

4.14 GREENHOUSE GAS EMISSIONS

This section examines the potential impacts from greenhouse gas (GHG) emissions associated with development under the Draft 2030 General Plan and the Climate Action Plan. In this section, “emissions” refers to annual emissions in metric tons (tonnes) of carbon dioxide-equivalent units (CO₂e).

A. *Environmental Setting*

This section provides general background information on GHGs and the environmental impacts of climate change.

1. **Greenhouse Gases**

GHGs are gases emitted by human activity that trap heat in the atmosphere and regulate the earth’s temperature. This phenomenon, known as the Greenhouse Effect, is responsible for maintaining a habitable climate. While the emission of GHGs in general, and CO₂ in particular, into the atmosphere is not of itself an adverse environmental effect, the increased concentrations of GHGs in the atmosphere and the associated consequences of climate change result in adverse environmental effects.

The most common GHGs are carbon dioxide and water vapor, but the gases that are widely seen as the principal contributors to human-induced global climate change are: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). GHGs are released into the earth’s atmosphere through a variety of human activities:

- ◆ Carbon dioxide and nitrous oxide are byproducts of fossil fuel combustion.
- ◆ Nitrous oxide is also associated with agricultural operations such as fertilization of crops.
- ◆ Methane is commonly created by off-gassing from agricultural practices (e.g. keeping livestock) and landfill operations.

- ◆ Chlorofluorocarbons were widely used as refrigerants, propellants and cleaning solvents until banned by international treaty.
- ◆ Hydrofluorocarbons are now used as a substitute for chlorofluorocarbons in refrigeration and cooling.
- ◆ Perfluorocarbons and sulfur hexafluoride emissions are common by-products of industries such as aluminum production and semi-conductor manufacturing.

Each GHG has its own potency and effect upon the earth's energy balance. This is expressed in terms of a global warming potential (GWP), with carbon dioxide being assigned a value of 1 and sulfur hexafluoride being many orders of magnitude stronger with a GWP of 23,900. In GHG emission inventories, the weight of each gas is multiplied by its GWP and is measured in units of carbon dioxide equivalents (CO₂e).

2. Environmental Effects of Greenhouse Gases and Climate Change

Temperatures in California are expected to rise significantly by the end of the century as a result of climate change.¹ This warming trend will likely have an adverse effect on naturally-occurring resources within California. Increased precipitation and sea level rise could increase coastal flooding, saltwater intrusion (a particular concern in the low-lying Sacramento–San Joaquin Delta, where potable water delivery pumps could be threatened) and degradation of wetlands. Mass migration and loss of plant and animal species could also occur. Potential effects of global climate change that could adversely affect human health include more extreme heat waves and heat-related stress; an increase in climate-sensitive diseases; more frequent and intense natural disasters such as flooding, hurricanes and drought; and increased levels of air pollution.

The scientific evidence supporting these assertions continues to build, with updated modeling scenarios being testing on an ongoing basis. The science of climate change is such that it is constantly evolving, with information pre-

¹ California Climate Change Center, *Our Changing Climate. Assessing the Risks to California*, 2006, page 3.

sented as a component of public policy quickly becoming out of date. For this reason, the specificity of impacts to San Carlos as a result of climate change is included in the City of San Carlos' Climate Action Plan, which is an adaptively managed document meant to be updated every five years to address changes in both the science and policy approach to addressing climate change at the local government level. However, general impacts as a result of climate change, as currently known at the adoption of this document, are outlined below.

To date, the primary impact of global climate change has been a rise in the average global tropospheric temperature of 0.2°C per decade, determined from meteorological measurements worldwide between 1990 and 2005.² Climate change modeling using 2000 emission rates shows that further warming could occur, which would cause additional changes in the global climate system during the 21st century.

Impacts to the environment of California that could result from continued global warming include, but are not limited to:

- ◆ Increasing temperatures by as much as 8 to 10.4 degrees Fahrenheit (°F) under the higher emission scenarios, resulting in a 25 to 35 percent increase in the number of days ozone pollution standards are exceeded in most urban areas;
- ◆ Increased electricity demand, particularly in the hot summer months;
- ◆ Decline of the Sierra snowpack, which accounts for a significant amount of the stored surface water in California, by 70 percent to 90 percent over the next 100 years;³
- ◆ Decline in spring stream flow by as much as 30 percent, causing severe water shortages;

² The troposphere is the zone of the atmosphere characterized by water vapor, weather, winds, and decreasing temperature with increasing altitude.

³ California Climate Change Center, *Our Changing Climate. Assessing the Risks to California*, 2006, page 6.

- ◆ The loss of sea ice and mountain snow pack, resulting in higher sea levels and higher sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures;
- ◆ Rise in global average sea level primarily due to thermal expansion and melting of glaciers and ice caps in the Greenland and Antarctic ice sheets;
- ◆ Changes in weather, such as widespread changes in precipitation, ocean salinity and wind patterns, and increased incidence of extreme weather, including droughts, heavy precipitation, heat waves, extreme cold and the intensity of tropical cyclones;
- ◆ Impacts to agricultural production due to increased temperatures, reduced water supply and increased threats from pests and pathogens;⁴
- ◆ High potential for erosion of California's coastlines and seawater intrusion into the Delta and levee systems; and
- ◆ Increased wildfire risk resulting from dry vegetation and extended droughts.

B. Regulatory Setting

This section summarizes key federal, State, regional and City statutes, regulations and policies that would apply to the project. Global climate change resulting from GHG emissions is an emerging environmental concern discussed at the international, national and statewide levels. At each level, agencies are considering strategies to control emissions of gases that contribute to global warming.

1. Federal Laws and Regulations

At this time, there are no federal regulations or policies pertaining to GHG emissions. However, President Obama announced on May 20, 2009 that he

⁴ California Climate Change Center, *Our Changing Climate. Assessing the Risks to California*, 2006, page 9.

intends to adopt new fuel economy standards to increase fuel economy and reduce GHGs. The new standards are expected to reduce GHG emissions by approximately 900 million tonnes over the life of the program. Moreover, on April 17, 2009, United States Environmental Protection Agency (EPA) Administrator Lisa Jackson signed a finding that GHGs in the atmosphere endanger the public health and welfare. The proposed endangerment finding now enters the public comment period, which is the next step in the process EPA must undertake before issuing final findings and legislation to regulate GHG emissions.

In addition, the United States participates in the United Nations Framework Convention on Climate Change (UNFCCC). While the United States signed the Kyoto Protocol, which would have required reductions in GHGs, Congress never ratified the protocol. The federal government chose voluntary and incentive-based programs to reduce emissions and has established programs to promote climate technology and science. For example, in 2002, the United States announced a strategy to reduce the GHG intensity of the American economy by 18 percent over a 10-year period from 2002 to 2012.

2. State Laws and Regulations

Through several laws and regulations, the State of California has indicated that it is concerned about GHG emissions and their effect on global climate change. The State recognizes that “there appears to be a close relationship between the concentration of GHGs in the atmosphere and global temperatures” and that “the evidence for climate change is overwhelming.”

a. State of California Executive Order S-3-05 (2005)

In June 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, which established the following aggressive emissions reduction goals: by 2010, GHG emissions must be reduced to 2000 levels; by 2020, GHG emissions must be reduced to 1990 levels; and by 2050, GHG emissions must be reduced to 80 percent below 1990 levels. The Executive Order identified the California Environmental Protection Agency (Cal/EPA) as the lead coordinating State agency for establishing climate change emission reduction targets

in California. A “Climate Action Team,” a multi-agency group of State agencies, was set up to implement Executive Order S-3-05. GHG emission reduction strategies and measures to reduce global warming were identified by the California Climate Action Team in 2006.

b. State of California Renewable Portfolio Standard

The State of California Renewable Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country. Established in 2002 in Senate Bill 1078, the PS program requires electricity providers to increase the portion of energy that comes from renewable sources to 20 percent by 2010 and by 33 percent by 2020.

c. Assembly Bill 32, The California Global Warming Solutions Act (2006)

In 2006, Governor Arnold Schwarzenegger signed Assembly Bill (AB) 32, the Global Warming Solutions Act, into legislation. The Act requires that California cap its GHG emissions at 1990 levels by 2020. This legislation requires the California Air Resources Board (CARB) to establish a program for statewide GHG emissions reporting and monitoring/enforcement of that program. CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions.

Many of the measures to reduce GHG emissions from transportation will come from CARB. AB 1493, the Pavley Bill, directed CARB to adopt regulations to reduce emissions from new passenger vehicles. CARB’s AB 32 Early Action Plan, released in 2007, included a strengthening of the Pavley regulation for 2017 and included a commitment to develop a low carbon fuel standard (LCFS). Current projections indicate that with implementation of a strengthened Pavley Regulation, including LCFS, California will still fall short of the 1990 level targets for transportation emission reductions. On April 23, 2009, CARB adopted new regulation to implement the Governor’s LCFS. The regulation calls for GHG emissions from California’s transportation fuels to be reduced by 10 percent by 2020.

CARB is also targeting other sources of emissions. The main measures to reduce GHG emissions are contained in the AB 32 Scoping Plan, which CARB approved on December 11, 2008. This plan includes a range of GHG reduction actions. Central to the Plan is a cap and trade program covering 85 percent of the State's emissions. This program will be developed in conjunction with the Western Climate Initiative, comprised of seven states and three Canadian provinces, to create a regional carbon market. The Plan also proposes that utilities produce a third of the State's energy from renewable sources such as wind, solar and geothermal, and proposes to expand and strengthen existing energy efficiency programs and building and appliance standards. The Plan also includes full implementation of the Pavley standards to provide a wide range of less polluting and more efficient cars and trucks to consumers, who will save on fuel costs. CARB is working to implement the Scoping Plan, and has already adopted a number of actions and measures required by the Plan. The majority of this implementation phase must be completed by the end of 2010.

d. Senate Bill 97, Modification to the Public Resources Code (2007)

Pursuant to Senate Bill (SB) 97, the Governor's Office of Planning and Research (OPR) is in the process of developing CEQA guidelines addressing GHGs. OPR is required to "prepare, develop, and transmit" the guidelines to the Resources Agency on or before July 1, 2009. In June 2008, OPR first released a Technical Advisory on CEQA Amendments, *CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review*. OPR released a draft of the proposed CEQA Guidelines Amendments on January 8, 2009, and transmitted the finalized CEQA Amendments to the Resources Agency on April 13, 2009 for rulemaking and adoption by January 1, 2010. OPR's CEQA Amendments Section 15064.4 provides that lead agencies should "make a good faith effort, based on available information to describe, calculate, or estimate" GHG emissions and notes that an agency may identify emissions either by selecting a "model or methodology" to quantify the emissions or relying on "qualitative or other performance based standards."

At the direction of OPR, CARB is currently developing statewide interim thresholds of significance for GHG emissions. CARB is focusing on common project types that, collectively, are responsible for substantial GHG emissions, specifically industrial, residential and commercial projects. The ongoing workshops have been planned to discuss further development of concepts introduced in its *Preliminary Draft Staff Proposal on Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act (CEQA)*.

e. Senate Bill 375, California's Regional Transportation and Land Use Planning Efforts (2008)

Recently, California enacted legislation (SB 375) to expand the efforts of AB 32 by controlling indirect GHG emissions caused by urban sprawl. SB 375 develops emissions-reduction goals applicable to regional planning activities. SB 375 provides incentives for local governments and developers to implement new, conscientiously-planned growth patterns. This includes incentives for creating attractive, walkable and sustainable communities and revitalizing existing communities. The legislation also allows developers to bypass certain environmental reviews under CEQA if they build projects consistent with the new sustainable community strategies. Development of more alternative transportation options that would reduce vehicle trips and miles traveled, along with traffic congestion, would be encouraged. SB 375 enhances CARB's ability to reach the AB 32 goals by directing the agency to develop regional GHG emission reduction targets for 2020 and 2035 to be met by the transportation sector. SB 375 directs CARB to work with metropolitan planning organizations (e.g. ABAG and MTC) to align their regional transportation, housing, and land use plans to reduce vehicle miles traveled and demonstrate the region's ability to attain its GHG reduction targets. A similar process is used to reduce transportation emissions of ozone precursor pollutants in the Bay Area.

3. Regional and City Regulations

a. Bay Area Air Quality Management District

In 2005, the Bay Area Air Quality Management District (BAAQMD) initiated a Climate Protection Program that integrates climate protection activities into existing District programs and functions. Current BAAQMD climate action activities include grant programs, commenting on CEQA documents, regulations, inventory development, and outreach. BAAQMD awarded a total of \$3 million to 53 local agencies to prepare climate protection programs aimed at reducing GHG emissions in the Bay Area. In addition, the District has prepared elementary school teaching curricula.

The BAAQMD proposed a regional GHG emission inventory in 2002 and updated it in 2007. The inventory provides an overview of GHG emission sources in the Bay Area, including a breakdown by county and emission sector. The inventory allows District staff and others to identify emission sectors where potential GHG and criteria pollutant emission reductions can be achieved.

In 2008, the BAAQMD adopted a fee program that applies to permitted stationary sources. These fees are used to fund the District's climate protection programs, while providing an incentive for sources to reduce their emissions.

BAAQMD is in the process of devising numerical thresholds for GHG emissions against which a project's emissions can be measured for CEQA analysis. This was presented at public workshops in April 2009. The District's goal is to ensure that new development contributes feasible reductions to meet the goals of new and changing legislation and regulations.

b. City of San Carlos Climate Action Plan

The Climate Action Plan (CAP) augments the objectives, goals, policies and actions of the Draft 2030 General Plan related to the reduction of GHG emissions. The ultimate objective of the CAP is to reduce GHG emissions by 15 percent below 2005 levels by 2020 and 35 percent below 2005 levels by 2035. The goals and implementation measures of the CAP focus on three separate

sectors of emissions consistent with standard industry protocol including energy, waste and transportation emissions.

As a component of the Draft 2030 General Plan process, the City of San Carlos chose to develop a citywide GHG emissions inventory and Climate Action Plan (CAP) that can be seamlessly integrated into the Draft 2030 General Plan and associated actions in order to facilitate a more thorough, adaptive and defensible approach to climate action within the city. As further outlined in the Climate Action Plan, the greenhouse gas baseline inventory and Climate Action Plan were developed as an adaptively managed document that does the following:

- a) Summarizes federal, State, regional, and local legislation and regulations for addressing climate change while also outlining the most recent scientific understanding of the impacts climate change will have on the San Carlos community.
- b) Inventories the emissions by energy, waste, and transportation sectors originating within the political boundary of San Carlos, with the projected emissions for Draft 2030 General Plan buildout. Information items for other emission sources related to but not directly under the control of San Carlos were also summarized.
- c) Mitigates the impacts of San Carlos on climate change (by reducing greenhouse gas emissions consistent with the direction of the State of California via AB32 and Governor's Order S-03-05 and Public Resources Code section 21083.3). The CEQA Guidelines encourage the adoption of policies or programs as a means of addressing comprehensively the cumulative impacts of projects. (See CEQA Guidelines, §§ 15064, subd. (h)(3), 15130, subd. (c).)
- d) Requires the greenhouse gas emissions inventory and Climate Action Plan to be updated every five years and respond to changes in science, effectiveness of emission reduction measures and federal, State,

regional or local policies to further strengthen the City's response to the challenges of climate change.

- f) Provides substantial evidence that the emission reductions estimated in the Climate Action Plan are feasible.
- g) Serves as the threshold of significance within the City of San Carlos for climate change, by which all applicable developments within the City will be reviewed. If a proposed development is consistent with the emission reduction, adaptation measures included in the Climate Action Plan, and the programs resulting from the CAP, the project would be considered to have a less than significant impact on climate change and emissions consistent with the direction of the California Attorney General (Climate Change, CEQA and General Plans, Revised March 6, 2009) and Public Resources Code 21083.3.
- h) Provides the GHG emissions reductions and monetary costs into a cost per metric ton of GHG figure which allows for easy comparison across all measures and identified 'low-hanging fruit' for immediate implementation.

In order to accomplish the above for the purposes of CEQA, the Climate Action Plan is incorporated in both the Draft 2030 General Plan and the Draft 2030 General Plan EIR and is consistent with the State's goals related to climate change Governor's Order S-03-05 and Assembly Bill 32, the Global Warming Solutions Act of 2006).

C. Existing Conditions

An emissions inventory is a well-recognized and useful tool for understanding climate change impacts. An emissions inventory identifies and quantifies the primary human-generated sources and sinks of GHGs and, thereby, accounts for the amount of GHGs emitted to or removed from the atmosphere over a specific period of time by a particular source. This section summarizes the

latest information on global, national, State, regional and County GHG emission inventories.

1. Global Inventory

According to the United Nations Framework Convention on Climate Change, worldwide GHG emissions in 2004 were 30 billion tonnes of CO_{2e} per year (including both ongoing emissions from industrial and agricultural sources, but excluding emissions from land use changes).⁵

2. National Inventory

As part of its commitments to UNFCCC, the US EPA has developed an inventory of anthropogenic emissions by sources and removals by sinks of all GHGs. This inventory is periodically updated with the latest report published in 2009. In 2004, the United States emitted about 8 billion tonnes of CO_{2e}, or about 25 tonnes per person per year.⁶ It is estimated that the United States contributes up to 35 percent of the world's CO₂ equivalent emissions. The EPA reports that total US emissions have risen by 17 percent from 1990 to 2007.⁷ A 1.1 percent decrease in emissions was noted from 2005 to 2006, which is reported as attributable to: (1) climate conditions, (2) reduced use of petroleum products for transportation, and (3) increased use of natural gas over other fuel sources. The inventory noted that the transportation sector emits about 33 percent of CO₂ emissions, with 60 percent of those emissions coming from personal automobile use. Residential uses, primarily from en-

⁵ United Nations Framework Convention on Climate Change (UNFCCC), 2007. *Sum of Annex I and Non-Annex I Countries Without Counting Land-Use, Land-Use Change and Forestry (LULUCF). Predefined Queries: GHG total without LULUCF* (Annex I Parties). Bonn, Germany. Website: unfccc.int/ghg_emissions_data/predefined_queries/items/3814.php

⁶ US Environmental Protection Agency (EPA). 2008. *The US Greenhouse Gas Emissions and Sinks: Fast Facts*. Website: www.epa.gov/climatechange/elemissions/downloads/2008_GHG_Fast_Facts.pdf.

⁷ US EPA, 2009. *2009 US Greenhouse Gas Inventory Report. Chapter 2: Trends in Greenhouse Gas Emissions*. <http://www.epa.gov/climatechange/emissions/downloads09/trendsGhGEmissions.pdf>.

ergy use, accounted for 20 percent of CO₂ emissions. After the decrease from 2005 to 2006, emissions from fuel combustion grew from 2006 to 2007.⁸

As a part of the EPA's responsibility to develop and update an inventory of national GHG emissions and sinks, EPA compared trends of other US data. Over the period between 1990 and 2006, GHG emissions increased at a rate of about 0.9 percent per year. Population growth was slightly higher at 1.1 percent, while energy and fossil fuel consumption were more closely related at 1.0 percent. GDP and energy generation grew at much higher rates.

3. State of California Inventory

California GHG or CO₂e emissions were estimated at 484 million tonnes of CO₂e, which is about 6 percent of total emissions from the entire United States. Transportation is the largest source of GHG emissions in California, contributing about 40 percent of the total emissions. Electricity generation is second, at over 20 percent, but California also imports electricity during the summer, which brings energy sources up to about 25 percent. Industrial activities account for about 20 percent of the State's emissions. On a per-person basis, GHG emissions are lower in California than in most other states; however, California is a populous state and the second largest emitter of GHGs in the United States and one of the largest emitters in the world.

Under a "business as usual" scenario, GHG emissions in California are estimated to increase to approximately 600 million tonnes of CO₂e by 2020. CARB staff has estimated the 1990 statewide emissions level to be 427 million tonnes of CO₂e, therefore requiring a reduction of almost 30 percent in emissions by 2020 to meet the AB 32 goal.

4. Bay Area Inventory

BAAQMD estimated GHG emissions for the Bay Area at 102.7 million tonnes of CO₂e in 2007. The inventory is broken down by county, and San

⁸ US EPA, 2009. 2009 US Greenhouse Gas Inventory Report. Chapter 2: Trends in Greenhouse Gas Emissions. <http://www.epa.gov/climatechange/emissions/downloads09/trendsGhGEmissions.pdf>.

Mateo County emissions are the fourth highest in the Bay Area, at 10.7 percent. In San Mateo County, transportation accounts for about 73 percent of the emissions. However, these emissions include those from shipping, aircraft and trains. About 30 percent of the entire Bay Area inventory is attributable to on-road vehicles.

5. San Carlos Inventory

San Carlos recently inventoried its 2005 GHG emissions using ICLEI software and methodology. Table 4.14-1 describes the total results per sector for GHG emissions.

As shown in Table 4.14-1, the transportation sector accounted for approximately 56 percent of San Carlos' GHG emissions, at 150,663 tonnes of CO₂e. Commercial/Industrial emissions are the next largest sector, accounting for approximately 20 percent of community emissions for the city.

D. Standards of Significance

Although CEQA guidelines now require a quantitative analysis of GHGs emitted by the project, there are no defined criteria against which project emissions can be compared to determine significance. Various influential agencies and groups, including the California Air Pollution Control Officers Association, the South Coast Air Quality Management District and County of San Diego have released guidance on significance thresholds. CARB has also issued a preliminary draft staff proposal for recommending approaches to setting significance thresholds to evaluate project GHG emissions, but this document does not suggest specific thresholds.⁹

⁹ *Preliminary Draft Staff Proposal Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act.* CARB October 24, 2008.

TABLE 4.14-1 **SAN CARLOS GREENHOUSE GAS EMISSIONS INVENTORY, 2005**

Sector	Emissions in Tonnes of CO ₂ e	Percent of Total Emissions
Residential	49,178	18.4%
Commercial/Industrial	54,619	20.4%
Transportation	150,663	56.4%
Waste	12,777	4.8%
Total	267,237	100.0%

Source: PMC, 2009.

Other Air Districts are considering quantifiable thresholds for projects; however, only the South Coast Air Quality Management District (SCAQMD) has formally adopted interim CEQA significance thresholds. These currently adopted thresholds are for stationary sources only. The District has proposed thresholds for residential/commercial projects but has deferred them to further define performance standards and coordinate with CARB staff's interim GHG proposal. The initial significance threshold identified by SCAQMD is 3,000 tonnes of CO₂e per year.

In the absence of CEQA significance thresholds related to GHG emissions, the City of San Carlos Draft Climate Action Plan emissions target will be used as the established threshold to compare emissions resulting from the implementation of the Draft 2030 General Plan. The CAP sets a reduction target of reducing GHG emissions by 15 percent below 2005 levels by 2020 and 35 percent below 2005 levels by 2030. The Draft 2030 General Plan will be considered to have a significant impact on GHG emissions if it results in community wide GHG emissions that are above the established targets in the Climate Action Plan.

E. Impact Discussion

This section provides a discussion of the methodology used to develop the existing conditions and year 2030 inventories, and the potential impacts related to GHG emissions that would occur as a result of implementation of the Draft 2030 General Plan.

The GHG emissions inventory for San Carlos was developed using ICLEI's 2005 Clean Air and Climate Protection (CACCP) software and data embedded in that software. The 2005 baseline inventory measured GHG emissions from four major sectors: residential, commercial/industrial, transportation, and solid waste.

1. Baseline Inventory for San Carlos

The GHG emissions baseline was prepared by PMC in August 2008¹⁰ and was updated in June 2009. The GHG emissions baseline inventory applies to the San Carlos community as a whole defined by its geographic borders. The community-scale analysis provides a performance baseline against which the City can demonstrate progress being made throughout San Carlos.

Creating the 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 a subset of the waste data, which utilizes a California statewide waste characterization study conducted in 2003-04.¹¹

¹⁰ PMC, 2008, *City of San Carlos Greenhouse Gas Emissions Inventory Report (2005) Community-Wide Emissions*.

¹¹ California Integrated Waste Management Board (CIWMB), 2004, *2004 Waste Characterization Report*, <http://www.ciwmb.ca.gov/publications/default.asp?pubid=1097>.

For community activities, such as 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 GHGS 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 GHG accounting. Examples of Information Items are biogenic carbon emissions or quantity of electricity generated from solar photovoltaic panels.

The emissions inventory primarily contains emission sources falling within Scope 1, 2 and 3. Data availability and privacy laws, as well as time and budget constraints, meant that most Information Items were not included in the San Carlos emissions inventory. Information Items include emissions from freight train travel, aircraft travel, emissions from waste sent to landfill before 2005, and other sources of emissions not usually included in jurisdictional GHG inventories due to the unreliability of methodology or data.

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

- ◆ carbon dioxide (CO₂)
- ◆ nitrous oxide (NO₂)
- ◆ methane (CH₄)
- ◆ sulfur hexafluoride (SF₆)
- ◆ perfluorocarbons (PFCs)
- ◆ hydrofluorocarbons (HFCs)

The Clean Air and Climate Protection (CACP) software quantifies all GHG emissions in CO₂ equivalency (CO₂e), 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 (MTCO₂e). A metric tonne is equivalent to 2,205 pounds, and one pound of CO₂ can fill approximately 120 party balloons. This means that one MTCO₂e could fill more than 250,000 party balloons.

There were five criteria air pollutant emissions inventoried in this project:

- ◆ Carbon monoxide (CO)
- ◆ Sulfur dioxide (SO₂)
- ◆ Nitrogen oxides (NO_x)
- ◆ Volatile organic compounds (VOCs)
- ◆ Particulate matter (PM₁₀)

These pollutants, described in Section 4.2, Air Quality, harm both human health and the environment though they do not contribute directly to global climate change.

As shown in Table 4.14-1, the CACP calculations resulted in a 2005 baseline emissions inventory for San Carlos of 267,237 metric tonnes of CO₂e.

2. Future Emissions Forecast

The San Carlos 2005 baseline GHG emissions inventory was used to build a year 2030 forecast for buildout under the Draft 2030 General Plan.

a. Growth Rates

Data from the buildout analysis for the Draft 2030 General Plan were used to forecast growth rates for jobs and households in San Carlos through 2030. Annual growth rates through 2030 for San Carlos were assumed to be 0.54 percent for households, 2.44 percent for jobs, and 0.55 percent for population. Using these growth rates, the Forecast Builder tool in the CACP model was used to estimate total emissions in 2030 for the energy and waste sectors.

The 2030 transportation sector projection was based on State VMT growth rates provided in the 2007 Integrated Energy Policy Report by the California Energy Commission. However, to maintain consistency with the Draft 2030 General Plan buildout scenario, the Climate Action Plan used VMT projected by Hexagon Transportation Consultants, Inc. to reflect the growth conditions of San Carlos under the Draft 2030 General Plan rather than State data.

b. Presumed Mitigating Factors

The 2030 emissions inventory is based on the assumption that GHG generation in San Carlos, San Mateo County, California and the nation will change due to various factors through 2030. State and federal emission reduction efforts were identified and quantified through various policy documents from the California Energy Commission, California Air Resources Board, and more as detailed in the Climate Action Plan. Reduction measures specific to the City of San Carlos were identified through a literature review and extensive community involvement process. The measures were then quantified using the Climate and Air Pollution Planning Assistant (CAPPA) provided by ICLEI. They include increased technological efficiencies, improved market mechanisms and stricter regulatory controls.

The mitigating assumptions used to develop the 2030 emissions inventory in the Draft Climate Action Plan for San Carlos are described below:

- ◆ **Energy Use Strategies.** As shown in Table 4.14-2, PMC estimated that the energy use goals and measures as identified in the CAP would result

TABLE 4.14-2 SUMMARY OF CAP MEASURES AND STATE PROGRAMS

	2020 Metric Tonnes CO ₂ e per year	2030 Metric Tonnes CO ₂ e per year
Reference Year 2030 Emissions Projection	321,519	365,787
Energy Use Strategies	-12,628	- 29,792
Transportation and Land Use Strategies	-12,886	-18,518
Solid Waste	-4,815	-7,274
Subtotal – Emissions with CAP	291,210	310,203
Renewable Portfolio Standard	- 13,834	- 31,566
Pavley I and II	- 34,649	- 91,978
Low Carbon Fuel Standard	- 14,124	-10,304
Title 24	n/a	-2,947
Total – Emissions with CAP and State Programs	228,603	173,408
Base Year 2005 Community Emissions	267,237	267,237
Percent below 2005 Level	14.5%	35.1%

Source: PMC, 2009.

in a reduction of 12,628 metric tones per year of CO₂e by 2020 and a reduction of 29,792 metric tones per year of CO₂e by 2030. The energy related measures from the CAP and the yearly reduction of GHGs due to implementation of the measures are shown in Table 4.14-3. These numbers were derived using CAPPAs as detailed in the Climate Action Plan and appendices.

- ◆ **Transportation and Land Use Strategies.** As shown in Table 4.14-2, PMC estimated that the transportation and land use goals and implementation measures as identified in the CAP would result in a reduction of 12,886 metric tones per year of CO₂e by 2020 and a reduction of 18,518

TABLE 4.14-3 **SUMMARY OF CAP ENERGY USE REDUCTION MEASURES**

Energy Use Reduction Measure	Metric Tonnes CO ₂ e per year
Goal 1 – Expand energy saving opportunities to businesses.	-13,300
1.1 Consider developing a tax rebate program for efficiency improvements in businesses.	
1.2. Expand energy saving opportunities and assistance for large and small commercial and industrial businesses.	
Goal 2 - Improve residential energy efficiency.	-3,838
2.1. Consider establishing energy efficiency standards for new construction and remodel projects that exceed the State’s Title 24 energy standards.	
2.2. Perform energy-efficient lighting retrofits and/or home energy audits.	
2.3. Expand the distribution of free or subsidized energy and water saving devices and services to the mass market.	
2.4. Expand and better integrate programs that increase energy efficiency in low-income households.	
Goal 3 - Adopt a green building standard for all new development and major remodels.	-9,879
3.1a. (first option) Enforce State green building requirements and provide information and support to developers on LEED and GreenPoint standards.	
Vs.	
3.1b. (second option) Develop a green building ordinance consistent with that of neighboring jurisdictions that requires a GreenPoint, LEED, or equivalent green building certification per development category.	
Goal 4 - Create water and waste efficient landscapes.	- 485
4.1. Formalize the City’s efficient landscaping practice by writing it into the Parks Master Plan.	
4.2. Expand the current landscaping ordinance to require efficient landscaping in conjunction with all residential and commercial property improvements.	

TABLE 14.1-3 SUMMARY OF ENERGY USE REDUCTION MEASURES
(CONTINUED)

Energy Use Reduction Measure	Metric Tonnes CO _{2e} per year
Goal 5 - Identify opportunities for on-site renewable energy generation on City and privately-owned property.	- 394
5.1. Identify opportunities for increasing solar system installations in the community and on City facilities.	
5.2. Identify opportunities for Wind energy generation.	
5.3. Identify opportunities for Biomass energy opportunities.	
Goal 6 - Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.	-160
6.1. Implement reduction strategies included in the energy audit of City facilities. Continue to monitor City facility performance.	
Goal 7 - Provide for increased albedo (reflectivity) of all urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.	-2,320
7.1. Provide for increased albedo (reflectivity) of all urban surfaces including roads, driveways, sidewalks, and roofs in order to minimize the urban heat island effect.	
Goal 8 - Encourage tree planting.	-356

metric tonnes of CO_{2e} per year by 2030. The transportation and land use related measures from the CAP and the yearly reduction of GHGs due to implementation of the measures are shown in Table 4.14-4. These numbers were derived using a variety of tools and research, including CAPP, URBEMIS, CARB’s EMFAC 2007 v2.3, and more as detailed in the Climate Action Plan and appendices.

- ◆ **Solid Waste.** As shown in Table 4.14-2, PMC estimated that the solid waste goals and implementation measures as identified in the CAP would result in a reduction of 4,815 metric tonnes of CO_{2e} per year by 2020 and a reduction of 7,274 metric tonnes of CO_{2e} per year by 2030. The solid waste related measures from the CAP and the yearly reduction of GHGs due to implementation of the measures as detailed in the Climate Action Plan and appendices.

TABLE 4.14-4 **SUMMARY OF CAP TRANSPORTATION AND LAND USE REDUCTION MEASURES**

Transportation and Land Use Reduction Measure	2020 Metric Tonnes CO _{2e} per year
Goal 1 - Encourage development that is mixed-use, infill, and higher density.	-5,544
1.1. Revise municipal codes to encourage and allow for mixed use, infill, and high-density development.	
Goal 2 - Increase housing density near transit.	-4,957
2.1. Revise municipal codes to encourage and allow for higher density commercial and residential centers near transit corridors with the express intent of encouraging transit ridership and reducing the use of personal automobiles.	
Goal 3 - Address and minimize vegetation that degrades access along public rights-of-way.	n/a
3.1. Provide for an education program to residents and businesses as well as increased code enforcement in order to minimize vegetation that degrades access along public rights-of-way.	
Goal 4 - Increase bike parking.	-150
4.1. Increase the bicycle parking requirement for commercial projects in order to promote cyclist safety, security, and convenience.	
4.2. Require large employers to provide facilities that encourage bicycle commuting, including shower facilities, and covered or indoor bicycle parking.	
Goal 5 - Actively promote walking and biking as safe modes of local travel, particularly for children attending local schools.	-170
5.1. Promote traffic calming methods on City streets such as landscaped median barriers and traffic circles.	
5.2. Establish clear and convenient pedestrian rights-of-way with shade and minimal tripping hazards.	
5.3. Incorporate bicycle-friendly intersections and boulevards into street design as recommended by the Bicycle Transportation Plan currently being updated.	
5.4. Promote “Walk pools” or “Walking buses” to increase the number of students who walk to school.	
Goal 6 - Create travel routes that ensure that destinations may be reached conveniently by public transit, bicycling and walking.	-122
6.1. Create a plan to identify and address barriers to safe or	

TABLE 14.1-4 SUMMARY OF TRANSPORTATION AND LAND USE REDUCTION MEASURES (CONTINUED)

Transportation and Land Use Reduction Measure	2020 Metric Tonnes CO _{2e} per year
convenient walking, biking, and transit ridership from major residential areas to public areas of interest and see to the plan's implementation.	
6.2. Make it a condition for approval that new large-scale developments address transit, biking, and walking access to the location.	
Goal 7 - Provide for a shuttle service in order to increase transit ridership.	-1,733
7.1. Establish a shuttle service within the City of San Carlos connecting areas not adequately served by public transit to Caltrain.	
Goal 8 - Promote car sharing programs.	-1,158
8.1. See to the establishment of a car sharing program.	
8.2. Provide parking spaces for car share vehicles at convenient locations accessible by public transportation.	
Goal 9 - Convert more City vehicles to hybrid, electric, alternative fuel, or smaller vehicles.	-59
9.1. Replace 15 traditional automobiles in the City's fleet with hybrid vehicles by 2020.	
Goal 10 - Increase accommodation and promotion of alternatively fueled vehicles and hybrid vehicles.	-49
10.1. Offer prioritized parking for hybrid or alternative fuel cars on City streets.	
10.2. Encourage siting of alternative fueling stations within close proximity to potential customers.	
10.3. Encourage developers to dedicate parking lot spaces to electric vehicle recharging stations.	
Goal 11 - Price on-street parking in high-traffic areas in order to alleviate congestion, increase motorist convenience, reduce VMT, and create a new revenue stream for the City.	-4,576
11.1. Price on-street parking in high-traffic areas in order to alleviate congestion, increase motorist convenience, reduce VMT, and create a new revenue stream for the City.	

TABLE 4.14-5 **SUMMARY OF CAP SOLID WASTE REDUCTION MEASURES**

Solid Waste Reduction Measure	Metric Tons CO _{2e} per year
Goal 1 – Promote zero waste.	-510
1.1. For municipal operations, establish a zero waste policy.	
Goal 2 - Require recycling and composting as a condition of approval for public events.	-255
2.1. Require recycling and composting as a condition of approval for public events.	
Goal 3 - Establish an environmentally preferable purchasing program (EPP) for government operations.	-287
3.1. Create an Environmentally Preferable Purchasing Policy (EPP) for municipal operations.	
Goal 4 - Increase overall waste diversion by at least 1 percent per year.	-6,222
4.1. Increase required Construction and Demolition (C&D) diversion rate beyond the 50% currently required.	
4.2. Provide for expanded recycling outreach and services to multi-family residential buildings, including renter-occupied apartment buildings.	
4.3. Mandate commercial recycling.	

These numbers were derived using a variety of tools and research, including CAPP and EPA’s Waste Reduction Model (WARM) as detailed in the Climate Action Plan and appendices.

- ◆ **Renewable Portfolio Standard.** As described in the Regulatory Setting of this chapter and in the Climate Action Plan, the California Renewable Portfolio Standard (RPS) will require that energy providers deliver a specified percentage of renewable sources. As shown in Table 4.14-2, implementation of this law will result in a reduction of 13,834 metric tonnes of CO_{2e} per year by 2020 and a reduction of 31,566 metric tonnes of CO_{2e} per year by 2030. This estimate is based on the assumptions of Ex-

ecutive Order S-14-08 and assumes a 50 percent renewable mix by 2030. Current (2005) mix of renewable energy for PG&E delivered electricity provided by the California Public Utilities Commission.¹²

- ◆ **AB 1493 (Pavley I and II).** As described in the Regulatory Setting of this chapter and in the Climate Action Plan, AB 1493 will result in reduced emissions from new passenger vehicles. As shown in Table 4.14-2, implementation of this bill will result in a reduction of 34,649 metric tonnes of CO_{2e} per year by 2020 and a reduction of 91,978 metric tonnes of CO_{2e} per year by 2030. Percentage reduction in CO_{2e} per model year were derived from California Air Resources Board.¹³
- ◆ **Low Carbon Fuel Standard.** The Low Carbon Fuel Standard (LCFS) is a flexible performance standard designed to accelerate the availability and diversity of low-carbon fuels by taking into consideration the full life-cycle of GHG emissions. As shown in Table 4.14-2, implementation of this bill will result in a reduction of 14,124 metric tonnes of CO_{2e} per year by 2020 and a reduction of 10,304 metric tonnes of CO_{2e} per year by 2030. As assumed in the AB 32 Scoping Plan, the LCFS is expected to reduce the intensity of transportation fuels by 10 percent.¹⁴
- ◆ **Title 24.** The Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24) were established in 1978 in response to a legislative mandate to reduce California's energy consumption. Title 24 contains the regulations that govern the construction of buildings in California. As shown in Table 4.14-2, implementation of this bill will result in a reduction of 2,947 metric tonnes of CO_{2e} per year by 2030. This estimate is based on the recommendations of a recent California Long-Term

¹² California Public Utilities Commission, 2006, *Progress of The California Renewable Portfolio Standard*, ftp://ftp.cpuc.ca.gov/puc/energy/electric/renewable_energy/rps_leg_report_oct_2006_vjb.pdf.

¹³ California Air Resources Board, 2008, *Comparison of Greenhouse Gas Reductions for the United States and Canada Under U.S. Café Standards and California Air Resources Board Greenhouse Gas Regulations*, Table 11, page 13.

¹⁴ CARB, 2008, *AB 32 Scoping Plan*, page 14.

Energy Efficiency Plan that recommended Title 24 standards be updated to require all new residential buildings will be zero net energy by 2020.

There is the potential that there could be further improvements in technology and efficiency that could take effect by the General Plan horizon year of 2030. Therefore, these mitigation measures may underestimate the full reductions that are likely to occur during the lifetime of the Draft 2030 General Plan.

c. Greenhouse Gas Inventory Modeling Results

Based on the results of the model, year 2020 emissions under the Draft 2030 General Plan and CAP would be approximately 15 percent lower than existing conditions in 2005 as shown in Table 4.14-2. Additionally, 2030 emissions under the Draft 2030 General Plan and CAP would be approximately 35 percent lower than existing conditions in 2005.

Table 4.14-6 details the emissions in each emission reduction goal for 2020 and 2030 conditions under the Draft 2030 General Plan and the Climate Action Plan.

Buildout under the Draft 2030 General Plan, with assumed mitigating factors, would result in 2030 emissions of 173,408 tonnes of CO₂e, a reduction of 93,829 tonnes from the annual 2005 emissions under existing conditions. The largest component of 2030 emissions would be from the transportation sector, accounting for 42.8 percent of total 2030 emissions. Commercial/industrial uses would contribute approximately 36.9 percent of total 2030 emissions.

The 2020 and 2030 emissions under the Draft 2030 General Plan would be lower than existing conditions for the residential, commercial/industrial, transportation and waste sectors. These reductions are in large part the result of the goals and implementation measures included in the Climate Action Plan, which functions as an extension of the Draft 2030 General Plan.

TABLE 4.14-6 SAN CARLOS GREENHOUSE GAS EMISSIONS INVENTORY,
2020 AND 2030

Sector	2020 Metric Tonnes CO _{2e} per year	2020 Percent of Total Emissions	2030 Metric Tonnes CO _{2e} per year	2030 Percent of Total Emissions
Residential	42,726	18.7%	27,868	16.1%
Commercial/ Industrial	62,598	27.4%	63,962	36.9%
Transportation	114,232	50.0%	74,216	42.8%
Waste	9,047	4.0%	7,362	4.2%
Total	228,603	100.0%*	173,408	100.0%

* Due to rounding, percentages do not add up to 100%.
Source: PMC, 2009.

for the purposes of a CEQA threshold of significance and mitigation for climate change within San Carlos.

Under the Draft 2030 General Plan, San Carlos would meet the CAP reduction target of reducing GHG emissions by 15 percent below 2005 levels by 2020 and by 35 percent by 2030.

As a result, implementation of the Draft 2030 General Plan and Climate Action Plan would result in a *less-than-significant* impact with regard to GHG emissions.

F. Impacts and Mitigation Measures

Following implementation of the goals, policies, and implementation measures included in the Draft 2030 General Plan and Climate Action Plan, no impacts were found to be significant; therefore, no additional mitigation measures are required.