City of Oakley

2005 Community-Wide
Greenhouse Gas Emissions Inventory

Photo source: City of Oakley

Narrative Report

Produced by Isabelle Reining
Supported by Pacific Gas and Electric Company (PG&E)
In Collaboration with Association of Bay Area Governments (ABAG) and ICLEI-Local Governments for Sustainability USA

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1. Introduction

The City of Oakley recognizes that greenhouse gas (GHG) emissions from human activity are contributing to climate change and that the City must act quickly to reduce these emissions, both through its government operations and by inspiring change throughout the community. Oakley's commitment to mitigating climate change began in 2007 when the City Council authorized the City of Oakley to join ICLEI's (Local Governments for Sustainability) Cities for Climate Protection Campaign (CCP). Oakley is one of 600 cities in the United States to join ICLEI and in doing so, member cities have committed to inventory their emissions of greenhouse gases, set reduction targets, develop comprehensive strategies to meet these targets, implement these emissions reduction actions, and measure the results.

In 2008, the City began its efforts to identify and quantify greenhouse gas emissions with the assistance of ICLEI – Local Governments for Sustainability.

Presented in this report are estimates of greenhouse gas emissions resulting from activities in the Oakley community as a whole. Due to data availability and the desire to conduct a baseline inventory for the same year as other San Francisco Bay Area cities, data are presented for the year 2005. These data will provide a baseline against which the City will be able to compare future performance and demonstrate progress in reducing emissions. Additionally, the City of Oakley also completed a greenhouse gas inventory of its local government operations (LGO) in May 2011, using the year 2005 as a baseline year. This LGO inventory can be considered a subset of the City's community-wide inventory. The results and analysis of the City's LGO greenhouse gas inventory are presented in a separate report titled *City of Oakley Government Operations Greenhouse Gas Emissions Inventory*, hereinafter referred to as the *LGO Inventory Report.*

1.1. Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence suggests that human activities are increasing the concentration of greenhouse gases, most notably the burning of fossil fuels for transportation and electricity generation which introduces large amounts of carbon dioxide and other gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperature to rise, which is in turn expected to affect global climate patterns and cause climate change.

Many communities in the United States have taken responsibility for addressing climate change at the local level. Oakley could be impacted by rising sea levels and resultant changes in the height, salinity and behavior of the San Francisco Bay, as well as other changes to local and regional weather patterns. Beyond Oakley, scientists also expect changing temperatures to result in more frequent and damaging storms accompanied by flooding and land slides, summer water shortages as a result of reduced snow pack, and disruption of ecosystems, habitats and agricultural activities.

1.2. California Legislation

Since 2005, the State of California has 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 requires the State to reduce its greenhouse gas emissions to 1990 levels by 2020. The AB 32 Scoping Plan was developed to identify strategies for meeting the AB 32 goal, and was adopted by the California Air Resources Board (ARB) in December 2008. Among many other strategies, it encourages local governments to reduce emissions in their jurisdictions by 15 percent below current (2008 or earlier) levels by 2020. In addition, it identifies the following strategies that will impact local governance:

- Develop a California cap-and-trade program
- Expand energy efficiency programs
- Establish and seek to achieve reduction targets for transportation-related GHG emissions
- 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
- Reduce methane emissions at landfills
- Preserve forests that sequester carbon dioxide

Other measures taken by the State include 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 legislative and regulatory changes that have significant implications for 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) authorizes 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 jurisdiction.

SB 375 (2008) revises the process of regional transportation planning by metropolitan planning organizations (MPOs), which are governed by elected officials from local jurisdictions. The statute calls on ARB to establish regional transportation-related greenhouse gas targets and requires the large MPOs to develop regional "Sustainable Communities Strategies" of land use, housing and transportation policies that will move the region towards its GHG target. The statute stipulates that transportation investments must be consistent with the Sustainable Communities Strategy and provides CEQA streamlining for local development projects that are consistent with the Strategy.

1.3. ICLEI Local Governments for Sustainability

The City of Oakley, along with more than 600 local governments in the United States, is a member of ICLEI.[1] In addition to Oakley, there are over 130 jurisdictions (municipal and county) throughout California that are ICLEI members.

ICLEI provides a framework for local governments to identify and reduce greenhouse gas emissions, organized along five milestones:

1. Conduct an inventory of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions reduction target;
3. Develop an action plan for achieving the emissions reduction target;
4. Implement the action plan; and,
5. Monitor and report on progress.

This report represents the completion of the first milestone, and provides a foundation for future work to reduce greenhouse gas emissions in Oakley.

1.4. Pacific Gas and Electric Company Supports Inventory Project

With the support of Pacific Gas and Electric Company (PG&E), ICLEI - Local Governments for Sustainability was contracted to work with the Association of Bay Area Governments (ABAG) to provide a series of in-depth trainings to local governments on conducting and reporting greenhouse gas emissions. In 2011, ICLEI provided training and technical assistance to participating regional organizations, interns, and local government staff and facilitated the completion of this report.

1.5. Sustainability & Climate Change Mitigation Activities in Oakley

The City of Oakley has already begun to address energy efficiency and other greenhouse gas reduction issues. The following climate change mitigation measures have been taken or are in process in the City of Oakley:

- The City implemented a recycling program throughout the community in conjunction with Oakley Disposal to facilitate disposal of recyclables such as green-waste, plastic, glass, cardboard, and paper.
- The City conducts a series of workshops on composting to educate the public about recycling organic materials and also provides discounted compost bins to the public.
- The City gives priority to and expedites Solar Photovoltaic Permit Submittals at no extra charge.
- The City has reduced Permit Fees by 50% for Energy Conserving Permits such as more efficient water heaters, skylights, dual pane window installations and HVAC change outs.
- The City is installing energy-efficient LED streetlights for energy conservation.

[1] ICLEI was formerly known as the International Council for Local Environmental Initiatives, but the name has been changed to ICLEI – Local Governments for Sustainability.

- City Hall was built with a number of LEED recommended features to facilitate water and energy savings including recycled building materials, a cool roof, energy efficient HVAC systems, low to no VOC paint, and waterless urinals. Bike racks and showers are provided on-site to encourage bike commuting by employees.
- The City has implemented an environmentally preferable purchasing policy that covers City supplies and requires environmental materials where possible in City projects.
- The City uses mulching lawnmowers and water efficient landscaping in parks and landscape areas.
- The City added at least one hybrid vehicle to its vehicle fleet in 2010.
- The City is moving towards paper-less options for newsletters and agenda notifications.
- The City participated in the Earth Hour campaign on March 26, 2011 by powering down the Civic Center and community message board.

2. Methodology

2.1. Greenhouse Gas Emissions Inventory Protocols

The first step towards achieving tangible greenhouse gas emissions reductions requires identifying baseline levels and sources of emissions. As local governments continue to join the climate protection movement, the need for a standardized approach to quantify these emissions is essential. Given this, Oakley staff used the International Local Government GHG Emissions Analysis Protocol (IEAP)[2] to inventory the City's community-wide GHG emissions. Similarly, Oakley used the Local Government Operations Protocol (LGOP)[3] to inventory GHG emissions from Oakley's operations, which are evaluated as a subsector of the community inventory, and the results of which are presented separately in the City's *LGO Inventory Report.*

2.1.1. Community Emissions Protocol (IEAP)

The IEAP, developed by ICLEI, provides an easily implementable set of guidelines to assist local governments in quantifying greenhouse gas emissions from the whole community within their geopolitical boundaries. This protocol was used to inventory Oakley's community emissions. ICLEI began development of the IEAP with the inception of its Cities for Climate Protection Campaign in 1993, and formalized an official version in 2009 to establish a common GHG emissions inventory protocol for all local governments worldwide.

2.1.2. Local Government Operations Protocol (LGOP)

In 2008, ICLEI, the California Air Resources Board (ARB), and the California Climate Action Registry (CCAR) released the LGOP to serve as a national appendix to the IEAP.[4] The LGOP serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGOP is to provide the principles, approach, methodology, and procedures needed to develop a greenhouse gas emissions inventory of local government operations. This protocol was used to conduct the local government emissions inventory specifically. While the State of California does not currently require local governments to inventory and report their emissions, an emissions inventory is a critical first step for the City to develop internal emissions reduction strategies and track future progress.

[2] http://www.icleiusa.org/programs/climate/ghg-protocol/international-emissions-analysis-protocol
[3] http://www.icleiusa.org/programs/climate/ghg-protocol/local-government-operations-protocol
[4] ARB adopted the LGOP in 2008. An updated version of the protocol was subsequently released in 2010.

2.2. Quantifying Greenhouse Gases Emissions

2.2.1. Establishing a Base Year

A primary aspect of the emissions inventory process is the requirement to select a base year with which to compare current emissions. While the State's AB 32 emissions reduction goals establish a 1990 base year for the State, most local governments lack comprehensive data from that time period and would be unsuccessful in conducting an accurate inventory for that year. Due to this, the majority of cities and counties currently in the emissions inventory process opt to use 2005 as the base year due to the availability of accurate and complete data. Similar to these jurisdictions, Oakley's greenhouse gas emissions inventory utilizes 2005 as its base year.

2.2.2. Establishing Boundaries

Community: Geopolitical Boundary

Setting an organizational boundary for greenhouse gas emissions accounting and reporting is an important step in the inventory process. Oakley's community inventory assesses emissions resulting from activities taking place within the City's geopolitical boundary. The IEAP defines geopolitical boundary as that "consisting of the physical area or region over which the local government has jurisdictional authority." Activities that occur within this boundary can be, for the most part, controlled or influenced by Oakley's policies and educational programs. Although the City may have limited influence over the level of emissions from some activities, it is important that every effort be made to compile a complete analysis of all activities that result in greenhouse gas emissions.

Government: Organizational Boundaries

According to the LGOP, a government can use two approaches to define its organizational boundary for reporting greenhouse gas emissions: activities and operations that the jurisdiction controls operationally, and activities and operations that the jurisdiction controls financially. Staff estimated Oakley's local government emissions based on activities and facilities for which the City maintains operational control.

2.2.3. Emission Types

The IEAP and LGOP recommend assessing emissions from the six internationally recognized greenhouse gases regulated under the Kyoto Protocol as listed in Table 1. However, for community-wide inventories, quantifying emissions beyond the three primary GHGs (CO_2, CH_4, and N_2O) can be difficult. Therefore, ICLEI has developed a means for local governments to produce a simplified inventory that includes the three primary GHGs, yet is still in accordance with the IEAP methodology. Oakley's community inventory uses the ICLEI Three-GHG methodology. The City's inventory of local government operations accounted for all applicable greenhouse gas emissions resulting from the City's operations, the results of which can be found in the City's *LGO Inventory Report*.

Table 1: Greenhouse Gases

Greenhouse Gas	Chemical Formula	Global Warming Potential
Carbon Dioxide	**CO_2**	**1**
Methane	**CH_4**	**21**
Nitrous Oxide	**N_2O**	**310**
Hydrofluorocarbons	**Various**	**43-11,700**
Perfluorocarbons	**Various**	**6,500-9,000**
Sulfur Hexafluoride	**SF_6**	**23,900**

2.2.4. Quantification Methods

Greenhouse gas emissions can be quantified in 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.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used: *Activity Data x Emission Factor = Emissions*

Oakley's community-wide greenhouse gas inventory was primarily conducted using calculation-based methodologies. 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 electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated emissions quantities. They are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO_2/kWh of electricity). Table 2 demonstrates an example of common emission calculations that use this formula. Please see appendices for details on the emissions factors used in this inventory.

Table 2: Basic Emissions Calculations

Activity Data	Emissions Factor	Emissions
Electricity Consumption (kWh)	**CO2 emitted/kWh**	**CO2 emitted**
Natural Gas Consumption (therms)	**CO2 emitted/therm**	**CO2 emitted**
Gasoline/Diesel Consumption (gallons)	**CO2 emitted /gallon**	**CO2 emitted**
Vehicle Miles Traveled	**CH4, N2O emitted/mile**	**CH4, N20 emitted**

2.2.5. CACP 2009 Software

To facilitate community efforts to reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection 2009 (CACP 2009) software package in partnership with the National Association of Clean Air Agencies (NACAA) and the U.S. Environmental Protection Agency (EPA). CACP 2009 is designed for compatibility with the IEAP and LGOP and determines emissions by combining activity data (energy consumption, waste generation, etc.) with verified emission factors.[5]

Greenhouse gas emissions are aggregated and reported in terms of equivalent carbon dioxide units, or 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, relative to the amount of warming caused by carbon dioxide. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide on a per weight basis in its capacity to trap heat, so the CACP 2009 software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents. See Table 1 for the GWPs of the commonly occurring greenhouse gases.

The CACP 2009 software has been and continues to be used by local governments affiliated with ICLEI to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides governments with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation of reality, rather than an exact value.

2.3. Evaluating Emissions

There are several important concepts involved in the analysis of emissions arising from many different sources and chemical/mechanical processes throughout the community. Those not touched on already are explored below.

2.3.1. Emissions by Scope

For both community and government operations, emissions sources are categorized according to where they fall relative to the geopolitical boundary of the community, or the operational boundaries of the government. Emissions sources are categorized as direct or indirect emissions--Scope 1, Scope 2, or Scope 3. One of the most important reasons for using the scopes framework for reporting greenhouse gas emissions at the local level is to prevent double counting for major categories such as electricity use and waste disposal.

[5] The emission factors and quantification methods employed by the CACP 2009 software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form 1605), and the Local Government Operations Protocol (LGOP).

Community Scope Definitions

The Scopes framework identifies three emissions scopes for community emissions:

- **Scope 1:** All direct emissions from sources located within the geopolitical boundary of the local government.
- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the geopolitical boundary of the local government, but that occur at sources located outside of the government's jurisdiction.
- **Scope 3:** All other indirect or embodied emissions not covered in Scope 2 that occur as a result of activity within the geopolitical boundary.

Scope 1 and Scope 2 sources are the most essential components of a community greenhouse gas analysis as these sources are typically the most significant in scale, and are most easily impacted by local policy making.

2.3.2. Emissions by Sector

In addition to categorizing emissions by scope, this inventory examines emissions by sector. Many local governments find a sector-based analysis more relevant to policy making and project management, as it assists in formulating sector-specific reduction measures and climate action plan components. This inventory evaluates community emissions by sectors listed in Table 3.

Table 3: Community Sectors

Community
Residential
Commercial / Industrial
Transportation
Waste

3. Community Emissions Inventory Results

3.1. Emissions by Scope

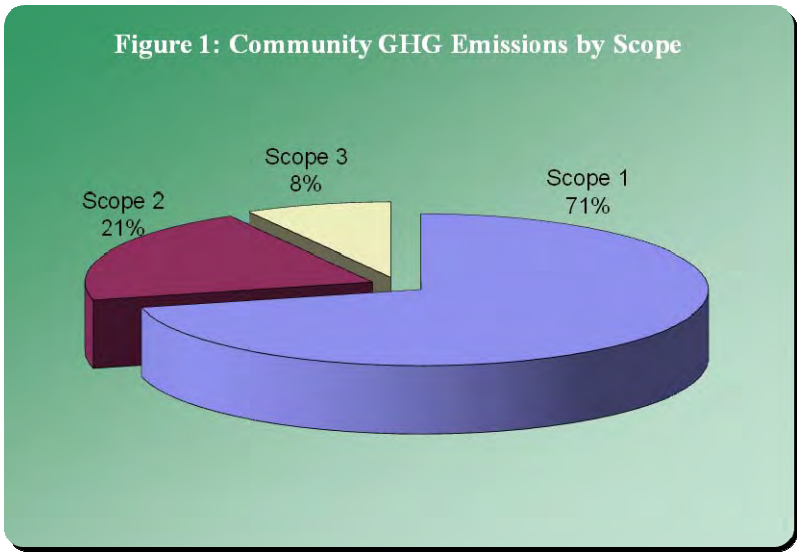
There are numerous items that can be included in a community-wide greenhouse gas emissions inventory, as demonstrated in Table 4 below. This inventory includes Scope 1, Scope 2, and Scope 3 sources from the following sectors:

- Residential
- Commercial / Industrial
- Transportation
- Waste

Table 4: Scopes and Sectors Included in Oakley Community Inventory

Sector	Scope 1	Scope 2	Scope 3
Residential	**Natural Gas**	**Electricity**	
Commercial / Industrial	**Natural Gas**	**Electricity**	
Transportation	**Gasoline & Diesel**		
Waste			**Future Emissions from 2005 Waste**

Including all scopes and sectors, the community of Oakley emitted approximately 120,360 metric tons[6] of CO_2e in the year 2005. As shown in Table 5 and illustrated in Figure 1 below, Scope 1 emissions are by far the largest (71 percent) with Scope 2 (21 percent) and Scope 3 (8 percent) constituting the remainder.



[6] All emissions estimated using ICLEI's Clean Air and Climate Protection (CACP) 2009 Software.

Table 5: Community GHG Emissions per Sector per Scope (metric tons CO_2e)

Sector	Scope 1	Scope 2	Scope 3	TOTAL
Residential	19,728.9	18,266.5		37,995
Commercial / Industrial	2,024.0	6,711.8		8,736
Transportation	63,637.3			63,637
Waste			9,991.3	9,991
TOTAL	85,390	24,978	9,991	**120,360**
% of Total CO2e	71%	21%	8%	**100%**

As shown in Table 6 and Figure 2 below, the largest percentage of Scope 1 emissions came from the Transportation Sector (75 percent). Transportation Sector emissions are the result of diesel and gasoline use on local roads and on the State highways located within Oakley city limits. Natural gas consumption in Oakley homes (Residential Sector) constituted 23 percent of Scope 1 emissions. The remainder of Scope 1 emissions was caused by natural gas consumption in Oakley's Commercial/Industrial Sector (2 percent).

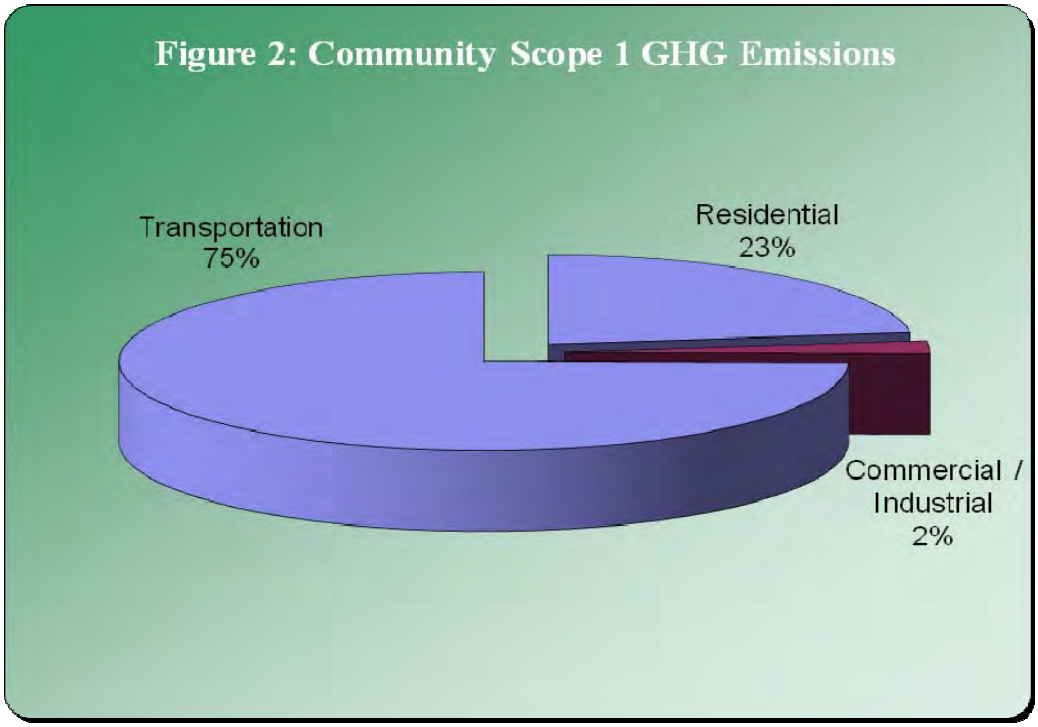


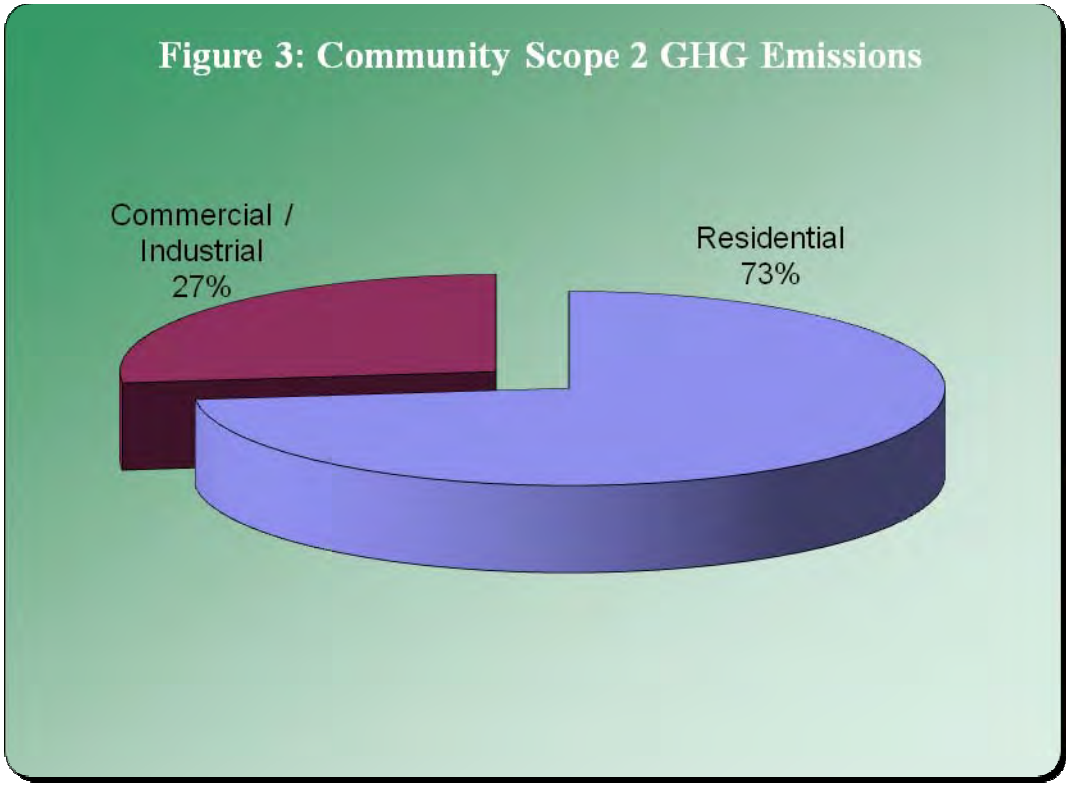
Table 6: Community Scope 1 GHG Emissions (metric tons CO_2e)

Scope 1 Emissions By Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO2e (metric tons)	19,728.9	2,024.0	63,637.3		**85,390**
% of Total CO2e	23%	2%	75%		**100%**
MMBtu	371,151.0	38,076.9	881,208.1		**1,290,436**

Oakley's Scope 2 emissions came from electricity consumption by both the Residential and Commercial / Industrial sectors within City boundaries. As shown in Table 7 and Figure 3 below, the largest percentage of 2005 Scope 2 emissions was generated by the Residential Sector (73 percent). The remainder (27 percent) of Scope 2 emissions was caused by the Commercial / Industrial Sector. As noted above in the general description of Scope 2 parameters, the actual emissions from these activities were generated outside of Oakley city boundaries—in this case, at the source of electricity generation (i.e., at power generation facilities).

Table 7: Community Scope 2 GHG Emissions (metric tons CO_2e)

Scope 2 Emissions By Sector	Residential	Commercial / Industrial	TOTAL
CO2e (metric tons)	18,266.5	6,711.8	**24,978**
% of Total CO2e	73%	27%	**100%**
MMBtu	278,675.4	93,064.7	**371,740**



The remaining portion of emissions included in the City of Oakley 2005 community inventory fall under the category of Scope 3. All emissions in this category are an estimate of future emissions over the lifecycle decomposition of waste and alternative daily cover (ADC)[7] generated by the City in the base year (2005).[8]

[7] ADC is defined as cover material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging. More information is available on the California Department of Resources Recycling and Recovery web-page: http://www.calrecycle.ca.gov/lgcentral/basics/adcbasic.htm

[8] More details on emissions from the waste sector are presented later in the report.

3.2. Emissions by Sector

As noted above, the community of Oakley, across all scopes, emitted approximately 120,360 metric tons of CO_2e in the year 2005. In addition to viewing these data through the lens of the various scopes, we can also focus specifically on each sector, with scopes aggregated by sector. As visible in Figure 4 and Table 8 below, gasoline and diesel usage within the Transportation Sector were by far the largest sources of community emissions (53 percent). Emissions from the Residential Sector (due to electricity and natural gas usage) accounted for 32 percent of total community emissions, and electricity and natural gas consumption within the Commercial / Industrial Sector caused 7 percent of the City's overall emissions. The remaining 8 percent of emissions came from waste generated by Oakley's residents and businesses in 2005 (Scope 3 Sector). See below for further detail on each sector.

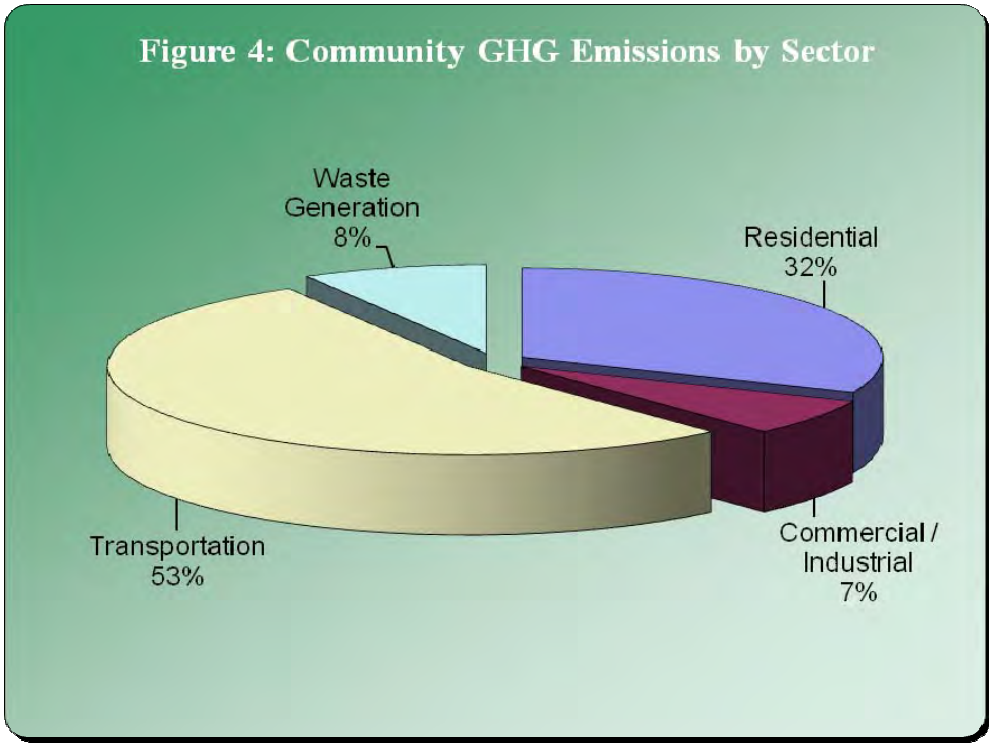


Table 8: Community GHG Emissions by Sector (metric tonsCO_2e)

2005 Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste Generation	TOTAL
CO2e (metric tons)	37,995.4	8,735.8	63,637.3	9,991.3	**120,360**
% of Total CO2e	32%	7%	53%	8%	**100%**
MMBtu	649,826.4	131,141.6	881,208.1		**1,662,176**

3.2.1. Residential

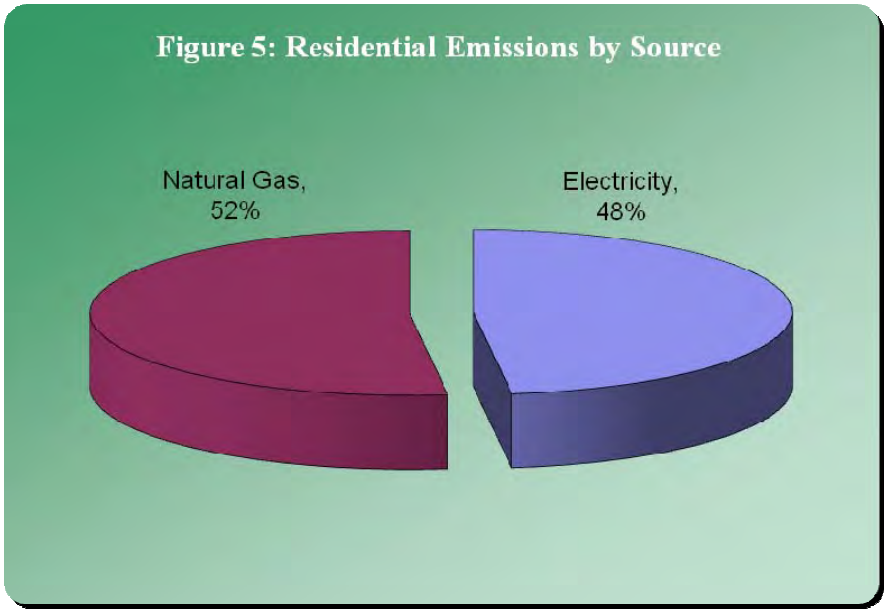
As shown in Table 8, Oakley's Residential Sector generated an estimated 37,955 metric tons of CO_2e in 2005. This estimate was calculated using 2005 electricity and natural gas consumption data provided by PG&E, and only includes consumption through residential buildings. Data on residential equipment usage, such as lawnmowers, or on-site electricity generation (e.g., diesel back-up generators) is not included in this inventory. GHG emissions associated with residential transportation and residential waste generation are included separately in the Transportation and Waste Sector emissions totals.

Table 9 provides information on residential emissions on a per household basis. Oakley households generated an average of 4 metric tons each of GHG emissions in 2005. The average Oakley household housed 3.26 persons in 2005.[9] Per household emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one's emissions with neighboring cities and against regional and national averages.

Table 9: Oakley 2005 Greenhouse Gas Emissions per Household

Number of Occupied Housing Units[9]	**8,864**
Total Residential GHG Emissions (metric tons CO2e)	**37,995**
Residential GHG Emissions/Household (metric tons CO2e)	**4**

Figure 5 and Table 10 illustrate the breakdown of residential GHG emissions by fuel type. Approximately 52 percent of residential GHG emissions were generated from the use of natural gas. Natural gas is typically used in residences as a fuel for home heating, water heating and cooking. Approximately 48 percent of residential GHG emissions were generated through electricity provided by PG&E and generated at power generation facilities located outside of the City.



[9] State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2010, with 2000 Benchmark.. From: http://www.dof.ca.gov/research/demographic/reports/view.php

Table 10: Residential Emissions by Source

Residential Emission Sources 2005	Electricity	Natural Gas	TOTAL
MTCO2e	18,266.5	19,728.9	**37,995**
% of Total CO2e	48%	52%	**100%**
MMBtu	278,675.4	371,151.0	**649,826**

3.2.2. Commercial / Industrial

As mentioned previously, Oakley's businesses and industries generated 7 percent of community-wide GHG emissions in 2005, or 8,736 metric tons of CO_2e. The GHG emissions from electricity consumption in commercial and industrial sectors are calculated differently, as they originate from different sources. The commercial sector in Oakley receives electricity produced by PG&E, whereas the industrial sector receives direct access (DA) electricity from other power generation facilities which is transmitted by PG&E's transmission and distribution lines.[10] The actual quantity of direct access electricity could not be reported by PG&E due to the California Public Utilities Commission (CPUC) 15/15 rule.[11] Therefore, this quantity was indirectly estimated based on data provided by the California Energy Commission (CEC).[12] Emissions from DA electricity are included in this inventory based on the estimated quantity of DA electricity received by the industrial sector. Electricity received by the commercial sector was directly reported by PG&E and therefore used as input data to calculate emissions from the commercial sector.

The GHG emissions from natural gas provided by PG&E to the commercial and industrial sectors are calculated as one aggregated quantity, because the input data on the quantity of natural gas consumption in the commercial and industrial sectors was combined and reported by PG&E as an aggregated quantity due to the 15/15 rule.

As illustrated in Figure 6 and Table 11, 23 percent of Commercial / Industrial emissions were generated from the combustion of natural gas. Commercial / Industrial electricity consumption accounts for 77 percent of the Commercial / Industrial greenhouse gas emission sources.

[10] Direct Access electricity refers to electricity purchased directly by industries from power generation facilities, which is then delivered through the transmission lines of public or private utility.
[11] The 15/15 Rule was adopted by the CPUC in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. If the number of customers in the complied data is below 15, or if a single customer's load is more than 15 percent of the total data, categories must be combined before the information is released.
[12] The CEC provided an estimate of 2005 DA electricity consumption within Contra Costa County at large. The countywide DA consumption figures provided by the CEC were used to estimate the proportion of DA electricity consumed within the City of Oakley. It is important to note that the direct access data included in the inventory may not be comprehensive given that it is primarily based on regional estimates.

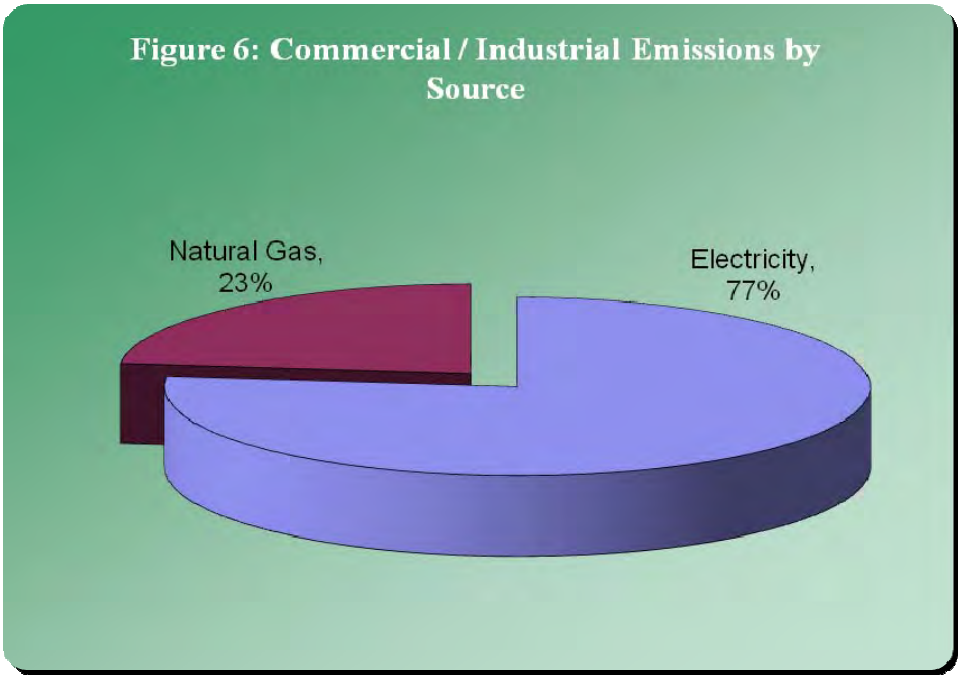


Table 11: Commercial / Industrial Emissions by Source

Commercial / Industrial Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO2e (metric tons)	6,711.8	2,024.0	**8,736**
Percentage of Total	77%	23%	**100%**
MMBtu	93,064.7	38,076.9	**131,142**

3.2.3. Transportation

As shown previously in Figure 4 and Table 8, Oakley's Transportation Sector accounted for 63,637 metric tons CO_2e, or 53 percent of the City's 2005 GHG emissions. The Transportation Sector analysis includes emissions from all on-road vehicle use within Oakley's city boundaries (whether on local roads or State highways passing through Oakley's jurisdiction). Transportation emissions from off-road vehicle use, rail transport, and boat use were not available at the time of this report and are not included in the Transportation Sector analysis.

Figure 7 and Table 12, show that nearly 52 percent of Oakley's 2005 transportation-related greenhouse gas emissions were generated from vehicle miles traveled (VMT) on State highways located within City boundaries (i.e., Highway 4 / Main Street), while 48 percent was generated from vehicles on local roads.

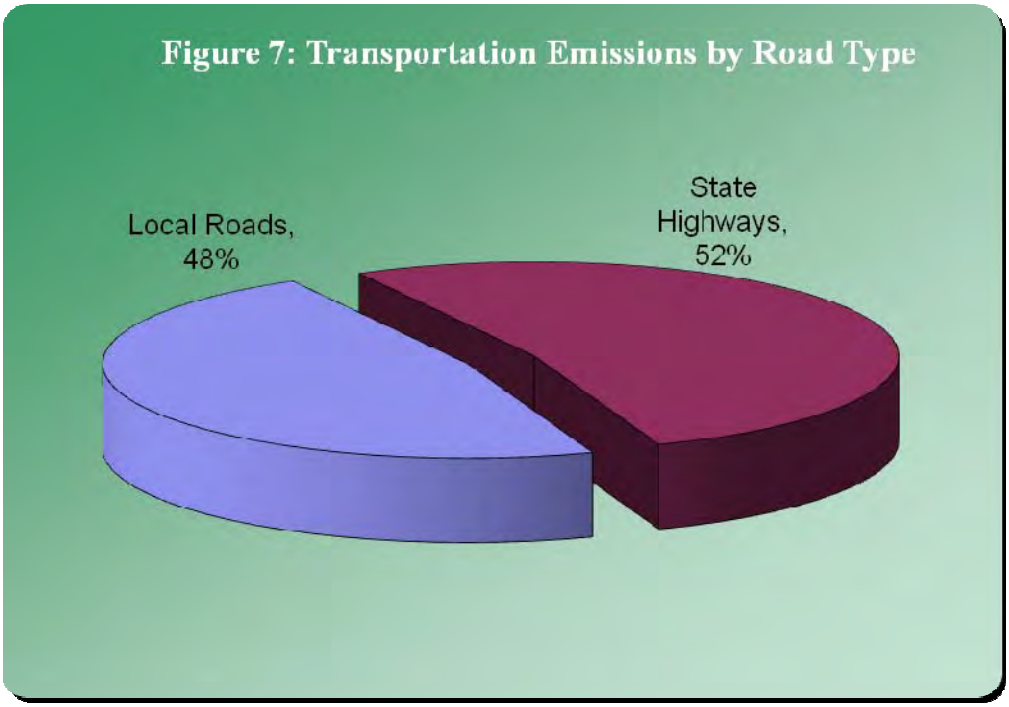


Table 12: Transportation Emissions by Road Type

Transportation Road Type Emissions Sources 2005	Local Roads	State Highways	TOTAL
CO2e (metric tons)	30,288.2	33,349.0	**63,637**
Percentage of Total CO2e	48%	52%	**100%**
MMBtu	419,412.2	461,796.0	**881,208**

Emissions from the air travel of Oakley residents were not included in the Transportation Sector analysis. With more time and the availability of additional data the greenhouse gas emissions from air travel could be estimated. Because there are no airports located within the geographic boundaries of Oakley it is reasonable to exclude air travel from this inventory. Please see Appendix D for more detail on methods and emissions factors used in calculating emissions from the Transportation Sector

3.2.4. Waste

As noted above in Figure 4 and Table 8, the Waste Sector constituted 8 percent of total 2005 emissions for the community of Oakley. Emissions from the Waste Sector are an estimate of methane generation from the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) that are deposited in a landfill. The waste emissions included in this report stem from the following source:

> **W*aste Generation (Scope 3 above):*** Emissions from Oakley-generated 2005 waste and alternative daily cover (ADC) sent to Keller Canyon Landfill, West Contra Costa Sanitary Landfill, Vasco Road Sanitary Landfill, and Potrero Hills Landfill.

Table 13 details Waste Sector emissions, which are categorized as Scope 3 emissions.

Table 13: Waste Emissions by Scope

Waste Emissions Categories 2005	Waste Generation
MTCO2e	9,991.3
% of Total CO2e	100%

The waste generation emissions included in this report are the estimated future emissions of waste or ADC that was sent to any landfill by the Oakley community in the base year 2005. These emissions are considered Scope 3 because they are not generated in the base year, but will result from the decomposition of the 2005 waste over the full 100+ year cycle of its decomposition.

Landfill waste emission estimates were made using the same landfill gas recovery rate used in the GHG inventory conducted by the nearby City of Pittsburg, which sends its waste to the same landfills. A 60% percent methane recovery factor was used to determine the percentage of all generated emissions that was likely escaping into the atmosphere (fugitive emissions).[13]

Waste generation emissions figures are the product of a modeling exercise that estimates the future emissions that will result over the full decomposition of the organic waste and ADC sent to any landfill in the base year 2005. The model used to run this estimation is based on the U.S. EPA Waste Reduction Model (WARM). In order to estimate the relative quantities of various types of waste included in the general disposal figures obtained from Oakley, waste characterization figures were utilized from the 2004 California Waste Characterization Study.[14]

This source of greenhouse gas emissions is included because data on this source enables policy development addressing waste diversion. Transportation emissions generated from the collection, transfer and disposal of solid waste are included in Transportation Sector GHG emissions.

3.3. Per Capita Emissions

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. That said, due to differences in emission inventory methods, it can be difficult to get a directly comparable per capita emissions number, and one must be cognizant of this margin of error when comparing figures.

As detailed in Table 14, dividing total community GHG emissions by population yields a result of 4 metric tons of CO_2e per capita. It is important to understand that this number is not the same as the carbon footprint of the average

[13] See Appendix E for more information on methods and emissions factors used in the Waste Sector analysis.
[14] http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

individual living in Oakley (which would include lifecycle emissions, emissions resulting from air travel, etc.).

Table 14: Oakley 2005 Greenhouse Gas Emissions per Capita

Estimated 2005 Population[15]	**26,824**
Community GHG Emissions (metric tons CO_2e)	**120,360**
GHG Emissions / Resident (metric tons CO_2e)	**4**

[15] US Census Bureau, Population Estimates Program. http://factfinder.census.gov/servlet/SAFFPopulation?_event=Search&geo_id=01000US&_geoContext=01000US&_street=&_county=oakley&_cityTown=oakley&_state=04000US06&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=010&_submenuId=population_0&ds_name=null&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=

4. Conclusion and Next Steps

The City of Oakley has made a commitment to reduce its greenhouse gas emissions. This emissions inventory provides baseline emission levels against which future progress can be demonstrated.

This analysis found that the Oakley community as a whole was responsible for emitting 120,360 metric tons of CO_2e in the base year 2005, with emissions from the Transportation Sector contributing the most to this total (See summary table in Appendix A for more detail).

While Oakley has already begun to reduce greenhouse gas emissions through its actions, this inventory represents the first step in a systematic approach to reducing Oakley's emissions. This system, developed by ICLEI, is called the Five Milestones for Climate Mitigation. This Five Milestone process involves the following steps:

Milestone One: Conduct a baseline emissions inventory and forecast
Milestone Two: Adopt an emissions reduction target for the forecast year
Milestone Three: Develop a local climate action plan
Milestone Four: Implement the climate action plan
Milestone Five: Monitor progress and report results

Figure 8: ICLEI's Five Milestones for Climate Mitigation

ICLEI staff are available to local governments who are members and should be contacted to discuss the full range of resources available at each stage of the Milestone process. The following sections provide a glimpse at next steps and help capture the lessons learned in conducting this inventory.

4.1. Setting Emissions Reduction Targets

This inventory provides an emissions baseline that can be used to inform Milestone Two of ICLEI's Five-Milestone process—setting emissions reduction targets for the Oakley community. The greenhouse gas emissions reduction target is a goal to reduce emissions to a certain percentage below base year levels by a chosen planning horizon year. An example target might be a 15 percent reduction in emissions below 2005 levels by 2020. A target provides an objective toward which to strive and against which to measure progress. It allows a local government to quantify its commitment to fighting climate change - demonstrating that the jurisdiction is serious about its commitment and systematic in its approach.

In selecting a target, it is important to strike a balance between scientific necessity, ambition, and what is realistically achievable. Oakley should give itself enough time to implement chosen emissions reduction measures—noting that the farther out the target year is, the more the City should pledge to reduce. ICLEI recommends that regardless of the chosen long-term emissions reduction target (e.g., 15-year, 40-year), Oakley should establish linear interim targets for every two- to three-year period. Near-term targets facilitate additional support and accountability, and linear goals help to ensure continued momentum around local climate protection efforts. To monitor the effectiveness of its programs, Oakley should plan to re-inventory its emissions on a regular basis; many jurisdictions are electing to perform annual inventories. ICLEI recommends conducting an emissions inventory every three to five years.

4.1.1 The Long-Term Goal

ICLEI recommends that near-term climate work should be guided by the long-term goal of reducing its emissions by 80 percent to 95 percent from the 2005 baseline level by the year 2050. By referencing a long-term goal that is in accordance with current scientific understanding, Oakley can demonstrate that it intends to do its part towards addressing greenhouse gas emissions from its community-wide activities.

It is important to keep in mind that it will be next to impossible for local governments to reduce emissions by 80 to 95 percent without the assistance of state and federal policy changes that create new incentives and new sources of funding for emissions reduction projects and programs. However, in the next 15 years, there is much that local governments can do to reduce emissions independently. It is also important that Oakley works to reduce its emissions sooner, rather than later: the sooner a stable level of greenhouse gases in the atmosphere is achieved, the less likely it is that some of the most dire climate change scenarios will be realized.

4.1.2 State of California Targets and Guidance

An integral component of the State of California's climate protection approach has been the creation of three core emissions reduction targets at the community level. On June 1, 2005, California Governor Schwarzenegger signed Executive Order S-3-05 establishing climate change emission reductions targets for the State of California. The California targets are an example of near-, mid- and long-term targets:

- Reduce emissions to 2000 levels by 2010
- Reduce emissions to 1990 levels by 2020
- Reduce emissions to 80 percent below 1990 levels by 2050

The AB 32 Scoping Plan also provides further guidance on establishing targets for local governments; specifically the Plan suggests creating an emissions reduction goal of 15 percent below "current" levels by 2020. This target has informed many local governments' emission reduction targets for community-wide emissions —most local governments in California with adopted targets of 15 to 25 percent reductions under 2005 levels by 2020.

4.2. Creating an Emissions Reduction Strategy

This inventory identifies the major sources of emissions from the Oakley community and, therefore, where policymakers will need to target emissions reductions activities if they are to make significant progress toward adopted targets. For example, since transportation was a major source of emissions from the Oakley community, it is possible that Oakley could meet near-term targets by implementing a few major actions within Transportation Sector. Medium-term targets could be met by focusing emissions reduction actions on the Residential, Commercial/Industrial, and Waste sectors, and the long term (2050) target will not be achievable without major reductions in all of these sectors.

As Oakley moves forward with considering emission reduction strategies and create a local climate action plan, the City should identify and quantify the emission reduction benefits of climate and sustainability strategies that could be implemented in the future, including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction and other strategies. Through these efforts and others the City of Oakley can achieve additional benefits beyond reducing emissions, including saving money and improving Oakley's economic vitality and its quality of life. City staff will continue to update this inventory as additional data become available.

4.3. Improving Emissions Estimates

One of the benefits of a community inventory is that the City can identify areas in their community-wide activities where data collection can be improved. For example, data is often not available from certain sub-sectors within the

transportation sector, such as off-road vehicles. This affects the accuracy of the emissions estimate and may have other implications for the community as a whole.

During the inventory process, Oakley identified the following gaps in data that, if resolved, would allow Oakley to make its future inventories more comprehensive.

- Off-road vehicle use.
- Railroad transportation including Amtrak and freight transport though the City on the Burlington Northern Santa Fe (BNSF) Railway.
- Boat transportation in and out of the City's three marinas.
- Air travel of Oakley residents.
- Residential equipment usage (for example, fuel used in lawnmowers and other equipment).
- Residential on-site electricity generation (for example, diesel back-up generators).

4.4. Project Resources

ICLEI has created tools for Oakley to use to assist with future monitoring inventories. These tools are designed to work in conjunction with the IEAP, which is the primary reference document for conducting an emissions inventory. The following tools should be saved as resources and supplemental information to this report:

- ICLEI's Clean Air & Climate Protection (CACP) 2009 Software
- CACP "Community Analysis Inputs/Outputs, Summary with Notes" export report which contains a summary report in Excel format of all calculated emissions, with explanatory notes included.
- CACP "Community Analysis Inputs/Outputs, Details" export report which contains a detailed report in Excel format of all calculated emissions.
- CACP "Backup" file which contains the calculations of emissions based on inputs from the data files. CACP software is required to open the Backup file.
- A folder of final data files that contains most or all of the raw data that was entered in CACP software and used to calculate community-wide emissions. Includes a "Data Summary File" of key data points.
- The "Master Data Workbook" that was used for conditioning charts and tables for inclusion in this report. Note: the majority of the tabs in the Master Data Workbook have not been populated with data, therefore the raw data files should be reviewed for access to this information.

5. Appendices

5.1. Appendix A - Detailed Community Greenhouse Gas Emissions in 2005

Sector	Emissions Source	Equiv CO_2 (metric tons)	Equiv CO_2 (%)	Energy (MMBtu)	Data Source
Residential					
	Electricity	18,266.5	15.18%	278,675.4	PG&E
	Natural Gas	19,728.9	16.39%	371,151.0	PG&E
Subtotal Residential		**37,995**	**31.57%**	**649,826**	
Commercial/Industrial					
	Electricity	6,711.8	5.58%	93,064.7	PG&E, CEC
	Natural Gas	2,024.0	1.68%	38,076.9	PG&E
Subtotal Commercial		**8,736**	**7.26%**	**131,142**	
Transportation					
Local Roads AVMT					
	Gasoline	25,856.5	21.48%	359,535.0	MTC, HPMS
	Diesel	4,431.8	3.68%	59,877.1	MTC, HPMS
State Highways AVMT					
	Gasoline	28,469.4	23.65%	395,867.9	MTC
	Diesel	4,879.6	4.05%	65,928.0	MTC
Subtotal Transportation		**63,637**	**52.87%**	**881,208**	
Waste					
ADC					
	Plant Debris	373.9	0.31%		Alameda County Disposal Report 2005, Contra Costa County Quarterly Disposal Data, Kern County Quarterly Disposal Data, San Joaquin Quarterly Disposal Data, Potrero Hills Landfill Quarterly Data
Total Waste Disposed (w/o ADC)					
	Paper Products	5,369.6	4.46%		
	Food Waste	2,105.9	1.75%		
	Plant Debris	565.1	0.47%		
	Wood/Textiles	1576.9	1.31%		
Subtotal Waste		**9,991**	**8.30%**		
Grand Total		**120,360**	**100.0%**	**1,662,176**	

5.2. Appendix B - Residential Sector Notes

Data Inputs:

Residential	Electricity Consumption	kWh	81,651,898
	Natural Gas Consumption	Therms	3,711,510

Data Sources:

1. Data on residential electricity and natural gas consumption provided by PG&E: Jasmin Ansar, JxA2@pge.com, Xantha Bruso, XxB1@pge.com.
   Data Source: City of Oakley Community-wide PGE data_2005.xls

   Data entry in CACP 2009 guided by ICLEI. For questions on emission calculations, please contact Xico Manarolla, Senior Program Officer, ICLEI: xico.manarolla@iclei.org, (510) 844-0699 ext. 303

Notes:

1. The emissions associated with electricity supplied by PG&E are calculated by using emission factors for the three greenhouse gases that are emitted as a result of electricity generation (CO_2, CH_4 and N_2O). The emission factor for CO_2 (489.16 lbs/MWh) was provided by PG&E and is listed in the Local Government Operations Protocol (LGOP) under Table G.6: Utility-Specific Verified Electricity CO_2Emission Factors (2000-2007). The emission factors for CH_4 (0.03 lbs/MWh) and N_2O (0.011 lbs/MWh) are calculated from California-wide data on the quantity of electricity consumption (provided by the California Energy Commission) and greenhouse gas emissions from electricity consumption (provided by the California Air Resources Board). These emission factors are listed in the LGOP under Table G.7: California Grid Average Electricity Emission Factors (1990 – 2007).

2. The emissions associated with natural gas supplied are calculated by using emission factors for the three greenhouse gases that are emitted as a result of natural gas combustion. The emission factors for CO_2 are taken from EPA Final Mandatory Reporting of Greenhouse Gases Rule Table C-1 and from US Inventory of Greenhouse Gas Emissions and Sinks 2004-2007 (2009). They are also listed in the LGOP under Table G.1. U.S Default Factors for Calculating Carbon Dioxide Emissions from Fossil Fuel Combustion. The emission factors for N_2O and CH_4 are taken from EPA Climate Leaders, Stationary Combustion Guidance (2008), Table A-1, based on U.S. EPA, *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2005* (2007), Annex 3.1. These emission factors are listed in the LGOP under Table G.3 Default Methane and Nitrous Oxide Emission Factors by Fuel Type and Sector.

5.3. Appendix C - Commercial / Industrial Sector Notes

Data Inputs:

Commercial	Electricity Consumption	kWh	24,331,192
	Natural Gas Consumption	Therms	380,769
Industrial	Electricity Consumption (Not Applicable)	kWh	Not Applicable
	Natural Gas Consumption (Fails 15/15 Rule)	Therms	Combined with Commercial Natural Gas
Direct Access (see below for DA emission factor)	Electricity Direct Access (from PG&E – Fails 15/15 Rule)	kWh	Not directly reported due to 15/15 rule
	% DA County Estimate for Residential	%	0.00%
	% DA County Estimate for Commercial and Industrial	%	12.07%
	Estimated Direct Access Electricity Consumption	kWh	2,936,758
	Natural Gas DA from Industries	Therms	Not Applicable

Data Sources:

1. Data on commercial electricity and natural gas consumption provided by PG&E: Jasmin Ansar, JxA2@pge.com, Xantha Bruso, XxB1@pge.com.
   Data Source: City of Oakley Community-wide PGE data_2005.xls

2. There was no data reported by PG&E on electricity consumption in the industrial sector.

3. Data on natural gas consumption in the industrial sector failed the 15/15 rule[16] and was therefore combined with the reported quantity of natural gas consumption in the commercial sector.

4. Data on Direct Access Electricity provided by California Energy Commission (CEC): Andrea Gough, agough@energy.state.ca.us, (916) 654.4928.

5. Data entry in CACP 2009 guided by ICLEI. For questions on emission calculations, please contact Xico Manarolla, Senior Program Officer, ICLEI: xico.manarolla@iclei.org, (510) 844-0699 ext. 303.

Notes:

1. The emissions associated with electricity supplied by PG&E are calculated by using emission factors for the three greenhouse gases that are emitted as a result of electricity generation (CO_2, CH_4 and N_2O). The emission factor for CO_2 (489.16 lbs/MWh) was provided by PG&E, and is also listed in the Local Government Operations Protocol (LGOP) under Table G.6: Utility-Specific Verified Electricity CO_2Emission Factors (2000-2007). Utility-specific emission factors for CH_4 and N_2O are not available, and therefore, the emission factors for CH_4 (0.03 lbs/MWh) and N_2O (0.011 lbs/MWh) are calculated from California-wide data on the quantity of electricity consumption (provided by the California Energy Commission) and greenhouse gas emissions from electricity consumption (provided by the California Air Resources Board). These emission factors are listed in the LGOP under Table G.7: California Grid Average Electricity Emission Factors (1990 – 2007).

[16] The 15/15 Rule requires that any aggregated information provided by the utilities must be made up of at least 15 customers, and a customer's load must be less than 15% of an assigned category

2. The emissions associated with natural gas are calculated by using emission factors for the three greenhouse gases that are emitted as a result of natural gas combustion. The emission factors for CO_2 are taken from EPA Final Mandatory Reporting of Greenhouse Gases Rule Table C-1 and from US Inventory of Greenhouse Gas Emissions and Sinks 2004-2007 (2009). They are also listed in the LGOP under Table G.1. U.S Default Factors for Calculating Carbon Dioxide Emissions from Fossil Fuel Combustion. The emission factors for N_2O and CH_4 are taken from EPA Climate Leaders, Stationary Combustion Guidance (2008), Table A-1, based on U.S. EPA, *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2005* (2007), Annex 3.1. These emission factors are listed in the LGOP under Table G.3 Default Methane and Nitrous Oxide Emission Factors by Fuel Type and Sector.

3. Estimates of direct access electricity purchased by the industrial sector in the City of Oakley are based on data provided by the California Energy Commission on total average county-wide direct access electricity consumption. The quantity of county-wide total direct access electricity consumption was found to be 12.07% of county-wide non-direct access electricity in 2005. It was assumed that the City of Oakley's direct access electricity consumption must also be 12.07% of the City's total non-direct access commercial electricity usage. Therefore, the 12.07% factor was applied to the City's commercial electricity usage to estimate the quantity of direct access electricity consumed by the City's industrial sector.

4. The emissions associated with direct access electricity are calculated by using emission factors for the three greenhouse gases that are emitted as a result of electricity generation (CO_2, CH_4 and N_2O). Since utility-specific emission factors are not available for direct access electricity, the emission factors for CO_2 (948.28 lbs/MWh), CH_4 (0.03 lbs/MWh) and N_2O (0.011 lbs/MWh) are calculated from California-wide data on the quantity of electricity consumption (provided by the California Energy Commission) and greenhouse gas emissions from electricity consumption (provided by the California Air Resources Board). These emission factors are listed in the LGOP under Table G.7: California Grid Average Electricity Emission Factors (1990 – 2007).

5.4. Appendix D - Transportation Sector Notes

Data Inputs:

Transportation	Gasoline and Diesel Consumption (VMT)	Annual VMT (95.2% Gasoline 4.8% Diesel)	56,231,900
	State Highway VMT	Annual VMT (95.2% Gasoline 4.8% Diesel)	61,914,430

Data Sources:

1. Local Roads Vehicle Miles Traveled (VMT) 2005 data provided by Metropolitan Transportation Commission (MTC). This data is also available in the Highway Performance Monitoring System's 2005 California Public Road Data Report.[17] For questions, please contact Benjamin Espinosa, Planner, Metropolitan Transportation Commission (MTC) bespinosa@mtc.ca.gov, (510) 817-5744. Data analyzed by ICLEI. For questions on emission calculations, please contact Xico Manarolla, Senior Program Officer, ICLEI: xico.manarolla@iclei.org, (510) 844-0699 ext. 303.
   Data File: City of Oakley Local Roads VMT CCC 2005.xls

2. State Highways Vehicle Miles Traveled (VMT) 2005 data provided by Metropolitan Transportation Commission (MTC). For questions, please contact Benjamin Espinosa, Planner, Metropolitan Transportation Commission (MTC) bespinosa@mtc.ca.gov, (510) 817-5744. Data analyzed by ICLEI. For questions on emission calculations, please contact Xico Manarolla, Senior Program Officer, ICLEI: xico.manarolla@iclei.org, (510) 844-0699 ext. 303.
   Data File: City of Oakley State Highway VMT CCC 2005 UPDATED 6-3-11.xls

3. Emission Factors for CO_2 for different kinds of transport fuel are based on following sources:
   - U.S. EPA, Inventory of Greenhouse Gas Emissions and Sinks: 1990-2007 (2009), Annex Table A-34, A-39, A-42.
   - EPA Climate Leaders, Mobile Combustion Guidance, Table B-3, B-4, B-5, B-6, B-7(2008)
   - California Climate Action Registry General Reporting Protocol Version 2.2, 2007, Table C.3.

   These emission factors are also listed in the LGOP under Table G.11. Default CO_2 Emission Factors for Transport Fuels.

   Emission Factors for N_2O and CH_4 for different kinds of vehicle categories are based on U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008 (2010). These emission factors are also listed in the LGOP under Table G.12 Default CH_4 and N_2O Emission Factors for Highway Vehicles by Model Year

Notes:

1. Fleet mix data (on road fleet breakdown by vehicle type, fuel efficiency, and fuel type) was used to estimate the quantity of gasoline and diesel consumed on Oakley roads and state highways from VMT data. Fleet mix data was provided by the Metropolitan Transportation Commission (MTC). For questions, please contact Benjamin Espinosa, Planner, Metropolitan Transportation Commission (MTC) bespinosa@mtc.ca.gov, (510) 817-5744.

2. State Highway VMT data provided by MTC was modified during the completion of this report in response to feedback provided by City of Oakley staff. VMT data for Oakley originally included percentages of two segments of Highway 160, however City staff reported that this highway is outside city boundaries and the segments attributed to Oakley fall within unincorporated areas. As a result, VMT figures for Highway 160 were removed from Oakley's State Highway total and the total only includes Highway 4/Main Street. These changes are reflected in the data file: City of Oakley State Highway VMT CCC 2005 UPDATED 6-3-11.xls

[17] http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf

5.5. Appendix E - Waste Sector Notes

Data Inputs:

Waste	Total Landfill Waste	Metric Tons	29,895
	Total Alternative Daily Cover	Metric Tons	1,363
	% ADC Green Material	%	100.00%

Data Sources:

1. 2005 Waste Disposal Figures for the City of Oakley were based on data from the following sources:
   - Alameda County Disposal Report 2005
   - Contra Costa County Quarterly Disposal Data
   - Kern County Quarterly Disposal Data
   - San Joaquin Quarterly Disposal Data
   - Potrero Hills Landfill Quarterly Data

   For questions, please contact Contra Costa County Community Development Department: Deidra Dingman, Solid Waste Program Manager, dding@cd.cccounty.us, (925) 335-1224.
   Data File: City of Oakley Community-wide Solid Waste Data_2005.xls

2. Waste Characterization data based on 2004 Statewide Waste Characterization Study by Center for Integrated Waste Management Board (CIWMB). This state average waste characterization accounts for residential, commercial and self-haul waste. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097
   Data source file: CA Waste Characterization per CACP.xls

Methods:

1. CO_2e emissions from 2005 waste disposal were calculated using the methane commitment method in the CACP 2009 software, which uses a simplified version of 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)