furnaces), except the control room that has a rooftop DX unit. All units run 24/7. The outside air and return air dampers all appear to be manually set, but their positions are very inconsistent. Also there is no building static pressure feedback or any relief dampers present. A number of gas furnaces were replaced four years ago.

The facility has a Honeywell EBI control system for the rooftop units, which mainly control the space temperature through modulating the gas furnaces. However, at the time of the audit, the computer with EBI was turned off, so it's uncertain whether the EBI has been working at all recently.

8.2 Correctional Facility

This includes the K-Pod (Men's cell block), Rotunda, Sally Port & the Women's Cell Block. The K-Pod includes men's cells and the infirmary. Men's cells are served by 10 heating and ventilating units, 100% OSA, with exhaust fans. Infirmary is served by three heating and ventilating units, with supply and return fans, and an economizer system. The control sequence for the economizers (a pneumatic system) is simply to open up the outside air damper and close the return when the outdoor air drops below 75 deg F. The control room (guard station) is served by its own DX HVAC system.

The Women's Cell Block is very similar to the Men's Block, but smaller. It has six heating and ventilating systems (supply and exhaust fans) with 100% outside air. The guard station is served by its own DX HVAC system.

8.3 New Jail

There are 8 rooftop heating and ventilating recirculating units with economizers. They appear generally in good shape, except the economizers are rusty. There are 7 small (approx 3 ton) rooftop AC units, which serve control rooms. These have been retrofitted with aftermarket economizers where the outside air intake bypasses the filter, which have caused damage to the cooling coils. There are also two larger AC units (ACU-1 & 7). ACU-1 serves the classification offices, with DX coils and electric resistance duct heaters, and recirculates air with no economizer (fixed outdoor air damper only). This unit is rusting away and has a bad controller. ACU-7 (20 tons) has DX cooling, hot water heat and an economizer (badly corroded).

The units are controlled by a central control system with a head end located in Laurel Yard. The controllers are obsolete, where replacements are difficult to obtain.

8.4 Public Safety Building

The building was constructed in 1986 with mostly original HVAC equipment in place. The HVAC systems are generally separated into three sections.

AC-1 through 5 and HU-1 through 5 serve a variable air volume (VAV) dual duct multi-zone (DDMZ) system. AC-1 through 5 are large Trane units (18 to 25 tons), in very poor condition. The controls for SAT, deadband and static pressure are manual dials, but most likely do not work properly. In discussions with Honeywell's Service Tech, he mentioned the inlet guide vanes (IGVs) are all rusted and non-functioning; meaning the only static pressure control available is through the discharge dampers for each zone. Several units have economizer dampers that aren't functioning properly and many of the filters are bowed, allowing unfiltered air into the building. One compressor cabinet was opened and oil leaks were observed. HU-1 through 5, served by a 1,200 MBtuh boiler, has fairly clean coils but the heating valves and IGVs appear non-functional. Most valve indicators showed 100% open or closed, but they all

appeared to be supplying heat. Also the fan shaft for HU-1 was sheared off with the fan motor simply running without being connected to the fan. AC-1 & 5 run 24/7 and the rest are controlled by time clocks and run from 7 am to 5 pm.

AC-6 & 7 are 5 ton single zone units near the Coroners' area and appear to be original with the building. The Coroners' area was re-done in 1995 when an additional, single zone, 5 ton AC unit was added. These units cycle with space heat/cool requirements and are enabled from 6 am to 6 pm, M-F.

An air-cooled chiller and AH-1 & 2 serve the main Coroners' area. AH-2, the larger unit, supplies 100% OSA. AH-2 recirculates air with an economizer system. Supply and exhaust fans for AH-1 are controlled by VFDs, but running nearly full speed (56 Hz) at the time of the audit. The air-cooled chiller has a 60 ton capacity.

HVAC controls are through a central control system (Honeywell EBI) with minimal capabilities. The EBI controls the Coroners' area and gives zone feedback for the rest of the building (but the thermostats are manually set). AC-1 through 5 and HU-1 through 5 are not currently on the EBI system.

8.5 Probation Headquarters

Operation schedule is 5 am to 5 pm, M-F. HVAC is a constant volume multi-zone system with 100% OSA. System is fully pneumatic with some of the zone actuators disabled. Stationary Engineer says the pneumatic thermostats need calibration. Cooling is through three (3) split systems (relatively new) mounted on the ground with refrigerant piping running up to the AHU evaporator coils in the penthouse (above the 2nd floor). Heating is through a hot water boiler. Switch-over between heating and cooling is 70 deg OSA (heating locked out above and cooling locked out below). Building exhaust is through a 5 hp fan that runs 24/7, but at the time of the audit, it was broken with no exhaust in the building. There is also a small RTU serving the courtroom only.

8.6 Probation Juvenile Intake

Operation schedule is 24/7. HVAC is primarily through rooftop heating and ventilating units and some ceiling mounted heating/ventilating units. The Secretary's office and mail room have a common baseboard radiator bank. The radiator heats all the time and the local thermostat has no effect on its function. During the time of the audit, none of the rooftop units were running. They were either not running due to no need for heating in the spaces or were manually turned off. The Stationary Engineer indicated the systems tend to put out too much heat, so get turned off at times. Also the Stationary Engineer indicated all the rooftop exhaust fans need replacing and that the pneumatic system needs calibration.

There are three boilers on site; in the A, B & C wing boiler rooms. The controls for each boiler could be improved. In each boiler system, it is unclear what the actual hot water temperature is set at. B & C wing show a 74 deg F boiler outdoor air temperature lock-out where A wing shows a 92 deg F lock-out.

8.7 Probation Juvenile D Wing

These are two dorm rooms, each with its own rooftop AC unit (5 ton) with gas heat and no economizer. The units were manufactured in 1994 but appear in good condition. The units are each controlled by a programmable thermostat. During the time of the audit, one unit was turned off, but site personnel said it's usually on. After a brief inspection the unit thermostats need to be re-programmed.

8.8 Probation Youth Center

Operation schedule is generally 24/7. There are seven (7) heating and ventilating units and four (4) rooftop packaged units (heat and cool), installed in 1995. Each unit appears to have been retrofitted with after-market economizers. Only one outdoor air sensor was located, but for the heating units, damper positions varied considerably. Outdoor air dampers ranged from fully open, to fully closed to ½ open. The linkage is somewhat rusty on each unit. The drawings show CO2 sensors on three units, but only one was located during the site walk. The units are controlled by a central control system with the head-end located in Laurel Yard, which controls air temperatures in the AHU through economizer and heating valve modulation. Through inspecting the EMS screens, the sensors and control loops could use calibration – many of the temperatures relative to economizer and valve position are not optimum.

Sleeping areas are typically unoccupied from 8 am to 3 pm (when they have school), but can sometimes have inmates present. Heating units in these areas still run 24/7.

There's a newer building that's all class rooms. They have four (4) HVAC units controlled by programmable thermostats. At the time of the audit, two (2) of the units were turned off completely. The scheduling in the thermostats is 6 am to 5 pm, 7 days/week.

8.9 DSES – Seaside Office

Occupancy schedule is M-F, 8 am to 5 pm. The building is served by six (6) rooftop units ranging in capacity from 6 to 10 tons each. Two units are new, with the remaining (labeled AC-1, 3, 5 & 6) being approximately 20 years old. AC-1 is leaking condensate, which is dripping onto the dropped ceiling area of the 2nd floor. Each unit serves a portion of the 1st and 2nd floor (two thermostats per unit). The HVAC system was initially designed as a variable volume and temperature (VVT) system, but never did work correctly. Currently the variable volume dampers have been set in fixed positions where they run as single zone constant volume. At the time of the audit, the thermostat screens were locked, so actual programming could not be checked. There are issues with excessive heat and cool in the building. For example, building personnel

mentioned the lunch room is 10 deg cooler than the office area. Also the 1st floor feels much warmer than the 2nd.

The County is considering moving out of this building in the near future.

8.10 Agricultural Buildings

Operation schedule is 8 am to 5 pm, M-F. This facility has an older section, a newer section and an Agricultural Extension building (conference rooms). The older section is served by six (6) packaged HVAC units, installed in 1993. The newer section (constructed within the past year) is served by two (2) packaged units, both in good condition. Facilities staff felt that three (3) of the units in the older section operate 24/7, but this should be verified. On all units, the fans cycle with heat and cool (not continuous). Thermostats are set with a wide dead band (74 cool, 68 heat).

The conference center is split into two areas, each cooled by two (2) Trane split systems and heated by two (2) residential type furnaces.

8.11 Animal Shelter

Occupancy is generally 8 am to 6 pm, 7 days. The facility went through a major retrofit 10 years ago, with all new HVAC equipment. People areas are served by five (5) packaged HVAC units, controlled by programmable thermostats. Supply fans cycle with heating and cooling demands. Three of the five units are interlocked with heat recovery ventilators (HRVs). Several programmable thermostats were inspected, and it was found the settings are not consistent. Each has heat and cool set-points that can be adjusted for different times of the day, but the day-time settings are not consistent and the night time set-backs don't always set-back. No natural gas service is available, so they have two 500 gallon propane tanks.

There are two kennels on the property. Each has a radiant floor heating system and a 100% OSA heating/ventilating system. Radiant heat for each kennel is obtained through a tank-type hot water heater feeding a heat exchanger that serves the radiant floor piping network (closed loop system). The tank-type hot water heater also supplies wash water (to hose down the kennels). There is a high degree of outdoor air infiltration into the kennels. The facility is surrounded by flat farm land and the wind is fairly constant year round. The dog doors for the kennels do not provide any type of sealing against the wind. The heating (radiant and heating/ventilator system) controls are used to maintain a constant indoor air temperature, 24/7/365. A constant indoor air temperature is really not necessary. A better control strategy would be to keep the radiant slab at a warm temperature during colder hours of the year.

8.12 Marina Coastal Offices

Building is maybe 50% occupied from 8 am to 5 pm, M-F. Most of the building is served by a VAV (supply fan with VFD) ventilation unit with hot water reheat (no mechanical cooling). The unit is controlled by a time clock set at approximately 6 am to 6 pm, M-F, although some of the "pins" have slipped one or two hours and should be adjusted. Each zone is controlled by a pneumatic thermostat. The unit has an economizer that appears to be functional, although some of the linkage is rusty. Air filtration is not operating properly – some of the 1" pleated filters are "buckled", thus allowing unfiltered air into the building. There is no roof insulation that can be seen, but the dropped ceiling area is the return plenum. There is also one small (approx 2 ton) HVAC rooftop unit serving a portion of the core area.

8.13 Laurel Yard

Laurel Yard consists of eight (8) different buildings; some with just office areas and some are a combination of office areas and maintenance facilities. HVAC for the office areas are generally wall mounted, split systems or small packaged AC units (all are 6 ton capacity or less) with programmable thermostats. The maintenance bays have ceiling mounted gas furnaces or

radiant heaters on manual control. Workers in the bays will turn on the heat as necessary, and in some cases, it is necessary to have some roll-up doors open while the heat is on.

9. Recommended HVAC Measures

There are several HVAC measures recommended to increase comfort, energy efficiency and ability to maintain the systems. The recommended HVAC measures will be discussed for each building. Important points to note:

- Total estimated savings includes both energy and operation and maintenance (O&M) savings.
- Simple payback is calculated using both O&M and energy savings.
- Potential PG&E incentives are shown for reference only and are not used in any payback or project cost calculations.
- Project prices are budgetary estimates only, to be used for planning purposes, and are not firm contract pricing.
- Further information, including pre and post measure energy use, is included in Appendix A.
- Energy savings calculation methodology is included in Appendix C.

9.1 Adult Rehab

Only one HVAC measure was identified for the Adult Rehab building – air balance of the rooftop units.

			Gas Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
ECM ID	ECM Name	ECM Description	Therms/yr	$/yr							
4.1	Air balance	Perform air balancing of units (qty 18). Clean dampers and set outside and return air dampers to maintain proper airflow.	5,283	$2,853	61,805	$2,853	$17,714	$20,567	$5,283	$27,672	1.3

9.2 Correctional Facility

Recommended measures include replacing most heating/ventilating units, except the two units serving the Receiving Wing, where retro-commissioning is recommended. Replacement units that are currently 100% outside air are recommended to be replaced with air recirculation units. It is also recommended to add all units to a central control system (Honeywell EBI), which will include optimal economizer and heating valve operation.

			Gas Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
ECM ID	ECM Name	ECM Description	Therms/yr	$/yr							
3.1	Install EBI	Most of the rest of the Jail is on EBI but this area is not. Add all heating/ventilating units onto EBI.	16,656	$8,994	194,877	$8,994	$3,034	$12,029	$16,656	$54,260	4.5
4.1	Heating units - 100% OSA	Replace with recirculating units and economizers. Add CO2 sensing. Current heating units for men's and women's jail are rusting away. 15 units, 1 hp supply fan, 3/4 hp exhaust, 2,440 cfm, 160 MBH.	16,551	$8,938	193,650	$8,938	$3,034	$11,972	$16,551	$360,612	30.1
4.2	Heating units - recirculating	Replace units. Current heating units for infirmary are rusting away. 3 units, economizers, 2 hp supply, 1 hp exhaust, 6,000 cfm, 210 MBH.	1,681	$908	19,664	$908	$3,034	$3,942	$1,681	$111,235	28.2
4.3	Heating units - receiving wing	Retro-commission two multi-zone heating units for receiving wing. Units are 100% OSA and serve 4 zones each with mixing dampers at the AHU.	5,172	$2,793	60,515	$2,793	$3,034	$5,827	$5,172	$7,784	1.3
4.4	Heating unit - women's dayroom	Replace unit. Existing unit is rusting away. 1-1/2 hp supply fan, 4,500 cfm, 290 MBH.	2,004	$1,082	23,451	$1,082	$3,034	$4,117	$2,004	$37,275	9.1

9.3 New Jail

Gas savings can be produced through retro-commissioning and adding the roof top heating/ventilating units to EBI.

ECM ID	ECM Name	ECM Description	Gas Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
			Therms/yr	$/yr							
3.1	Install EBI	Add all units to EBI	3,046	$1,645	35,633	$1,645	$3,637	$5,282	$3,046	$72,359	13.7
4.1	Retro-Commission HV units	These units (qty 8) generally range from 6,000 to 20,000 Btuh, supply fan motors 7.5 to 20 hp and return fan motors 5 or 7.5 hp. Refirbish economizers, calibrate sensors and adjust hot water valve sequencing.	3,046	$1,645	35,633	$1,645	$3,637	$5,282	$3,046	$14,397	2.7

Electric savings can be produced through retro-commissioning ACU-7, replacing ACU-1 and replacing the 3 ton units serving the control rooms.

ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
			kWh/yr	Peak kW	$/yr							
4.2	ACU-7 Retro-Commissioning	Replace condenser coil. Retro-commission ACU-7 (20 ton unit) by refirbishing economizers and calibrating sensors and sequence of operations.	9,808	4.0	$1,177	4,472	$1,177	$3,637	$4,814	$883	$21,232	4.4
4.3	3- ton AC units	Replace 7 units (3 tons each) with air source heat pump units.	25,746	4.2	$3,090	11,740	$3,090	$3,637	$6,727	$0	$106,231	15.8
4.4	ACU-1 replacement	Replace unit - 10 ton capacity.	12,260	2	$1,471	5,591	$1,471	$3,637	$5,108	$0	$29,307	5.7

9.4 Public Safety Building

There are several HVAC measures recommended for the PSB. These measures are all interactive.

1) Replace AC-1 through AC-5. Replace units with same cooling capacity, but with economizers and VFD fans.

2) Retro-Commission HU-1 through HU-5. Replace heating valves and add VFD controls to supply fans. Repair broken HU-1 (fan shaft and bearings).

3) Add rooftop units to EBI. Control features include SAT reset controls for both cold and hot decks and static pressure reset controls.

			Electric Savings			Gas Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	Therms/yr	$/yr							
3.1	Expand EBI	Map points from new AC-1 through 5 and control SAT reset based on building demand. Install controllers for HU-1 through 5 and control SAT reset. Replace HVAC time clocks with on/off controls through EBI. Calibrate zone thermostats.	50,205	6.4	$7,480	9,095	$4,911	129,305	$12,392	$1,527	$13,919	$13,613	$47,203	3.4
4.1	Retrocommission HU-1 through 5	Replace pneumatic hot water valves and calibrate, clean coils, check bearings, repair broken fan shaft and bearings in HU-1. Remove IGVs and add VFDs. 4 fans are 5 hp and one is 7.5 hp.	23,436	0.0	$3,492	6,410	$3,462	85,689	$6,954	$1,527	$8,481	$8,520	$49,164	5.8
4.2	Replace AC-1 through 5	Replace existing units (3 @ 18 ton, 1 @ 23 ton, 1 @ 25 ton) with new cooling only units with economizers, VFD fans and capability for SAT reset controls.	256,855	30.8	$38,271			117,126	$38,271	$1,527	$39,799	$0	$359,326	9.0
4.3	Replace 5-ton, single-zone units	Two units were installed in 1986 and one in 1995. Replace units of same capacity and type.	9,570	3.0	$1,426			4,364	$1,426	$1,527	$2,953	$0	$63,638	21.5

9.5 Probation Headquarters

The main HVAC energy savings measures available to the Probation HQ is improving control functions at the air handlers and building zones. The following are the recommended features:

1) Replacing the pneumatic thermostats and installing wireless pneumatic thermostats (WPTs). This product gives direct digital control (DDC) capabilities down to the zone level, without the need to run wires.

2) Adding DDC controls to the air handlers, which in conjunction with the WPTs, gives the following functionalities:

    a. Optimal morning start-up.

    b. Optimal "switch-over" between heating and cooling.

    c. SAT reset controls based on building demand (for both hot and cold deck).

    d. Hot water temperature reset.

The Stationary Engineer also mentioned the building exhaust fan runs 24/7. New building controls can also schedule the exhaust to be interlocked with the building supply fans.

			Electric Savings			Gas Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	Therms/yr	$/yr							
3.1	Install EBI	Install controllers for AHUs, boilers and split systems. Include programming for optimal morning start-up, optimized "switch-over" from heat to cool, and SAT and boiler hot water resets. Tie points from WPTs into EBI. Schedule exhaust fan to run only when supply fans are running. Add on/off controls for courtroom RTU.	15,665	0.0	$1,880	1,115	$602	20,194	$2,482	$0	$2,482	$2,525	$80,229	32.3
3.2	Wireless pneumatic thermostats	The building has pneumatic thermostats, currently in need of calibration (qty 18). Repair zone damper actuators (some are disconnected).	6,713	0.0	$806	478	$258	8,654	$1,064	$0	$1,064	$1,082	$24,719	23.2

9.6 Probation Juvenile Intake

Savings measures include retro-commissioning the heating/ventilating units, adding the units to a central control system (Honeywell EBI), and repairing the heating valve in the Secretary's office.

			Gas Savings								
ECM ID	ECM Name	ECM Description	Therms/yr	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
3.1	Install EBI	Provide DDC controls for boiler systems and air handlers. Monitor fan status, supply air temperature and return air temperature.	832	$449	9,737	$449	$423	$872	$832	$80,229	92.0
4.1	Retro-Commission heating/ventilating units	Site Engineer indicates units produce too much heat. Retro-Commission by investigating valve operation and airflow and performing necessary adjustments.	832	$449	9,737	$449	$423	$872	$832	$12,679	14.5
4.2	Baseboard heating valve - Secreatary's office	Replace heating valve and calibrate/replace local thermostat.	180	$97	2,111	$97	$423	$520	$180	$2,270	4.4
4.3	Exhaust Fans	Investigate exhaust fans that aren't functioning properly and replace as needed. Estimate nine exhaust fans @ 3/4 HP each. There are a total of 18 exhaust fans on site.			0	$0	$423	$423	$0	$32,406	76.6

Facilities staff mentioned that a number of exhaust fans are not currently working. These could be replaced, but would not produce energy savings.

9.7 Probation Youth Center

Recommended gas savings measures are through retro-commissioning the heating units. Recommended electric savings measures are through replacing the 15 year old HVAC units.

			Electric Savings			Gas Savings								
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	Therms/yr	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
4.1	Retro-Commissioning Heating Units	Includes replacing dampers and calibrating damper sequencing. Calibrate existing CO2 sensors (3 units).				1,528	$1,375	17,876	$1,375	$0	$1,375	$1,528	$9,025	6.6
4.2	Replace 15 year old packaged AC units	There are four units (1 @ 6 tons, 1 @ 2 tons, 2 @ 4 tons) located on the roof.	7,656	2.4	$1,064			3,491	$1,064	$0	$1,064	$0	$77,450	72.8

9.8 DSES – Seaside Office

The HVAC measures available for the DSES Seaside Office are as follows:

1) Replace AC-1, 3, 5 & 6 with newer, higher efficiency units.

2) Re-duct the building so each unit only serves a portion of one floor (eliminate the split between serving 1st and 2nd floor zones). Re-ducting the building is more to address comfort issues rather than energy efficiency.

			Electric Savings									
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
4.1	HVAC duct work	Systems were installed as Carrier VVT but have been converted to constant volume. Each unit serves areas in both 1st and 2nd floor. Tenants have complained of poor AC control. Re-duct units so units only control zones on the same floor.				0	$0	$1,924	$1,924	$0	$56,757	29.5
4.2	Replace AC-1,3,5 & 6	Units are 20 years old. Two are 3-ton, one is 7 ton and one is 8 ton.	10,566	9.5	$1,669	4,818	$1,669	$1,924	$3,593	$0	$101,132	28.1

9.9 Agricultural Commission

The Agricultural Building has six (6) packaged HVAC units that are near end of useful life. It is recommended to replace these units.

			Electric Savings									
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
4.1	Replace older HVAC units	Remove and replace six units (2 @ 8 ton, 1 @ 5 ton, 1 @ 6 ton, 1 @ 10 ton, 1 @ 13 ton)	14,314	7.3	$2,476	6,527	$2,476	$400	$2,876	$0	$170,324	59.2

9.10 Animal Shelter

The Animal Shelter utilizes propane fuel for hot water heating, radiant floor heating (kennels) and space heating. The cost of propane is approximately 4x per kBtu of heat produced relative to natural gas. Therefore any measures to reduce propane use were strongly considered.

The most highly recommended measure includes upgrading the heating controls for the kennel. Currently there is a high degree of outside air infiltration into the space, and the radiant heating system is intended to maintain space temperatures. A better strategy is to use the radiant heating system to maintain slab temperature, since its main function is to keep the dogs warm.

Other measures evaluated include replacing the hot water heaters with high efficiency condensing units. This would increase the annual fuel efficiency ratio (AFUE) from 80% to 91.5%.

			Electric Savings			Propane Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	Gal/yr	$/yr							
1.1	Hot water heaters	Replace propane fired hot water heaters (3 @ 100 gal each) with condensing units.				2,400	$9,432	30,307	$9,432	$0	$9,432	$0	$53,843	5.7
3.1	Install EBI	Tie rooftop units and radiant heating systems into EBI. Modify radiant heating controls by embedding temp sensors (qty 6) into slabs and control based on slab temp - not on space temp.				6,078	$23,887	76,755	$23,887	$186	$24,073	$0	$42,879	1.8

9.11 Marina Coastal Offices

The main measure available to the Marina Coastal Offices involves reducing air flow (and subsequently fan speed), and reducing the need for hot water heating. The recommended retrofits accomplish these goals without sacrificing comfort for the occupants.

1) Add building controls (EBI) to the system. This allows fine tuning of the economizer system and boiler operation for greater system efficiency.

2) Install wireless pneumatic thermostats and tie to EBI. This allows features such as closing VAV dampers in unoccupied areas (reducing overall airflow), resetting fan static pressure based on building demand, and further tuning of economizer function based on heating/cooling requirements of the individual zones.

			Electric Savings			Gas Savings		CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr	Therms/yr	$/yr							
3.1	Install EBI	Include building optimzation agorithms such as optimize economizer function, optimal start/stop, boiler lock-out, hot water temperature resets.	3,296	4.5	$514	670	$643	9,342	$1,157	$4,510	$5,668	$967	$44,467	7.8
3.2	Wireless pneumatic thermostats	Add wireless pneumatic thermostats for 18 zones. Tie to EBI and close VAV dampers in unoccupied areas and use zone information to optimize air handler operation.	3,296	4.5	$514	670	$643	9,342	$1,157	$4,510	$5,668	$967	$24,719	4.4

10. Recommended Lighting Measures

There are some lighting measures recommended for both indoor and outdoor lighting. Overall potential savings estimates are summarized on this section.

10.1 Indoor Lighting – Adult Rehab, Correctional Facility, New Jail

Most interior areas of each building audited have had the overhead lighting retrofitted within the past five (5) years with newer T8 lamps and electronic ballasts. Several areas in the Adult Rehab, Correctional Facility and New Jail appear to be very brightly lit. It is recommended to further evaluate these areas and potentially re-engineer the lighting. In a large number of cases, it appears de-lamping and replacing a number of fixtures with more modern types (more efficient diffusers that better distribute the light) would greatly reduce electric use.

Also there are a few interior areas that have skylights or adjoining window area where day-lighting controls may be appropriate.

				Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
Bldg Name	ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr							
Adult Rehab	5.1	Interior Lighting Retrofit	Facility is very brightly lit. Delamp facility by either completely retrofitting a number of fixtures or simply removing lamps.	33,689	7.3	$4,043	15,362	$4,043	$0	$4,043	$1,684	$56,973	14.1
Adult Rehab	5.3	Interior Lighting Controls	Infirmary area has skylights which provide adequate lighting throughout much of the day. Add daylighting or timeclock to turn off lighting during daylight hours.	3,167	0	$380	1,444	$380	$0	$380	$158	$5,666	14.9

				Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
Bldg Name	ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr							
Correctional Facility	5.1	Interior Lighting	Facility is very brightly lit. Delamp facility by either completely retrofitting a number of fixtures or simply removing lamps.	150,835	27.6	$18,100	68,781	$18,100	$0	$18,100	$7,542	$194,289	10.7

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings kWh/yr	Peak kW	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
New Jail	5.2	Interior Lighting Controls	Dorm areas have windows which provide adequate lighting throughout much of the day. Add daylighting or timeclock to turn off outer rows of lighting during daylight hours.	7,508	0	$901	3,423	$901	$0	$901	$375	$31,576	35.0
New Jail	5.3	Interior Lighting	Facility is very brightly lit. Delamp facility by either completely retrofitting a number of fixtures or simply removing lamps.	184,439	32.9	$22,133	84,104	$22,133	$0	$22,133	$9,222	$174,638	7.9

10.2 Outdoor Lighting

Most outdoor lighting at the County facilities is called “high-intensity discharge” (HID). Major subcategories of this type of lighting include mercury vapor (MV), metal halide (MH), high pressure sodium (HPS) and low pressure sodium (LPS). It is recommended this type of lighting be retrofitted with more efficient options; in most cases induction lighting, which can produce the same light output but with a much lower wattage. Below are the general energy savings estimates per building. Fixture type and quantity estimates, along with recommended retrofit strategies, were developed through review of electrical plans, visual inspection and discussions with County staff. The final count, fixture type and retrofit strategies can be developed with more detailed site walks.

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings kWh/yr	Peak kW	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
Adult Rehab	5.2	Outdoor Lighting	Replace HID lighting with more efficient options	74,329	NA	$8,919	33,894	$8,919	$1,360	$10,279	$3,716	$83,697	8.1

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings kWh/yr	Peak kW	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
Correctional Facility	5.2	Outdoor Lighting	Replace HID lighting with more efficient options	58,680	NA	$7,042	26,758	$7,042	$1,240	$8,282	$2,934	$74,337	9.0

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings kWh/yr	Peak kW	$/yr	CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
New Jail	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	36,836	NA	$4,420	16,797	$4,420	$1,680	$6,100	$1,842	$68,415	11.2

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Public Safety Building	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	12,833	NA	$1,912	5,852	$1,912	$940	$2,852	$642	$19,444	6.8

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Probation Headquarters	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	13,490	NA	$1,619	6,151	$1,619	$600	$2,219	$675	$14,834	6.7

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Probation Juvenile Intake	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	7,774	NA	$933	3,545	$933	$620	$1,553	$389	$11,906	7.7

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Probation Juvenile D Wing	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	1,971	NA	$237	899	$237	$200	$437	$99	$3,282	7.5

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Probation Youth Center	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	23,586	NA	$3,278	10,755	$3,278	$840	$4,118	$1,179	$18,504	4.5

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
DSES Seaside Office	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	21,313	NA	$3,367	9,719	$3,367	$920	$4,287	$1,066	$21,971	5.1

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Agricultural Commission Admin	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	33,835	NA	$5,853	15,429	$5,853	$1,380	$7,233	$1,692	$50,759	7.0

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Animal Shelter	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	27,462	NA	$4,449	12,523	$4,449	$1,240	$5,689	$1,373	$48,025	8.4

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Marina Coastal Offices	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	11,629	NA	$1,814	5,303	$1,814	$860	$2,674	$581	$14,159	5.3

Bldg Name	ECM ID	ECM Name	ECM Description	Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
				kWh/yr	Peak kW	$/yr							
Laurel Yard Facility	5.1	Outdoor Lighting	Replace HID lighting with more efficient options	72,270	NA	$10,407	32,955	$10,407	$2,500	$12,907	$3,614	$73,563	5.7

11. Cogeneration

Cogeneration at the jail facility was evaluated utilizing a combined heat and power system. This runs off natural gas while utilizing waste heat for the hot water system. When developing the project, further work is necessary to determine the appropriate size system to be used. In design of the final system, limitations of hot water usage needs and peak kW at the facility will be thoroughly evaluated. Typically PG&E does not allow exporting of energy from a cogen system of this type into the utility grid. Therefore at least a 50 kW "buffer" between maximum cogen output and facility minimum kW draw throughout the day is required in sizing a system, to avoid a potential power export condition.

				Electric Savings			CO2 Emissions Reduction (lbs/yr)	Total Energy Savings ($/yr)	Operations & Maintenance Savings ($/yr)	Total Cost Savings ($/yr)	Potential PG&E Incentive	Price	Simple Payback (years)
Bldg Name	ECM ID	ECM Name	ECM Description	kWh/yr	Peak kW	$/yr							
New Jail	11.1	Cogeneration	Provide gas fired cogeneration system with waste heat recovery	1,217,315	167	$130,291	-271,509	$92,140	-$18,260	$73,880	$0	$773,720	10.5

One thing to note is the CO2 emissions reduction and O&M savings are both negative. Installing a cogen system increases CO2 emissions relative to using electricity from the utility and having this piece of equipment requires increased O&M. Therefore these values are negative in the above table.

12. Electric and Gas Sub Metering

Strategic sub metering is recommended in some of the County's facilities. For example, there is one electric service that serves the Jail (Rehab, Corr Fac, and New Jail) along with the Juvenile Intake and Probation Headquarters. Also there is one gas service for all of the previous mentioned facilities, but including the PSB. This makes it very difficult for County personnel to effectively manage their energy use, due to lack of visibility where the energy is going.

Electric sub metering can be accomplished by selecting certain electrical panels or building service entrances to install the meter. Honeywell has a line of electric sub meters where data can be read and recorded through a central energy management system (such as Honeywell's EBI).

Throughout the Jail facilities there are a few gas meters currently in place (typically one at each boiler room). It is recommended these be retrofitted by adding a pulse outputter that can be read by a central energy management system. By counting the "pulses" and knowing the meter "K" factor (or multiplier constant), gas use can be trended throughout the day.

Sub metering does not directly produce energy savings. However, it gives a facilities manager visibility to where energy is going, which enables better decisions regarding facility operation.

13. Appendices

13.1 Appendix A – Full ECM Spreadsheet

Monterey ECM
Listing per Bldg - for r

13.2 Appendix B – Equipment Lists

Lists of the major equipment in the facilities where ECMs were considered are as follows:

PSB RTUs

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Return Fan HP	VFDs? (Y/N)	Fan Cycle?	Design airflow (CFM)	EER	Air distribution type	Min Outside Air (CFM)	Schedule
AC-1	DX Unitary	307	NA	1986	10	5	N	N	9,600	8	VAV - DDMZ	1,900	24/7
AC-2	DX Unitary	219	NA	1986	10	3	N	N	8,300	9	VAV - DDMZ	1,700	7-5, M-F
AC-3	DX Unitary	219	NA	1986	10	3	N	N	8,350	9	VAV - DDMZ	1,700	7-5, M-F
AC-4	DX Unitary	276	NA	1986	10	5	N	N	10,300	9	VAV - DDMZ	2,100	7-5, M-F
AC-5	DX Unitary	212	NA	1986	7.5	3	N	N	7,200	9	VAV - DDMZ	1,400	24/7
AC-6	DX Unitary	61	UNK	1986	2	1	N	Y	2,000	8	SZ	460	6-6, M-F
AC-7	DX Unitary	61	UNK	1986	2	1	N	Y	2,000	8	SZ	460	6-6, M-F
AC-8	DX Unitary	62.3	97	1995	1	0	N	Y	2,200	10	SZ	880	6-6, M-F
HU-1	HW Coils	NA	230	1986	7.5	0	N	N	8,500	NA	VAV - DDMZ	0	24/7
HU-2	HW Coils	NA	60	1986	5	0	N	N	6,000	NA	VAV - DDMZ	0	7-5, M-F
HU-3	HW Coils	NA	80	1986	5	0	N	N	4,700	NA	VAV - DDMZ	0	7-5, M-F
HU-4	HW Coils	NA	160	1986	5	0	N	N	5,500	NA	VAV - DDMZ	0	7-5, M-F
HU-5	HW Coils	NA	100	1986	5	0	N	N	4,000	NA	VAV - DDMZ	0	24/7
HU-6	HW Coils	NA	27.4	1986	FRAC	0	N	Y	815	NA	SZ	0	
AH-1	CH & HW Coils			1995	5	0	Y	N	2,200	NA	CV Cool/Heat	675	7-5, M-F
AH-2	CH & HW Coils			1995	15	0	Y	N	13,185	NA	CV Cool/Heat & RH	13,185	7-5, M-F

PSB Exhaust Fans				
Mark	ESP	CFM	HP	Area
EF-1	0.25	5,225	0.75	General
EF-3	0.75	1,100	0.5	General
EF-9	0.125	22,500	1.5	Garage
EF-12	2	625	0.5	General
EF-17	3.5	13,685	15	Autopsy Area
Others	0.25	6,630	FRAC	17 fans

Main Jail

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Ret/Exh Fan HP	VFDs? (Y/N)	Design airflow (CFM)	Air distribution type	Min Outside Air (CFM)	Area Served
HV-1	HW Coils		730		5	5	N	12,000	CV MZ (4 zones)	12,000	Receiving Wing
HV-2	HW Coils		440		3	1	N	7,200	CV MZ (4 zones)	7,200	Receiving Wing
HV-3	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Women's Security Hexagon
HV-4	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Women's Security Hexagon
HV-5	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Women's Security Hexagon
HV-6	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Women's Security Hexagon
HV-7	HW Coils		190	1975	1	0.75	N	3,000	CV SZ	3,000	Women's Holding Hexagon
HV-8	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-9	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-10	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-11	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-12	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-13	HW Coils		160	1975	1	1	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-14	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-15	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-16	HW Coils		160	1975	1	1	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-17	HW Coils		160	1975	1	0.75	N	2,440	CV SZ	2,440	Men's Security Hexagon
HV-18	HW Coils		290	1975	1.5	0.75	N	4,500	CV SZ	4,500	Women's Dayroom
HV-19	HW Coils		210	1975	2	1	N	6,000	CV SZ	1,200	Infirmary
HV-20	HW Coils		210	1975	2	1	N	6,000	CV SZ	1,200	Infirmary
HV-21	HW Coils		210	1975	2	1	N	6,000	CV SZ	1,200	Infirmary
AC-1	Unitary DX	24			0.25	0	N	800	SZ	80	Women's Control Booth
AC-2	Unitary DX	36			0.33	0	N	1,200	SZ	120	Men's Control Booth

Rehab

Mark	Type	Heating Input (MBH)	Heating Output (MBH)	Year Installed	Supply Fan HP	Return Fan HP	VFDs? (Y/N)	Design airflow (CFM)	Air distribution type	Min Outside Air (CFM)	Area Served
HV-1	Furnace	100	80	2006	0.5	0	N	1,000	CV SZ	200	A Wing - Ext Offices
HV-2	Furnace	100	80	2006	0.5	0	N	1,000	CV SZ	1,000	A Wing - Int Offices
HV-3	Furnace	350	262.5	2006	1.5	0	N	4,000	CV SZ		B Wing - Rec Room
HV-4	Furnace	75	56.3	2006	0.33	0	N	860	CV SZ		B Wing - Int Cell
HV-5	Furnace	75	56.3	2006	0.33	0	N	860	CV SZ		B Wing - Int Cell
HV-6	Furnace	100	75	2006	0.5	0	N	1,150	CV SZ		B Wing - Ext Cell
HV-7	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		C Wing - Dorm
HV-8	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		C Wing - Dorm
HV-9	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		D Wing - Dorm
HV-10	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		D Wing - Dorm
HV-11	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		E Wing - Dorm
HV-12	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		E Wing - Dorm
HV-13	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		F Wing - Dorm
HV-14	Furnace	200	150	2006	0.5	0	N	1,500	CV SZ		F Wing - Dorm
HV-15	Furnace	360	288	2006	3	0	N	5,000	CV SZ	5,000	G Wing - Dining & TV
HV-16	Furnace	150	120	2006	0.75	0	N	1,750	CV SZ		G Wing - Kitchen Make-up
HV-17	Furnace	315	252	2006	2	0	N	3,600	CV SZ	1,200	H Wing - Recreation & TV
HV-18	Furnace	100	75	2006	1	0	N	1,600	CV SZ		Corridor
UH-1	Furnace	75	60	2006	FRAC	0	N		CV SZ	0	G Wing Dry Storage
UH-2	Furnace	75	60	2006	FRAC	0	N		CV SZ	0	H Wing - Linen & Storage
UH-3	Furnace	75	60	2006	FRAC	0	N		CV SZ	0	H Wing - Laundry

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Return Fan HP	VFDs? (Y/N)	Design airflow (CFM)	Air distribution type	Min Outside Air (CFM)	Area Served
AC-1	Unitary DX	60	45		0.2	0	N	800	SZ	80	Control Room

New Jail

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Return/ Exh Fan HP	VFDs? (Y/N)	Design airflow (CFM)	Air distribution type	Min Outside Air (CFM)	Area Served
HV-1	HW Coils		543	1993	30	20	N	30,000	CV SZ	30,000	Kitchen
HV-2	HW Coils		150	1993	10	7.5	N	11,500	CV SZ	4,200	Dorms
HV-3	HW Coils		226.5	1993	10	5	N	7,500	CV SZ	1,200	Dorms
HV-4	HW Coils		235.5	1993	10	5	N	7,500	CV SZ	1,600	Dorms
HV-5	HW Coils		226.5	1993	10	5	N	7,500	CV SZ	1,600	Dorms
HV-6	HW Coils		154.5	1993	7.5	5	N	5,500	CV SZ	1,000	Intake
HV-9	HW Coils		450	1993	20	2	N	16,000	CV RH	13,000	Intake
ACU-1	Unitary DX	120		1993			N				Classification Offices
ACU-2	Unitary DX	24		1993	0.25	0	N	700	CV SZ	50	Control room
ACU-3	Unitary DX	48		1993	0.75	0	N	1,800	CV SZ	100	Kitchen offices
ACU-4	Unitary DX	24		1993	0.25	0	N	500	CV SZ	50	Kitchen offices
ACU-5	Unitary DX	24		1993	0.25	0	N	500	CV SZ	50	Kitchen offices
ACU-7	Unitary DX	300		1993	7.5	3	N	8,000	CV RH	1,100	Sallyport
ACU-8	Unitary DX	24		1993	0.25	0	N	500	CV SZ	50	Control room
ACU-9	Unitary DX	24		1993	0.25	0	N	500	CV SZ	50	Control room
ACU-10	Unitary DX	36		1993	0.25	0	N	1,000	CV SZ	60	Control room

New Jail Exhaust Fans

Mark	ESP	CFM	HP	Area
A Wing	0.125	1,250	FRAC	2 fans
EF-3	0.5	4,800	1.5	B Wing Shower & Toilets
EF-4	0.5	2,000	0.33	C Wing Shower & Toilets
EF-5	0.5	2,000	0.33	D Wing Shower & Toilets
EF-6	0.5	2,000	0.33	E Wing Shower & Toilets
EF-7	0.5	2,000	0.33	F Wing Shower & Toilets
H Wing	0.125	2,100	FRAC	2 fans

Corr Facility Exhaust Fans				
Mark	**ESP**	**CFM**	**HP**	**Area**
K-Pod	0.33	7,170	2.08	4 Fans
EF-1	0.75	11,000	5	Receiving Wing (HV-1)
EF-2	0.375	3,600	1	Receiving Wing (HV-2)
EF-3	0.25	2,720	0.75	Women's Hex (HV-3)
EF-4	0.25	2,720	0.75	Women's Hex (HV-4)
EF-5	0.25	2,720	0.75	Women's Hex (HV-5)
EF-6	0.25	2,720	0.75	Women's Hex (HV-6)
EF-7	0.25	2,720	0.75	Women's Hex (HV-7)
EF-8	0.25	2,720	0.75	Men's Hex (HV-8)
EF-9	0.25	2,720	0.75	Men's Hex (HV-9)
EF-10	0.25	2,720	0.75	Men's Hex (HV-10)
EF-11	0.25	2,720	0.75	Men's Hex (HV-11)
EF-12	0.25	2,720	0.75	Men's Hex (HV-12)
EF-13	0.375	3,870	1	Men's Hex (HV-13)
EF-14	0.25	2,720	0.75	Men's Hex (HV-14)
EF-15	0.25	2,720	0.75	Men's Hex (HV-15)
EF-16	0.375	4,320	1	Men's Hex (HV-16)
EF-17	0.25	2,720	0.75	Men's Hex (HV-17)
EF-18	0.25	2,700	0.75	Holding Hex (HV-18)
EF-19	0.375	3,500	1	Men's Wing (HV-19)
EF-20	0.375	3,500	1	Men's Wing (HV-20)
EF-21	0.375	3,500	1	Men's Wing (HV-21)
EF-22	0.375	3,600	1	Exercise Control
Others	0.25	4,700	FRAC	4 Fans

Probation YC RTUs

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Fan Cycle?	Design airflow (CFM)	EER	Air distribution type	Economizer (Y/N)	CO2 Sensor (Y/N)	Min Outside Air (CFM)
AC-1	DX Unitary	44.7	38	1995	0.33	Y	1,200	12	SZ	Y	N	100
AC-2	DX Unitary	44.7	38	1995	0.33	Y	1,200	12	SZ	Y	N	100
AC-3	DX Unitary	75	97	1995	1	Y	2,250	10	SZ	Y	N	225
AC-4	DX Unitary	24	40	1995	0.33	Y	850	10	SZ	Y	N	100
AH-1	Furnace		60	1995	0.33	N	1,140	NA	SZ	Y	Y	115
AH-2	Furnace		60	1995	0.33	N	980	NA	SZ	Y	N	100
AH-3	Furnace		72	1995	0.5	N	1,680	NA	SZ	Y	Y	170
AH-4	Furnace		60	1995	0.33	N	1,100	NA	SZ	Y	N	300
AH-5	Furnace		160	1995	1.5	N	2,800	NA	SZ	Y	Y	280
AH-6	Furnace		120	1995	1	N	2,460	NA	SZ	Y	Y	245
AH-7	Furnace		60	1995	0.5	N	1,500	NA	SZ	Y	N	150

Probation Juvenile Intake

Mark	Type	Heating (MBH)	Year Installed	Supply Fan HP	Fan Cycle?	Design airflow (CFM)	Air distribution type	Economizer (Y/N)	Min Outside Air (CFM)	Area Served
FC-1	Fan Coil	102	2004	0.75	Y	1,200	SZ	N	240	Classroom F101
FC-2	Fan Coil	102	2004	0.75	Y	1,200	SZ	N	240	Classroom F102
FC-3	Fan Coil	68	2004	0.5	Y	800	SZ	N	160	Office F103A
FC-4	Fan Coil	134	2004	0.75	Y	1,600	SZ	N	320	Classroom F106
FC-5	Fan Coil	102	2004	0.75	Y	1,200	SZ	N	240	Cells C116-C126
FC-6	Fan Coil	134	2004	0.75	Y	1,600	SZ	N	320	Cells C101-C115
FC-7	Fan Coil	102	2004	0.75	Y	1,050	SZ	N	210	Cells B116-B124
FC-8	Fan Coil	134	2004	0.75	Y	1,600	SZ	N	320	Cells B101-B115
FC-9	Fan Coil	102	2004	0.75	Y	1,050	SZ	N	210	Cells A114-A122
FC-10	Fan Coil	134	2004	0.75	Y	1,400	SZ	N	280	Cells A101-A113
A-30.0	Baseboard	30	Old	NA	NA	NA	Radiator	NA	NA	Secretary's Office (Room H118)
A-8.0	Baseboard	8	Old	NA	NA	NA	Radiator	NA	NA	Room H119
1-S	Fan Coil	156	Unknown	1	N	3,600	SZ	N	720	Activity 203
2-S	Fan Coil	156	Unknown	1	N	3,600	SZ	N	720	Activity 303
3-S	Fan Coil	156	Unknown	1	N	3,600	SZ	N	720	Activity 403
4-S	Fan Coil	100	Unknown	0.5	N	2,000	SZ	N	400	Dining Rooms
5-S	Fan Coil	253	Unknown	1	N	3,600	MZ	N	3,600	Administration

Probation HQ

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Design airflow (CFM)	EER	Air distribution type	Min Outside Air (CFM)	Area Served	Schedule
AH-1	DX Split	288	890	2005	7.5	13,600	10	CV MZ	13,600	1st Floor (12 Zones)	M-F, 5 am to 5 pm
AH-2	DX Split	144	350	2005	3	5,250	10	CV MZ	5,250	2nd Floor (6 Zones)	M-F, 5 am to 5 pm
EF-1	Exhaust	NA	NA		0.17	1,000	NA	EX	NA		M-F, 5 am to 5 pm
EF-2	Exhaust	NA	NA		3	9,215	NA	EX	NA		M-F, 5 am to 5 pm
EF-3	Exhaust	NA	NA		0.13	2,800	NA	EX	NA		M-F, 5 am to 5 pm
EF-4	Exhaust	NA	NA		FRAC	450	NA	EX	NA		M-F, 5 am to 5 pm
EF-5	Exhaust	NA	NA		1	5,900	NA	EX	NA		M-F, 5 am to 5 pm
EF-6	Exhaust	NA	NA		FRAC	90	NA	EX	NA		M-F, 5 am to 5 pm
EF-7	Exhaust	NA	NA		FRAC	90	NA	EX	NA		M-F, 5 am to 5 pm

Agricultural Building

Mark	Type	Cooling (MBH)	Heating Intput (MBH)	Heating Output (MBH)	Year Installed	Supply Fan HP	Fan Cycle?	Design airflow (CFM)	EER	Air distribution type	Economizer (Y/N)	Min Outside Air (CFM)	Schedule
AC-1	Unitary DX	92.5	120	96	1993	1	Y	3,000	8.90	CV SZ	Y	305	M-F, 8 am to 5 pm
AC-2	Unitary DX	92.5	120	96	1993	1	Y	3,000	8.90	CV SZ	Y	220	M-F, 8 am to 5 pm
AC-3	Unitary DX	75.4	120	97	1993	1.00	Y	2,500	9.00	CV SZ	Y	170	M-F, 8 am to 5 pm
AC-4	Unitary DX	155	150	100	1993	5	Y	5,000	9.00	CV SZ	Y	595	M-F, 8 am to 5 pm
AC-5	Unitary DX	125	150	100	1993	2.00	Y	4,000	8.90	CV SZ	Y	300	M-F, 8 am to 5 pm
AC-6	Unitary DX	62.7	90	70	1993	0.63	Y	2,000	9.85	CV SZ	Y	150	M-F, 8 am to 5 pm
AC-7	Unitary DX	49.9	60	49	2008	1	Y	1,600	15 (SEER)	CV SZ	Y	140	M-F, 5 am to 5 pm
AC-8	Unitary DX	94	120	97.2	2008	2.00	Y	3,000	11.20	CV SZ	Y	300	M-F, 5 am to 5 pm

Marina Coastal Office

Mark	Type	Cooling (MBH)	Supply Fan HP	Return Fan HP	VFDs? (Y/N)	Fan Cycle?	Design airflow (CFM)	Air distribution type	Total VAV Reheat (MBH)	Supply Air Temp	Reset range	Economizer (Y/N)	Min Outside Air (CFM)	Area Served	Schedule
SF-1 & RF-1	Vent Unit	NA	20	10	Y	N	16,225	VAV RH	168.3		NA	Y	3,245	15 Zones	M-F, 6 am to 6 pm
AC-1	DX Split	18			N	Y	725	SZ	NA		NA	Y	145		UNK

DSES Seaside Office

Mark	Type	Cooling (MBH)	Heating Intput (MBH)	Heating Output (MBH)	Year Installed	Supply Fan HP	Design airflow (CFM)	EER	Air distribution type	Economizer (Y/N)	Min Outside Air (CFM)	Schedule
AC-1	Unitary DX	80.4	114	91.2	1988	1.5	2,625	8.2	CV - 2 zones (1st & 2nd Flr)	N	265	M-F, 7 am to 6 pm
AC-2	Unitary DX	58	80	61	2006	1	2,200	10.3	CV - 2 zones (1st & 2nd Flr)	N	425	M-F, 7 am to 6 pm
AC-3	Unitary DX	35	80	61	1988	0.75	1,300	8.2	CV - 2 zones (1st & 2nd Flr)	N	295	M-F, 7 am to 6 pm
AC-4	Unitary DX	69.6	120	92.4	2006	1	2,100	10.3	CV - 2 zones (1st & 2nd Flr)	N	165	M-F, 7 am to 6 pm
AC-5	Unitary DX	97.5	203	160	1988	1.50	3,300	8.2	CV - 2 zones (1st & 2nd Flr)	N	430	M-F, 7 am to 6 pm
AC-6	Unitary DX	35.6	80	61	1988	0.75	1,400	8.2	CV - 2 zones (1st & 2nd Flr)	N	140	M-F, 7 am to 6 pm

Animal Shelter

Mark	Type	Cooling (MBH)	Heating Intput (MBH)	Heating Output (MBH)	Year Installed	Supply Fan HP	Design airflow (CFM)	EER	Air distribution type	Economizer (Y/N)	Min Outside Air (CFM)	Area Served	Schedule
AC-1	Unitary DX	38.8	60	47	2001	1	1,080	10.50	CV SZ	N	1,080	Main Bldg	7 days, 6 am to 6 pm
AC-2	Unitary DX	67.5	60	47	2001	1	2,400	9.90	CV SZ	Y	550	Main Bldg	7 days, 6 am to 6 pm
AC-3	Unitary DX	39.3	60	47	2001	1	1,200	10.50	CV SZ	Y	600	Main Bldg	7 days, 6 am to 6 pm
AC-4	Unitary DX	66	80	63	2001	1	1,995	9.90	CV SZ	N	1,200	Main Bldg	7 days, 6 am to 6 pm
AC-5	Unitary DX	53.4	80	63	2001	1	1,600	10.00	CV SZ	N	1,600	Main Bldg	7 days, 6 am to 6 pm
HRU-1	Heat Recovery	NA	NA	NA	2001		1,600	NA	CV	NA	NA	Main Bldg	7 days, 6 am to 6 pm
HRU-2	Heat Recovery	NA	NA	NA	2001		1,200	NA	CV	NA	NA	Main Bldg	7 days, 6 am to 6 pm
HRU-3	Heat Recovery	NA	NA	NA	2001		1,080	NA	CV	NA	NA	Main Bldg	7 days, 6 am to 6 pm
F-1	Duct Furnace	NA	175	140	2001	FRAC	3,000	NA	CV	N	3,000	Kennel	24/7
F-2	Duct Furnace	NA	175	140	2001	FRAC	3,000	NA	CV	N	3,000	Kennel	24/7

13.3 Appendix C – Analysis Methodology

13.3.1 Adult Rehab

The adult rehab building has air recirculating heating units. On inspection of dampers (outside and return air) they are not set consistently. For the analysis, it is assumed on average, 40% outdoor air is drawn in. After air balancing, they would all be set for 20% outdoor air and the return dampers set accordingly to provide a slight positive pressure in the building spaces.

A Bin analysis was performed. It is assumed heating only occurs when the outdoor air temperature is under 65 deg F and the heating supply temperature is 95 deg F. Gas use was determined by the following equation:

Btu = 1.08 x CFM x (95 – SAT)

1 therm = 100,000 Btus

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Cooling - Econ (kBtuh)	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	59	40%	59	32,820	610	0	1,283	209
35	14	60	40%	60	32,820	581	0	1,176	206
37	43	60	40%	60	32,820	553	0	1,073	577
39	80	61	40%	61	32,820	525	0	973	973
41	211	62	40%	62	32,820	496	0	877	2,314
43	216	63	40%	63	32,820	468	0	785	2,119
45	266	64	40%	64	32,820	440	0	696	2,313
47	392	64	40%	64	32,820	411	0	610	2,990
49	425	65	40%	65	32,820	383	0	528	2,806
51	361	66	40%	66	32,820	354	0	450	2,029
53	685	67	40%	67	32,820	326	0	375	3,210
55	874	68	40%	68	32,820	298	0	304	3,316
57	1113	68	40%	68	32,820	269	0	236	3,279
59	1381	69	40%	69	32,820	241	0	171	2,960
61	653	70	40%	70	32,820	213	0	111	904
63	508	71	40%	71	32,820	184	0	54	340
65	412	72	40%	72	32,820	156	0	0	0
67	344	72	40%	72	32,820	128	0	0	0
69	210	73	40%	73	32,820	99	0	0	0
71	217	74	40%	74	32,820	71	0	0	0
73	120	75	40%	75	32,820	43	0	0	0
75	63	76	40%	76	32,820	14	0	0	0
77	55	76	40%	76	32,820	-14	14	0	0
79	41	77	40%	77	32,820	-43	43	0	0
81	25	78	40%	78	32,820	-71	71	0	0
83	18	79	40%	79	32,820	-99	99	0	0
85	8	80	40%	80	32,820	-128	128	0	0
87	4	80	40%	80	32,820	-156	156	0	0
89	4	81	40%	81	32,820	-184	184	0	0
91	2	82	40%	82	32,820	-213	213	0	0
93	0	83	40%	83	32,820	-241	241	0	0
95	2	84	40%	84	32,820	-269	269	0	0
Total	**8760**							**9,701**	**30,544**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Cooling - Econ (kBtuh)	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67.4	20%	67	32,820	305	0	978	159
35	14	67.8	20%	68	32,820	291	0	904	158
37	43	68.2	20%	68	32,820	276	0	831	447
39	80	68.6	20%	69	32,820	262	0	760	760
41	211	69	20%	69	32,820	248	0	691	1,823
43	216	69.4	20%	69	32,820	234	0	624	1,684
45	266	69.8	20%	70	32,820	220	0	558	1,856
47	392	70.2	20%	70	32,820	206	0	494	2,423
49	425	70.6	20%	71	32,820	191	0	432	2,297
51	361	71	20%	71	32,820	177	0	372	1,679
53	685	71.4	20%	71	32,820	163	0	314	2,686
55	874	71.8	20%	72	32,820	149	0	257	2,808
57	1113	72.2	20%	72	32,820	135	0	202	2,811
59	1381	72.6	20%	73	32,820	121	0	149	2,570
61	653	73	20%	73	32,820	106	0	97	796
63	508	73.4	20%	73	32,820	92	0	48	304
65	412	73.8	20%	74	32,820	78	0	0	0
67	344	74.2	20%	74	32,820	64	0	0	0
69	210	74.6	20%	75	32,820	50	0	0	0
71	217	75	20%	75	32,820	35	0	0	0
73	120	75.4	20%	75	32,820	21	0	0	0
75	63	75.8	20%	76	32,820	7	0	0	0
77	55	76.2	20%	76	32,820	-7	7	0	0
79	41	76.6	20%	77	32,820	-21	21	0	0
81	25	77	20%	77	32,820	-35	35	0	0
83	18	77.4	20%	77	32,820	-50	50	0	0
85	8	77.8	20%	78	32,820	-64	64	0	0
87	4	78.2	20%	78	32,820	-78	78	0	0
89	4	78.6	20%	79	32,820	-92	92	0	0
91	2	79	20%	79	32,820	-106	106	0	0
93	0	79.4	20%	79	32,820	-121	121	0	0
95	2	79.8	20%	80	32,820	-135	135	0	0
Total	**8760**							**7,713**	**25,261**

13.3.2 Correctional Facility

The Correctional Facility (or Main Jail) consists of four (4) categories: 1) security hexagons (men's or women's), 2) infirmary, 3) receiving wing, 4) women's dayroom.

A Bin analysis was performed for each category. It is assumed heating only occurs when the outdoor air temperature is under 65 deg F and the heating supply temperature is 95 deg F. Gas use was determined by the following equation:

Btu = 1.08 x CFM x (95 – SAT)

1 therm = 100,000 Btus

Security Hexagons:

Existing condition is 100% OSA units. These will be replaced with recirculating units equipped with outdoor air dampers that modulate from 20% to 100% depending on outdoor air conditions.

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	33	100%	33	37,160	0	2,488	404
35	14	35	100%	35	37,160	0	2,257	395
37	43	37	100%	37	37,160	0	2,037	1,095
39	80	39	100%	39	37,160	0	1,826	1,826
41	211	41	100%	41	37,160	0	1,625	4,287
43	216	43	100%	43	37,160	0	1,435	3,874
45	266	45	100%	45	37,160	0	1,254	4,170
47	392	47	100%	47	37,160	0	1,084	5,310
49	425	49	100%	49	37,160	0	923	4,904
51	361	51	100%	51	37,160	0	773	3,486
53	685	53	100%	53	37,160	0	632	5,412
55	874	55	100%	55	37,160	0	502	5,481
57	1113	57	100%	57	37,160	0	381	5,304
59	1381	59	100%	59	37,160	0	271	4,676
61	653	61	100%	61	37,160	0	171	1,392
63	508	63	100%	63	37,160	0	80	510
65	412	65	100%	65	37,160	0	0	0
67	344	67	100%	67	37,160	0	0	0
69	210	69	100%	69	37,160	0	0	0
71	217	71	100%	71	37,160	0	0	0
73	120	73	100%	73	37,160	0	0	0
75	63	75	100%	75	37,160	0	0	0
77	55	77	100%	77	37,160	40	0	0
79	41	79	100%	79	37,160	120	0	0
81	25	81	100%	81	37,160	201	0	0
83	18	83	100%	83	37,160	281	0	0
85	8	85	100%	85	37,160	361	0	0
87	4	87	100%	87	37,160	441	0	0
89	4	89	100%	89	37,160	522	0	0
91	2	91	100%	91	37,160	602	0	0
93	0	93	100%	93	37,160	682	0	0
95	2	95	100%	95	37,160	763	0	0
Total	**8760**						**17,739**	**52,526**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67	20%	67	37,160	0	1,108	180
35	14	68	20%	68	37,160	0	1,023	179
37	43	68	20%	68	37,160	0	941	506
39	80	69	20%	69	37,160	0	861	861
41	211	69	20%	69	37,160	0	783	2,064
43	216	69	20%	69	37,160	0	706	1,907
45	266	70	20%	70	37,160	0	632	2,102
47	392	67	31%	67	37,160	0	632	3,097
49	425	67	33%	67	37,160	0	562	2,985
51	361	67	36%	67	37,160	0	492	2,218
53	685	67	39%	67	37,160	0	421	3,608
55	874	67	43%	67	37,160	0	351	3,836
57	1113	67	47%	67	37,160	0	281	3,908
59	1381	67	53%	67	37,160	0	211	3,637
61	653	67	62%	67	37,160	0	142	1,157
63	508	66	75%	66	37,160	0	72	458
65	412	66	93%	66	37,160	0	0	0
67	344	67	100%	67	37,160	0	0	0
69	210	69	100%	69	37,160	0	0	0
71	217	71	100%	71	37,160	0	0	0
73	120	73	100%	73	37,160	0	0	0
75	63	75	100%	75	37,160	0	0	0
77	55	76	20%	76	37,160	8	0	0
79	41	77	20%	77	37,160	24	0	0
81	25	77	20%	77	37,160	40	0	0
83	18	77	20%	77	37,160	56	0	0
85	8	78	20%	78	37,160	72	0	0
87	4	78	20%	78	37,160	88	0	0
89	4	79	20%	79	37,160	104	0	0
91	2	79	20%	79	37,160	120	0	0
93	0	79	20%	79	37,160	136	0	0
95	2	80	20%	80	37,160	153	0	0
Total	**8760**						**9,218**	**32,704**

Infirmary:

Existing condition is a pneumatic damper that opens when the OSA drops below 75 deg F. These will be replaced with units equipped with outdoor air dampers that modulate from 20% to 100% depending on outdoor air conditions.

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	33	100%	33	18,000	0	1,205	196
35	14	35	100%	35	18,000	0	1,094	191
37	43	37	100%	37	18,000	0	987	530
39	80	39	100%	39	18,000	0	885	885
41	211	41	100%	41	18,000	0	787	2,077
43	216	43	100%	43	18,000	0	695	1,876
45	266	45	100%	45	18,000	0	608	2,020
47	392	47	100%	47	18,000	0	525	2,572
49	425	49	100%	49	18,000	0	447	2,375
51	361	51	100%	51	18,000	0	374	1,689
53	685	53	100%	53	18,000	0	306	2,622
55	874	55	100%	55	18,000	0	243	2,655
57	1113	57	100%	57	18,000	0	185	2,569
59	1381	59	100%	59	18,000	0	131	2,265
61	653	61	100%	61	18,000	0	83	674
63	508	63	100%	63	18,000	0	39	247
65	412	65	100%	65	18,000	0	0	0
67	344	67	100%	67	18,000	0	0	0
69	210	69	100%	69	18,000	0	0	0
71	217	71	100%	71	18,000	0	0	0
73	120	73	100%	73	18,000	0	0	0
75	63	75	100%	75	18,000	0	0	0
77	55	73	20%	76	18,000	4	0	0
79	41	73	20%	77	18,000	12	0	0
81	25	74	20%	77	18,000	19	0	0
83	18	74	20%	77	18,000	27	0	0
85	8	75	20%	78	18,000	35	0	0
87	4	75	20%	78	18,000	43	0	0
89	4	75	20%	79	18,000	51	0	0
91	2	76	20%	79	18,000	58	0	0
93	0	76	20%	79	18,000	66	0	0
95	2	77	20%	80	18,000	74	0	0
Total	**8760**						**8,592**	**25,443**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67	20%	67	18,000	0	537	87
35	14	68	20%	68	18,000	0	496	87
37	43	68	20%	68	18,000	0	456	245
39	80	69	20%	69	18,000	0	417	417
41	211	69	20%	69	18,000	0	379	1,000
43	216	69	20%	69	18,000	0	342	924
45	266	70	20%	70	18,000	0	306	1,018
47	392	67	31%	67	18,000	0	306	1,500
49	425	67	33%	67	18,000	0	272	1,446
51	361	67	36%	67	18,000	0	238	1,075
53	685	67	39%	67	18,000	0	204	1,748
55	874	67	43%	67	18,000	0	170	1,858
57	1113	67	47%	67	18,000	0	136	1,893
59	1381	67	53%	67	18,000	0	102	1,762
61	653	67	62%	67	18,000	0	69	560
63	508	66	75%	66	18,000	0	35	222
65	412	66	93%	66	18,000	0	0	0
67	344	67	100%	67	18,000	0	0	0
69	210	69	100%	69	18,000	0	0	0
71	217	71	100%	71	18,000	0	0	0
73	120	73	100%	73	18,000	0	0	0
75	63	75	100%	75	18,000	0	0	0
77	55	76	20%	76	18,000	4	0	0
79	41	77	20%	77	18,000	12	0	0
81	25	77	20%	77	18,000	19	0	0
83	18	77	20%	77	18,000	27	0	0
85	8	78	20%	78	18,000	35	0	0
87	4	78	20%	78	18,000	43	0	0
89	4	79	20%	79	18,000	51	0	0
91	2	79	20%	79	18,000	58	0	0
93	0	79	20%	79	18,000	66	0	0
95	2	80	20%	80	18,000	74	0	0
Total	**8760**						**4,465**	**15,842**

Receiving Wing:

Existing condition is 100% OSA units. These will be replaced with recirculating units equipped with outdoor air dampers that modulate from 20% to 100% depending on outdoor air conditions.

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	33	100%	33	19,200	0	1,286	209
35	14	35	100%	35	19,200	0	1,166	204
37	43	37	100%	37	19,200	0	1,052	566
39	80	39	100%	39	19,200	0	943	943
41	211	41	100%	41	19,200	0	840	2,215
43	216	43	100%	43	19,200	0	741	2,002
45	266	45	100%	45	19,200	0	648	2,155
47	392	47	100%	47	19,200	0	560	2,743
49	425	49	100%	49	19,200	0	477	2,534
51	361	51	100%	51	19,200	0	399	1,801
53	685	53	100%	53	19,200	0	327	2,796
55	874	55	100%	55	19,200	0	259	2,832
57	1113	57	100%	57	19,200	0	197	2,741
59	1381	59	100%	59	19,200	0	140	2,416
61	653	61	100%	61	19,200	0	88	719
63	508	63	100%	63	19,200	0	41	263
65	412	65	100%	65	19,200	0	0	0
67	344	67	100%	67	19,200	0	0	0
69	210	69	100%	69	19,200	0	0	0
71	217	71	100%	71	19,200	0	0	0
73	120	73	100%	73	19,200	0	0	0
75	63	75	100%	75	19,200	0	0	0
77	55	77	100%	77	19,200	21	0	0
79	41	79	100%	79	19,200	62	0	0
81	25	81	100%	81	19,200	104	0	0
83	18	83	100%	83	19,200	145	0	0
85	8	85	100%	85	19,200	187	0	0
87	4	87	100%	87	19,200	228	0	0
89	4	89	100%	89	19,200	270	0	0
91	2	91	100%	91	19,200	311	0	0
93	0	93	100%	93	19,200	353	0	0
95	2	95	100%	95	19,200	394	0	0
Total	**8760**						**9,165**	**27,139**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67	20%	67	19,200	0	572	93
35	14	68	20%	68	19,200	0	529	93
37	43	68	20%	68	19,200	0	486	261
39	80	69	20%	69	19,200	0	445	445
41	211	69	20%	69	19,200	0	404	1,066
43	216	69	20%	69	19,200	0	365	985
45	266	70	20%	70	19,200	0	327	1,086
47	392	67	31%	67	19,200	0	327	1,600
49	425	67	33%	67	19,200	0	290	1,542
51	361	67	36%	67	19,200	0	254	1,146
53	685	67	39%	67	19,200	0	218	1,864
55	874	67	43%	67	19,200	0	181	1,982
57	1113	67	47%	67	19,200	0	145	2,019
59	1381	67	53%	67	19,200	0	109	1,879
61	653	67	62%	67	19,200	0	73	598
63	508	66	75%	66	19,200	0	37	237
65	412	66	93%	66	19,200	0	0	0
67	344	67	100%	67	19,200	0	0	0
69	210	69	100%	69	19,200	0	0	0
71	217	71	100%	71	19,200	0	0	0
73	120	73	100%	73	19,200	0	0	0
75	63	75	100%	75	19,200	0	0	0
77	55	76	20%	76	19,200	4	0	0
79	41	77	20%	77	19,200	12	0	0
81	25	77	20%	77	19,200	21	0	0
83	18	77	20%	77	19,200	29	0	0
85	8	78	20%	78	19,200	37	0	0
87	4	78	20%	78	19,200	46	0	0
89	4	79	20%	79	19,200	54	0	0
91	2	79	20%	79	19,200	62	0	0
93	0	79	20%	79	19,200	71	0	0
95	2	80	20%	80	19,200	79	0	0
Total	**8760**						**4,763**	**16,898**

Women's Dayroom:

Existing condition is 100% OSA units. These will be replaced with recirculating units equipped with outdoor air dampers that modulate from 20% to 100% depending on outdoor air conditions.

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	33	100%	33	4,500	0	301	49
35	14	35	100%	35	4,500	0	273	48
37	43	37	100%	37	4,500	0	247	133
39	80	39	100%	39	4,500	0	221	221
41	211	41	100%	41	4,500	0	197	519
43	216	43	100%	43	4,500	0	174	469
45	266	45	100%	45	4,500	0	152	505
47	392	47	100%	47	4,500	0	131	643
49	425	49	100%	49	4,500	0	112	594
51	361	51	100%	51	4,500	0	94	422
53	685	53	100%	53	4,500	0	77	655
55	874	55	100%	55	4,500	0	61	664
57	1113	57	100%	57	4,500	0	46	642
59	1381	59	100%	59	4,500	0	33	566
61	653	61	100%	61	4,500	0	21	169
63	508	63	100%	63	4,500	0	10	62
65	412	65	100%	65	4,500	0	0	0
67	344	67	100%	67	4,500	0	0	0
69	210	69	100%	69	4,500	0	0	0
71	217	71	100%	71	4,500	0	0	0
73	120	73	100%	73	4,500	0	0	0
75	63	75	100%	75	4,500	0	0	0
77	55	77	100%	77	4,500	5	0	0
79	41	79	100%	79	4,500	15	0	0
81	25	81	100%	81	4,500	24	0	0
83	18	83	100%	83	4,500	34	0	0
85	8	85	100%	85	4,500	44	0	0
87	4	87	100%	87	4,500	53	0	0
89	4	89	100%	89	4,500	63	0	0
91	2	91	100%	91	4,500	73	0	0
93	0	93	100%	93	4,500	83	0	0
95	2	95	100%	95	4,500	92	0	0
Total	**8760**						**2,148**	**6,361**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67	20%	67	4,500	0	134	22
35	14	68	20%	68	4,500	0	124	22
37	43	68	20%	68	4,500	0	114	61
39	80	69	20%	69	4,500	0	104	104
41	211	69	20%	69	4,500	0	95	250
43	216	69	20%	69	4,500	0	86	231
45	266	70	20%	70	4,500	0	77	255
47	392	67	31%	67	4,500	0	77	375
49	425	67	33%	67	4,500	0	68	361
51	361	67	36%	67	4,500	0	60	269
53	685	67	39%	67	4,500	0	51	437
55	874	67	43%	67	4,500	0	43	465
57	1113	67	47%	67	4,500	0	34	473
59	1381	67	53%	67	4,500	0	26	440
61	653	67	62%	67	4,500	0	17	140
63	508	66	75%	66	4,500	0	9	55
65	412	66	93%	66	4,500	0	0	0
67	344	67	100%	67	4,500	0	0	0
69	210	69	100%	69	4,500	0	0	0
71	217	71	100%	71	4,500	0	0	0
73	120	73	100%	73	4,500	0	0	0
75	63	75	100%	75	4,500	0	0	0
77	55	76	20%	76	4,500	1	0	0
79	41	77	20%	77	4,500	3	0	0
81	25	77	20%	77	4,500	5	0	0
83	18	77	20%	77	4,500	7	0	0
85	8	78	20%	78	4,500	9	0	0
87	4	78	20%	78	4,500	11	0	0
89	4	79	20%	79	4,500	13	0	0
91	2	79	20%	79	4,500	15	0	0
93	0	79	20%	79	4,500	17	0	0
95	2	80	20%	80	4,500	18	0	0
Total	**8760**						**1,116**	**3,960**

13.3.3 New Jail

The New Jail consists of eight (8) rooftop heating only units. Dampers are rusty and it was assumed they have limited functionality. It was assumed they can, on average, close down to 40% and open up to 80%. The post retrofit condition assumed they will modulate from 20% to 80% depending on outdoor weather conditions.

It is assumed heating only occurs when the outdoor air temperature is under 65 deg F and the heating supply temperature is 95 deg F. Gas use was determined by the following equation:

Btu = 1.08 x CFM x (95 – SAT)

1 therm = 100,000 Btus

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	59	40%	59	85,500	0	3,343	543
35	14	60	40%	60	85,500	0	3,065	536
37	43	60	40%	60	85,500	0	2,796	1,503
39	80	61	40%	61	85,500	0	2,536	2,536
41	211	62	40%	62	85,500	0	2,285	6,028
43	216	63	40%	63	85,500	0	2,044	5,519
45	266	64	40%	64	85,500	0	1,812	6,025
47	392	64	40%	64	85,500	0	1,589	7,788
49	425	65	40%	65	85,500	0	1,376	7,309
51	361	66	40%	66	85,500	0	1,172	5,287
53	685	67	40%	67	85,500	0	976	8,361
55	874	67	43%	67	85,500	0	808	8,827
57	1113	67	47%	67	85,500	0	646	8,993
59	1381	67	53%	67	85,500	0	485	8,369
61	653	67	62%	67	85,500	0	326	2,662
63	508	66	75%	66	85,500	0	166	1,054
65	412	67	80%	67	85,500	0	0	0
67	344	69	80%	69	85,500	0	0	0
69	210	70	80%	70	85,500	0	0	0
71	217	72	80%	72	85,500	0	0	0
73	120	74	80%	74	85,500	0	0	0
75	63	75	80%	75	85,500	0	0	0
77	55	76	40%	76	85,500	37	0	0
79	41	77	40%	77	85,500	111	0	0
81	25	78	40%	78	85,500	185	0	0
83	18	79	40%	79	85,500	259	0	0
85	8	80	40%	80	85,500	332	0	0
87	4	80	40%	80	85,500	406	0	0
89	4	81	40%	81	85,500	480	0	0
91	2	82	40%	82	85,500	554	0	0
93	0	83	40%	83	85,500	628	0	0
95	2	84	40%	84	85,500	702	0	0
Total	**8760**						**25,425**	**81,340**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67	20%	67	85,500	0	2,549	414
35	14	68	20%	68	85,500	0	2,355	412
37	43	68	20%	68	85,500	0	2,165	1,164
39	80	69	20%	69	85,500	0	1,981	1,981
41	211	69	20%	69	85,500	0	1,801	4,749
43	216	69	20%	69	85,500	0	1,625	4,388
45	266	70	20%	70	85,500	0	1,454	4,836
47	392	67	31%	67	85,500	0	1,454	7,126
49	425	67	33%	67	85,500	0	1,293	6,868
51	361	67	36%	67	85,500	0	1,131	5,104
53	685	67	39%	67	85,500	0	970	8,302
55	874	67	43%	67	85,500	0	808	8,827
57	1113	67	47%	67	85,500	0	646	8,993
59	1381	67	53%	67	85,500	0	485	8,369
61	653	67	62%	67	85,500	0	326	2,662
63	508	66	75%	66	85,500	0	166	1,054
65	412	66	93%	66	85,500	0	0	0
67	344	67	100%	67	85,500	0	0	0
69	210	69	100%	69	85,500	0	0	0
71	217	71	100%	71	85,500	0	0	0
73	120	73	100%	73	85,500	0	0	0
75	63	75	100%	75	85,500	0	0	0
77	55	76	20%	76	85,500	18	0	0
79	41	77	20%	77	85,500	55	0	0
81	25	77	20%	77	85,500	92	0	0
83	18	77	20%	77	85,500	129	0	0
85	8	78	20%	78	85,500	166	0	0
87	4	78	20%	78	85,500	203	0	0
89	4	79	20%	79	85,500	240	0	0
91	2	79	20%	79	85,500	277	0	0
93	0	79	20%	79	85,500	314	0	0
95	2	80	20%	80	85,500	351	0	0
Total	**8760**						**21,208**	**75,248**

13.3.4 Public Safety Building

The PSB was modeled using eQUEST software and the baseline model features adjusted to match billing history for both electric and gas usage. EQUEST is very sophisticated building

energy simulation software utilizing weather information based on climate zone.[8] The features for the AC-1 through AC-5 and HU-1 through HU-5 are shown below.

[8] http://doe2.com/equest/

PSB RTUs Existing

Mark	Type	Cooling (MBH)	Heating (MBH)	Year Installed	Supply Fan HP	Return Fan HP	VFDs? (Y/N)	Design airflow (CFM)	EER	Adjusted EER	Air distribution type	Supply air temperature (°F)	Reset range	Economizer (Y/N)	Min Outside Air (CFM)	Schedule
AC-1	DX Unitary	307	NA	1986	10	5	N	9,600	8	6.6	VAV - DDMZ	55	NA	N	1,900	24/7
AC-2	DX Unitary	219	NA	1986	10	3	N	8,300	9	7.5	VAV - DDMZ	55	NA	N	1,700	7-5, M-F
AC-3	DX Unitary	219	NA	1986	10	3	N	8,350	9	7.5	VAV - DDMZ	55	NA	N	1,700	7-5, M-F
AC-4	DX Unitary	276	NA	1986	10	5	N	10,300	9	7.5	VAV - DDMZ	55	NA	N	2,100	7-5, M-F
AC-5	DX Unitary	212	NA	1986	7.5	3	N	7,200	9	7.5	VAV - DDMZ	55	NA	N	1,400	24/7
HU-1	HW Coils	NA	230	1986	7.5	0	N	8,500	NA	NA	VAV - DDMZ	95	NA	N	0	24/7
HU-2	HW Coils	NA	60	1986	5	0	N	6,000	NA	NA	VAV - DDMZ	95	NA	N	0	7-5, M-F
HU-3	HW Coils	NA	80	1986	5	0	N	4,700	NA	NA	VAV - DDMZ	95	NA	N	0	7-5, M-F
HU-4	HW Coils	NA	160	1986	5	0	N	5,500	NA	NA	VAV - DDMZ	95	NA	N	0	7-5, M-F
HU-5	HW Coils	NA	100	1986	5	0	N	4,000	NA	NA	VAV - DDMZ	95	NA	N	0	24/7

Most of the system parameters are self-explanatory and were taken from either design drawings or through inspection of the units. One parameter requires more explanation – "Adjusted EER". The EER shown on the above table was taken from the design drawings. This is the EER when the equipment was new. Over time, unit EER will degrade, by an average of 17.1%.[9] The Adjusted EER is calculated by reducing the EER by 17.1%.

These HVAC values were used in the eQUEST model as a baseline (using Adjusted EER). A new model simulating retrofit strategies was created in stages, 1) replacing the cooling units with Title 24 compliant units (economizers, VFD fans, Title 24 minimum EER), 2) adding VFDs to the heating units, and 3) applying SAT reset controls to all units. The parameters changed for the retrofit eQUEST model are as follows:

PSB RTUs New				
Mark	VFDs? (Y/N)	EER	SAT Reset Range	Economizer (Y/N)
AC-1	Y	10	55-68	Y
AC-2	Y	11	55-68	Y
AC-3	Y	11	55-68	Y
AC-4	Y	10	55-68	Y
AC-5	Y	11	55-68	Y
HU-1	Y	NA	80-100	N
HU-2	Y	NA	80-100	N
HU-3	Y	NA	80-100	N
HU-4	Y	NA	80-100	N
HU-5	Y	NA	80-100	N

[9] Mowris, Blankenship, Jones, Robert Mowris and Associates, "Field Measurements of Air Conditioners with and without TXVs", 2004 ACEEE Summer Study Proceedings

13.3.5 Probation Headquarters

The Probation Headquarters was modeled using eQUEST software and the baseline model features adjusted to match billing history for both electric and gas usage. The building is two stories, with the 2nd floor being approximately half the floor area of the 1st floor. The table below shows the existing parameters that were modeled.

Probation HQ Existing

Mark	Type	Cooling (MBH)	Heating (MBH)	Supply Fan HP	VFDs? (Y/N)	Design airflow (CFM)	EER	Air distribution type	Hot Deck SAT	Cold Deck SAT	Reset range	Economizer (Y/N)	Min Outside Air (CFM)	Area Served	Schedule
AH-1	DX Split	288	890	7.5	N	13,600	10	CV MZ	95	55	NA	N	13,600	1st Floor (12 Zones)	M-F, 5 am to 5 pm
AH-2	DX Split	144	350	3	N	5,250	10	CV MZ	95	55	NA	N	5,250	2nd Floor (6 Zones)	M-F, 5 am to 5 pm

The retrofit model simply included SAT reset controls. For the cold deck, reset is based on building demand, or warmest zone. For the hot deck, reset is based on coolest zone. This reset strategy will minimize both heating and cooling loads. The adjustments to the existing conditions are given below.

Prob HQ New Control Settings

Mark	Hot Deck Reset	Cold Deck Reset
AH-1	80-90	55-65
AH-2	80-90	55-65

Additionally the hot water temperature is reset from 140 to 180 deg F.

13.3.6 Probation Juvenile Intake

A Bin analysis was performed assuming the outdoor air dampers, on average, are stuck at 40% open. After retrofit, they will be fully functional, cycling from 20% closed to 100% open, depending on outdoor air temperatures.

It is assumed heating only occurs when the outdoor air temperature is under 65 deg F and the heating supply temperature is 95 deg F. Gas use was determined by the following equation:

Btu = 1.08 x CFM x (95 – SAT)

1 therm = 100,000 Btus

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	59	40%	59	12,700	0	497	81
35	14	60	40%	60	12,700	0	455	80
37	43	60	40%	60	12,700	0	415	223
39	80	61	40%	61	12,700	0	377	377
41	211	62	40%	62	12,700	0	339	895
43	216	63	40%	63	12,700	0	304	820
45	266	64	40%	64	12,700	0	269	895
47	392	64	40%	64	12,700	0	236	1,157
49	425	65	40%	65	12,700	0	204	1,086
51	361	66	40%	66	12,700	0	174	785
53	685	67	40%	67	12,700	0	145	1,242
55	874	68	40%	68	12,700	0	117	1,283
57	1113	68	40%	68	12,700	0	91	1,269
59	1381	69	40%	69	12,700	0	66	1,145
61	653	70	40%	70	12,700	0	43	350
63	508	71	40%	71	12,700	0	21	132
65	412	72	40%	72	12,700	0	0	0
67	344	72	40%	72	12,700	0	0	0
69	210	73	40%	73	12,700	0	0	0
71	217	74	40%	74	12,700	0	0	0
73	120	75	40%	75	12,700	0	0	0
75	63	76	40%	76	12,700	0	0	0
77	55	76	40%	76	12,700	5	0	0
79	41	77	40%	77	12,700	16	0	0
81	25	78	40%	78	12,700	27	0	0
83	18	79	40%	79	12,700	38	0	0
85	8	80	40%	80	12,700	49	0	0
87	4	80	40%	80	12,700	60	0	0
89	4	81	40%	81	12,700	71	0	0
91	2	82	40%	82	12,700	82	0	0
93	0	83	40%	83	12,700	93	0	0
95	2	84	40%	84	12,700	104	0	0
Total	**8760**						**3,754**	**11,819**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67	20%	67	12,700	0	379	62
35	14	68	20%	68	12,700	0	350	61
37	43	68	20%	68	12,700	0	322	173
39	80	69	20%	69	12,700	0	294	294
41	211	69	20%	69	12,700	0	267	705
43	216	69	20%	69	12,700	0	241	652
45	266	70	20%	70	12,700	0	216	718
47	392	67	31%	67	12,700	0	216	1,059
49	425	67	33%	67	12,700	0	192	1,020
51	361	67	36%	67	12,700	0	168	758
53	685	67	39%	67	12,700	0	144	1,233
55	874	67	43%	67	12,700	0	120	1,311
57	1113	67	47%	67	12,700	0	96	1,336
59	1381	67	53%	67	12,700	0	72	1,243
61	653	67	62%	67	12,700	0	48	395
63	508	66	75%	66	12,700	0	25	157
65	412	66	93%	66	12,700	0	0	0
67	344	67	100%	67	12,700	0	0	0
69	210	69	100%	69	12,700	0	0	0
71	217	71	100%	71	12,700	0	0	0
73	120	73	100%	73	12,700	0	0	0
75	63	75	100%	75	12,700	0	0	0
77	55	76	20%	76	12,700	3	0	0
79	41	77	20%	77	12,700	8	0	0
81	25	77	20%	77	12,700	14	0	0
83	18	77	20%	77	12,700	19	0	0
85	8	78	20%	78	12,700	25	0	0
87	4	78	20%	78	12,700	30	0	0
89	4	79	20%	79	12,700	36	0	0
91	2	79	20%	79	12,700	41	0	0
93	0	79	20%	79	12,700	47	0	0
95	2	80	20%	80	12,700	52	0	0
Total	**8760**						**3,150**	**11,177**

13.3.7 Probation Youth Center

A Bin analysis was performed assuming the outdoor air dampers, on average, are stuck at 50% open. After retrofit, they will be fully functional, cycling from 20% closed to 100% open, depending on outdoor air temperatures.

It is assumed heating only occurs when the outdoor air temperature is under 65 deg F and the heating supply temperature is 95 deg F. Gas use was determined by the following equation:

Btu = 1.08 x CFM x (95 – SAT)

1 therm = 100,000 Btus

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	55	50%	55	12,700	0	555	90
35	14	56	50%	56	12,700	0	508	89
37	43	57	50%	57	12,700	0	462	248
39	80	58	50%	58	12,700	0	418	418
41	211	59	50%	59	12,700	0	375	990
43	216	60	50%	60	12,700	0	335	904
45	266	61	50%	61	12,700	0	296	983
47	392	62	50%	62	12,700	0	258	1,266
49	425	63	50%	63	12,700	0	223	1,184
51	361	64	50%	64	12,700	0	189	853
53	685	65	50%	65	12,700	0	157	1,343
55	874	66	50%	66	12,700	0	126	1,381
57	1113	67	50%	67	12,700	0	98	1,360
59	1381	68	50%	68	12,700	0	71	1,221
61	653	69	50%	69	12,700	0	45	371
63	508	70	50%	70	12,700	0	22	139
65	412	71	50%	71	12,700	0	0	0
67	344	72	50%	72	12,700	0	0	0
69	210	73	50%	73	12,700	0	0	0
71	217	74	50%	74	12,700	0	0	0
73	120	75	50%	75	12,700	0	0	0
75	63	76	50%	76	12,700	0	0	0
77	55	77	50%	77	12,700	7	0	0
79	41	78	50%	78	12,700	21	0	0
81	25	79	50%	79	12,700	34	0	0
83	18	80	50%	80	12,700	48	0	0
85	8	81	50%	81	12,700	62	0	0
87	4	82	50%	82	12,700	75	0	0
89	4	83	50%	83	12,700	89	0	0
91	2	84	50%	84	12,700	103	0	0
93	0	85	50%	85	12,700	117	0	0
95	2	86	50%	86	12,700	130	0	0
Total	**8760**						**4,139**	**12,841**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	CFM	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr
33	13	67.4	20%	67	12,700	0	379	62
35	14	67.8	20%	68	12,700	0	350	61
37	43	68.2	20%	68	12,700	0	322	173
39	80	68.6	20%	69	12,700	0	294	294
41	211	69	20%	69	12,700	0	267	705
43	216	69.4	20%	69	12,700	0	241	652
45	266	69.8	20%	70	12,700	0	216	718
47	392	67	31%	67	12,700	0	216	1,059
49	425	67	33%	67	12,700	0	192	1,020
51	361	67	36%	67	12,700	0	168	758
53	685	67	39%	67	12,700	0	144	1,233
55	874	67	43%	67	12,700	0	120	1,311
57	1113	67	47%	67	12,700	0	96	1,336
59	1381	67	53%	67	12,700	0	72	1,243
61	653	66.75	62%	67	12,700	0	48	395
63	508	66.25	75%	66	12,700	0	25	157
65	412	65.75	93%	66	12,700	0	0	0
67	344	67	100%	67	12,700	0	0	0
69	210	69	100%	69	12,700	0	0	0
71	217	71	100%	71	12,700	0	0	0
73	120	73	100%	73	12,700	0	0	0
75	63	75	100%	75	12,700	0	0	0
77	55	76.2	20%	76	12,700	3	0	0
79	41	76.6	20%	77	12,700	8	0	0
81	25	77	20%	77	12,700	14	0	0
83	18	77.4	20%	77	12,700	19	0	0
85	8	77.8	20%	78	12,700	25	0	0
87	4	78.2	20%	78	12,700	30	0	0
89	4	78.6	20%	79	12,700	36	0	0
91	2	79	20%	79	12,700	41	0	0
93	0	79.4	20%	79	12,700	47	0	0
95	2	79.8	20%	80	12,700	52	0	0
Total	**8760**						**3,150**	**11,177**

13.3.8 DSES – Seaside Office

The DSES Seaside Office was modeled using eQUEST software and the baseline model features adjusted to match electric billing history. The features for the AC-1 through AC-6 are shown below in the table below:

DSES Seaside Office Baseline														
Mark	Type	Cooling (MBH)	Heating Output (MBH)	Year Installed	Supply Fan HP	VFDs? (Y/N)	Design airflow (CFM)	EER	Adjusted EER	Air distribution type	Supply Air Temp	Economizer (Y/N)	Min Outside Air (CFM)	Schedule
AC-1	Unitary DX	80.4	91.2	1988	1.5	N	2,625	8.2	6.8	CV - 2 zones (1st & 2nd Flr)	55	N	265	M-F, 7 am to 6 pm
AC-2	Unitary DX	58	61	2006	1	N	2,200	10.3	NA	CV - 2 zones (1st & 2nd Flr)	55	N	425	M-F, 7 am to 6 pm
AC-3	Unitary DX	35	61	1988	0.75	N	1,300	8.2	6.8	CV - 2 zones (1st & 2nd Flr)	55	N	295	M-F, 7 am to 6 pm
AC-4	Unitary DX	69.6	92.4	2006	1	N	2,100	10.3	NA	CV - 2 zones (1st & 2nd Flr)	55	N	165	M-F, 7 am to 6 pm
AC-5	Unitary DX	97.5	160	1988	1.50	N	3,300	8.2	6.8	CV - 2 zones (1st & 2nd Flr)	55	N	430	M-F, 7 am to 6 pm
AC-6	Unitary DX	35.6	61	1988	0.75	N	1,400	8.2	6.8	CV - 2 zones (1st & 2nd Flr)	55	N	140	M-F, 7 am to 6 pm

Most of the system parameters are self-explanatory and were taken from either design drawings or through inspection of the units. One parameter requires more explanation – "Adjusted EER". The EER shown on the above table was taken the minimum Title 24 efficiency required for HVAC equipment of that vintage (year installed). This is the EER when the equipment was new. Over time, unit EER will degrade, by an average of 17.1%.[10] The Adjusted EER is calculated by reducing the EER by 17.1%.

These HVAC values were used in the eQUEST model as a baseline (using Adjusted EER). A new model was created with new equipment for AC-1, 3, 5 & 6. The features of the new equipment are as follows:

[10] Mowris, Blankenship, Jones, Robert Mowris and Associates, "Field Measurements of Air Conditioners with and without TXVs", 2004 ACEEE Summer Study Proceedings

DSES Seaside Office New HVAC		
Mark	EER	Economizer (Y/N)
AC-1	11.2	Y
AC-3	11.2	Y
AC-5	11.2	Y
AC-6	11.2	Y

The savings analysis assumes new units, with economizers and an EER that matches current minimum Title 24 requirements.

13.3.9 Agricultural Commission

An eQUEST model was built for the Agricultural Admin building. Within the past year, additions were made to the building. The model created was of the old building (prior to the additions) and without the Agricultural Extension building. The eQUEST model was adjusted to generally match the electric use for one year of billing history prior to the additions.

The baseline model was created by assuming one HVAC "system" of six (6) units with the following parameters:

- Total cooling capacity: 50 tons
- Total heating capacity: 750 kBtuh
- Heating and cooling set-points of 68 and 74 deg respectively
- Fans cycle with heating and cooling requirements
- Airflow of 19,500 cfm with minimum 20% OSA
- Adjusted EER of 7.5. EER of new equipment of this size and vintage is approximately 9. The adjusted EER is assumed to be 17.1% below that rating.

The retrofit modeled included simply to replace the HVAC equipment with currently Title 24 standard ratings – EER 11.0.

13.3.10 Animal Shelter

An eQUEST building simulation model was built for the Animal Shelter. This consisted of 3 buildings – the main building (animal care and administration) and two kennels. The main building was modeled to include the five (5) rooftop HVAC units and the three (3) heat recovery units. Each kennel was modeled with a heating ventilator (100% OSA) and a radiant heating system. Hot water usage was adjusted to closely match the baseline heating energy used in the

summer. Infiltration to the kennels was adjusted until the propane use closely matched the facilities winter usage.

From this baseline model a retrofit model was created. The retrofit model included lowering the required space temperature by 5 deg F and to lock out all heating when the outdoor air is above 70 deg. This modeling strategy was used since eQUEST cannot model slab temperatures, only space temperatures. It is assumed that reducing the modeled space temperature by 5 deg would effectively show savings if only slab temperatures are controlled.

13.3.11 Marina Coastal Offices

A Bin model was created for the facility and adjusted to meet the expected annual fan and gas heat energy for the building. For the retrofit model, the following features were included:

1) Tune the economizer operation to allow 68 deg supply air during heating season.

2) Reduce maximum and minimum airflow by 20% due to closing off VAV dampers in unoccupied areas.

Heating energy used is determined through the following equation:

Btu = 1.08 x CFM x (95 - SAT)

Where:

SAT = supply air temperature out of the VAV boxes

95 is the assumed heating air temperature

CFM = airflow of the system in cubic feet per minute

It is understood that each VAV box may produce a different airflow and require a different amount of reheat. The Bin analysis is a simplification with the assumption there's a single average airflow and reheat amount for each temperature Bin.

The following equation was used for fan motor kW:

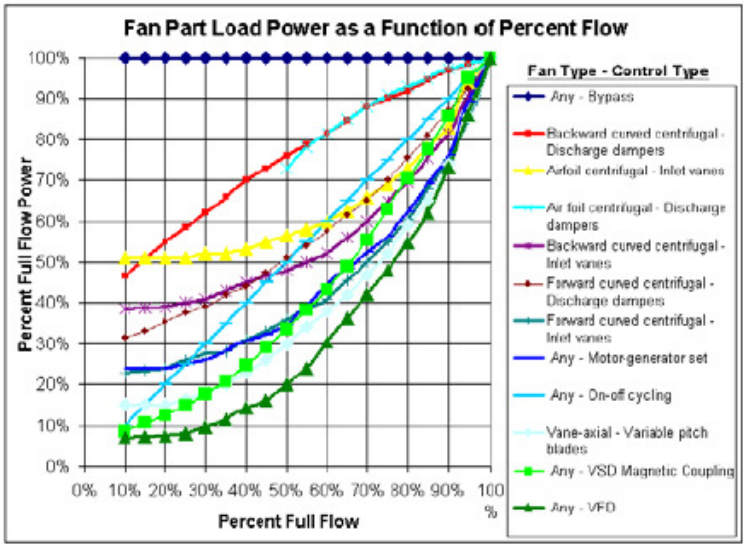
Fan kW = 0.746 x Motor HP x % Full Flow Power / Motor Efficiency

Where:

Motor HP = nameplate HP

Motor Efficiency = nameplate efficiency (if available) or EPACT minimum efficiency

The % Full Flow Power for VFD fans is determined through a table included in a motor study performed by Aspen Systems Corporation[11] and included below:



[11] Maxwell, Jonathan B., "How to Avoid Overestimating Variable Speed Drive Savings", Aspen Systems Corporation, ESL-IE-05-05-05, May 2005 (http://repository.tamu.edu/bitstream/handle/1969.1/5621/ESL-IE-05-05-05.pdf?sequence=4)

BASELINE

Avg OAT	Hours/yr	SAT	Econ %	MAT	Airflow Fraction	CFM	Cooling - Econ (kBtuh)	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr	Fan Part Load Factor	Fan Static Pressure Factor	Fan Power (kW)	Fan Energy (kWh/yr)
29	1	60	34%	60	0.50	8,113	140	0	307	4	0.20	1.00	5	5
31	5	60	36%	60	0.50	8,113	140	0	292	18	0.20	1.00	5	24
33	1	60	37%	60	0.50	8,113	140	0	277	3	0.20	1.00	5	5
35	8	60	39%	60	0.50	8,113	140	0	262	26	0.20	1.00	5	39
37	13	60	41%	60	0.50	8,113	140	0	247	40	0.20	1.00	5	64
39	23	60	43%	60	0.50	8,113	140	0	232	67	0.20	1.00	5	113
41	59	60	46%	60	0.50	8,113	140	0	217	160	0.20	1.00	5	289
43	49	60	48%	60	0.50	8,113	140	0	202	124	0.20	1.00	5	240
45	55	60	52%	60	0.50	8,113	140	0	187	129	0.20	1.00	5	269
47	99	60	55%	60	0.50	8,113	140	0	172	213	0.20	1.00	5	485
49	87	60	59%	60	0.50	8,113	140	0	157	171	0.20	1.00	5	426
51	91	60	64%	60	0.50	8,113	140	0	142	162	0.20	1.00	5	446
53	155	60	70%	60	0.50	8,113	140	0	127	246	0.20	1.00	5	759
55	235	60	76%	60	0.50	8,113	140	0	112	330	0.20	1.00	5	1,151
57	353	60	84%	60	0.50	8,113	140	0	97	429	0.20	1.00	5	1,729
59	497	60	94%	60	0.50	8,113	140	0	82	511	0.20	1.00	5	2,434
61	331	61	100%	61	0.51	8,300	134	0	67	277	0.20	1.00	5	1,621
63	312	63	100%	63	0.53	8,674	122	0	51	200	0.20	1.00	5	1,528
65	273	65	100%	65	0.56	9,049	107	0	36	122	0.23	1.00	6	1,537
67	232	67	100%	67	0.58	9,423	92	0	21	60	0.23	1.00	6	1,307
69	145	69	100%	69	0.60	9,797	74	0	7	12	0.30	1.00	7	1,065
71	148	71	100%	71	0.63	10,172	55	0	0	0	0.30	1.00	7	1,087
73	82	73	100%	73	0.65	10,546	34	0	0	0	0.30	1.00	7	602
75	40	75	100%	75	0.67	10,921	12	0	0	0	0.36	1.00	9	353
77	33	76	20%	76	0.70	11,295	0	2	0	0	0.36	1.00	9	291
79	23	77	20%	77	0.72	11,670	0	8	0	0	0.41	1.00	10	231
81	17	77	20%	77	0.74	12,044	0	13	0	0	0.41	1.00	10	171
83	10	77	20%	77	0.77	12,418	0	19	0	0	0.48	1.00	12	118
85	5	78	20%	78	0.79	12,793	0	25	0	0	0.48	1.00	12	59
87	4	78	20%	78	0.81	13,167	0	31	0	0	0.54	1.00	13	53
89	2	79	20%	79	0.83	13,542	0	38	0	0	0.54	1.00	13	26
91	2	79	20%	79	0.86	13,916	0	45	0	0	0.62	1.00	15	30
93	0	79	20%	79	0.88	14,290	0	52	0	0	0.62	1.00	15	0
95	2	80	20%	80	0.90	14,665	0	60	0	0	0.73	1.00	18	36
97	0	80	20%	80	0.93	15,039	0	68	0	0	0.73	1.00	18	0
99	1	81	20%	81	0.95	15,414	0	77	0	0	0.85	1.00	21	21
Total	**3393**								**3,293**	**3,303**			**21**	**18,612**

RETROFIT

Avg OAT	Hours/yr	SAT	Econ %	MAT	Airflow Fraction	CFM	Cooling - Econ (kBtuh)	Heating OSA (kBtuh)	Heating Equipment (kBtuh)	Heating Therms/yr	Fan Part Load Factor	Fan Static Pressure Factor	Fan Power (kW)	Fan Energy (kWh/yr)
29	1	67	20%	67	0.35	5,679	58	0	172	2	0.12	1.00	3	3
31	5	67	20%	67	0.35	5,679	55	0	163	10	0.12	1.00	3	15
33	1	67	20%	67	0.35	5,679	53	0	155	2	0.12	1.00	3	3
35	8	68	20%	68	0.35	5,679	49	0	141	14	0.12	1.00	3	24
37	13	68	21%	68	0.35	5,679	49	0	133	22	0.12	1.00	3	38
39	23	68	22%	68	0.35	5,679	49	0	125	36	0.12	1.00	3	68
41	59	68	23%	68	0.35	5,679	49	0	117	86	0.12	1.00	3	173
43	49	68	24%	68	0.35	5,679	49	0	109	67	0.12	1.00	3	144
45	55	68	26%	68	0.35	5,679	49	0	101	69	0.12	1.00	3	162
47	99	68	28%	68	0.35	5,679	49	0	93	115	0.12	1.00	3	291
49	87	68	30%	68	0.35	5,679	49	0	85	92	0.12	1.00	3	256
51	91	68	32%	68	0.35	5,679	49	0	77	87	0.12	1.00	3	267
53	155	68	35%	68	0.36	5,817	50	0	70	136	0.12	1.00	3	455
55	235	68	38%	68	0.38	6,093	53	0	65	191	0.12	1.00	3	690
57	353	68	42%	68	0.39	6,369	55	0	59	260	0.12	1.00	3	1,037
59	497	68	47%	68	0.41	6,645	57	0	52	323	0.14	1.00	3	1,704
61	331	68.4	51%	68	0.43	6,922	57	0	44	181	0.14	1.00	3	1,135
63	312	69.2	52%	69	0.44	7,198	53	0	34	134	0.14	1.00	3	1,070
65	273	70	55%	70	0.46	7,474	48	0	25	84	0.16	1.00	4	1,070
67	232	70.8	58%	71	0.48	7,750	44	0	15	43	0.16	1.00	4	909
69	145	71.6	63%	72	0.49	8,026	38	0	5	9	0.16	1.00	4	568
71	148	72.4	72%	72	0.51	8,302	32	0	0	0	0.20	1.00	5	725
73	82	73.2	93%	73	0.53	8,579	26	0	0	0	0.20	1.00	5	402
75	40	75	100%	75	0.55	8,855	10	0	0	0	0.20	1.00	5	196
77	33	76	20%	76	0.56	9,131	0	2	0	0	0.23	1.00	6	186
79	23	77	20%	77	0.58	9,407	0	6	0	0	0.23	1.00	6	130
81	17	77	20%	77	0.60	9,683	0	10	0	0	0.23	1.00	6	96
83	10	77	20%	77	0.61	9,959	0	15	0	0	0.30	1.00	7	73
85	5	78	20%	78	0.63	10,236	0	20	0	0	0.30	1.00	7	37
87	4	78	20%	78	0.65	10,512	0	25	0	0	0.30	1.00	7	29
89	2	79	20%	79	0.66	10,788	0	30	0	0	0.36	1.00	9	18
91	2	79	20%	79	0.68	11,064	0	36	0	0	0.36	1.00	9	18
93	0	79	20%	79	0.70	11,340	0	42	0	0	0.36	1.00	9	0
95	2	80	20%	80	0.72	11,616	0	48	0	0	0.41	1.00	10	20
97	0	80	20%	80	0.73	11,893	0	54	0	0	0.41	1.00	10	0
99	1	81	20%	81	0.75	12,169	0	60	0	0	0.48	1.00	12	12
Total	**3393**								**1,840**	**1,963**			**12**	**12,020**

13.3.12 Indoor Lighting

This only applies to the jail facilities (Adult Rehab, Correctional Facility and New Jail). A previous audit report included a count of fixtures and types, when they were primarily T12s. These fixtures had been recently retrofitted with T8 lamps, but it looks like it was merely a lamp-to-lamp retrofit, resulting in a number of areas that are very bright. The energy savings analysis assumed re-engineering the spaces, which could result in having a much lower lamp count. Below are the savings estimates.

LIGHTING RETROFIT ENERGY SAVINGS CALCULATIONS: Monterey County Jail

Fixture Code	QTY	FIXTURE DESCRIPTION	WATTS		Hours / Year		kWh	Peak	kWh	Peak	kWh	Peak
			Before	After	Before	After	Before	Before	After	After	Save	Save
Adult Rehab												
DD^20	31	4- Lamp Fluorescent 2X4	116	55	4625	4625	16,632	3.6	7,886	1.7	8,746	1.9
2BT^20	140	4- Lamp Fluorescent strip	116	96	4625	4625	75,110	16.2	62,160	13.4	12,950	2.8
2AT^20	8	2- Lamp Fluorescent strip	58	48	4625	4625	2,146	0.5	1,776	0.4	370	0.1
A	8	1- Lamp Fluorescent	50	24	4625	4625	1,850	0.4	888	0.2	962	0.2
TOTAL							**95,738**	**20.7**	**72,710**	**15.7**	**23,028**	**5.0**
Men's Jail												
DD	32	4- Lamp Fluorescent 2X4	116	55	5460	5460	20,268	3.7	9,610	1.8	10,658	2.0
B1NKD	456	2- Lamp Fluorescent	58	28	5460	5460	144,406	26.4	69,713	12.8	74,693	13.7
TOTAL							**164,674**	**30.2**	**79,323**	**14.5**	**85,351**	**15.6**
K-Pod												
B	72	2- Lamp Fluorescent	58	48	5460	5460	22,801	4.2	18,870	3.5	3,931	0.7
Women's Jail												
DD	14	4- Lamp Fluorescent 2X4	116	55	5460	5460	8,867	1.6	4,204	0.8	4,663	0.9
B1NKD	308	2- Lamp Fluorescent	58	28	5460	5460	97,537	17.9	47,087	8.6	50,450	9.2
TOTAL							**106,404**	**19.5**	**51,291**	**9.4**	**55,113**	**10.1**
Office Hallways												
B1NKD	12	2- Lamp Fluorescent	58	28	8760	8760	6,097	0.7	2,943	0.3	3,154	0.4
infirmary												
DD^20	35	4- Lamp Fluorescent 2X4	116	55	4625	4625	18,778	4.1	8,903	1.9	9,874	2.1
B^20	17	2- Lamp Fluorescent	58	48	4625	4625	4,560	1.0	3,774	0.8	786	0.2
TOTAL							**23,338**	**5.0**	**12,677**	**2.7**	**10,661**	**2.3**
Kitchen												
DDH	98	4- Lamp Fluorescent 2X4	116	68	8136	8136	92,490	11.4	54,218	6.7	38,272	4.7
B1NKD	27	2- Lamp Fluorescent	58	28	8136	8136	12,741	1.6	6,151	0.8	6,590	0.8
A	1	1- Lamp Fluorescent	50	24	8136	8136	407	0.1	195	0.0	212	0.0
TOTAL							**105,638**	**13.0**	**60,564**	**7.4**	**45,073**	**5.5**
Receiving												
DD	59	4- Lamp Fluorescent 2X4	116	55	4625	4625	31,654	6.8	15,008	3.2	16,645	3.6
B1NKD	334	2- Lamp Fluorescent	58	28	4625	4625	89,596	19.4	43,253	9.4	46,343	10.0
TOTAL							**121,249**	**26.2**	**58,261**	**12.6**	**62,988**	**13.6**
REC2 Dorm Halls												
DD	7	4- Lamp Fluorescent 2X4	116	55	5460	5460	4,434	0.8	2,102	0.4	2,331	0.4
B1NKD	18	2- Lamp Fluorescent	58	28	5460	5460	5,700	1.0	2,752	0.5	2,948	0.5
TOTAL							**10,134**	**1.9**	**4,854**	**0.9**	**5,280**	**1.0**
Dorms A-E												
DD	204	4- Lamp Fluorescent 2X4	116	55	5460	5460	129,205	23.7	61,261	11.2	67,944	12.4
Jail Lobby												
DD	7	4- Lamp Fluorescent 2X4	116	55	5460	5460	4,434	0.8	2,102	0.4	2,331	0.4
B1NKD	20	2- Lamp Fluorescent	58	28	5460	5460	6,334	1.2	3,058	0.6	3,276	0.6
2BT	9	4- Lamp Fluorescent strip	116	96	4625	4625	4,829	1.0	3,996	0.9	833	0.2
TOTAL							**15,596**	**3.0**	**9,156**	**1.8**	**6,440**	**1.2**
Overall Total Savings											**368,963**	**67.9**

13.3.13 Outdoor Lighting

The outdoor lighting is predominantly HID type (mercury vapor – MV, high pressure sodium – HPS and metal halide – MH). Through the site walk, review and drawings and input from County staff, baseline fixture type and count was estimated. Then retrofits and associated savings were determined for each site. Below is a summary of the savings available. A more thorough site walk is necessary in developing a final project.

LIGHTING RETROFIT ENERGY SAVINGS CALCULATIONS: Monterey County Exterior

Facility	Mounting	QTY	Existing Lamp Type	WATTS Before	WATTS After	Hours / Year Before	Hours / Year After	kWh Before	kWh After	kWh Save
Main Jail	Wall	16	MV	455	125	4380	4380	31,886	8,760	23,126
	Wall	18	PAR 38	150	40	4380	4380	11,826	3,154	8,672
	P-Lot	3	2 L HPS	910	400	4380	4380	11,957	5,256	6,701
	Roof	12	PAR 56	500	125	4380	4380	26,280	6,570	19,710
TOTAL								81,950	23,740	58,210
New Jail	Wall	40	MV	150	80	4380	4380	26,280	14,016	12,264
	P-Lot	10	HPS	455	200	4380	4380	19,929	8,760	11,169
	P-Lot	6	2 L HPS	910	400	4380	4380	23,915	10,512	13,403
TOTAL								70,124	33,288	36,836
Rehab	Wall	40	MV	455	120	4380	4380	79,716	21,024	58,692
	P-Lot	6	HPS	455	200	4380	4380	11,957	5,256	6,701
	P-Lot	4	2 L HPS	910	400	4380	4380	15,943	7,008	8,935
TOTAL								107,617	33,288	74,329
PSB	Pole - 14'	8	HPS	180	80	4380	4380	6,307	2,803	3,504
	Surface - Ceiling	13	HPS	130	40	4380	4380	7,402	2,278	5,125
	Wall	2	HPS	88	40	4380	4380	771	350	420
	Recessed	8	HPS	88	28	4380	4380	3,084	981	2,102
	Pole - 42"	8	HPS	88	40	4380	4380	3,084	1,402	1,682
TOTAL								20,647	7,814	12,833
Probation HQ	Street	2	MV	455	120	4380	4380	3,986	1,051	2,935
	Street	1	2 L MV	910	240	4380	4380	3,986	1,051	2,935
	Pole	5	MH	300	120	4380	4380	6,570	2,628	3,942
	Wall	12	MH	130	60	4380	4380	6,833	3,154	3,679
TOTAL								21,374	7,884	13,490
Juvenile Hall	Surface - Ceiling	17	MH	70	35	4380	4380	5,212	2,606	2,606
	Wall	10	MH	180	80	4380	4380	7,884	3,504	4,380
	Wall	4	MH	85	40	4380	4380	1,489	701	788
TOTAL								14,585	6,811	7,775
Juvenile D Wing	Wall	10	MH	85	40	4380	4380	3,723	1,752	1,971
Youth Center	Wall	12	MH	210	80	4380	4380	11,038	4,205	6,833
	Pole - 23'	4	MH	455	200	4380	4380	7,972	3,504	4,468
	Pole - 23'	11	MH	455	200	4380	4380	21,922	9,636	12,286
TOTAL								40,931	17,345	23,586
DSES Seaside	Recessed	18	MV	100	28	4380	4380	7,884	2,208	5,676
	P-Lot	8	MH	455	200	4380	4380	15,943	7,008	8,935
	P-Lot	3	2 L MH	910	400	4380	4380	11,957	5,256	6,701
TOTAL								35,785	14,472	21,313
Animal Shelter	Wall	2	2 L PAR 38	300	70	4380	4380	2,628	613	2,015
	Wall	4	MH	130	60	4380	4380	2,278	1,051	1,226
	Wall	28	MH	130	60	4380	4380	15,943	7,358	8,585
	P-Lot	6	MH	455	200	4380	4380	11,957	5,256	6,701
	P-Lot	4	2 L MH	910	400	4380	4380	15,943	7,008	8,935
TOTAL								48,749	21,287	27,463
Marina Coastal	P-Lot	6	MH	290	125	4380	4380	7,621	3,285	4,336
	P-Lot	2	2 L MH	580	250	4380	4380	5,081	2,190	2,891
	Pole	6	MH	130	60	4380	4380	3,416	1,577	1,840
	Wall	13	HPS	85	40	4380	4380	4,840	2,278	2,562
TOTAL								20,958	9,329	11,629
Ag Commission	Wall	13	MH	85	40	4380	4380	4,840	2,278	2,562
	P-Lot	18	MH	455	200	4380	4380	35,872	15,768	20,104
	P-Lot	5	2 L MH	910	400	4380	4380	19,929	8,760	11,169
TOTAL								60,641	26,806	33,836
Laurel Yard	Wall	87	MV	250	125	4380	4380	95,265	47,633	47,633
	Wall	2	MV	400	125	4380	4380	3,504	1,095	2,409
	Street	16	MV	400	125	4380	4380	28,032	8,760	19,272
	Street	1	2 L MV	800	250	4380	4380	3,504	1,095	2,409
TOTAL								130,305	58,583	71,723
Overall Total Savings										**394,993**

Appendix D

Natividad Medical Center: Phase II Energy Efficiency Audit Report Healthcare Energy Efficiency Program

Pacific Gas and Electric Company®

WILLDAN Energy Solutions
Doing Business as Intergy Corp.

NATIVIDAD MEDICAL CENTER

JUNE 13, 2011

PHASE II ENERGY EFFICIENCY AUDIT REPORT
HEALTHCARE ENERGY EFFICIENCY PROGRAM

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1.0 EXECUTIVE SUMMARY

Willdan Energy Solutions (dba Intergy Corporation) conducted an audit of the Natividad Medical Center of Salinas, California to explore opportunities for reducing energy consumption and costs through the Healthcare Energy Efficiency Program (HEEP) funded by Pacific Gas & Electric (PG&E). Representatives of Willdan Energy Solutions (WES) met with key members of the hospital staff, Jim Kari and Ray Padilla, as well as Rob Cruz, PG&E Account Manager, for the initial site visit. Based on the initial audit and analysis, WES believes Natividad Medical Center can save significant energy costs by implementing the recommended measures identified in this report. Additionally, the program offers substantial incentives for implemented measures.

Willdan Energy Solutions (WES) recommends Natividad Medical Center pursue the measures in this report to take advantage of the energy efficiency consulting and financing available through the HEEP program. Prior to implementation of the selected measures, WES may perform a detailed audit and investigation to fully document the energy savings and potential incentive.

The table below shows the energy consumption and cost from April 2009 to March 2010 at the facility.

PROJECT ENERGY SAVINGS	Total Use	Total Cost
Elecricity (kWh)	13,108,410	$1,595,021
Natural Gas (therms)	1,092,486	$76,565

Based on the WES analysis, the facility can save energy costs by implementing the recommended measures identified in this report. Additionally, the program offers substantial incentives for implemented measures. This report summarizes the EEM recommendations and energy and cost savings and follows:

PROJECT ENERGY SAVINGS	Total	% Reduction
Estimated Demand Reduction (Peak kW)	167.4	8%
Estimated Annual Electricity Savings (kWh)	1,723,745	13%
Estimated Annual Natural Gas Savings (therms)	211,600.0	19%
Estimated Annual Utility Cost Savings	**$447,551**	**17%**

PROJECT COST OVERVIEW	
Estimated total project costs	$887,254
Estimated total incentive available*	$169,737
Estimated net cost to site	**$717,517**
Estimated Simple Payback (Years)	**1.6**

*The results are based on estimated savings and are considered preliminary findings; actual savings and incentive may vary. The total incentive cannot exceed 50% of the total project cost.

The following are the specific measures along with a forecast of associated costs of implementing the measures, energy savings and related operating cost reductions, pertinent incentives, and simple payback period.

Table 1. Energy Efficiency Measure Recommendations Summary

		Annual Energy Savings			Annual Cost Savings	Estimated Project Financials			Simple Payback (years)
Meas. #	Measure Description	Peak Demand (kW)	Electricity (kWh)	Natural Gas (Therms)	$	Total Project Cost	Program Incentive	Net Cost to Site	
EEM-01	Install DX Units for Common Room, Lab and building 300. Chiller off at night	13.00	257,000	0	$38,550	$358,964	$24,430	$334,534	8.7
EEM-02	AHU Schedule, and boilers off at night	-17.10	691,200	113,100	$212,256	$50,000	$25,000	$25,000	0.1
EEM-03	Install Boiler Isolation Valves	0.00	0	17,963	$17,244	$18,400	$9,200	$9,200	0.5
EEM-04	Isolate the Dietary/Dishwasher Boiler Hot Water Loop from the Domestic Loop	0.00	0	11,100	$10,656	$10,350	$5,175	$5,175	0.5
EEM-05	Replace the HHW Condensing Boilers	0.00	0	69,437	$66,660	$80,500	$40,250	$40,250	0.6
EEM-06	Convert 3-Way to 2-Way Valves and Implement Chilled Water Temperature Reset	78.70	30,100	0	$4,515	$68,000	$10,579	$57,421	12.7
EEM-07	Implement Condenser Water Temperature Reset	-1.50	1,600	0	$240	$500	$144	$356	1.5
EEM-08	Air Balance	7.40	32,500	0	$4,875	$10,000	$3,665	$6,335	1.3
EEM-09	Schedule the Building 151 Packaged Unit to Operate Only During Occupied Hour	0.00	160,900	0	$24,135	$30,000	$14,481	$15,519	0.6
EEM-10	Install Controls for the Kitchen Hood Exhaust	3.90	47,156	0	$7,073	$9,940	$4,634	$5,306	0.8
EEM-11	Exhaust fan Timers (2-% H.P. Fans)	0.00	31,714	0	$4,757	$600	$300	$300	0.1
EEM-12	Lighting Upgrade	83.00	471,575	0	$56,589	$250,000	$31,879	$218,121	3.9
	Total	**167.40**	**1,723,745**	**211,600**	**$447,551**	**$887,254**	**$169,737**	**$717,517**	**1.6**

The "simple payback" is the number of years it will take for the annual cost savings to pay for the cost of implementing the measure. Payback calculations do not account for inflation, equipment life, or operation and maintenance costs.

2.0 CONTACTS

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3.0 INTRODUCTION

The Healthcare Energy Efficiency Program (HEEP) is a targeted energy efficiency enhancement program funded by Pacific Gas & Electric (PG&E). The program targets healthcare facilities throughout the PG&E territory and offers a broad range of energy efficiency services to assist customers with identification of energy efficiency measures (EEMs) and available utility incentives. HEEP provides project development services to assist you in maximizing available incentives through successful identification and implementation of energy savings projects.

This report is provided to help identify cost-effective energy efficiency opportunites at your facility. After review and discussion of the report, you may choose to implement some or all of the recommended measures. The installation of the measures may be initialized immediately or as part of your long term equipment replacement/upgrade program. Should you wish to move forward with the energy efficiency measures in this report, the program can provide implementation assistance with contractor selection, proposal specifications, proposal review, project management, incentive calculations, and complete application assistance.

The recommendations within this report are based on utility data, a site audit, and related engineering calculations. The site audit consisted of a comprehensive walk-through of the facility and review of the associated systems and equipment. The primary areas covered in the audit were the existing HVAC systems, lighting systems, water heating, and operational and maintenance procedures. The audit also included an initial interview with operational and maintenance personnel.

4.0 BASELINE SITE INFORMATION

4.1 PROJECT STATISTICS

Project Name:	Natividad Medical Center
Location:	1441 Constitution Boulevard, Salinas, CA 93906
County:	Monterey
Building Type:	Hospital (General Acute Hospital)
Building Size:	676,000 square feet
Operating hours:	24 hours a day, 365 days per year
Number of beds:	172
Date of Audit:	January 11, 2011
Auditors:	Chaitanya Sharma & Elizabeth O'Connell / WES

4.2 PROJECT DESCRIPTION

4.2.1 SITE DESCRIPTION

The Natividad Medical Center is a 172-bed acute care medical center owned and operated by Monterey County. The site in Salinas, CA includes 11 main buildings plus smaller support buildings, totaling approximately 676,000 square feet. The majority of the site is patient rooms, operation rooms, emergency rooms, ancillary services, support space, and other medical facilities. Also included are medical office buildings and an administrative office building which are occupied during normal business hours (7 am to 6 pm, Monday through Friday).

4.2.2 MECHANICAL SYSTEMS DESCRIPTION

Most buildings on the hospital campus are served by built-up Variable Air Volume (VAV) air handlers that are located on the roofs of the buildings they serve. The VFDs on the supply and return fans of these air handlers currently modulate to account only for filter loading and hence realize minimal fluctuations. The units are mostly cooling only systems with reheat coils within the VAV boxes distributing air to the different zones.

There are two (2) 500-ton Carrier 19XL5353 water cooled chillers supplying chilled water to the entire campus through a common chilled water loop. The chilled water loop is served by two (2) 60 HP VFD equipped pumps that distribute chilled water throughout the campus. The pumps are dedicated to the chillers. There are two (2) induced-draft cooling towers serving the condenser side of the chillers. The tower fans which are 40 HP in size are equipped with VFDs and run to maintain a condenser water supply temperature set-point of 75 °F. The cooling towers are fed by two (2) 60 HP VFD equipped condenser water pumps.

There are four (4) 5500 MBH boilers serving the heating hot water demands of the campus. Typically only two (2) units run but a third is needed during peak demand conditions. These boilers run to make heating hot water at 180 °F. The hot water is distributed to the heating coils of the air-handlers and the re-heat coils of the VAV boxes through two (2) 40 HP VFD equipped pumps. Typically only one pump runs to meet the heating demand of the hospital. There are two (2) RAYPAK boilers rated at 1158 kBtu-hr serving the domestic hot water demands of the hospital. Domestic hot water is provided at 112 °F. There are five (5) RITE steam boilers each rated at 33 HP that provide steam for sterilizing and other miscellaneous use throughout the plant.

4.3 UTILITY AND METER DATA

A full set of utility bills was obtained from April 2010 to March 2011. Data were provided by the utility for both electricity and natural gas consumption. The facility is provided with electricity by Pacific Gas & Electric (PG&E). The facility utilizes another supplier for natural gas but still pays PG&E transmission fees for the therms supplied.

The electricity and natural gas rates vary throughout the year. The electricity rate used for the preliminary energy cost savings estimates is based on actual rates for this site from the most recent twelve months. The virtual energy cost rate is determined by dividing the total energy cost for twelve months by the total energy consumption for the same period. The natural gas rate is based on an estimated current market price.

Energy Type	Virtual Energy Cost
Electricity	$0.12/kWh
Natural Gas	$1.00/Therm

4.4 ENERGY CONSUMPTION AND PROFILE

According to records provided by PG&E, the annual energy consumption for the site is approximately 13,108,410 kWh and 1,092,486 therms. Below are the figures showing average monthly energy consumption and total energy costs for twelve months. In the summer months, the electricity usage increases due to the higher space cooling loads and more full load cooling hours. In the winter months, the natural gas usage increases due to an increase in space heating demand. The boiler runs continuously through the year to supply steam for hot water and for sterilization of medical instruments. The demand for steam increases in the winter months, thus increasing the number of boiler cycles and natural gas usage.

Table 2. Calendar Year Electricity Usage & Cost

Month	Electricity Demand (Peak kW)	Electricity Usage (kWh)	Electricity Cost
Apr-10	2,231	1,081,035	$111,211
May-10	2,227	1,123,169	$114,436
Jun-10	2,220	951,595	$148,529
Jul-10	2,052	1,049,126	$152,412
Aug-10	2,061	1,173,138	$163,183
Sep-10	2,175	1,137,726	$164,457
Oct-10	1,985	1,139,995	$158,115
Nov-10	2,007	1,173,686	$161,209
Dec-10	2,050	1,123,790	$108,710
Jan-11	2,193	1,002,059	$100,444
Feb-11	2,206	1,099,565	$107,880
Mar-11	2,197	1,053,526	$104,435
Total	**2,231**	**13,108,410**	**$1,595,021**

Chart 1. Calendar Year Electric Usage & Cost

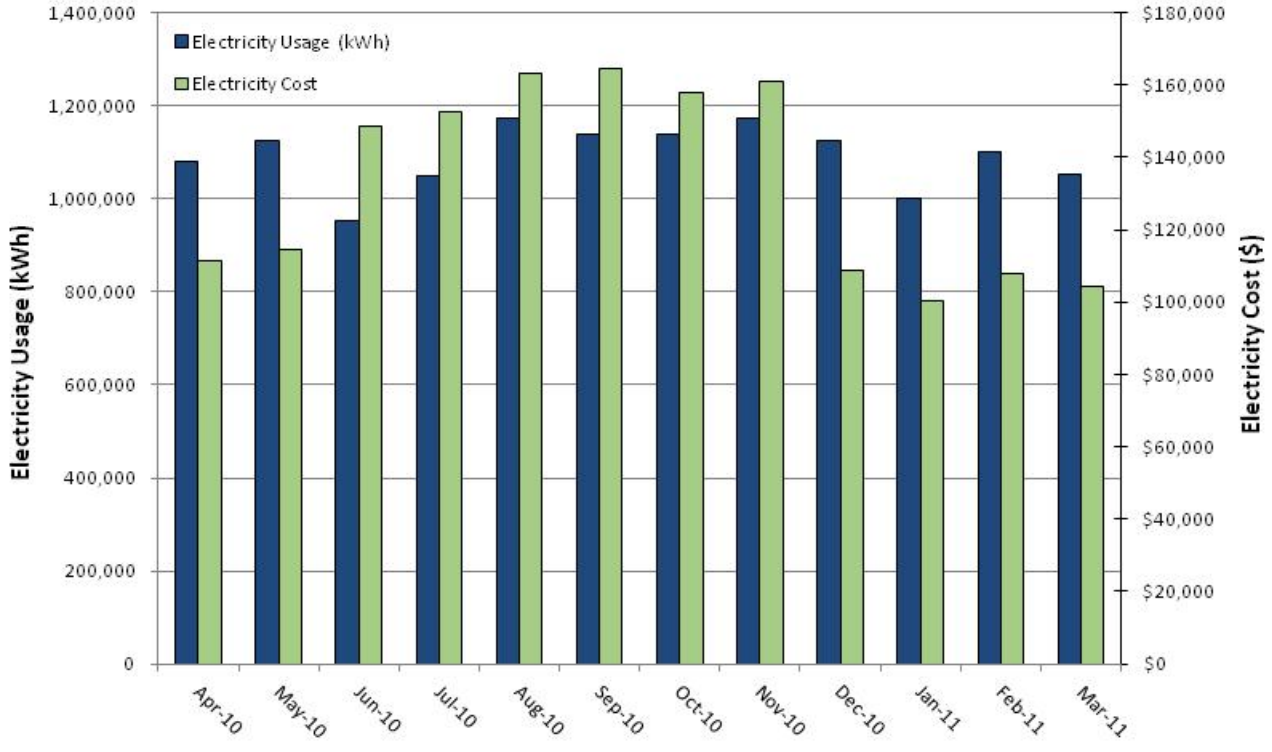
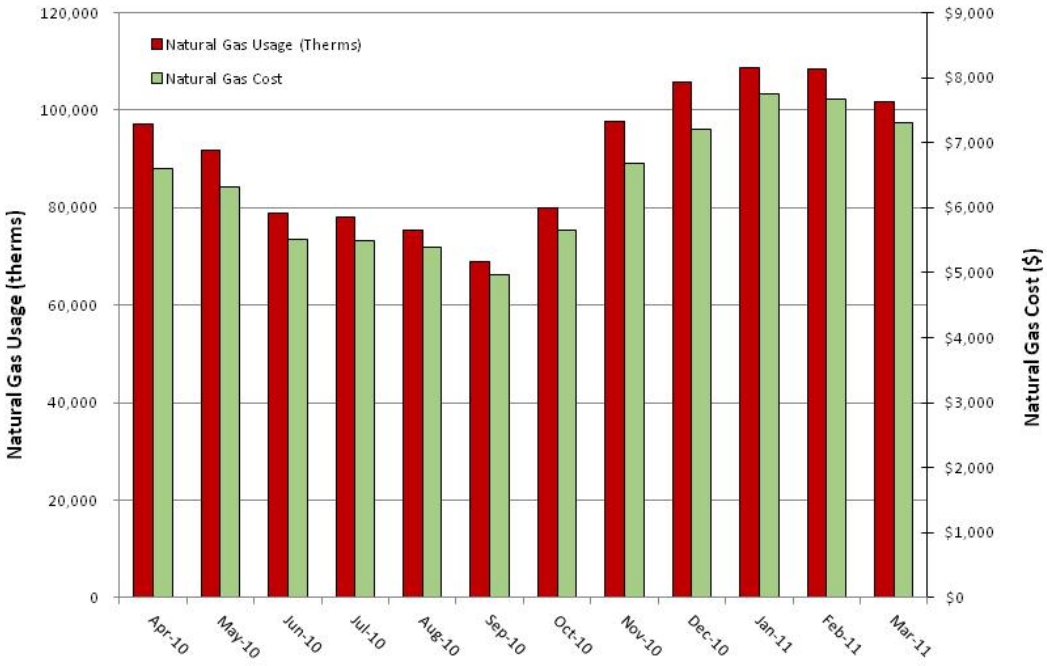


Table 3: Calendar Year Natural Gas Usage & Cost

Month	Natural Gas Usage (Therms)	Natural Gas Cost
Apr-10	97,173	$6,602
May-10	91,808	$6,316
Jun-10	78,763	$5,515
Jul-10	77,938	$5,491
Aug-10	75,506	$5,389
Sep-10	68,878	$4,967
Oct-10	79,863	$5,653
Nov-10	97,693	$6,690
Dec-10	105,821	$7,201
Jan-11	108,752	$7,761
Feb-11	108,554	$7,668
Mar-11	101,737	$7,312
Total	**1,092,486**	**$76,565**

Chart 2. Calendar Year Natural Gas Usage & Cost



4.5 BUILDING ENERGY MODEL

To assist in understanding the energy use of the facility, a simplified building energy model has been created using DOE-2 software (eQuest). The model includes details of the building envelope, lighting systems, HVAC, receptacle and process loads and domestic hot water usage.

The model shows the building's electric energy used is approximately 10,801,000 kWh/yr. The facility's utility bill for 12 months from April 2010 to March 2011 had electric usage of 13,108,410-kWh/yr, as such the energy model is within 18% of the electric meter data. The model's kWh consumption is on the lower side because all the medical equipment within the hospital has not been captured.

The model shows the building's gas energy used is approximately 551,600 therm/yr. The facility's utility bill for 12 months from April 2010 to March 2011 had gas usage of 1,092,486-kWh/yr. The gas usage reflected in the utility bills, however, also includes the gas consumption for the Juvenile Hall and the Jail facility which are adjacent to the hospital. There are not sub-meters installed that can be used to break-out the usage for the Juvenile Hall and the Jail. The hospital pays for the entire usage reflected on the bills without sub-charging the other two facilities. To adjust for the non-hospital usage, WES broke out the gas energy consumption for only the hospital was through meter addresses. The gas utility information had two (2) meters, one indicating a consumption of 661,471 therms and the other indicating a consumption of 431,015 therms. The gas meter address for the meter reading 661,471 therms matches with the electric gas meter address for the hospital. Hence this portion of the total gas usage was allocated to the hospital. The model's gas consumption is calibrated to within 17%. The model's gas consumption is on the lower side because all the medical equipment within the hospital has not been captured.

The building energy model also provides a breakout of the building electrical energy by end use. This is very useful in understanding the relative uses of electric energy within the building.

Figure-1: Building Electric Energy Use Breakdown

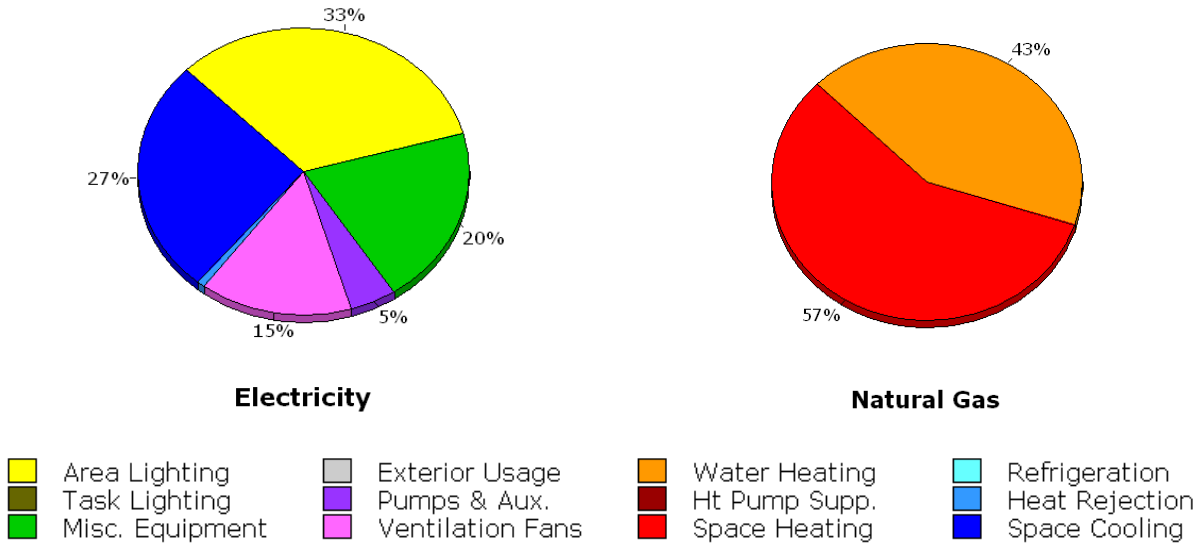


Figure-1 shows that the HVAC energy uses, cooling, heat rejection, pumps and fans account for over 47% of the total building electric energy use.

5.0 INCENTIVE RATES

5.1 INCENTIVE RATES

The Healthcare Energy Efficiency Program has financial incentives available for the usage reduction of peak demand (kW), electricity (kWh), and natural gas (therms). As per the 2010 PG&E Customized Retrofit Incentives Offering, the available incentives are listed in the table below. The incentives are valid for all eligible work completed by November 15, 2012. The total project incentive cannot exceed 50% of the total project cost.

Energy Efficiency Measure Category	Category Code	Available Incentive
Air Conditioning and Refrigeration I	AC&R I	$0.15/kWh
Air Conditioning and Refrigeration II	AC&R II	$0.09/kWh
Lighting	LTG	$0.05/kWh
Motors and Other Equipment	Other	$0.09/kWh
Natural Gas	Gas	$1.00/therm
Peak Demand*	kW	$100/kW

*Paid in addition to kWh incentives

6.0 ENERGY EFFICIENCY MEASURE RECOMMENDATIONS

6.1 IDENTIFIED ENERGY EFFICIENCY MEASURES

Based on the information obtained from the WES audit, the following represents a list of EEMs specifically identified for this facility. The tables below summarize the energy efficiency measure recommendations, energy savings and cost savings. Because of the energy savings potential and initial interest expressed by the site, it is recommended that they are implemented.

6.1.1 EEM-01—INSTALL DX UNITS FOR COMMON, LAB, 300 AND TURN CHILLER OFF

There are two 500 ton chillers that serve the hospital. There is a common chilled water loop to distribute chilled water to the different zones. There are three (3) zones within this loop, namely the common/elevator rooms, the Lab, and Building 300 that need cooling after regular occupied hours which causes these chillers to run after hours. It is recommended to install DX package units for these three (3) zones and remove them from the common chilled water loop. This will allow the site to shut off the chillers during unoccupied hours. Energy savings will be realized from equipment shut down.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction	**13.00**	**kW**
Electrical Energy Savings	**257,000**	**kWh**
Natural Gas Energy Savings	**0**	**Therms**
Energy Cost Savings	$ 38,550	
Total Cost Savings	**$ 38,550**	
Initial Project Cost	$ 358,964	
Incentives Available	$ 24,430	
Net Project Cost	**$ 334,534**	
Simple Payback	**8.7**	**Years**

6.1.2 EEM-02—OPTIMIZE AHU SCHEDULE AND TURN BOILERS OFF AT NIGHT

Building 400, 300, 600, and 200 currently operate from 8 a.m. to 5 p.m., Monday through Friday. The air handlers that serve these buildings operate 24 hours per day, 7 days a week. The boilers serving the heating coils of these air handlers also run continuously. It is recommended to implement a schedule for the air handlers to allow them to be shut down during unoccupied hours. A typical schedule would be 6 AM to 6 PM Monday through Friday to allow for morning warm-up and evening cool down cycles. Additionally it is also suggested to implement the above mentioned schedule on the boilers serving these air handlers. To ensure that piping corrosion is avoided during unoccupied hours, one hot water pump can be run continuously to constantly circulate water through the hot water coils.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction	**-17.10**	**kW**
Electrical Energy Savings	**691,200**	**kWh**
Natural Gas Energy Savings	**113,100**	**Therms**
Energy Cost Savings	$ 212,256	
Total Cost Savings	**$ 212,256**	
Initial Project Cost	$ 50,000	
Incentives Available	$ 25,000	
Net Project Cost	**$ 25,000**	
Simple Payback	**0.1**	**Years**

6.1.3 EEM-03—INSTALL BOILER ISOLATION VALVES

There are four (4) heating hot water boilers that meet the heating load of the hospital and run to produce hot water at 180°F with a return temperature of 140°F. Depending on the time of year there may only be a need for two or three boilers. However, there are no isolation dampers on the boilers, so return water goes through the offline boiler at 140°F and exits to mix with the supply water from the other boilers that is 180°F, therefore cooling the supply water. This cooling of the heating hot water forces the pumps to run harder to meet the heating demands of the hospital. This measure recommends installing isolation valves on the boilers so when they are turned off they can be disconnected from the loop, saving energy.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction	**0.00**	**kW**
Electrical Energy Savings	**0**	**kWh**
Natural Gas Energy Savings	**17,963**	**Therms**
Energy Cost Savings	$ 17,244	
Total Cost Savings	**$ 17,244**	
Initial Project Cost	$ 18,400	
Incentives Available	$ 9,200	
Net Project Cost	**$ 9,200**	
Simple Payback	**0.5**	**Years**

6.1.4 EEM-04—DIETARY/DISHWASHER BOILER HOT WATER LOOP FOR DOMESTIC LOOP

There are two boilers for the domestic hot water loop serving the dietary/dishwasher and the kitchen/restroom needs. For dietary/dishwashing, the boilers need to produce 160°F water. For domestic use, that water is mixed with cold water to bring the temp down to 112°F. The boilers produce 160°F water 24 hours per day, 7 days a week, but the dietary/dishwasher is only used for 12 hours per day. This measure recommends isolating the dietary/dishwasher loop from the domestic loop and scheduling its boiler to run the 12 hours per day that 160°F water is needed. The other boiler for the domestic loop will operate 24 hours per day, 7 days per week producing 112°F water.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction	**0.00**	**kW**
Electrical Energy Savings	**0**	**kWh**
Natural Gas Energy Savings	**11,100**	**Therms**
Energy Cost Savings	$ 10,656	
Total Cost Savings	**$ 10,656**	
Initial Project Cost	$ 10,350	
Utility Incentives	$ 5,175	
Net Project Cost	**$ 5,175**	
Simple Payback	**0.5**	**Years**

6.1.5 EEM-05—REPLACE THE HHW BOILER WITH CONDENSING BOILER

There are four (4) 5500 MBH boilers that run to meet the demand of the heating hot water system. Their rated efficiency is 80%. Over the course of their use, however, this efficiency is normally significantly degraded. It is recommended that the existing boilers be replaced with high efficiency condensing boilers which can have rated efficiencies of up to 94.5% (Thermal Efficiency)allowing a return temperature of 95°F. This Thermal Efficiency number indicates that Condensing Boiler converts 94.5% of the fuel into heat while the remaining 5.5% is lost elsewhere. Instead of representing a peak percentage, the thermal efficiency measurement seeks to show the average efficiency of a device for an entire season. High-efficiency boilers ensure that nearly all of the fuel used goes to heating the space. New boilers also have electric ignition, computerized controls, and the latest combustion technologies—all of which help save energy.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction	**0.00**	**kW**
Electrical Energy Savings	**0**	**kWh**
Natural Gas Energy Savings	**69,437**	**Therms**
Energy Cost Savings	$ 66,660	
Total Cost Savings	**$ 66,660**	
Initial Project Cost	$ 80,500	
Utility Incentives	$ 40,250	
Net Project Cost	**$ 40,250**	
Simple Payback	**0.6**	**Years**

6.1.6 EEM-06—CONVERT 3-WAY TO 2-WAY VALVES AND IMPLEMENT CHILLED WATER SUPPLY TEMPERATURE RESET

When in operation, the chilled water central plant generates supply water at a temperature of 44 °F regardless of the load on the plant. This measure recommends varying the chilled water supply temperature based on the outside air temperature. The site has a design outdoor temperature of 96 °F, and the chillers are sized to provide chilled water at 45°F at this peak outside air temperature. For example, on a mild day when the outdoor temperature is 70°F, the facility will require some cooling due to the reduced envelope and ventilation loads and also from the constant internal loads. To meet these load conditions, CHWST as low as 44°F is excessive and the CHWST can be increased to 50°F and still

fully meet the reduced loads while reducing the energy usage of the chiller. Additionally, this measure also recommends converting all 3-way valves on the chilled water coils of the air handlers to 2-way valves since the chilled water loop that these coils are fed from is variable in nature.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction		**78.70**	**kW**
Electrical Energy Savings		**30,100**	**kWh**
Natural Gas Energy Savings		**0**	**Therms**
Energy Cost Savings	$	4,515	
Total Cost Savings	**$**	**4,515**	
Initial Project Cost	$	68,000	
Utility Incentives	$	10,579	
Net Project Cost	**$**	**57,421**	
Simple Payback		**12.7**	**Years**

6.1.7 EEM-07—IMPLIMENT CONDENSER WATER TEMPERATURE RESET

The condenser water loop serving the chillers is variable in nature. The two (2) condenser water pumps along with the cooling tower fans are all equipped with VFDs but currently run to maintain a fixed condenser water temperature set-point of 75 °F. It is recommended to implement a condenser water temperature reset strategy based on the outside air temperature. During the low load conditions, the condenser water temperature set-point can be adjusted upwards and still fully meet the cooling loads while reducing the energy usage of the cooling tower. Energy savings are realized from reduced load on the condenser water system.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction		**-1.50**	**kW**
Electrical Energy Savings		**1,600**	**kWh**
Natural Gas Energy Savings		**0**	**Therms**
Energy Cost Savings	$	240	
Total Cost Savings	**$**	**240**	
Initial Project Cost	$	500	
Utility Incentives	$	144	
Net Project Cost	**$**	**356**	
Simple Payback		**1.5**	**Years**

6.1.8 EEM-08—AIR BALANCE

The hospital was originally designed for a certain cooling load which governed the air balancing of the hospital. However, over the years the IT and other electronic equipment growth occurred at a rapid pace thereby adding significant additional cooling load on the cooling systems. This has caused an imbalance in the cooling systems serving the site including the air handlers. To compensate for the excessive cooling requirements, the VFDs on most of the air handlers currently run at near maximum speed. Similarly the variability in the chilled water pumping system is also compromised due to the excessive cooling load demand. It is recommended to perform a complete air balancing of the site to properly distribute the loads among the different systems serving the site. This proper distribution of

the load will allow the VFD equipped air handlers as well as the chilled water pumps to modulate properly thereby resulting in energy savings.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction		**7.40**	**kW**
Electrical Energy Savings		**32,500**	**kWh**
Natural Gas Energy Savings		**0**	**Therms**
Energy Cost Savings	$	4,875	
Total Cost Savings	**$**	**4,875**	
Initial Project Cost	$	10,000	
Utility Incentives	$	3,665	
Net Project Cost	**$**	**6,335**	
Simple Payback		**1.3**	**Years**

6.1.9 EEM-09—SCHEDULE 151 BUILDING PACKAGE UNIT TO OPERATE ONLY DURING OCCUPIED HOURS

Currently, the package units serving Building 151 run continuously to condition the different zones that they serve. The building, however, is only occupied from 8 AM to 5 PM Monday through Friday. It is recommended to implement a schedule for these package units to allow them to be shut down during unoccupied hours. A typical schedule would be 6 AM to 6 PM Monday through Friday to allow for morning warm-up and evening cool down cycles. Energy savings will be realized from equipment shut down.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction		**0.00**	**kW**
Electrical Energy Savings		**160,900**	**kWh**
Natural Gas Energy Savings		**0**	**Therms**
Energy Cost Savings	$	24,135	
Total Cost Savings	**$**	**24,135**	
Initial Project Cost	$	30,000	
Utility Incentives	$	14,481	
Net Project Cost	**$**	**15,519**	
Simple Payback		**8**	**Months**

6.1.10 EEM-10—KITCHEN HOOD CONTROLS

The kitchen hood is served by a 5-HP exhaust fan motor. This measure recommends upgrading the existing fan motors to premium efficiency motors with a hood demand ventilation control system with a variable speed drive. The kitchen hood ventilation control system senses heat and smoke to determine when cooking is taking place at which time the fan is activated to full speed. At other times, the fan operates at partial speed resulting in fan energy savings.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction		**3.90**	**kW**
Electrical Energy Savings		**47,156**	**kWh**
Natural Gas Energy Savings		**0**	**Therms**
Energy Cost Savings	$	7,073	
Total Cost Savings	**$**	**7,073**	
Initial Project Cost	$	9,940	
Utility Incentives	$	4,634	
Net Project Cost	**$**	**5,306**	
Simple Payback		**0.8**	**Years**

6.1.11 EEM-11—EXHAUST FAN TIMERS

There are two (2) exhaust fans, EF-M-3 and EF-21, serving the Lobby Smoke Evacuation and the Kitchen area; these currently run continuously. The spaces, however, are only occupied from 8 AM to 5 PM, all 7 days a week. It is recommended to install HVAC timers on these exhaust fans and put them on a 6 AM to 7 PM schedule. The extra 2 hours of operation each day is to account for the morning warm-up and evening cool-down cycles. Energy savings will be realized from equipment shut down.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction		**0.00**	**kW**
Electrical Energy Savings		**31,714**	**kWh**
Natural Gas Energy Savings		**0**	**Therms**
Energy Cost Savings	$	4,757	
Total Cost Savings	**$**	**4,757**	
Initial Project Cost	$	600	
Utility Incentives	$	300	
Net Project Cost	**$**	**300**	
Simple Payback		**0.1**	**Years**

6.1.12 EEM-12 – LIGHTING UPGRADES

There are several different types of lights serving the different sections of the hospital. These different lights date from different times and might have been energy efficient during the time of their installation but are not energy efficient by today's standards. With the technological advancement in lighting systems, more energy efficient lights are available to serve the different lighting needs of the hospital. It is recommended that the hospital install these energy efficient lights. Energy savings are realized from an improvement in the efficiency of the lighting systems.

Measure Calculations: Annual Savings & Costs

Peak Electrical Demand Reduction	**83.00**	**kW**
Electrical Energy Savings	**471,575**	**kWh**
Natural Gas Energy Savings	**0**	**Therms**
Energy Cost Savings	$ 56,589	
Total Cost Savings	**$ 56,589**	
Initial Project Cost	$ 250,000	
Utility Incentives	$ 31,879	
Net Project Cost	**$ 218,121**	
Simple Payback	**3.9**	**Years**

7.0 ENVIRONMENTAL BENEFITS

California is ranked second among states for the most carbon dioxide (CO2) emissions[1]. CO_2 is one of the primary greenhouse gases (GHGs) emitted into the atmosphere.

In 2005, Executive Order S-3-05 was issued for the state of California setting GHG emission reduction targets. By 2010, California must reduce emissions down to year 2000 levels. Additionally, AB32, the California Global Warming Solutions Act of 2006, mandated a statewide reduction target to 1990 levels by 2020.

By reducing energy consumption, energy production decreases, and GHG emissions are reduced. If all measures in this report are implemented, the energy savings will yield a substantial equivalent reduction in pounds of CO_2 emissions. The annual CO_2 emissions reduction is equivalent to removing passenger vehicles from the roads for one year as shown below.

Annual Electricity Reduction (kWh)	Annual Natural Gas Reduction (therms)	Annual CO_2 Equivalent Reduction (lbs)[2]	Annual Equivalent Passenger Vehicles Removed[3]
1,723,745	211,600	5,568,000	13,240

1 Based on data from the Vulcan Project, a NASA/DOE funded effort under the North American Carbon Program

2 Calculations are based on the methodology of the PG&E Carbon Footprint Calculator and the U.S. Environmental Protection Agency

3 Calculation is based on the methodology of the U.S. Environmental Protection Agency

8.0 DISCLAIMER

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the HVAC, lighting and refrigeration systems at your facility. Appropriate detail is included in this report to make decisions about implementing energy efficiency measures at the facility. However, this report is not intended to serve as a detailed engineering design document, as the description of the improvements are only diagrammatic in nature in order to document the basis of cost estimates and savings and to demonstrate the feasibility of constructing the improvements. It should be noted that detailed design efforts may be required in order to implement several of the improvements evaluated as part of this energy analysis. As appropriate, costs for those design efforts are included as part of the cost estimate for each measure.

While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonable and accurate, the findings are estimates and actual results may vary. As a result, PG&E and Willdan Energy Solutions are not liable if projected estimated savings or economics are not actually achieved. All savings and cost estimates in the report are for information purposes and are not to be construed as a design document or as guarantees.

The various incentives are calculated based on the estimated energy savings and estimated total project cost. The total project cost includes, but is not limited to, audits, design, engineering, construction, materials, permits, fees, overhead, and labor. The total incentive available through HEEP cannot exceed 50% of the total project cost and the total site incentive cannot exceed the Project Site Cap as outlined in the 2010 Statewide Customized Offering documentation for single site applications.

In no event will PG&E or Willdan Energy Solutions be liable for the failure of the customer to achieve a specified amount of energy savings, the operation of customer's facilities, or any incidental or consequential damages of any kind in connection with this report of the installation of recommended measures.