Appendix C: City of San Carlos Baseline Greenhouse Gas Emissions Inventory Report (2005), Community-Wide Emissions, Updated October 2008

CITY OF SAN CARLOS

Baseline Greenhouse Gas Emissions Inventory Report (2005) Community-Wide Emissions

August 6, 2008
Updated October, 2008

ACKNOWLEDGEMENTS

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1. Introduction

1.1. Executive Summary

In May 2008, the City of San Carlos City Council adopted a resolution authorizing the Mayor to sign the San Carlos Climate Protection Letter, thereby committing the City to taking action for climate protection[1]. Through this resolution, San Carlos recognized that "climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution." Through energy efficiency in its facilities and vehicle fleet, clean alternative energy sources, sustainable purchasing and waste reduction efforts, land use and transportation planning, preparing for sea level rise, and other activities, the community of San Carlos can achieve multiple benefits, including lower energy bills, improved air quality, economic development, reduced emissions, and a better quality of life throughout the community. With the assistance of ICLEI – Local Governments for Sustainability, the City has begun its efforts to identify and reduce greenhouse gas emissions.

This greenhouse gas emissions inventory represents completion of the first step in San Carlos' climate protection process. As advised by ICLEI, it is essential to first quantify recent-year emissions to establish: 1) a baseline, against which to measure future progress, and 2) an understanding of where the highest percentages of emissions are coming from, and, therefore, where the greatest opportunities for emissions reductions are.

Presented here are estimates of greenhouse gas emissions resulting from the San Carlos community as a whole. The estimates are the product of data gathered from organizations including Pacific Gas & Electric (PG&E), the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC) and others on a community wide basis for cities in Silicon Valley and the 9 County Bay Area Region. The data was assembled by the City Staff (Assistant City Manager) and PMC with help from ICLEI at two workshops funded by the Bay Area Air Quality Management District (BAAQMD).

A second phase of this project, the development of a greenhouse gas inventory for City Operations, is now underway. That work is being conducted for 24 cities and counties in Silicon Valley under contract with ICLEI, Joint Venture: Silicon Valley and Sustainable Silicon Valley. Half of the cost of that effort is being funded by C/CAG (City/County Association of Governments). By working as a group, San Carlos and 24 agencies are getting their City Operation inventories at a reduced cost.

Due to the availability of Community greenhouse gas information for San Carlos, and the desire to move forward with the City's Climate Action Plan (CAP) as part of the General Plan Update project, this baseline report focuses on data related to community wide emissions. Government operations data will be released separately when it becomes available. In order to be consistent with other cities in Silicon Valley and the Bay Area, all data is presented for the year 2005. This data will provide a baseline against which the City will be able to compare future performance, enabling the City to demonstrate progress in reducing emissions.

[1] See Appendix D for a copy of the resolution.

1.1.1. Summary of Updates

In preparation for the City's Climate Action Plan, this emissions inventory was updated and re-released in October 2008 in order to assess the City's proposed reduction and adaptation strategies more accurately. Due to budget and time constraints, the original report did not contain an estimate of Caltrain emissions. This report was also updated with new GHG modeling protocol from ICLEI. A comparison of the draft and final GHG emissions outputs and methodology is included in Appendix D.

1.1.2. Community Emissions Inventory Summary

In the year 2005, the community of San Carlos emitted approximately 231,057 metric tons of CO_2e. As shown in Figure 1 and Table 1 below, the Transportation Sector was by far the largest emitter (49.5%), producing approximately 114,483 metric tons of CO_2e in 2005. Emissions from the Residential, Commercial, and Industrial Sectors accounted for a combined (44.9%) of the total, and the remaining (5.5%) was the result of emissions from waste sent to landfill in 2005.

The majority of Transportation Sector emissions were the result of gasoline consumption in private vehicles traveling on local roads and Highways. GHG figures from the Waste Sector are the estimated future emissions that will result from the decomposition of waste that was generated by San Carlos residents and businesses in the base year 2005.

Figure 1 – *Community GHG Emissions by Sector*

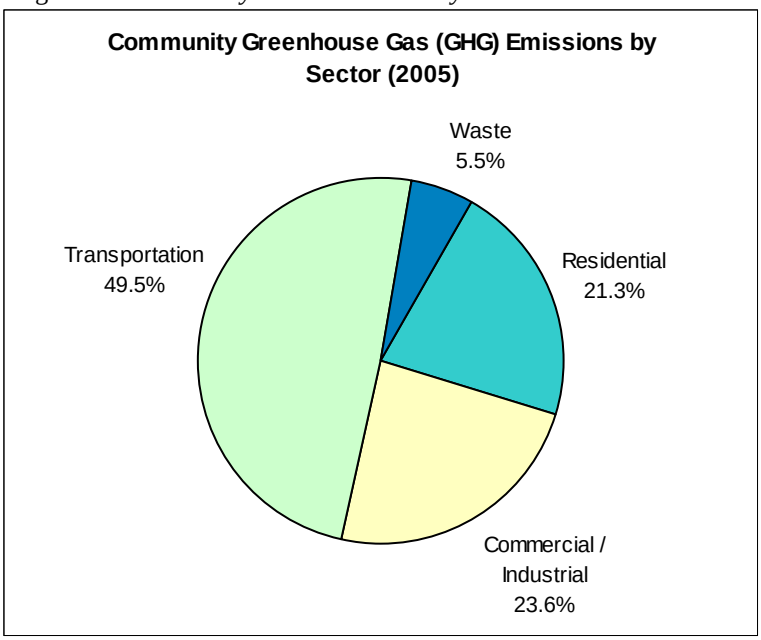


Table 1 – Community Wide Emissions by Sector, 2005

2005 Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO_2e (metric tons)	49,178	54,619	114,483	12,777	231,057
Percentage of Total CO_2e	21.3%	23.6%	49.5%	5.5%	100.0%
Energy Use (MMBtu)	866,726	856,101	1,566,320	0	3,289,147

Following the Cities for Climate Protection methodology, and what has become standard industry practice, it is recommended that the City of San Carlos begin documenting emission reduction measures that have already been implemented since 2005, and to quantify the emissions benefits of these measures to demonstrate progress made to date. As San Carlos moves forward with considering emission reduction targets for a local climate action plan, the City should identify and quantify the emission reduction benefits of new emissions reduction measures that could be implemented in the future, including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, trip reduction, and other strategies.

1.2. Climate Change Background

A balance of naturally occurring gases dispersed in the atmosphere determines the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Modern human activity, most notably the burning of fossil fuels for transportation and electricity generation, introduces large amounts of carbon dioxide and other gases into the atmosphere.

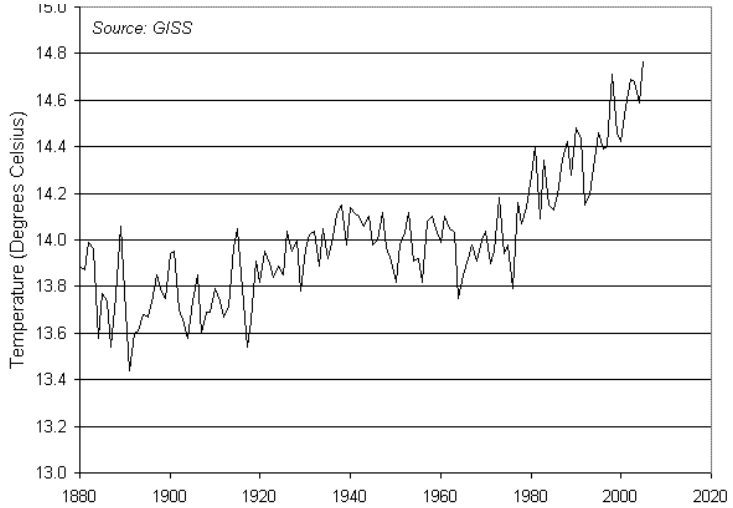
Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperature to rise, which is in turn expected to affect global climate patterns.

Overwhelming evidence suggests that human activities are increasing the concentration of greenhouse gases in the atmosphere, causing a rise in global average surface temperature and consequent climate change. In response to the threat of climate change, communities worldwide are voluntarily reducing greenhouse gas emissions. The Kyoto Protocol, an international effort to coordinate mandated reductions, went into effect in February 2005 with 161 countries participating. The United States is one of three industrialized countries that chose not to sign the Protocol.

In the face of federal inaction, many communities in the United States are taking responsibility for addressing climate change at the local level. In San Carlos, action was taken through a local Climate Protection letter that was developed and adopted by the City Council in May 2008 (Appendix A).

The San Carlos community may 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 and species migration. Beyond the community, 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.

Figure 2: *Average Global Temperature (1880-2005)*



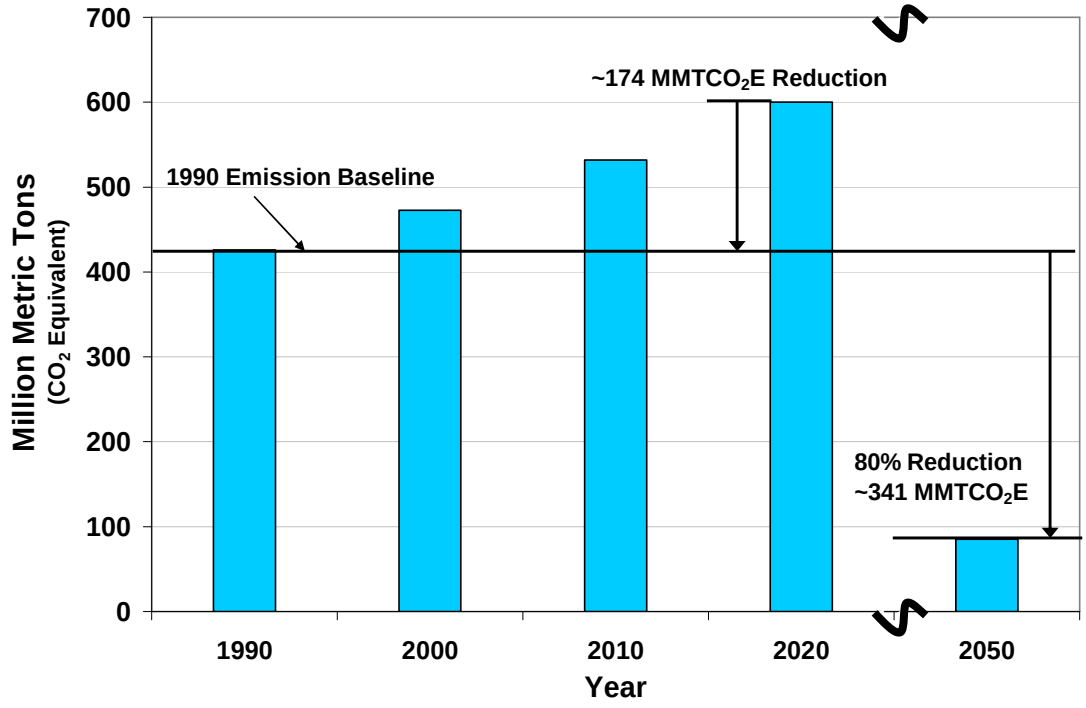
1.3. AB 32 and California Climate Change

On June 1, 2005, Governor Schwarzenegger issued Executive Order S-3-05 (S-3-05). It included the following statewide GHG emission reduction targets:

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

In 2006, the California State Legislature adopted the California Global Warming Solutions Act of 2006. AB 32 establishes a cap on statewide greenhouse gas emissions and sets forth the regulatory framework to achieve the corresponding reduction in statewide emissions levels. AB 32 charges the California Air Resources Board (CARB), the state agency charged with regulating statewide air quality, with implementation of the act. Under AB 32, greenhouse gases are defined as: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Figure 3: *California Climate Change Emissions and Targets*



Source: California Air Resources Board

The regulatory steps laid out in AB 32 require CARB to: adopt early action measures to reduce GHGs on a statewide basis; to establish a statewide greenhouse gas emissions cap for 2020 based on 1990 emissions; to adopt mandatory reporting rules for significant source of greenhouse gases; and to adopt a scoping plan indicating how emission reductions will be achieved via regulations, market mechanisms and other actions; and to adopt the regulations needed to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gases.

CARB is circulating draft GHG regulations that affect residents, businesses and cities and counties in California. The regulations that affect cities include goals that offer agencies flexibility in being part of the effort to reduce greenhouse gas emissions.

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an important environmental issue that requires analysis under CEQA. This bill directs the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the State Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, with certain exceptions, by July 1, 2009. The Resources Agency is required to certify or adopt those guidelines by January 1, 2010.

1.4. The Cities for Climate Protection Campaign

By adopting a resolution committing the City to locally advancing climate protection and becoming a member of ICLEI, San Carlos has joined an international movement of local governments. More than 800 local governments, including 440 in the United States, have joined ICLEI's Cities for Climate Protection (CCP) campaign. In addition to San Carlos, neighboring cities and the County of San Mateo are all members of ICLEI. Most Bay Area cities have committed to proactively addressing climate change.

The ICLEI CCP campaign provides a framework for local communities 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 a **climate action plan** for achieving the emissions reduction target;
4. **Implement** the climate action plan; and,
5. **Re-inventory** emissions to monitor and report on progress.

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

2. San Carlos 2005 Greenhouse Gas Emissions Community Inventory

The process of conducting a GHG inventory is relatively new. GHG inventories originated as an international response to mitigate global climate change. Fundamentally, a GHG inventory measures the amount of heat trapping gases that an entity contributes to the atmosphere. By quantifying emissions, GHG generators are able to benchmark their status as emissions producers defining their "carbon footprint."

In 2006 the United States Environmental Protection Agency (EPA) completed the "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1900-2004" which defined a GHG inventory as follows:

"A greenhouse gas inventory is an accounting of the amount of greenhouse gases emitted to or removed from the atmosphere over a specific period of time (e.g., one year). A greenhouse gas inventory also provides information on the activities that cause emissions and removals, as well as background on the methods used to make the calculations. Policy makers use greenhouse gas inventories to track emission trends, develop strategies and policies and assess progress. Scientists use greenhouse gas inventories as inputs to atmospheric and economic models" (EPA, 2006).

The first step toward reducing greenhouse gas emissions is to identify baseline levels and sources of emissions in San Carlos. In the case of this baseline report, community wide emissions are presented to proactively plan for addressing emissions related to community wide emissions. Municipal emissions were not included in the calculations. As noted earlier, ICLEI, under contract to the City through the Joint Venture: Silicon Valley Climate Protection Task Force, is in the process of collecting City operations greenhouse gas data.

This being considered, community sector emissions in San Carlos, as in any City, are responsible for the bulk of emissions in San Carlos. When the municipal data becomes available it will be released in a separate baseline report and incorporated into the Climate Action Plan implementation. The information contained in this report will inform the selection of a reduction target and possible reduction measures through the Climate Action Plan process occurring concurrently with the San Carlos General Plan update process.

2.1. Methodology

The Joint Venture: Silicon Valley Climate Protection Task Force works with ICLEI's Cities for Climate Protection campaign to assist local governments in San Mateo and Santa Clara Counties to systematically track energy and waste related activities in the community, and to calculate the relative quantities of greenhouse gases produced by each activity and sector within individual communities. The Joint Venture: Silicon Valley Climate Protection Task Force's work allows for baseline inventories that are all based in the year 2005, allowing for a uniform approach to addressing baseline data and subsequently future emissions reduction strategies. This may also lead to a regional approach to establish baselines within Santa Clara and San Mateo Counties that will allow for a more efficient approach to implementing emission reduction measures through multiple cities and counties.

The greenhouse gas inventory protocol involves performing two assessments: a community wide assessment and a separate inventory of municipal facilities and activities. The municipal inventory is a subset of the community inventory and has not yet been separately analyzed for the City of San Carlos.

The community wide data currently includes the municipal operations, but it does not separate it out into a separate subset. This will take place in the future as the municipal specific data becomes available. Once completed, these inventories provide the basis for the creation of an emission forecast, and allow for the quantification of emissions reductions associated with proposed measures.

2.1.1. Clean Air and Climate Protection Software

To facilitate community efforts to reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) software package in partnership with the National Association of Clean Air Agencies (NACAA)[2], and Torrie Smith Associates. This software calculates emissions resulting from energy consumption and waste generation. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. CACP aggregates and reports the three main greenhouse gas emissions (CO_2, CH_4, and N_2O) in terms of equivalent carbon dioxide units, or CO_2e. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane (CH_4) is twenty-one times more powerful than carbon dioxide on a per weight basis in its capacity to trap heat; so the CACP software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents.[3] The CACP software is also capable of reporting input and output data in several formats, including detailed, aggregate, source-based and time-series reports.

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

The CACP software has been and continues to be used by over 440 U.S. cities, towns, and counties to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides San Carlos 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.

2.1.2. Creating the Inventory

This greenhouse gas emissions inventory is for the San Carlos community as a whole defined by its geographic borders. A second inventory addressing municipal specific emissions is currently in the data collection phase and will be used to augment the Climate Action Plan when it is completed. The municipal inventory is effectively a subset of the community-scale inventory (the two are not mutually exclusive). This allows the municipal government to track its individual facilities and vehicles and to evaluate the effectiveness of its emissions reduction efforts at a more detailed level. At the same time, the community-scale analysis provides a performance baseline against which the City can demonstrate progress being made throughout San Carlos.

Creating this emissions inventory required the collection of information from a variety of sources, including the Pacific Gas and Electric Company (PG&E), the Metropolitan Transportation Commission (MTC), the California Integrated Waste Management Board, CalTrans, and internal City records. Data from the year 2005 was used for the community inventory, with the exception of

[2] Now the National Association of Clean Air Agencies (NACAA)
[3] The potency of a given gas in heating the atmosphere is defined as its Global Warming Potential, or GWP. For more information on GWP see: IPCC Fourth Assessment Report, Working Group I, Chapter 2, Section 2.10.

a subset of the waste data, which utilizes a California statewide waste characterization study conducted in 2003-04.

For community activities, like government operations, ICLEI categorizes emissions sources by scope. The community scopes are:

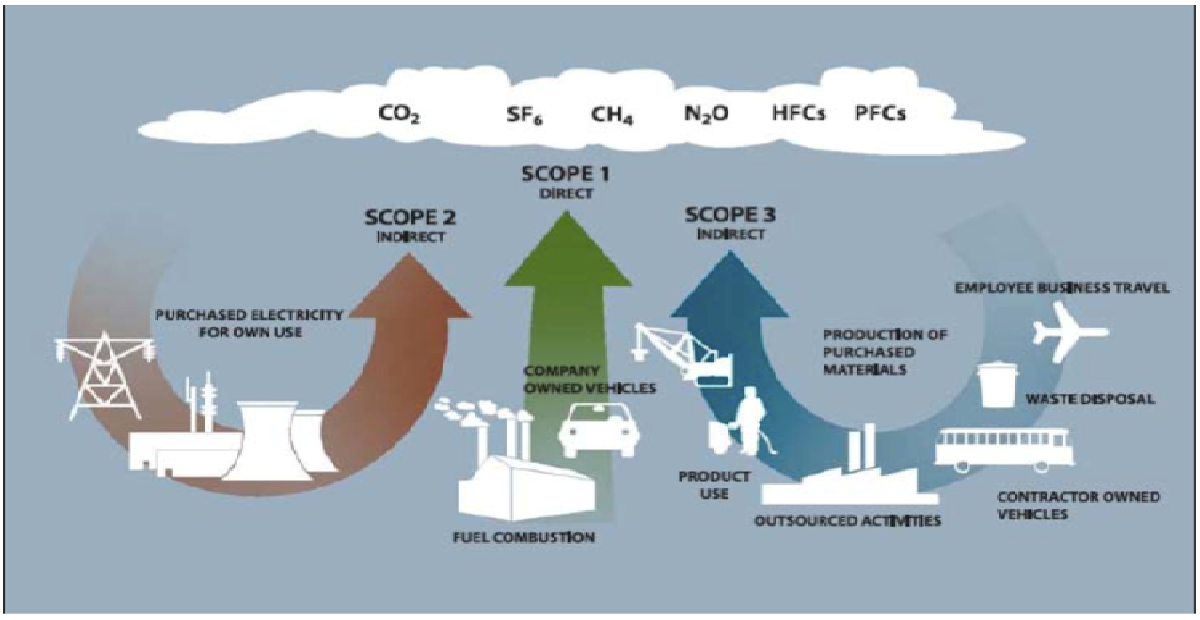
Scope 1 emissions are all direct emissions sources located within the geopolitical boundary of the local government. Examples of Scope 1 sources include use of fuels such as heavy fuel oil, natural gas or propane used for heating.

Scope 2 emissions are indirect emissions that result as a consequence of activity within the jurisdiction's geopolitical boundary limited to electricity, district heating, steam and cooling consumption. Examples of Scope 2 sources include purchased electricity used within the geopolitical boundaries of the jurisdiction associated with the generation of greenhouse gases at the power plant. These emissions should be included in the community-scale analysis, as they are the result of the community's electricity consumption.

Scope 3 emissions are all other indirect and embodied emissions that occur as a result of activity within the geopolitical boundary. Examples of Scope 3 emissions include methane emissions from solid waste generated within the community which decomposes at landfills either inside or outside of the community's geopolitical boundary.

Information Items are biogenic emissions and other indicators which may be relevant to a complete understanding of a community's energy use and climate impact, but which are not conventionally included in greenhouse gas accounting. Examples of information items are biogenic carbon emissions or quantity of electricity generated from solar photovoltaic panels.

Figure 4 – *Emissions Scopes*



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

Table 2 - *Community-Scale Emissions Inventory Protocol Summary*

Macro Sector (IPCC)		Scope 1 Emissions	Scope 2 Emissions	Scope 3 Emissions
Energy	Stationary Combustion	Utility-delivered fuel consumption Decentralized fuel consumption Utility-consumed fuel for electricity / heat generation	n/a	Upstream/downstream emissions (e.g., mining/transport of coal)
	Electricity / Heat Consumption	n/a	Utility-delivered electricity / heat /steam consumption Decentralized electricity / heat /steam consumption	Upstream/downstream emissions (e.g., mining/transport of coal)
	Mobile Combustion	Tailpipe emissions from on-road vehicles Tailpipe emissions from rail, sea, airborne and non-road vehicles operating within the community	Electricity consumption associated with vehicle movement within the community (e.g., light rail)	Tailpipe emissions from vehicles used by community residents Upstream/downstream emissions (e.g., mining/transport of oil) Tailpipe emissions from rail, sea, and airborne vehicles departing from or arriving into the community
	Other Energy	Fugitive emissions not already accounted for	n/a	Upstream/downstream emissions
Industrial Processes and Product Use		Decentralized process emissions	n/a	Upstream/downstream emissions
Agriculture, Forestry and Other Land Use		Livestock methane, managed soils	n/a	Upstream/downstream emissions from fertilizer/pesticide manufacture
		Net biogenic carbon flux	n/a	n/a
Waste	Solid Waste Disposal	Direct emissions from landfill, incineration and compost facilities located inside the community	n/a	Landfill, incineration and compost emissions occurring in present-year from waste produced to date inside the community Future emissions associated with waste disposed Upstream/downstream emissions (e.g., transport to the landfill)
	Wastewater Treatment and Discharge	Direct emissions from wastewater facilities located inside the community	n/a	Wastewater emissions occurring in present-year from wastewater produced to date inside the community

The emissions inventory that was conducted for the community activities of San Carlos primarily contains emission sources falling within Scope 1, 2 and 3. Data availability, as well as time and budget constraints, meant that most Information Items were not included in the San Carlos emissions inventory.

2.1.3. Greenhouse Gases Measured

The greenhouses gases that are typically measured and monitored in GHG inventories are:

- carbon dioxide (CO_2)
- nitrous oxide (NO_2)
- methane (CH_4)
- sulfur hexafluoride (SF_6)
- perfluorocarbons (PFCs) and
- hydrofluorocarbons (HFCs).

The CACP software does not, however, quantify the amounts of these individual gases. Instead, the CACP software quantifies all GHG emissions in CO_2 equivalency (CO_2e), allowing for easy comparison between separate gases. Due to the scale of this project all results are conveyed in metric tonnes of carbon dioxide equivalency ($MTCO_2e$). A metric tonne is equivalent to 2,205 pounds, and one pound of CO_2 can fill approximately 120 party balloons. This means that one $MTCO_2e$ could fill more than 250,000 party balloons.

There are five criteria air pollutant (CAP) emissions inventoried in this project. These pollutants harm both human health and the environment though they do not contribute directly to global climate change. They are carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, and particulate matter smaller than 10mm.

1. Carbon monoxide (CO) — Can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues.
2. Sulfur dioxide (SO_2) — Contributes to respiratory illness, particularly in children and the elderly, and aggravates existing heart and lung diseases. SO_2 contributes to the formation of acid rain, which: damages trees, crops, historic buildings, and monuments; and makes soils, lakes, and streams acidic. SO_2 also contributes to the formation of atmospheric particles that cause visibility impairment, most noticeably in national parks.
3. Nitrogen oxides (NO_x) — Causes a wide variety of health and environmental impacts because of various compounds and derivatives in the family of nitrogen oxides, including nitrogen dioxide, nitric acid, nitrous oxide, nitrates, and nitric oxide.
4. Volatile organic compounds (VOCs) — Includes a variety of chemicals associated with short and long term adverse health effects. VOCs also participate in photochemical reactions.
5. Particulate matter ($PM_{10)}$ — Fine particles that contain microscopic solids or liquid droplets that are so small that they can get deep into the lungs. Particulate matter can cause respiratory health problems such as decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, non-fatal heat attacks, and premature death in people with heart or lung disease.

2.2. Inventory Results

2.2.1. Community Emissions Inventory

There are numerous items that can be included in a community scale emissions inventory, as demonstrated above. This inventory includes Scope 1, Scope 2, and Scope 3[4] sources from the following sectors:

- Residential
- Commercial / Industrial
- Transportation
- Waste

Table 3 – *Emission Sources Included in 2005 Community Inventory by Scope and Sector*

Sector	Scope 1	Scope 2	Scope 3
Residential	*Natural Gas*	*Electricity*	
Commercial / Industrial	*Natural Gas*	*Electricity*	
Transportation	*Gasoline & Diesel*		*Caltrain Diesel*
Waste			*Methane from Decomposition*

Including all scopes and information items, the community of San Carlos emitted approximately *231,057 metric tons*[5] *of* CO_2e in the year 2005. As shown in Figure 5 and Table 4, Scope 1 emissions

[4] Please see pp. 6-7 for detailed explanations of the various Scopes.

were by far the largest source community-wide emissions (78.5%%), with Scope 2 (16.9%) and Information Items (4.6%) constituting the remainder.

As shown in Table 5 and Figure 6 below, the largest percentage of Scope 1 emissions came from the transportation sector (69.4%).

Figure 5 - *2005 Community GHG Emissions by Scope*

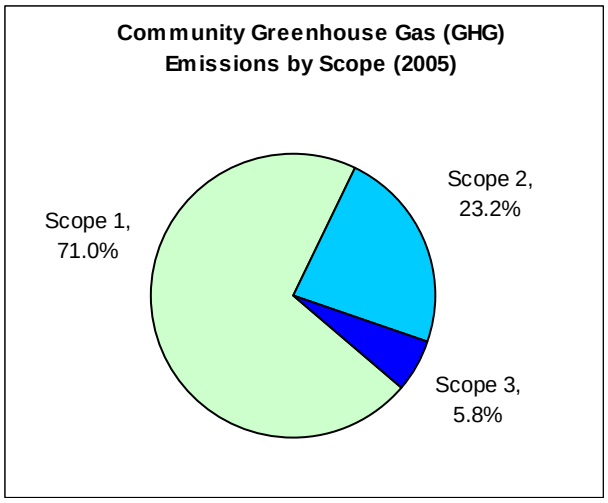


Table 4 – *Community GHG Emissions per Sector per Scope (metric tons of CO2e)*

Sector	Scope 1	Scope 2	Scope 3	TOTAL
Residential	32,858	16,320		49,178
Commercial / Industrial	17,266	37,352		54,618
Transportation	114,484		702	115,186
Waste			12,778	12,778
TOTAL	164,608	53,672	13,480	**231,760**
Percentage of Total CO_2e	71.0%	23.2%	5.8%	**100.0%**

The largest percentage of 2005 Scope 2 emissions (69.6%) was generated by the Commercial / Industrial Sector (Table 6 and Figure 7), and the remainder (30.4%) came from the Residential Sector. All of San Carlos' Scope 2 emissions came from electricity consumption within city boundaries.

Table 5 – *Community Scope 1 GHG Emissions (metric tons CO_2e)*

Scope 1 Emmissions By Sector	Residential	Commercial / Industrial	Transportation	TOTAL
CO_2e (metric tons)	32,858	17,266	113,781	163,905
Percentage of Total CO_2e	20.0%	10.5%	69.4%	100.0%
Energy Use (MMBtu)	617,574	324,531	1,557,935	2,500,040

5 All emissions estimated using the Clean Air and Climate Protection Software. See Appendices for information on emissions factors, etc.

Table 6 - *Community Scope 2 GHG Emissions (metric tons CO_2e)*

Scope 2 Emmissions By Sector	Residential	Commercial / Industrial	TOTAL
CO_2e (metric tons)	16,320	37,352	53,672
Percentage of Total CO_2e	30.4%	69.6%	100.0%
Energy Use (MMBtu)	249,152	531,572	780,724

Figure 6 – *Community Scope 1 Emissions*

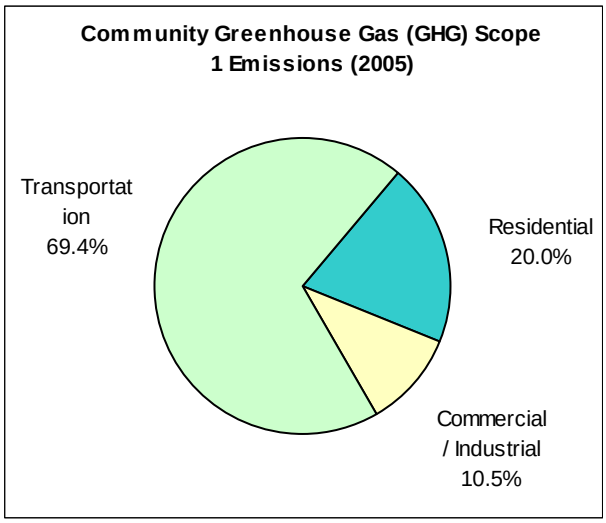
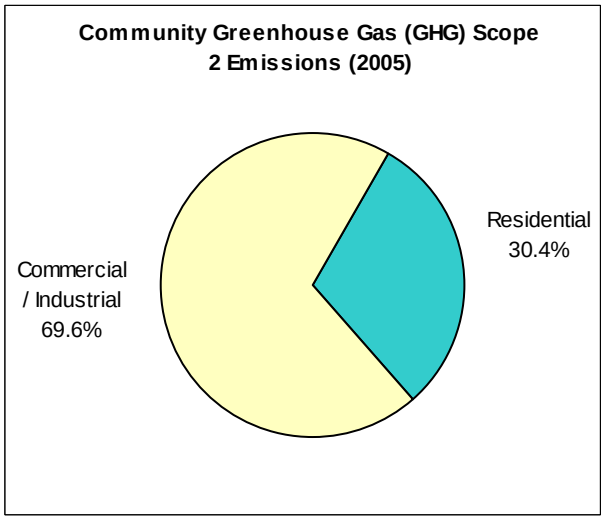


Figure 7 – *Community Scope 2 Emissions*



The remaining portion of emissions included in the San Carlos 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) sent to landfill in the base year (2005).[6]

All-Scope Emissions by Sector

In the base year 2005, the community of San Carlos emitted approximately 231,057 metric tons of CO_2e. As shown in Table 7 and 8, and illustrated in Figure 8 below, the transportation (49.5%) and residential (21.3%) sectors were the largest sources of greenhouse gas emissions. Emissions from the commercial/industrial sector and waste contributed 23.6% and 5.5% respectively. Table 15 breaks down greenhouse gas emissions by energy source. The burning of gasoline, electricity, and natural gas was responsible for most of the greenhouse gas emissions in San Carlos with 45.1%, 23.2%, and 21.7%. The remaining categories, with the exception of diesel, are landfill materials that emitted methane and carbon dioxide.

[6] See below for more detail on emissions from the waste sector.

Table 7, *Community Greenhouse Gas Emissions Input and Output Summary*

Sector	Emission Source	Input Data	Output Data CO_2e (metric tons/year)
Residential	Electricity Consumption	73,001,423 kWh	16,320
	Natural Gas Consumption	6,175,743Therms	32,858
	Subtotal		49,178
Commercial / Industrial	Electricity Consumption	1,557,50,225 kWh	37,352
	Natural Gas Consumption	3,245,306 Therms	17,267
	Subtotal		54,619
Transportation	Highway Gasoline and Diesel Consumption (VMT)	124.8 million Annual VMT (96.8% Gasoline 3.2% Diesel)	60,947
	City Roadway Gasoline and Diesel Consumption (VMT)	108.2 million Annual VMT (96.8% Gasoline 3.2% Diesel)	52,834
	CalTrain Diesel consumption for San Carlos commuters	68,726.78 gallons of diesel annually	702
	Subtotal		114,483
Waste	Lifetime Decomposition of Waste Generated	45,439 Tons	12,590
	Lifetime Decomposition of Alternative Daily Cover	834 Tons	187
	Subtotal		12,777
Total			**231,057**

Figure 8 – Community GHG Emissions by Sector

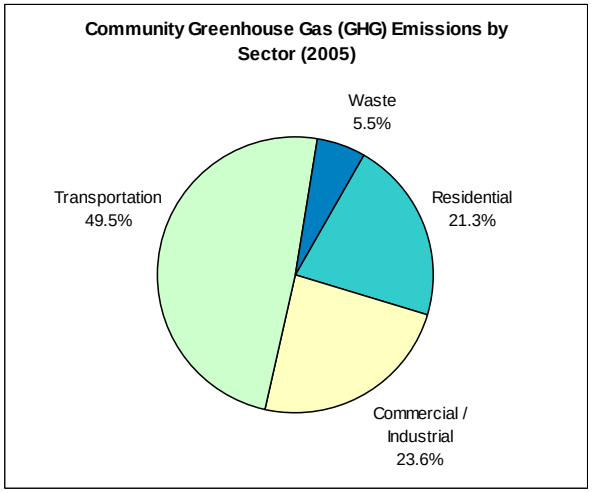


Figure 9 – *Community GHG Emissions by Sector*

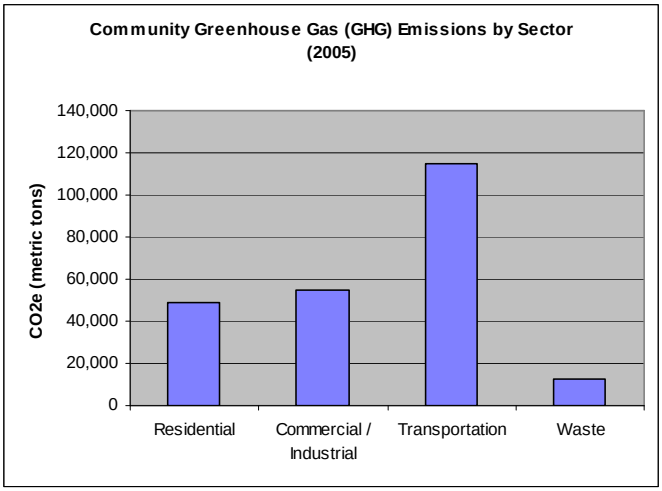


Table 8 – *Community GHG Emissions by Sector (metric tons CO_2e)*

2005 Community Emissions by Sector	Residential	Commercial / Industrial	Transportation	Waste	TOTAL
CO_2e (metric tons)	49,178	54,619	114,483	12,777	231,057
Percentage of Total CO_2e	21.3%	23.6%	49.5%	5.5%	100.0%
Energy Use (MMBtu)	866,726	856,101	1,566,320	0	3,289,147

Transportation Sector Emissions

The transportation sector's relative contribution to greenhouse gas emissions is equivalent to other San Francisco Bay area cities at 49.5% of total CO2e. Travel by motorized vehicle constitutes a significant percentage of greenhouse gas emissions. Approximately 46.2% of the emissions in the transportation sector came from travel on city roads. This number can be reduced dramatically by making it easier for residents to use alternative modes of transportation, including walking, bicycling, and riding public transportation. According to the Federal 'Highway Administration, VMT nationwide fell by 0.4% in the last year, ending in February 2008, showing a direct relationship between a disincentive such as high fuel price, and behavior of the average driver. Because San Carlos contains the heavily traveled Highway 101 within its borders, 53.2% of the greenhouse gas emissions in the transportation sector are a result of highway travel.

The remaining 0.6% of emissions is from Caltrain diesel consumption as a result of San Carlos weekday commuting patterns. These emissions call under Scope 3 because, although San Carlos commuters are responsible for their production, the emissions are released throughout the Bay Area. Caltrain diesel consumption was based on 2005 ridership averages during commuting hours as well as average trip distances and fuel efficiency estimates by Caltrain. Appendix C includes the sources, assumptions, and calculations for the Caltrain output.

Figure 10 – *Community GHG Emissions by Road Type*

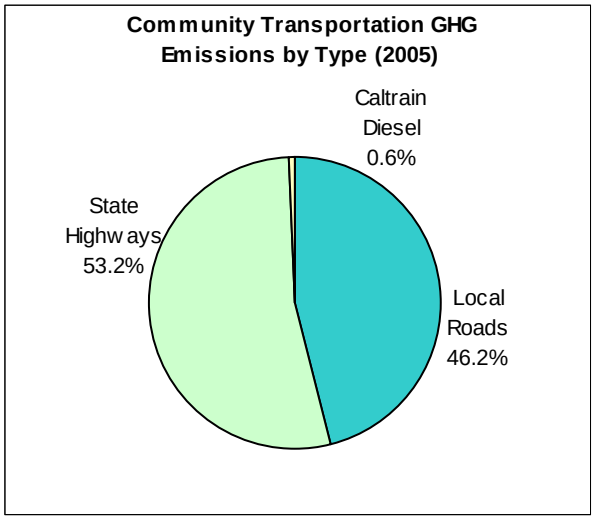


Figure 11 – *Community GHG Emissions by Fuel Type*

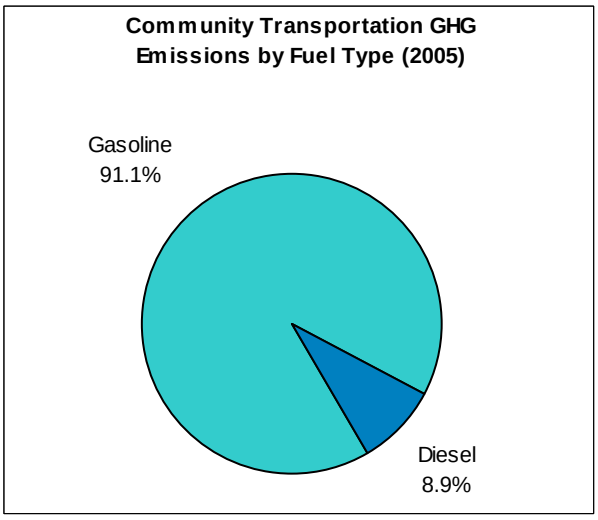


Table 9 – *Transportation GHG Emissions by Type*

Transportation Road Type Emissions Sources 2005	Local Roads	State Highways	Caltrain Diesel	TOTAL
CO_2e (metric tons)	52,834	60,947	702	114,483
Percentage of Total CO_2e	46.2%	53.2%	0.6%	100.0%
Energy Use (MMBtu)	723,413	834,522	8,386	1,566,321

Table 10 -- *Transportation GHG Emissions by Fuel Source*

Transportation Fuel Emissions Sources 2005	Gasoline	Diesel	TOTAL
CO_2e (metric tons)	104,255	10,229	114,484
Percentage of Total CO_2e	91.1%	8.9%	100%
Energy Use (MMBtu)	1,445,602	120,719	1,566,321

According to the peer-reviewed international emissions inventory protocol that ICLEI is currently finalizing, all significant emissions that occur within a local government's jurisdictional boundaries should be included in a local greenhouse gas emissions inventory, including emissions from vehicles that travel on the highways that fall within a local government's boundaries. The protocol also states that different types of emissions (direct, indirect, and other) should not be aggregated. For the transportation sector this means that the emissions from highway vehicles and Caltrain are not aggregated with emissions from local road vehicles.

The main reason for this is that local governments have a much greater degree of control over local traffic patterns than they do over highways and rail transit. In addition, a large portion of the vehicle miles traveled on highways is from pass-through traffic--vehicles that do not stop in the city.

Emissions from the airport located within the City of San Carlos were not included due to the difficulty of collecting this information and lack of a protocol for calculating CO2e. With more time and the availability of suitable proxy data, the greenhouse gas emissions from air travel and the airport could be estimated. Since air travel and the airport are forms of transportation that the municipal government of San Carlos have little influence or control over, it is reasonable to exclude these from this inventory at this time.

The Built Environment (Residential, Commercial, Industrial)

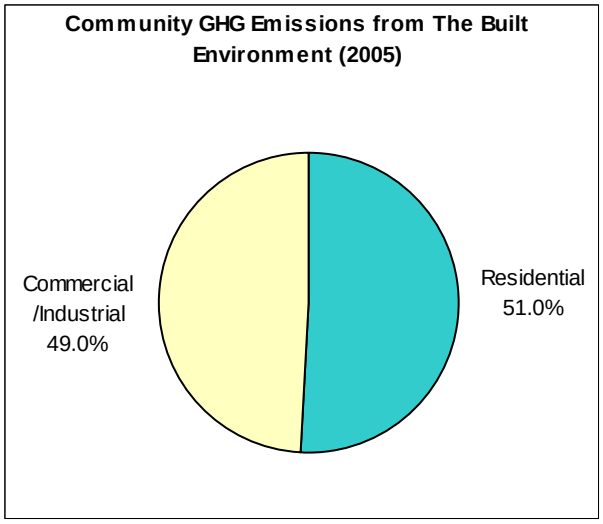
With all scopes aggregated, 44.9% of total community wide emissions in the year 2005 came from the "built environment." The built environment is comprised of the Residential, Commercial and Industrial Sectors. Within this report the Commercial and Industrial Sectors have been combined due to a mandatory aggregating of Commercial and Industrial data by PG&E[7], and due to the fact that there is little Industrial activity in San Carlos.

San Carlos' 2005 emissions from the built environment were almost evenly split between the Commercial / Industrial Sector and the Residential Sector (Figure 12). All of the emissions calculated from the built environment were the result of local natural gas consumption (Scope 1) and local consumption of electricity that was generated outside of San Carlos (Scope 2.) Approximately two-thirds of emissions in the Residential Sector resulted from the combustion of

[7] See Appendix A for details on methodology and data constraints.

natural gas for heating and cooking (see Figure 13 and Table 11), while it is nearly the opposite in the Commercial / Industrial Sector (see Figure 14 and Table 12), where the largest percentage of emissions came from electricity consumption.

Figure 12 – *Built Environment Emissions*



It is useful to consider the causes behind significant variations in data when developing policies and programs to reduce emissions from each sector. For example, the policies that would aim to reduce emissions from the Commercial/ Industrial Sector may differ from those aiming to reduce emissions from the Residential Sector based upon the information above (and in the figures and tables below). In this regard, the emissions inventory provides valuable insight into policy development strategies.

ICLEI estimated industrial and commercial GHG emissions by combining data from PG&E on electricity and natural gas consumption with estimates on Direct Access (DA) electricity provided to industries.[8] The Direct Access data included in this inventory were derived from two sources: PG&E and the California Energy Commission (CEC). PG&E provided a small record of DA electricity consumption (2,576,1087 kWh), and the CEC provided an estimate on 2005 DA electricity consumption within San Mateo County at large. The countywide DA consumption figures provided by the CEC were used to calculate the countywide proportion of DA usage to PG&E usage, which was in turn used to estimate the proportion of DA electricity consumed within the San Carlos. It is important to note that the Direct Access data included in the inventory may not be comprehensive given that is solely based on regional estimates.

In addition to emissions from natural gas and electricity consumption, there are major emissions sources within the Commercial / Industrial Sector that are not currently included in this inventory. These sources include fuel refineries, on-site combustion of fuel oil, diesel, etc., and off-road mobile equipment such as fork-lifts and cranes. Due to scope and data availability, data pertinent to these sources were not procured for this report. As a proxy, the Bay Area Air Quality Management District (BAAQMD) recently released a preliminary study on the top 200 largest GHG emitting facilities in the Bay Area.

[8] 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.

Figure 13 – *Residential Emissions*

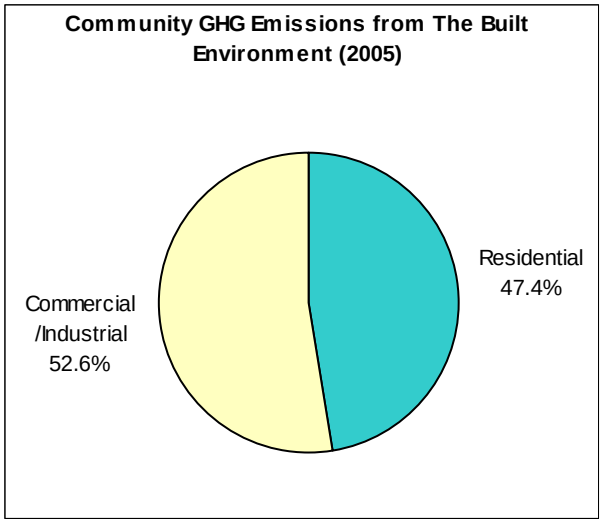


Figure 14 – *Commercial / Industrial Emissions*

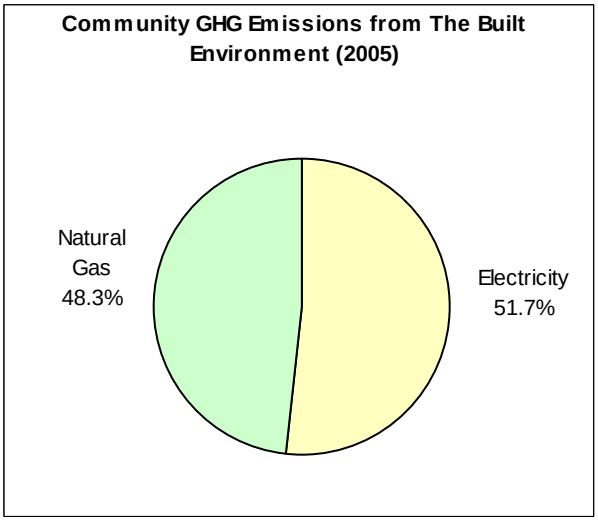


Table 11 – *Residential GHG Emissions Sources*

Residential Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO_2e (metric tons)	16,320	32,858	49,178
Percentage of Total CO_2e	33.2%	66.8%	100%
Energy Use (MMBtu)	249,152	617,574	866,726

Table 12 – *Commercial / Industrial GHG Emissions Sources*

RCI Emission Sources 2005	Electricity	Natural Gas	TOTAL
CO_2e (metric tons)	53,672	50,124	103,796
Percentage of Total CO_2e	51.7%	48.3%	100%
Energy Use (MMBtu)	780,724	942,105	1,722,829

Waste Sector Emissions

The waste sector contributed 5.5% of San Carlos' total CO2e in 2005. Because of the large amount of waste in county's closed landfills and the inherent difficulty in containing and capturing gases in large heterogeneous landfills, all landfills emitted nearly 760,000 metric tons of methane in CO_2e in 2005. This is despite the fact that six of the eight county landfills are closed and none are placed within the San Carlos City Limits. The emissions from waste generated by San Carlos residents and businesses that was landfilled in other locations in 2005 emitted 12,777 metric tons of CO_2e, accounting for 5.5% of the City's total emissions.

Table 13: Greenhouse Gas Emissions from Landfills in San Mateo County, 2005

City	Landfill	Status	Emissions (Methane in Metric tons of CO_2e)
Colma	Hillside Landfill	open	89,199
Half Moon Bay	Ox Mountain Landfill	open	405,965
Brisbane	Brisbane Landfill	closed	20,742
Burlingame	Burlingame Landfill	closed	10,796
Menlo Park	Marsh Rd Landfill	closed	43,533
Colma	Metro Bay Center Landfill	closed	3,512
Mountain View	Portion of Vista Landfill	closed	5,100
Mountain View	Shoreline	closed	177,302
Total			**756,148**

The waste sector of both the community and municipal inventories deserves additional explanation because of the particular challenges in measuring the amount of methane that is released from landfills. The CACP Software is designed to be used in communities with a variety of waste disposal methods including managed landfills, open dumps, and incineration.

Emissions from the waste sector in San Carlos came from one type of source called Methane Commitment which involves waste that was generated by residents and activities taking place within the City limits that was disposed of in landfills outside of the City.

In accordance with the inventory guidelines that are outlined in the Methods section above, this source type is categorized as a Scope 3.

For Methane Commitment, greenhouse gas emissions were calculated using a version of the EPA's Waste Reduction Model (WARM), which is embedded within the CACP Software. WARM calculates the emissions that will occur during the lifetime of waste that is disposed of using a variety of waste disposal technologies, including landfilling, recycling, incineration, composting, and source reduction. These calculations are primarily based on the composition of the waste and the waste disposal technology employed, including methane capture.

The model calculates emissions occurring in the inventory year based on the amount of decomposable waste in a landfill, the waste's methane generation potential, and an exponential time constant of decay.

It is also important to note that while waste-reduction through recycling does not overtly show up in this inventory, recycling saves a substantial amount of energy by reducing the need for virgin inputs, and by diverting paper products from landfills, which reduces the amount of landfill gas that is produced. The emissions benefits of recycling can be quantified when analyzing recycling as an emissions reduction strategy relative to the base year.

Figure 15 -- *Waste GHG Emissions by Category*

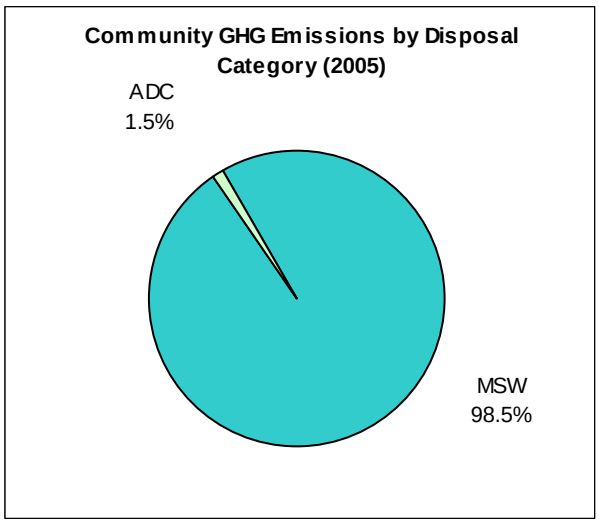


Figure 16 – *Waste GHG Emissions by Type*

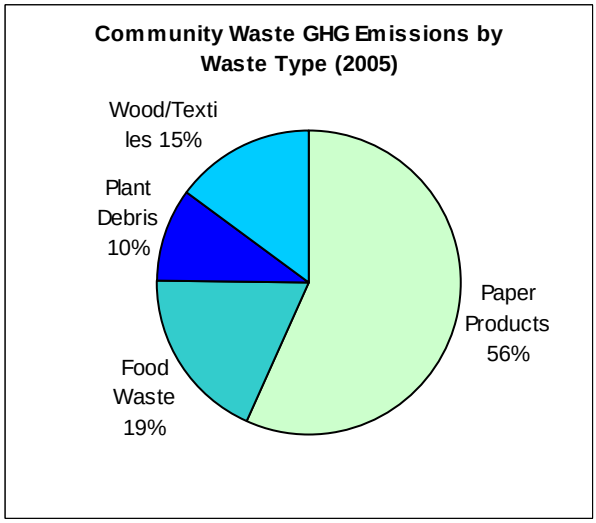


Table 14 – *Waste GHG Emissions by Disposal Category*

Waste Emissions Categories 2005	MSW	ADC	TOTAL
CO_2e (metric tons)	12,590	187	12,777
Percentage of Total CO_2e	98.5%	1.5%	100.0%
Energy Use (MMBtu)	0	0	0

Table 15 – *Waste GHG Emissions by Waste Type*

Waste Emissions Sources 2005	Paper Products	Food Waste	Plant Debris	Wood/Textiles	TOTAL
CO_2e (metric tons)	7,228	2,395	1,239	1,916	12,778
Percentage of Total CO_2e	56.6%	18.7%	9.7%	15.0%	100%
Energy Use (MMBtu)	0	0	0	0	0

Community Emissions by Source

In addition to viewing emission by sector and by scope, it can be useful for building policy and programs to analyze emissions according to their raw fuel or waste source. Figure 17 and Table 16 below show that *more than 45.1%* of all community emissions come from the consumption of gasoline on local roads and highways. These emissions, along with emissions from diesel consumption (4.4%), are the actual source of the 49.5% figure for the Transportation Sector. Natural gas (21.7%) and electricity (23.2%) consumption from the built environment are the next most significant figures, with the remainder coming from the various waste types.

Figure 17 – *Community GHG Emissions by Source*

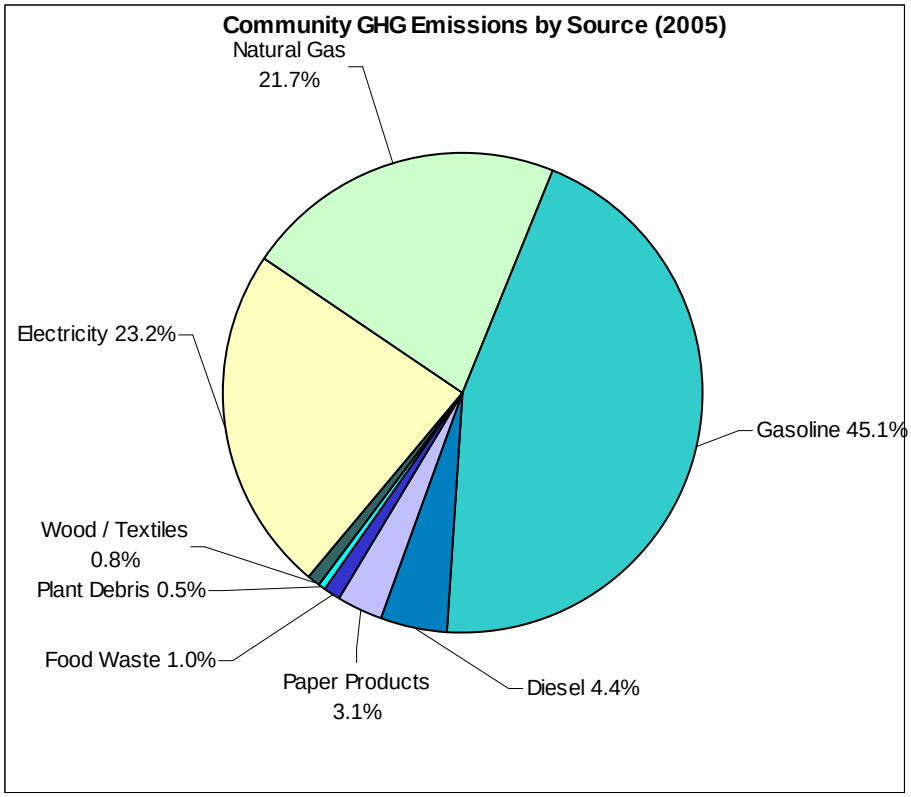


Table 16 – *Community GHG Emissions by Source*

Community Emissions 2005 by Source	CO_2e (metric tons)	CO_2e (percent of total)	MMBtu
Electricity	53,672	23.2%	780,722
Natural Gas	50,125	21.7%	942,105
Gasoline	104,255	45.1%	1,445,602
Diesel	10,228	4.4%	120,718
Paper Products	7,228	3.1%	0
Food Waste	2,395	1.0%	0
Plant Debris	1,239	0.5%	0
Wood / Textiles	1,916	0.8%	0
TOTAL	**231,058**	**100.0%**	**3,289,147**

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. Currently it is difficult to make meaningful comparisons between cities because of variation in the scope of inventories conducted, but in the near future a universal reporting standard will be developed and adopted through a process being driven by ICLEI, making this possible.

Dividing the total greenhouse gas emissions of the community (231,057 metric tons of CO_2e) by population (28,105 people) yields a result of 8.22 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 individual living in San Carlos, which is the estimated total emission associated with an individual. Rather, this number is the per capita CO_2e within the City of San Carlos. Downstream and upstream emissions are not quantified. The goal of the baseline report is to outline emission factors that can be influenced by the City, rather than all emissions associated with individuals within the City. Comparatively, the City of Menlo Park had a per capita emissions rate of 14.7 MMTCO2e, California has a per capita emissions rate of 12 MMT CO2e in 2005 and the nation as a whole had a per capita emissions rate of 24.1 MMT CO2e in 2004.

Although this comparison show San Carlos well below other per capita emission rates, it is important to note that the per capita emissions number for San Carlos is not directly comparable to other per capita numbers produced by other emissions studies because of differences in emission inventory methods.

2.2.2. Municipal Operations Emissions Inventory

Municipal emissions in San Carlos likely constitute 1% to 5% of the community's total greenhouse gas emissions assuming San Carlos municipal emissions are similar in nature to other cities in the Bay Area. This is not unusual; local government emissions typically account for around two percent of community levels.

As a minor contributor to total emissions, actions to reduce municipal energy use will have a limited impact on the San Carlos community's overall emissions levels. However, as previously mentioned, municipal action has symbolic value that extends beyond the magnitude of emissions actually reduced.

When municipal emissions specific data is collected, it will be released as a separate baseline analysis and used to implement emissions reduction measures in the Climate Action Plan. Specific emissions data that will be presented include municipal building, street lights, waste, water and stormwater pumping, and vehicle fleet data.

Please see Appendix B for a list climate change and emission reduction programs in which San Carlos currently participates

3. 2020 Forecast

If the community of San Carlos continues with the 2005 pattern of energy consumption, travel, and waste production, the rate of greenhouse gas emissions will increase to 280,655 metric tons of CO2e per year by 2020. This "business as usual forecast" is 17% higher than 2005 levels due to estimated increases in population, households, and commercial activity. The Association of Bay Area Governments (ABAG) projections for population, household, and job growth were used to provide consistency among Bay Area cities.

As shown in Table 18 and illustrated in Figure 18, the greenhouse gas emissions from transportation and commercial / industrial activity are projected to increase at higher rates than the residential and waste sectors. This most likely is due to a low estimate of household growth by the ABAG (0.7%).

As the City moves forward with the Climate Action Plan, the transportation and commercial / industrial sectors will be given greater attention.

Figure 18, *Emissions Forecast for 2020*

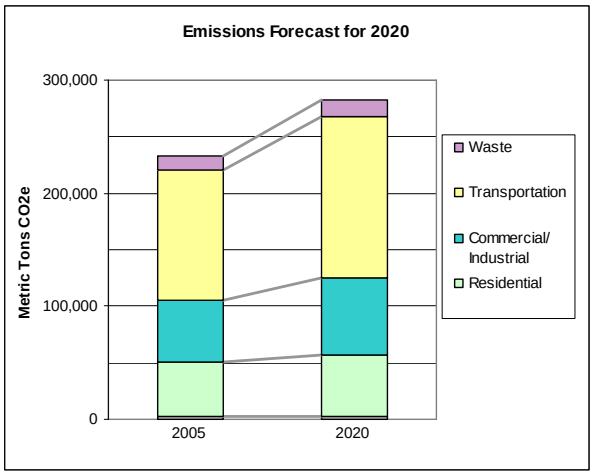


Table 17, *Emissions forecast for 2020 by Sector*

2005 Community Emissions Growth Forecast by Sector	2005	2020	Annual Growth Rate	Percent Change from 2005 to 2020
Residential	49,178	54,638	0.704%	11.1%
Commercial/ Industrial	54,619	68,344	1.506%	25.1%
Transportation	114,483	143,310	1.509%	25.2%
Waste	12,777	14,363	0.783%	12.4%
TOTAL	**231,057**	**280,655**	--	**21.5%**

Figure 19: *San Carlos' 2020 Greenhouse Gas Emission Scenarios*

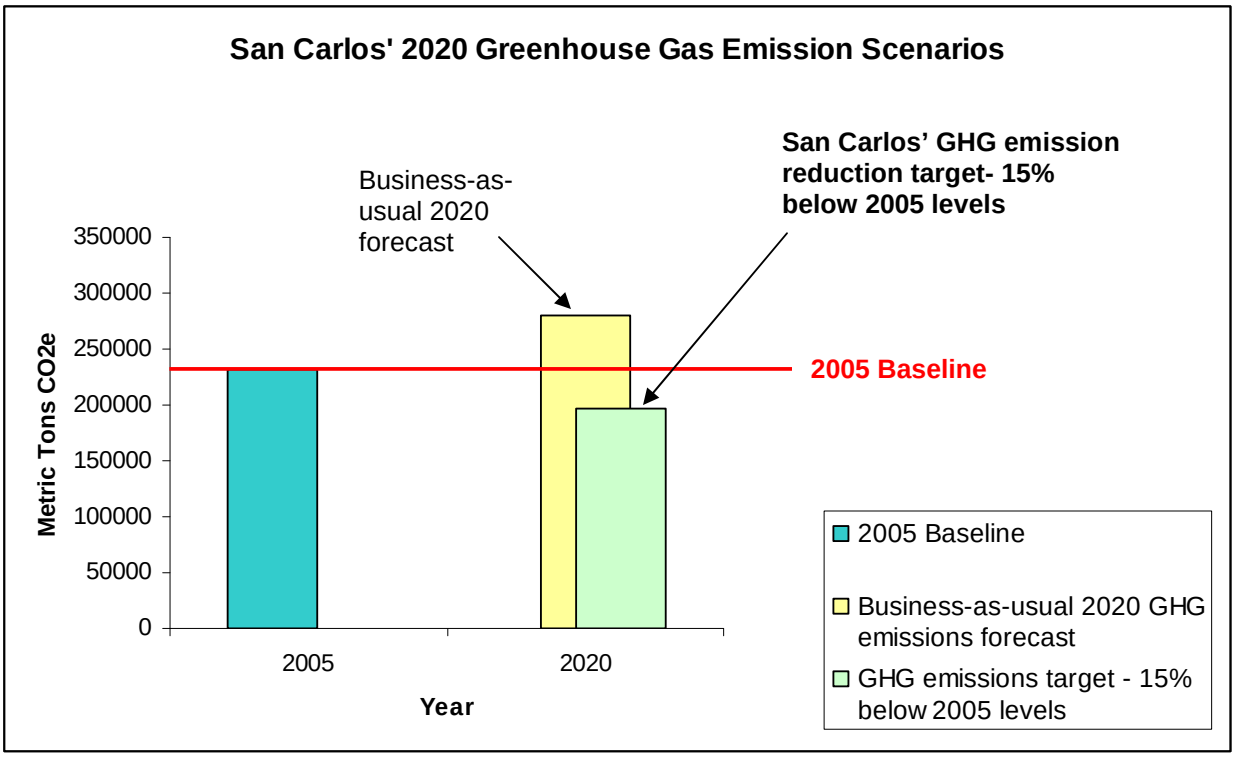
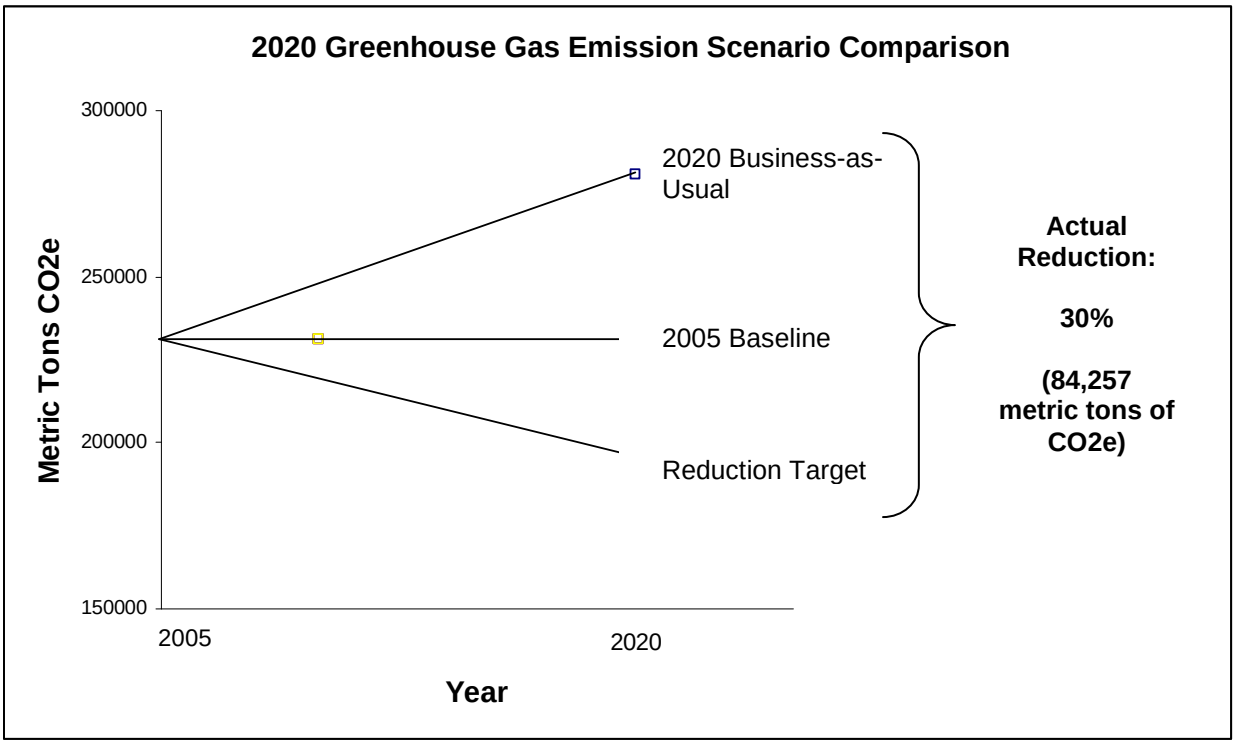


Figure 20: *Comparison of 2020 Greenhouse Gas Emissions Scenarios*



4. Conclusion

In passing a resolution to sign the San Carlos Climate Protection Letter, the City of San Carlos made a formal commitment to reduce its greenhouse gas emissions. This report lays the groundwork for those efforts by estimating baseline emission levels against which future progress can be demonstrated.

This analysis found that the City of San Carlos community as a whole was responsible for emitting *231,057 metric tons of CO_2e in the base year 2005*, with the Transportation Sector contributing the most (49.5%) to this total.

The ICLEI forecast tool found that if the community of San Carlos will emit 280,655 metric tons (17% more) greenhouse gas emissions in the year 2020 under 'business-as-usual.' The highest rate of increase is due to the transportation and commercial/industrial sector.

In addition to establishing the baseline for tracking progress over time and 2020 forecast to plan for the future, this report serves to identify the major sources of San Carlos' emissions, and therefore the greatest opportunities for emission reductions. In this regard, the emissions inventory ought to inform the focus of the San Carlos Climate Action Plan currently underway.

Following the ICLEI methodology, the City of San Carlos utilized the first draft of this inventory to set a greenhouse gas reduction target of 15% below 2005 levels by 2020. The City is currently working to create the Climate Action Plan and to identify and quantify the emission reduction benefits of projects that have already been implemented since 2005, as well as the emissions reduction benefits of proposed green policies and climate protection measures. The benefits of both existing and proposed strategies can be tallied against the baseline established in this report to determine the appropriate set of strategies that will deliver the community of San Carlos to its chosen emissions reduction goal of 15% below 2005 levels by 2020.

5. Appendices

Appendix A
San Carlos Climate Protection Letter

RESOLUTION NO. 2008-029

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN CARLOS ADOPTING THE SAN CARLOS CLIMATE PROTECTION LETTER

WHEREAS, the Inter-Governmental Panel on Climate Change (IPCC), the international community's most respected assemblage of scientists, has found that climate disruption is a reality and that human activities are largely responsible for increasing concentrations of global warming pollution; and

WHEREAS, recent, well-documented impacts of climate disruption include average global sea level increases of four to eight inches during the 20th century; a 40 percent decline in Arctic sea-ice thickness; and nine of the ten hottest years on record occurring in the past decade; and

WHEREAS, climate disruption of the magnitude now predicted by the scientific community will cause extremely costly disruption of human and natural systems throughout the world including: increased risk of floods or droughts; sea-level rises that interact with coastal storms to erode beaches, inundate land, and damage structures; more frequent and extreme heat waves; more frequent and greater concentrations of smog; and

WHEREAS, the United States of America, with less than five percent of the world's population, is responsible for producing approximately 25 percent of the world's global warming pollutants; and

WHEREAS, many leading US companies that have adopted greenhouse gas reduction programs to demonstrate corporate social responsibility have also publicly expressed preference for the US to adopt precise and mandatory emissions targets and timetables as a means by which to remain competitive in the international marketplace, to mitigate financial risk and to promote sound investment decisions; and

WHEREAS, state and local governments throughout the United States are adopting emission reduction targets and programs and that this leadership is bipartisan, coming from Republican and Democratic governors and mayors alike; and

WHEREAS, many cities throughout the nation, both large and small, are reducing global warming pollutants through programs that provide economic and quality of life benefits such as reduced energy bills, green space preservation, air quality improvements, reduced traffic congestion, improved transportation choices, and economic development and job creation through energy conservation and new energy technologies; and

NOW, THEREFORE, BE IT RESOLVED, the San Carlos City Council authorizes the Mayor to Sign and Issue the San Carlos Climate Protection Letter that reads as follows:

The City of San Carlos Climate Protection Letter

a. We urge the federal government and state governments to work to reduce global warming pollution levels, including efforts to: reduce the United States' dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel efficient technologies such as conservation, methane recovery for energy generation, waste to energy, wind and solar energy, fuel cells, efficient motor vehicles, and biofuels;

b. We will continue to work on programs that strive to reduce global warming pollution. This may include programs such as:

1. Inventory global warming emissions in City operations and in the Community;
2. Develop and Adopt a General Plan that includes a discussion of Climate Change and a Climate Action Plan;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Explore the use of clean, alternative energy;
5. Continue to make energy efficiency a priority, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Continue to increase the average fuel efficiency of municipal fleet vehicles through steps including the purchase of Hybrid powered vehicles;
7. Work to increase recycling rates in City operations and in the community;
8. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution, and
9. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO2.

BE IT FURTHER RESOLVED The City of San Carlos will work with its residents and businesses as well as in conjunction with neighboring cities, counties and other agencies interested in this matter to progress on reduce greenhouse gas emissions and to reduce global warming pollution levels.

I, Christine D. Boland, City Clerk, hereby certify that this Resolution was passed and adopted by the City Council of the City of San Carlos at a regular meeting held on the 27th day of May, 2008, by the following vote:

AYES, COUNCILMEMBERS: AHMAD, GRASSILLI, LEWIS, ROYCE

NOES, COUNCILMEMBERS: GROCOTT

ABSENT, COUNCILMEMBERS: NONE

City Clerk of the City of San Carlos

APPROVED:

Brad Lewis, Mayor
City of San Carlos

Appendix B
San Carlos Climate Change and Emission Reduction Program Participation

In San Carlos, the City has teamed up with several groups to advance this work including the San Carlos Chamber of Commerce, the South Bayside Waste Management Authority (SBWMA) and San Carlos Green to bring these programs and efforts to a city-wide audience of residents and businesses. The City Staff handles Green Programs at the City Government, the Chamber of Commerce works with the business community, the SBWMA offers solid waste, recycling and green programs to San Carlos residents and businesses and San Carlos Green works with San Carlos residents.

Regionally, San Carlos is a charter member of the Joint Venture: Silicon Valley Climate Protection Initiative and its Assistant City Manager is on the program's Executive Committee. This regional initiative works to develop and coordinate Climate Protection programs for all 42 cities and counties in Silicon Valley. This includes efficient and cost effective data collection for inclusion in baseline reports in municipalities in San Mateo and Santa Clara Counties as well as the balance of Silicon Valley, informational briefings on Solar Power, Energy Efficiency programs, community programs such as Green Neighbors, joint Solar Procurement projects, policy development, Green Building Codes and several other projects now underway on a regional level.

City Programs

The City of San Carlos was an early leader in several Green Program areas including the recycling of office paper, LED traffic signal lights, relamping of City Hall to reduce energy usage and costs and an award winning photovoltaic installation at the City Corporation Yard on Bransten Road. In the past year, the City teamed up with the South Bayside Waste Management Authority (SBWMA) to give away compost to San Carlos residents, conducting an eWaste event in July (and another planned for October) and to pilot a Residential Battery and Cell Phone Curbside Recycling Program that was so successful that it is now in place for residents at all 12 SBWMA member agencies.

City Council Approval of Green Programs and Climate Protection Work

On May 14 2007, the City Council considered a report from the City Staff to expand the City's Green Programs and to launch an effort to work on Climate Change and Climate Protection. It included a Community Solar Discount Program in partnership with Solar City, San Carlos Green, Joint Venture: Silicon Valley Climate Protection Initiative, San Mateo County Green Business Program and other regional programs in this area. The City Council directed the City staff to move ahead with these recommendations and expanded the City's Green and Climate Programs.

Certified Green Businesses in San Carlos

At the invitation of San Mateo County Supervisor Mark Church and the County's Recycle Works.Org Division, San Carlos became one of 6 cities in San Mateo County to pilot this County's participation in the Bay Area Green Business Program last year.

The program, which started 10 years ago in Alameda County is sponsored by the Association of Bay Area Governments (ABAG) and encourages local businesses of all sizes to adopt Green Business Practices and then to participate in a certification process. Certification involves completing an 11 page checklist, working with the City and inspections by local utilities and regulators and the County to insure compliance with Green standards. Certified Green Businesses receive a Green Business Program window sticker for their firm, Green Business artwork for their web site and a listing in a Bay Area Green Business Guide that now tops 1,000 firms. San Carlos now has 17 Certified Green Businesses, the largest number in San Mateo County. This demonstrates the business community's commitment to taking steps to participate in the City's Green Programs.

San Carlos Businesses and the Chamber of Commerce Green Task Force

Businesses in San Carlos have been active in Green Programs and Climate Protection in cooperation with the City. The San Carlos Chamber of Commerce is playing a leading role through their creation of a Green Business Task Force. The Task Force meets regularly and is providing information and profiles of leading businesses in San Carlos in their newsletter. The Chamber also has held two community-wide eWaste events in San Carlos. The Chamber also aids the City in identifying local firms to participate in the Bay Area Green Business Certification Program and has held two of their Pulse of Business monthly programs on adding green practices to your company as well as a recent Green Briefing and Trade Show at the San Carlos Library for businesses in San Carlos and throughout Northern San Mateo County.

Resident Programs and San Carlos Green

San Carlos residents are a key part of efforts to work on Green Programs and Climate Protection in San Carlos. Community volunteers with San Carlos Green have spearheaded a number of efforts, including the Solar City Discount Solar Program, Yahoo Greenest City contest, weeding and replanting of Vista Park with California natives, and distribution of energy and water efficiency fixtures and educational materials at community events.

Countywide and Regional Efforts

Recognizing the size and scope of the challenge, the City of San Carlos was a charter member of the Joint Venture: Silicon Valley Climate Protection Initiative. Today that effort has grown to include all 42 cities and counties in Silicon Valley. The City has also joined and participated in several related efforts including work by ICLEI, the Bay Area Air Quality Management District, the Association of Bay Area Governments (ABAG) , the Institute of Local Self Government (ILSG) and the League of California Cities.

Video Presentations - Green Programs and Climate Protection

The City Staff brings reports on the City's work in the areas of Green Programs and Climate Protection to the City Council on a periodic basis including reports to the City Council, the Solar City Community Solar Discount Program (June - August 2007) and recognition of the San Carlos businesses that have earned a Green Certification in the Bay Area Green Business Program. A recent report to the City Council in May celebrated the program's 1 Year Anniversary and highlighted plans for the coming year.

Community Greenhouse Gas Emissions in 2005
City of San Carlos Community Inventory
Detailed Report

	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)
RESIDENTIAL			
San Carlos, CA			
PG&E Electricity - Non Govt - 2005			
Electricity	16,320	7.1	249,152
Natural Gas	32,858	14.2	617,574
Subtotal PG&E Electricity - Non Govt - 2005	49,178	21.3	866,726
Subtotal Residential	49,178	21.3	866,726

Data Sources:
1. Electricity and natural gas data provided by PG&E: Xantha Bruso, XxB1@pge.com, (415) 973-2514.

Notes:
1. The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.492859 lbs/kWh of delivered elctricity. This emissions factor is certified by the California Climate Action Registry and was reported to ICLEI in January 2007 by Greg San Martin. Criteria air pollutant emission factors for electricity are derived from the NERC Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set.
2. The "California Coefficients for Natural Gas" coefficient set is based on a PG&E eCO2 emissions factor of 53.05 kg/MMBtu of delivered natural gas, certified by the California Climate Action Registry and the CEC, and was reported to ICLEI in Dec 2007 by Jasmin Ansar. Criteria air pollutant emissions factors for natural gas are derived from the US EPA's annual report of air pollution emission trends (USEPA, 2001c).

COMMERCIAL / INDUSTRIAL			
San Carlos, CA			
Industrial Direct Access Electricity			
Electricity	8,292	3.6	87,922
Subtotal Industrial Direct Access Electricity	8,292	3.6	87,922
Total Commercial Nongovernmental			
Electricity	27,168	11.8	414,770
Natural Gas	16,363	7.1	307,554
Subtotal Total Commercial Non-gov	43,532	18.8	722,324
Total Non-Commercial - City			
Electricity	654	0.3	9,979
Natural Gas	348	0.2	6,540
Subtotal Total Non-Commercial - City	1,002	0.4	16,519
Total Non-Commercial - District			
Electricity	954	0.4	14,562
Natural Gas	441	0.2	8,296
Subtotal Total Non-Commercial - District	1,395	0.6	22,857
Total Noncommercial - County			
Electricity	284	0.1	4,339
Natural Gas	114	0.0	2,141
Subtotal Total Noncommercial - County	398	0.2	6,480
Subtotal Commercial	54,619	23.6	856,101

Data Sources:

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	Equiv CO$_2$ (tonnes)	Equiv CO$_2$ (%)	Energy (MMBtu)

1. Andrea Gough, California Energy Commission, 1516 9th Street, MS-22, Sacramento, CA 95814 ph 916.654.4928 fax 916.654.4901 email agough@energy.state.ca.us

Notes:
1. The commercial and industrial sectors are combined as a result of the 15/15 rule. The 15/15 rule was adopted by the CPUC in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality.
2. Direct Access Electricity is electricity not generated by PG&E yet delivered to an industrial customer through PG&E lines.
3. Estimations of electricity purchased through Direct Access (DA) contracts at the county level based on data provided by the Calfifornia Energy Commission. The amount of DA in a given community varies. 19.82% of non-residential electricity consumption in San Mateo County was DA in 2005 according to the CEC.
4. The Average Grid Electricity Set is unknown for Direct Access Electricity because the power was not generated by PG&E, therefore Set 13 - Western Systems Coordinating Council - was used as the best available estimation.
5. The "PG&E California" electricity coefficient set is basedon the 2005 PG&E eCO2 emission factor of 0.492859 lbs/kWh of delivered elctricity. This emissions factor is certified by the California Climate Action Registry and was reported to ICLEI in January 2007 by Greg San Martin. Criteria air pollutant emission factors for electricity are derived from the NERC Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Set.
6. The "California Coefficients for Natural Gas" coefficient set is based on a PG&E eCO2 emissions factor of 53.05 kg/MMBtu of delivered natural gas, certified by the California Climate Action Registry and the CEC, and was reported to ICLEI in Dec 2007 by Jasmin Ansar. Criteria air pollutant emissions factors for natural gas are derived from the US EPA's annual report of air pollution emission trends (USEPA, 2001c).

TRANSPORTATION

San Carlos, CA

State Highway Vehicle Miles Traveled (VMT)			
Gasoline	55,844	24.2	774,350
Diesel	5,103	2.2	60,172
Subtotal State Highway VMT	60,947	26.4	834,522
Total Community On-Road Vehicle Miles Traveled (VMT)			
Gasoline	48,411	21.0	671,252
Diesel	4,424	1.9	52,161
Subtotal Total Community VMT	52,834	22.9	723,413
CalTrain Weekday Commuters			
Diesel	702	0.3	8,386
Subtotal CalTrain Weekday Commuters	702	0.3	8,386
Subtotal Transportation	114,483	49.5	1,566,320

Highway and On-Road Data Sources:
1. Local Roads Vehicle Miles Traveled (VMT) 2005 data provided by Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC) hbrazil@mtc.ca.gov, (510) 817-5747. Data analyzed by Micah Lang, Sr. Program Officer, ICLEI.
2. State Highways Vehicle Miles Traveled (VMT) 2005 data provided by CalTrans, analyzed by Micah Lang, Sr. Program Officer, ICLEI and Theresa Krebs, Program Officer, ICLEI. http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf. Data Source File from ICLEI: SanMateo_SantaClara_HighwayVMT_MarchUpdate_v workshop.xls
3. EMFAC data provided in November, 2007 by Amir Fanai, Principal Air Quality Engineer, Bay Area Air Quality Management District, AFanai@baaqmd.gov.

Highway and On-Road Notes:
1. Local Road VMT data provided by MTC is in Daily VMT (DVMT); Annual VMT = DVMT x 365 x 1000. State highway VMT provided in DVMT. VMT = DVMT x 365.
2. The VMT by fuel and vehicle type is calculated using San Mateo County VMT % (by vehicle type) and the CACP fleet breakdown by fuel type provided by EMFAC.

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	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)

---CALTRAIN ANALYSIS---
Data Sources:
1. CalTrain Ridership data came from the "2005 CalTrain Ridership Report,"
http://www.caltrain.com/pdf/annual_ridership_counts/2005_Caltrain_Ridership_Counts.pdf
2. CalTrain fuel usage and capacity data came from "Annual Operating and Capital Budget FY 2004-2005"
http://www.caltrain.com/pdf/Budget/FY2005.pdf
3. Data calculations modified from calculations performed in the City of Menlo Park Community Greenhouse Gas Emissions Analysis, 2005.
4. Data calculated and entered on Sept 23, 2008 by Jillian Rich, PMC, jrich@pmcworld.com, (510) 272-4491.

Calculation:
- Number of Riders going southbound from San Carlos during the AM peak hours in Feb 2005: 202
- Number of Riders going southbound from San Carlos during the AM peak hours in Feb 2005: 160
- Average total 2005 weekday ridership in San Carlos: 836
- Roundtrip distance from San Carlos caltrain to San Francisco caltrain: 24 miles (estimate)
- Roundtrip distance from San Carlos caltrain to San Jose caltrain: 25 miles (estimate)
  -> Total daily passenger miles traveled from San Carlos northbound: 11,208
  -> Total daily passenger miles traveled from San Carlos southbound: 9,225
  -> Therefore the total daily passenger miles traveled that San Carlos residents are responsible for is 20,433 (This is an estimate based on the ratio of riders going northbound versus southbound and assuming that all commuters are either going to San Jose or San Francisco).

- Overall, trains run at 38.1% of their capacity
- The average number of passenger cars per train is 4.7
- The average car capacity is 135 people.
- The average capacity for a train is 634.5 people

634.6 x 38.1% = 242 people are on each train on average

- On average, CalTrain engines use 3.13 gallons of diesel permile traveled

CalTrain Fuel efficiency = (1 mile / 3.13 gallons) x (242 passengers) = 77.3 passenger miles / gallon

The number of gallons of diesel that San Carlos weekday commuters are responsible for:
(20,433 passenger miles/weekday) x (1 gallon / 77.3 passenger miles) = (264.33 gallons / weekday) x (260 Working days / year) = 68,726.78 gallons of diesel per year from weekdays, not taking into consideration holidays.

WASTE

Total Solid Waste Landfill Tonnage			*Disposal Method - Managed Landfill*
Paper Products	7,228	3.1	
Food Waste	2,395	1.0	
Plant Debris	1,052	0.5	
Wood/Textiles	1,916	0.8	
Subtotal Total Solid Waste Landfill Tonnage	12,590	5.4	
San Carlos, CA			
Total Alternative Daily Cover (ADC)			*Disposal Method - Managed Landfill*
Plant Debris	187	0.1	
Subtotal Total Alternative Daily Cover (ADC)	187	0.1	
Subtotal Waste	12,777	5.5	

Data Sources:
1. Community waste tonnage, ADC tonnage, and ADC waste share by type is from the California Integrated Waste Management Board San Carlos profile: http://www.ciwmb.ca.gov/LGCentral/DRS/Reports/JurDspFa.asp
2. Percentages of waste share by type for Total Landfill Tonnage provided by the California Integrated Waste Management Board (CIWMB) Waste Characterization Report (2004) http://www.ciwmb.ca.gov/publications/default.asp?pubid=1097

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	Equiv CO_2 (tonnes)	Equiv CO_2 (%)	Energy (MMBtu)
Total	231,057	100.0	3,289,147

Notes:
1. 60% methane recovery factor is derived from EPA AP 42 emissions factor guidelines: http://www.epa.gov/ttn/chief/ap42
2. Recycling and compost tonnage has been omitted from this analysis.
3. Alternative Daily Cover (ADC) is "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" (California Integrated Waste Management Board).
4.The Ox Mountain Sanitary Landfill used 809 Tons of plant material as ADC while the Potrero Hills Landfill uses Construction and Demolition debris. Plant material has a small emissions coefficient, therefore resulting in 187 tonnes eCO2 from Ox Mountain and 0 (zero) tonnes eCO2 from Potrero Hills Landfill.