APPENDIX K
GREENHOUSE GAS EMISSIONS INVENTORY

COUNTY OF SAN DIEGO

DRAFT 2009 GREENHOUSE GAS EMISSIONS INVENTORY

LAND USE AND ENVIRONMENT GROUP

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I. INTRODUCTION

Greenhouse Gases (GHGs) and climate change have been at the center of a widely contested political, economic, and scientific debate surrounding global climate change (GCC). Although the conceptual existence of GCC is generally accepted, the extent that GHGs contribute to it remains a source of debate. The State of California has been at the forefront of developing solutions to address GCC. GCC refers to any significant change in measures of climate, such as average temperature, precipitation, or wind patterns over a period of time. Climate change may result from natural factors, natural processes, and human activities that change the composition of the atmosphere and alter the surface and features of the land. Significant changes in global climate patterns have recently been associated with global warming, an average increase in the temperature of the atmosphere near the Earth's surface, attributed to accumulation of GHG emissions in the atmosphere. GHGs trap heat in the atmosphere, which in turn heats the surface of the Earth. Some GHGs occur naturally and are emitted to the atmosphere through natural processes, while others are created and emitted solely through human activities. The emission of GHGs through the combustion of fossil fuels (i.e., fuels containing carbon) in conjunction with other human activities, appears to be closely associated with global warming.

State law defines GHG to include the following compounds: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (Health and Safety Code, section 38505(g).) The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide. When accounting for GHGs, all types of GHGs emissions are expressed in CO_2 equivalents (CO_2e) and are typically quantified in metric tons (MT) or millions of metric tons (MMT). Each individual GHG has variable Global Warming Potential (GWP) and atmospheric lifetime. GWP is a measure of how much a given mass of GHG is estimated to contribute to global warming over a specific time interval. The time interval is defined by the atmospheric lifetime of the GHG, or the average time the molecule stays stable in the atmosphere. The GWP is based on the atmospheric lifetime and the CO_2e which compares the gas in question to that of the same mass of carbon dioxide, which as a GWP of 1. The GWP and atmospheric lifetimes of common GHGs is provided in Table 1.

The purpose of this GHG inventory is to identify the sources and amounts of GHG emissions generated from the County's facilities and operations as well as the emissions of the land uses within the jurisdictional boundaries of the County. This analysis is commonly called a "greenhouse gas inventory". The purpose of an inventory is to create a clear picture of how a community uses fossil fuels and other forms of energy and generates pollutants and waste, and to pinpoint the activities and sectors contributing the most GHGs.

Table 1 - Global Warming Potentials and Atmospheric Lifetimes of Basic GHGs

GHG	Formula	100-year global warming potential*	Atmospheric lifetime (yrs)
Carbon dioxide	CO_2	1	Variable
Methane	CH_4	21	12 ± 3
Nitrous oxide	N_2O	310	120
Sulphur hexafluoride	SF_6	23,900	3 200

* The warming effects over a 100-year time frame relative to other GHGs. (USEPA 2006)

A. POTENTIAL CLIMATE CHANGE ADVERSE EFFECTS

The Climate Change Impact Assessments report, published in 2006 and updated in 2009 by the California Climate Action Team, uses a range of emissions scenarios developed by the IPCC to project a series of potential warming ranges (i.e., temperature increases) that may occur in California during the 21st century. Three warming ranges are identified: lower warming range [3.0 to 5.5 degrees Fahrenheit (^oF)]; medium warming range (5.5 to 8.0^oF); and higher warming range (8.0 to 10.5^oF). The Climate Change Impact Assessments report then presents an analysis of the future projected climate changes in California under each warming range scenario.

According to the report, substantial temperature increases would result in a variety of impacts to the people, economy, and environment of California. These impacts would result from a projected increase in extreme conditions, with the severity of the impacts depending upon actual future emissions of GHGs and associated warming. These impacts are described below. The San Diego Foundation has also prepared a study referred to as Focus 2050 that looks at these issues specifically for the San Diego Region. The Focus 2050 Working Paper and Technical Assessment are now available from the San Diego Foundation.

Public Health

Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, days with weather conducive to O_3 formation are projected to increase by 25 to 35 percent under the lower warming range and 75 to 85 percent under the medium warming range. In addition, if global background O_3 levels increase as is predicted in some scenarios, it may become impossible to meet local air quality standards. An increase in wildfires could also occur, and the corresponding increase in the release of PM2.5 (which can travel long distances depending on wind conditions) could further compromise air quality. The Climate Scenarios report indicates that large wildfires could become up to 55 percent more frequent if GHG emissions are not significantly reduced.

In addition, under the higher warming scenario, Los Angeles and Sacramento, by the year 2100, could experience as many as 100 more days per year with temperatures

above 90°F and 95°F respectively. This is a large increase over historical patterns and approximately twice the increase projected if temperatures remain within or below the lower warming range. Rising temperatures will increase the risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat.

Water Resources

A vast network of reservoirs and aqueducts capture and transport water throughout the State from northern California rivers and the Colorado River. The current distribution system relies on Sierra Nevada mountain snowpack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snowpack, increasing the risk of summer water shortages.

If GHG emissions continue unabated, more precipitation may fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent. Under the lower warming scenario, snowpack losses are expected to be only half as large as those expected if temperatures were to rise to the higher warming range. How much snowpack will be lost depends in part on future precipitation patterns, the projections for which remain uncertain. However, even under the wetter climate projections, the loss of snowpack would pose challenges to water managers, hamper hydropower generation, and could eliminate all skiing and other snow-related recreational activities.

The State's water supplies are also at risk from rising sea levels. An influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion caused by rising sea levels is a major threat to the quality of water within the southern edge of the Sacramento/San Joaquin River Delta. The Delta accounts for a portion of San Diego County's water supply and is a major source of water for the State as a whole.

Agriculture

Increased GHG emissions are expected to cause widespread changes to the agriculture industry, reducing the quantity and quality of agricultural products statewide. Significant reductions in available water supply to support agriculture will impact production. Although higher CO_2 levels can stimulate plant production and increase plant water-use efficiency, California's farmers will face greater water demand for crops and a less reliable water supply as temperatures rise. Crop growth and development will change, as will the intensity and frequency of pest and disease outbreaks. Rising temperatures will likely aggravate O_3 pollution, which will in turn make plants more susceptible to disease and pests and interfere with plant growth.

Plant growth tends to be slow at low temperatures and increase up to a certain point with rising temperatures. Faster growth, however, can result in less-than-optimal development for many crops, thus decreasing the quantity and quality of yield for a

number of California's agricultural products. Products likely to be most affected include wine grapes, fruits and nuts, and milk.

Ecosystems/Habitats

Continued global warming will likely shift the ranges of existing invasive plants and weeds, thus altering competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Should range contractions occur, it is likely that new weed species will fill the emerging gaps. Continued global warming is also likely to increase the populations of many pests, lead to the emergence of new types of pests, and increase pathogen growth rates amongst these pests. The effects of these changes on ecosystems are largely unknown. The potential exists, however, for these changes to have significant impacts on the health of the various ecosystems located in the County and the State.

Moreover, continued global warming will alter natural ecosystems and biological diversity within the State. For example, alpine and sub-alpine ecosystems are expected to decline by as much as 60 to 80 percent by the end of the century as a result of increasing temperatures. The productivity of the State's forests is also expected to decrease as a result of global warming.

Wildland Fires

Global warming is expected to increase the risk of wildfire and alter the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in the lower warming range. However, since wildfire risk is determined by a combination of factors including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform throughout the State. For example, an increase in precipitation (a potential result of a rise in temperatures) could lead to a 30 percent increase in southern California wildfires by the end of the century. In contrast, precipitation decreases could increase wildfires in northern California by as much as 90 percent.

Rising Sea Levels

Rising sea levels, more intense coastal storms, and warmer water temperatures will increasingly threaten the State's coastal regions. Under the higher warming scenario, sea level is anticipated to rise 22 to 35 inches by 2100. Elevations of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.

B. CLIMATE CHANGE POLICIES AND REGULATIONS

All levels of government have some responsibility for the protection of air quality, and each level (Federal, State, and regional/local) has specific responsibilities relating to air quality regulation. GHG emissions and the regulation of GHGs is a relatively new component of air quality.

National and International Efforts

International and Federal legislation have been enacted to deal with climate change issues. In 1988, the United Nations and the World Meteorological Organization established the IPCC to assess the scientific, technical, and socioeconomic information relevant to understanding the scientific basis for human-induced climate change, its potential impacts, and options for adaptation and mitigation. The most recent reports of the IPCC have emphasized the scientific consensus that real and measurable changes to the climate are occurring, that they are caused by human activity, and that significant adverse impacts on the environment, the economy, and human health and welfare are unavoidable.

In October 1993, President Clinton announced his Climate Change Action Plan, which had a goal of returning GHG emissions to 1990 levels by the year 2000. This was to be accomplished through 50 initiatives that relied on innovative voluntary partnerships between the private sector and government aimed at producing cost-effective reductions in GHG emissions. On March 21, 1994, the United States joined a number of countries around the world in signing the United Nations Framework Convention on Climate Change (UNFCCC). Under the Convention, governments agreed to gather and share information on GHG emissions, national policies, and best practices; launch national strategies for addressing GHG emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change.

Recently, the United States Supreme Court declared in the court case of Massachusetts et al. v. Environmental Protection Agency et al., 549 C.S. 497 (2007) that the EPA does have the ability to regulate GHG emissions.

The federal Corporate Average Fuel Economy (CAFE) standard determines the fuel efficiency of certain vehicle classes in the United States. The current standard has remained largely unchanged since 1990. In 2007, as part of the Energy Independence and Security Act of 2007, CAFE standards were increased for new light-duty vehicles to 35 miles per gallon by 2020. These increases in fuel efficiency translate into reductions of GHG emissions. On May 19, 2009 President Obama proposed a new national fuel economy program which adopts uniform federal standards to regulate both fuel economy and GHG emissions while preserving the legal authorities of DOT, EPA and California. Development of this program is underway.

In addition to the national and international efforts described above, many states and local jurisdictions have adopted climate change policies and programs.

State Regulations and Standards

California has been leading the charge on combating climate change through legislation and other initiatives as described below.

Senate Bill 1771 Sher, 2000

Requires the California Energy Commission (CEC) to prepare an inventory of the state's GHG emissions, to study data on global climate change, and to provide government agencies and businesses with information on the costs and methods for reducing GHGs. It also established the California Climate Action Registry to serve as a certifying agency for companies and local governments to quantify and register their GHG emissions for possible future trading systems.

Senate Bill 1078 Sher, 2002

Established a Renewable Portfolio Standard requiring electricity providers to increase purchases of renewable energy resources by 1% per year until they have attained a portfolio of 20% renewable resources.

Assembly Bill 1493 Pavley, 2002

Requires the State Air Resources Board to develop and adopt regulations that achieve the maximum feasible reduction of GHGs from new vehicles primarily used for non-commercial transportation by January 2005. Regulations aimed at on-road transportation emissions (such as this one) will be the primary source of emission reductions of GHGs by the year 2020. Once implemented, emissions from these vehicles are expected to be reduced in San Diego County by 21 percent by 2020.

Executive Order #S-3-05

Executive Order #S-3-05, signed by Governor Schwarzenegger on June 1, 2005, calls for a reduction in GHG emissions to 1990 levels by 2020 and for an 80 percent reduction in GHG emissions by 2050. Executive Order #S-3-05 also calls for the California EPA (CalEPA) to prepare biennial science reports on the potential impact of continued global warming on certain sectors of the California economy. The first of these reports was published in 2006. The second is currently in draft form and available on the California Climate Action Team Reports website (http://www.climatechange.ca.gov/publications/cat/index.html).

Assembly Bill 32 Nunez and Pavley, the California Climate Solutions Act of 2006[1]

In September 2006, Governor Arnold Schwarzenegger signed AB 32, the California Climate Solutions Act of 2006, into law. In general, AB 32 directs the CARB to do the following:

[1] Health and Safety Code Section 38500 *et seq*.

- Make publicly available a list of discrete early action GHG emission reduction measures that can be implemented prior to the adoption of the statewide GHG limit and the measures required to achieve compliance with the statewide limit;
- Make publicly available a GHG inventory for the year 1990 and determine target levels for 2020;
- On or before January 1, 2010, adopt regulations to implement the early action GHG emission reduction measures;
- On or before January 1, 2011, adopt quantifiable, verifiable, and enforceable emission reduction measures by regulation that will achieve the statewide GHG emissions limit by 2020, to become operative on January 1, 2012, at the latest. The emission reduction measures may include direct emission reduction measures, alternative compliance mechanisms, and potential monetary and non-monetary incentives that reduce GHG emissions from any sources or categories of sources that CARB finds necessary to achieve the statewide GHG emissions limit; and
- Monitor compliance with and enforce any emission reduction measure adopted pursuant to AB 32.

Regarding the first two bullets, CARB has already made available a list of discrete early action GHG emission reduction measures. CARB published a staff report titled *California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit* that determined the statewide levels of GHG emissions in 1990. CARB identified 427 million metric tons of CO_2 as the total statewide aggregated GHG 1990 emissions level and 2020 emissions limit. In December 2008, CARB adopted the Assembly Bill 32 Scoping Plan which contains the main strategies California will use to reduce the GHGs that cause climate change. The scoping plan has a range of GHG reduction actions which include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade system, and an AB 32 cost of implementation fee regulation to fund the program.

Senate Bill 97 Dutton, 2007

Senate Bill 97, enacted in 2007, amends the CEQA statute to clearly establish that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. It directs OPR to develop draft CEQA Guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions" by July 1, 2009 and directs the Resources Agency to certify and adopt the CEQA Guidelines by January 1, 2010. On April 13, 2009, OPR submitted to the Secretary for Natural Resources its proposed amendments to the state CEQA Guidelines. The Natural Resources Agency will conduct formal rulemaking prior to certifying and adopting the amendments.

Executive Order #S-1-07

The Low Carbon Fuel Standard (LCFS) was included in a California Governor's Executive Order that was promulgated in January 2007. This strategy addresses the type of fuel used in vehicles. Efficiency standards affect the total amount of fuel used, whereas the low-carbon fuel standard seeks to reduce the carbon content of the fuel,

therefore reducing GHG emissions even if total fuel consumption is not reduced. The Low-Carbon Fuel Standard has been approved by CARB as a discrete early action item under AB 32 and implementing regulations are currently under development. It is assumed that the effects of the Low-Carbon Fuel Standard would be a 10% reduction in GHG emissions from fuel use by 2020.

Local Regulations and Standards

The General Plan Update is based on smart growth and land planning principles that will reduce Vehicle Miles Traveled (VMT), and thus result in a reduction of GHGs. This will be accomplished by locating future development within and near existing infrastructure. The General Plan Update will result in an implementation plan, with respect to the reduction of GHGs, which will include the following actions:

- Prepare a climate change action plan based on this inventory and emissions reduction targets for GHG emissions from all sources;
- Develop regulations and procedures to encourage the design and construction of new buildings in accordance with "green building" programs; and
- Develop regulations that encourage the use of energy recovery, as well as photovoltaic and wind energy in appropriate areas;

Currently, the County has a number of aggressive outreach and small business assistance programs that promote ways to reduce air and water pollution. This includes a Green Building Program which is designed to educate builders and provide incentives for the incorporation of green building standards (http://www.sdcounty.ca.gov/dplu/greenbuildings.html). Additionally, there are outreach programs that focus on the importance of reducing air quality impacts (lawn mower trade-in program) and reducing solid waste by recycling (compost bin give always and transfer station events).

The County is also making its own effort to reduce its carbon footprint. The County has various internal policies in place to reduce GHG emissions from County operations.

Board Policy A-106 Water Supply, Conservation and Reclamation

This Policy serves to direct and guide various water-related uses at County facilities and discretionary actions of the Board of Supervisors.

Board Policy B-67 Recycled Products Procurement

This requires that preference be given to products which conform to the Minimum Recycled Content Standards. This includes purchases and is used by the County of San Diego, its contractors, and its grantees in its procurement practices.

Board Policy F-40 Procuring Architectural, Engineering and Related Professional Services
Selecting and contracting with private firms for certain professional services is guided by this policy.

Board Policy F-50 Voluntary Resource-Efficient Guidelines on New Construction and Building Renovation Project
This policy asserts the County's commitment to resource efficient building practices, and provide leadership and guidance in promoting, facilitating, and instituting such practices in the community by establishing voluntary guidelines that support efficient use of materials and resources such as land, water and energy, as well as encourage reuse and recycling during building construction, operation and demolition.

Board Policy G-15 Design Standards for County Facilities and Property
The County has established design standards for County facilities that set forth appropriate techniques, materials, and technology to improve public accessibility, energy performance, resource utilization, and the work environment. In the recent past, several county facilities have either been built to LEED standards or have incorporated renewable energy resources such as photovoltaics.

Board Policy G-16 Capital Facilities and Space Planning
This policy provides a centralized, comprehensive program and responsible agency to manage the capital facilities program and space needs of the County, and; establishes general objectives and standards for the location, design, and occupancy of County-owned or leased facilities, as well as serving as the steward of a Countywide master plan and individual campus plans.

Board Policy H-2 Fleet Vehicle Acquisition Policy
This policy governs the purchase of County vehicles that will increase fuel efficiency, lower emissions, and control costs. It is the intent of this policy to establish vehicle replacement criteria, limit the use of Sport Utility Vehicles (SUVs) to work assignments where they are essential, and to encourage the purchase of both Alternative Fuel Vehicles (AFVs) and Hybrid technology (gasoline/electric) vehicles to increase their percentage of the total County vehicle fleet.

Board Policy H-10 Assignment and Use of County-Owned Vehicles
This policy covers the assignment and utilization of County-owned vehicles. It is the intent of this policy to ensure the most efficient and cost-effective utilization of vehicles required for the County's transportation and operational needs.

Administrative Manual Policy 0050-01-7
This policy provides guidelines for the implementation of the energy conservation element of Board of Supervisors Policy G-15: Design Standards for County Facilities.

II. GHG EMISSIONS INVENTORY

An inventory of GHGs emitted both by the County government facilities and operations (Government Operations Analysis), as well as from land uses within the unincorporated area (Community Analysis) was prepared for this report. Emissions were calculated using two separate methodologies, one for the Government Analysis and another for the Community Analysis. Inventories were calculated for the Government and Community Analysis for the years 1990 and 2006. The overall summary of emissions can be seen in Table 8 below. These detailed results and methodologies are described in the subsequent sections.

A. METHODOLOGIES

Governmental Operations Analysis

The GHG emissions for both the 1990 and 2006 Government Operations Analysis were calculated using the Clean Air & Climate Protection (CACP) software which was developed by the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), the International Council for Local Environmental Initiatives (ICLEI) and Torre Smith Associates. This program was chosen to be used over the Local Government Operations Protocol released in September 2008 due to the lack of detailed data needed to use the newly released protocol. Future inventories will strive to use the new Local Government Operations Protocol.

The CACP software estimates emissions derived from energy consumption and waste generation. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of carbon dioxide equivalent units, or CO_2e. Converting all emissions to carbon dioxide equivalent units allows for the consideration of different GHGs in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of CO_2e.

The emissions coefficients and methodology employed by the 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 GHG Emissions Inventories), the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form1605), and, for emissions generated from solid waste, the U.S. EPA's Waste Reduction Model (WARM).

The CACP software has been and continues to be used by over 250 U.S. local governments to reduce their GHG emissions. However, it is worth noting that, although the software provides a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation rather than an exact value.

The Government Analysis inventory focused on GHG emissions that result from the operation of buildings (electricity and natural gas usage), operation of the County Fleet (gasoline, diesel and natural gas consumption), employee commute, water usage and waste generated. Limited data was available for the 1990 inventory, but where data was not available, back calculations were made using logical assumptions from the 2006 data. More accurate data was available for the 2006 inventory. Detailed assumptions and variables used in calculating GHG emissions for each sector are described below.

Government Buildings

Overall 2006 data for energy and natural gas consumption for the County of San Diego was readily available and provided by San Diego Gas and Electric (SDG&E). In 2006, the County's electricity consumption from all its buildings including buildings and street lights was 115,354,851 kilowatt hours (kWh). The total County operational natural gas consumption for 2006 equaled 2,540,445 therms. The settings in the CACP software were left at default. The grid electricity coefficients were set for the Western Systems Coordinating Council, which is applicable for the State of California. According to the CACP software, the totaled the GHG emissions from the electricity and natural gas consumption equals 54,429 metric tons of CO_2e.

SDG&E did not have County operational data available for electricity and natural gas consumption in 1990. In order to estimate 1990 totals, electricity and natural gas usage were back calculated using a per employee methodology. The 2006 overall electricity consumption was divided by the number of employees (17,573 employees includes non-permanent and part time employees) to get a kWh/employee (6564.32 kWh/employee). The same was done for the therms of natural gas usage. These numbers were then multiplied by the number of employees the County had in 1990 to calculate the total kWh (110,615,409.7 kWh) and therms (2,436,068.9 therms). These numbers were then used in the CACP software for the year 1990 which calculated a total of 48,399 metric tons of CO_2e.

Vehicle Fleet

2006 data on the details of the County's fleet and the amounts of different fuels consumed was available for this inventory. The 1990 data however was limited just to the totals of fuel consumed by the County's fleet. Specifics on the County's fleet was not available so assumptions were made to calculate total GHG emissions. The specifics are discussed in the paragraphs below.

In 2006, the County's consumed 2,675,949 gallons of unleaded gasoline, 383,391 gallons of diesel and 14,315 gallons of natural gas. The details of the vehicle / equipment that compose the County's fleet are in Table 2 below. In order to estimate GHGs for the County fleet using the CACP program, the quantities of fuel used for each applicable vehicle category is necessary. Since this data was not readily available, assumptions for fuel consumption for each applicable vehicle category were made. The most logical method for determining the fuel totals for each vehicle category was to determine the percentages of the vehicle categories compared to the overall fleet for a

fuel type. For example, the CCAP program has a category for Light Truck/SUV/Pickup. In 2006, the County had 494 SUVs and 551 Light Trucks which is a total of 1045 vehicles in this category. There are 3224 vehicles that are assumed to use gasoline or natural gas. The Truck/SUV/Pickup category therefore equals approximately 32.4% of the County's fleet of gasoline engines and would therefore consume approximately 32.4% of the total gasoline consumed in 2006. These percentages were calculated for the applicable CACP vehicle type categories. It was assumed that 100% of the diesel gallons consumed were in the CACP category called heavy trucks and the 100% of the natural gas consumed was applied to the CACP vehicle category called passenger vehicles.

Fuel consumption data for 1990 by the County's fleet was estimated to be 1,976,629.07 gallons of gasoline and 281,690.43 gallons of diesel. The numbers of and types of vehicles in the County's fleet in 1990 are not known. However, the same vehicle type percentages per fuel type were applied to the 1990 fuel totals based on the 2006 percentages. Using this methodology the total CO_2e for the County's fleet in 1990 was estimated at 22,071 metric tons.

Table 2 – 2006 County of San Diego Vehicle Fleet

Vehicle Category	# of Vehicles/Equipment
Sedans	1606
Vans	482
SUVs	494
Light Trucks	551
Med Trucks	79
Heavy Trucks	158
Off-road Construct	245
Moto/ATVs	91
trailers	154
Busses	18
Total Fleet	3,878
Gas Total	**3,224**
Diesel Total	**421**

Employee Commute

In order to get a CO_2e from employee commutes, the CACP software requires either fuel consumption data or vehicle miles traveled (VMT) data for fuel types. Fuel consumption data for employee commute was not readily available. Subsequently calculating total VMT provides a feasible approach to estimating GHGs for this category. According to SANDAG, the region-wide daily average one-way work commute distance in 2006 was 13.3 miles. This was then doubled and then multiplied by the number of employees (17,573) for that year to get a daily amount of 467,442 VMT. There are 5 work days in a week and 52 weeks in a year which equals 260 work

days. The daily VMT was then multiplied by the 260 work days to get a total yearly 121,534,868 VMT from the employee commute.

The CACP software requires that VMT is differentiated into different vehicle type categories for each fuel type. In order to accomplish this certain assumptions had to be made since a ratio of vehicle types of County employees is unknown. It was assumed that 63% of the VMT would be in the passenger vehicle category (the passenger vehicles class is a weighted mix of all sizes of automobile and light pick-up trucks), another 33% would be in the light truck / SUV vehicle category, 2.8% of the VMT from motorcycles and 0.2% from van pools. That constitutes 99% of the VMT which would be used in the gasoline fuel type. The remainder 1% was assumed to be diesel fuel type in the light truck / SUV / Pickup category. Using the aforementioned assumptions the total CO_2e from employee commutes in 2006 was estimated at 72,797 metric tons.

According to SANDAG, the region-wide daily average one-way work commute distance in 1990 was 10.27 miles. Using the same approach in calculating total annual VMT (89,991,080 VMT) and using the same percentages of vehicle mix for the employee commute, the total CO_2e in 1990 was estimated at 63,255 metric tons.

Water

In 2006, the County used 702,488,688 gallons of water as a part of its operations. According to the Demand Response Research Center, Water Supply Related Electricity Demand in California 2006, the embodied energy in water equals 0.0085 kWh/gal. This number multiplied by the total 2006 County water usage equals 5,971,154 kWh. According to the CACP software, that translates to 2,080 metric tons of CO_2e.

Total water consumption data by the County for 1990 was not readily available. Using the 2006 data, a per employee water consumption kWh rate was calculated by dividing the total 2006 kWh from water consumption by the number of 2006 employees (339.79 kWh/employee for water usage). This number was then multiplied by the number of 1990 employees (16,851 employees) for a total 5,725,824.475 kWh from water usage. Using this number the CACP software calculated a total of 1,799 metric tons of CO_2e.

Waste

The CACP model has an entry for total tonnage of waste. However, the waste is further broken down by percentages in the different categories of waste. The following are the categories listed in the CACP software: paper products; food waste; plant debris; wood/textiles; and other waste. Most of the waste generated by the County is paper products from office type work and packaging products. The following percentages of waste were used in the CACP software based on default California waste characterization for public administration from the California Integrated Waste Management Board (1999): 39.4% paper products, 10% food waste, 16.1% plant debris, 6% wood/textiles, and 28.5% other waste. These percentages were used for both the 2006 and 1990 totals.

Data on waste generated by the County and its operations was not readily available. To calculate waste totals in tonnage, a statistic provided by the Office of Federal Environmental Executive of 1.6 lbs./per employee per day. In 2006, there were 17,573 employees which totals to 3,514.6 tons of waste per year. Using the percentages above with "Managed Landfill" as the waste disposal technology used, the total CO_2e from waste was 1,751 metric tons.

In 1990, there were 16,851 employees which totals to 3,370.2 tons of waste per year. Using the percentages above with "Managed Landfill" as the waste disposal technology used, the total CO_2e from waste was 1,680 metric tons.

2020 GHG Forecasts

The CACP software automatically generated the 2020 estimates based on the 1990 and 2006 data inputs. The projected 2020 emissions of GHGs are based on the assumption of business as usual, prior to implementation of reduction measures. The 2020 estimates do have built into them future decreases in tailpipe emissions due to increased fuel efficiency and cleaner engines. Refer to Table 6 for the 2020 GHG emission forecasts.

Community Analysis

The County's Community Analysis portion of this inventory is based on a regional GHG inventory prepared by the University of San Diego School of Law Energy Policy Initiative Center (EPIC) in 2008[2]. This San Diego County Greenhouse Gas Inventory (SDCGHGI), also referred to as the EPIC Study, is a detailed inventory that takes into account the unique characteristics of the region in calculating emissions. The GHG inventory calculated GHG emissions for 14 categories shown in Figure 1 for years 1990 and 2006, with projections out to 2020. To the extent possible the SDCGHGI followed the same calculation methodology used by the CARB to develop the state-wide GHG inventory. However in some instances when doing so would yield more accurate data, the study modified the CARB method.

The County has chosen to use this study as the basis of the Community Analysis GHG Inventory. In many cases, the County would have been using the same base data as the EPIC Study to develop its community analysis. However, that data would have been input into the CCAP model which includes generic values and assumptions for nationwide applicability. Not all of the 14 categories included in the EPIC Study were used for the County's inventory. Those that are not typically included in community inventories or were considered of limited relevance to the unincorporated area were not used.

[2] The document is titled, "San Diego County Greenhouse Gas Inventory: An Analysis of Regional Emissions and Strategies to Achieve AB 32 Targets" and is available online at http://www.sandiego.edu/epic/ghginventory/.

Figure 1 – EPIC Study Emissions Inventory Categories

AGRICULTURE
- Enteric Fermentation
- Manure

CIVIL AVIATION
- Interstate Flights
- Intrastate Flights

ELECTRICITY
- Residential
- Commercial
- Industrial
- Mining
- Agricultural
- Telephone, communications, utilities (TCU)
- Street Lighting

DEVELOPMENT
- Loss of farmland
- Loss of native vegetation

INDUSTRIAL PROCESSES AND PRODUCTS
- HFC refrigerants
- Sulfur hexafluoride
- Other

NATURAL GAS END USES
- Residential
- Commercial
- Industrial
- Mining
- Agricultural

OFF-ROAD EQUIPMENT AND VEHICLES
- Construction and Mining Equipment
- Pleasure Craft
- Industrial Equipment
- Agriculture Equipment
- Other

ON-ROAD TRANSPORTATION
- Passenger Vehicles
- Light-Duty Trucks
- Heavy-Duty Trucks and Vehicles
- Motorcycle

OTHER FUELS/OTHER
- Manufacturing
- Transport
- Residential
- Commercial
- Non-Specified
- Agriculture
- Cogeneration Thermal Emissions

RAIL TRANSPORTATION

SEQUESTRATION FROM LAND COVER
- Forest growth
- Woodland growth
- Chaparral, scrub, and grasslands

WASTE
- Landfills
- Wastewater Treatment

WATER-BORNE NAVIGATION
- Ocean Going Vessels (OGV)
- Harbor Craft

WILDFIRES
- Forest
- Woodlands
- Chaparral, scrub, and grasslands

Totals for the various categories were calculated using either a per capita or per vehicle miles traveled (VMT) approach. The per capita methodology used SANDAG population numbers for the 1990, 2006 and 2020 estimates. Table 3 below shows the population numbers for both the entire region and the unincorporated area of San Diego County for

the years 1990, 2006 and 2020. Detailed methodologies for each sector are discussed below.

Table 3 – SANDAG Population Numbers Used in GHG Estimates

Year	Unincorporated Area	San Diego County
1990	397,763	2,498,016
2006	473,801	3,065,077
2020	627,142	3,635,855

Electricity

According to the SDCGHGI the total CO_2e for the entire region in 2006 was 9 million metric tons (MMT). The electricity sector included all of the following uses when calculating total electricity consumption: residential, commercial, industrial, mining, agriculture, TCU (transportation, communication and utilities), and street lighting. The 2006 population for the entire county, including all jurisdictions, was 3,065,077. This equates to a per capita CO_2e of 2.936 metric tons. This per capita equivalent was then multiplied by the population of the unincorporated area in 2006 (473,801) to get a total of 1,391,224 metric tons of CO_2e for the electricity sector of the unincorporated area.

The 1990 levels were calculated in the same manner. According to the SDCGHGI the total CO_2e for the entire region in 1990 was 6.5 million metric tons. In 1990 the population for the entire county, including all jurisdictions, was 2,498,016. This equates to a per capita CO_2e of 2.6020 metric tons. This per capita equivalent was then multiplied by the population of the unincorporated area in 1990 (397,763) to get a total of 1,035,005.18 metric tons of CO_2e for the electricity sector of the unincorporated area. This same per capita approach was used in calculating the 2020 GHG emission estimates.

The SDCGHGI considered all electricity consumed in the San Diego Region, which include electricity used by commercial (the greatest consumer of electricity), industrial and residential uses. Since most of the commercial uses are found in the incorporated jurisdictions of the County, the per capita approach is very conservative approach and probably overestimates the CO_2e for the unincorporated part of the County.

Similarly, the 2020 forecasts for the unincorporated area were calculated on a per capita approach based on the SDCGHGI 2020 numbers. The total GHG emissions forecasted for the region were divided by SANDAG's projected regional population (3,635,855), and then multiplied by SANDAG's projected population for the unincorporated area (627,142) for a total 1,897,370 MMT of CO_2e.

Waste

The SDCGHGI calculated that the total for the entire region in 2006 from landfill and wastewater treatment was 700,000 metric tons. Using the per capita approach, the average person generated 0.2284 metric tons of CO_2e per year. When multiplied by the population of the unincorporated area for the year 2006, the total for waste was 108,206 metric tons.

The total waste CO_2e in 1990 was actually higher than the 2006 levels at 900,000 metric tons. This was a result of the biogas and landfill gas that have been captured for combustion and electricity production since at least 1997. Using the per capita approach, the average person generated 0.3603 metric tons of CO_2e per year. When multiplied by the population of the unincorporated area for the year 1990, the total for waste was 143,308 metric tons.

The same approach was used to generate 2020 forecasts for the unincorporated area based on the SDCGHGI 2020 numbers. The total GHG emissions forecasted for the region (900,000 metric tons) were divided by SANDAG's projected regional population (3,635,855), and then multiplied by SANDAG's projected population for the unincorporated area (627,142) for a total 155,239 metric tons of CO_2e.

Transportation

In 2006, the total CO_2e emissions related to transportation according to the SDCGHGI was 16 million metric tons (MMT). According to the SDCGHGI, on-road transportation accounted for 46% of the regional GHG emissions in 2006. The referenced analysis used County on-road GHG emission data using EMFAC and calculated emissions using methodology used by CARB to develop the California GHG emissions inventory. The analysis considered CO_2, N_2O and CH_4.

For transportation it was determined that a per capita approach would not be the most accurate approach to estimate the GHG emissions for the incorporated area. Instead a percentage of the total vehicle miles traveled (VMT) approach was used. The total daily VMT for the unincorporated area was divided by the total daily VMT for the entire region to determine the percentage of trips in the unincorporated area of the County (15,922,150/87,144,000 = .1827 = 18.27%). VMT totals were provided by SANDAG. This percentage was then multiplied by the 16 MMT for 2006 to get a total of 2.92 MMT CO_2e emissions associated with transportation.

The 1990 CO_2e total for the transportation sector was calculated in the same manner. The total daily VMT for the unincorporated area was divided by the total daily VMT for the entire region to determine the percentage of trips in the unincorporated area of the County (11,797,07/,61,575,000 = 0.1916 = 19.16%). VMT totals were provided by SANDAG. This percentage was then multiplied by the 14.3 MMT for 1990 to get a total of 2.74 MMT CO_2e emissions associated with transportation. This same approach based on percent of VMT was used in calculating the 2020 GHG emission estimates for on-road transportation.

VMT totals for the unincorporated area were not readily available from SANDAG so the 18.27% was applied to the 2020 GHG totals from the on-road transportation sector of the SDCGHGI to get a total of 3,471,505 MMT of CO_2e for the unincorporated 2020 total.

Off-Road Equipment and Vehicles

In addition to emissions from on-road vehicles such as cars and trucks, off-road equipment and vehicles emit significant GHGs. According to the SDCGHGI, this category was responsible for 1.3 MMT of CO_2e for the entire region in 2006. The main sources in this category are from construction and mining, industrial, pleasure craft, and agriculture. A per capita approach (0.4241 metric tons) was used to calculate the total CO_2e emissions for the unincorporated area for this category, which was estimated at 200,955 metric tons.

The 1990 levels for this category were estimated in the same manner. The 1990 CO_2e total for the entire region was 1 MMT. The GHG emissions for the unincorporated area were estimated using the per capita (0.4003 metric tons) approach and totaled 175,889 metric tons of CO_2e.

The same approach was used in calculating the 2020 GHG emissions. The total GHG emissions forecasted for the region (1.8 MMT of CO_2e) were divided by SANDAG's projected regional population (3,635,855), and then multiplied by SANDAG's projected population for the unincorporated area (627,142) to get a total of 275,981 metric tons of CO_2e.

Natural Gas

It was determined that a per capita approach was appropriate for the natural gas sector. According to the SDCGHGI, the 2006 total CO_2e emissions were 3 MMT resulting from commercial, industrial and residential use of natural gas. Dividing this total by the 2006 population, results in per capita CO_2e emissions of 0.9782 metric tons. When multiplied by the population of the unincorporated area (473,801) the 2006 total CO_2e emissions related to natural gas was 463,741 metric tons.

Similarly, the 1990 levels were estimated using this per capita approach. Surprisingly the total CO_2e emissions related to natural gas consumption in 1990 were the same as 2006 (3 MMT). From 1990 to 2006, there was a decrease in industrial consumption of natural gas and the residential sector did not increase much due to better efficiencies. Using the unincorporated population in 1990, the per capita CO_2e emissions were estimated at 1.2 metric tons. This approach resulted in a total of 477,695 metric tons of CO_2e for the unincorporated area (based on a population of 397,763) related to natural gas in 1990.

The same approach was used in calculating the 2020 GHG emissions. The total GHG emissions forecasted for the region (3.6 MMT of CO_2e) were divided by SANDAG's projected regional population (3,635,855), and then multiplied by SANDAG's projected population for the unincorporated area (627,142) to get a total of 620,957 metric tons of CO_2e.

Other Fuels

Other fuels include distillate (other than in power production), coal (other than in power production), kerosene, gasoline (other than in transportation), LPG, residual fuel oil

(other than in power production), and wood. According to the SDCGHGI, there was no primary data available for this sector at the County level. Therefore, statewide averages were used and scaled down to the San Diego County using appropriate economic activity or population data.

For 2006, the other fuels category was estimated to generate 1.1 MMT of CO_2e. Multiplying the per capita equivalent (0.3587 metric ton) by the population of the unincorporated area in 2006 (473,801 – SANDAG estimate) provides an estimated total of 157,594 metric tons of CO_2e. Estimate of the region wide 1990 emissions of GHG from other fuels were higher than 2006 levels at 1.4 MMT of CO_2e. Multiplying the per capita equivalent for 1990 (0.6405 metric ton) by the population of the unincorporated area in 1990 (397,763) provides an estimated total of 222,924 metric tons of CO_2e.

The same approach was used in calculating the 2020 GHG emissions. The total GHG emissions forecasted for the region (1.3 MMT of CO_2e) were divided by SANDAG's projected regional population (3,635,855), and then multiplied by SANDAG's projected population for the unincorporated area (627,142) to get a total of 224,235 metric tons of CO_2e.

Wildfires

When natural vegetation burns it also releases the carbon that is inherently stored in vegetation. Wildfires are a common occurrence in Southern California. The SDCGHGI has used a summary of yearly fire emissions to estimate average yearly GHG emissions. The large fires in 2003 and in 2007 together released an estimated 14 MMT of CO_2e. However the average estimated CO_2e in 1990 was 200,000 metric tons, for 2006 was 300,000 metric tons and forecasted to be the same (300,000 MMT) in the year 2020. A per capita approach would not be appropriate since there is no correlation to fire. For conservative purposes the entire totals in the SDCGHGI are assumed to be in the County's jurisdiction.

Agriculture (Livestock)

Emissions of GHGs resulting from agricultural operations can occur from various components of what constitutes agriculture. Agriculture operations typically result in the consumption of electricity, natural gas and water, on-road transportation along with the use of off-road equipment. These components of agricultural GHG emissions have been accounted for in the applicable sections of the SDCGHGI. The discussion of GHG emissions from agriculture in this section involves the emissions from enteric fermentation of livestock and manure management. Manure management accounts for 65% of the GHG emissions in this category while enteric fermentation accounts for 35%. There is no primary data that separates location of livestock according to jurisdiction. Since maintaining livestock requires larger land tracts and appropriate zoning, it is a conservative approach to assume the entirety of these emissions fall in the County's jurisdiction.

According to the SDCGHGI, chickens, dairy cows, beef cows, other cows, breeding sheep and hogs were all considered for calculations of GHGs associated with manure

management. When considering enteric fermentation GHG emissions all of the above except for chickens were considered. The estimated emissions from livestock in 1990 were approximately 145,000 metric tons of CO_2e, in 2006 were approximately 65,000 metric tons of CO_2e and forecasts for 2020 are approximately 30,000 metric tons of CO_2e. This large reduction of GHG emissions is associated with a reduction in livestock agriculture in this county.

B. INVENTORY RESULTS

The tables below summarize the CO_2e for the years of 1990, 2006 and 2020 for the County of San Diego operations as well as the unincorporated area which it serves. The GHG emissions for the year 2020 in these tables do not include any reduction measures and are considered to be the "business as usual" emissions.

Table 4 – Government Operations GHG Inventory (metric tons)

	1990		2006		2020	
Category	**CO_2e**	**%**	**CO_2e**	**%**	**CO_2e**	**%**
Buildings	48,399	35.3	54,429	33.9	71,022	40.4
Vehicle Fleet	22,071	16.1	29,719	18.5	29,696	16.9
Employee Commute	63,255	46.1	72,797	45.3	70,201	40
Water	1,799	1.3	2,080	1.3	2,939	1.7
Waste	1,680	1.2	1,751	1.0	1,751	1.0
Totals	**137,204**	100	**160,776**	100	**175,609**	100

Figure 2 – Government Operations GHG Inventory (2006)

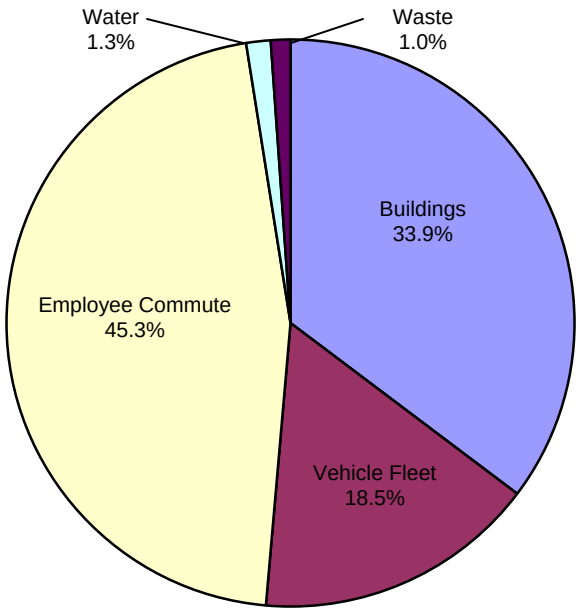

Table 5 – Community GHG Inventory (metric tons)

	1990		2006		2020	
Category	**CO_2e**	**%**	**CO_2e**	**%**	**CO_2e**	**%**
Electricity (includes water usage)	1,035,005	20.1	1,391,224	24.8	1,897,370	27.2
Natural Gas	477,695	9.3	463,741	8.3	620,957	8.9
On-Road Transportation	2,740,000	53.3	2,923,373	52.0	3,471,505	49.8
Off-Road Vehicles & Equipment	175,889	3.4	200,955	3.6	275,981	4.0
Waste	143,308	2.8	108,206	1.9	155,239	2.2
Other Fuels	222,924	4.3	170,039	3.0	224,235	3.2
Wildfire	200,000	3.9	300,000	5.3	300,000	4.3
Agriculture (Livestock)	145,000	2.8	62,000	1.1	30,000	0.4
Total	**5,139,821**	100	**5,619,538**	100	**6,975,287**	100

Figure 3 – Community GHG Inventory (2006)

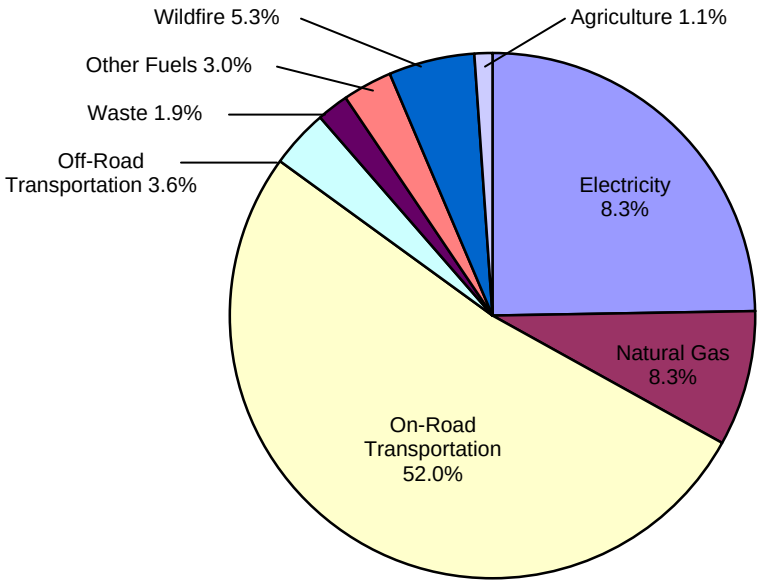

Table 6. Combined Operation and Community GHG Emissions (metric tons of CO_2e)

Category	1990	2006	2020
Government Operations	137,204	160,776	175,609
Community	5,139,821	5,619,538	6,975,287
Total	**5,277,025**	**5,780,314**	**7,150,896**

III. GHG REDUCTIONS AND CONCLUSIONS

The goal of AB 32 is to reduce 2020 emissions to 1990 levels and the Governor has set the target of 80 percent below 1990 levels for 2050.To achieve these levels of GHG emissions for both the County's operations and for the community emissions, a reduction plan will be essential.

A. REDUCTION TARGETS

The County's operational GHG emissions for 2020, assuming no reduction, would total 175,609 metric tons of CO_2e. This is 38,405 metric tons of CO_2e more than the 1990 level of 137,204 metric tons of CO_2e. Even maintaining the baseline levels of 2006 would exceed the 1990 levels by 23,575 metric tons of CO_2. In order for the County to reduce emissions consistent with AB 32, County operations must achieve a 17% reduction in emissions from 2006 emission levels by 2020. Compared to the business as usual 2020 projections, achievement of the 1990 levels represents a 22% reduction.

The community emissions for 2020, assuming no reduction, would total 6,975,287 metric tons of CO_2e. This is 1,835,466 metric tons of CO_2e more than the 1990 level of 5,139,821 metric tons of CO_2e. Maintaining the baseline levels of 2006 would exceed the 1990 levels by 479,717 metric tons of CO_2. In order for the County to reduce emissions consistent with AB 32, the County must achieve a 9% reduction in community emissions from 2006 levels by 2020. Compared to the business as usual 2020 projections, achievement of the 1990 levels represents a 26% reduction.

B. REDUCTION STRATEGIES

General Plan Update Policies

The General Plan takes steps to address the challenging issue of climate change by reducing GHG emissions, retaining and enhancing natural areas, improving energy efficiency, reducing waste, recycling, and managing water use. The General Plan will reduce GHG emissions primarily through minimizing vehicle trips and approving land use patterns that support increased density in areas where there is infrastructure to support it, increased opportunities for transit, pedestrians, and bicycles, and through green building and land development conservation initiatives. Policies also address adaptation to climate change, such as continued wildfire management and protection, monitoring flood hazards, and regional collaboration on biological preservation, water use and supply, and other areas of concern.

The sources, impacts, and solutions to climate changes are complex. Climate change and GHG emissions reduction are addressed in policies and programs from multiple elements of this General Plan rather than in a single section. Table 7 (General Plan Policies Addressing Emissions Reductions) identifies the policies in the San Diego County General Plan that will support reductions in GHG emissions and groups them by seven general strategies.

Table 7. General Plan Policies Addressing Emissions Reductions

Strategy A-1: Reduce vehicle trips generated, gasoline/energy consumption, and greenhouse gas emissions		
Land Use	LU-1.4	Leapfrog Development
	LU-1.5	Development Patterns
	LU-1.6	Village Expansion
	LU-3.3	Complete Neighborhoods
	LU-5.1	Reduction of Vehicle Trips within Communities
	LU-5.2	Sustainable Planning and Design
	LU-5.4	Planning Support
	LU-5.5	Projects that Impede Non-Motorized Travel
	LU-6.4	Sustainable Subdivision Design
	LU-9.5	Village Uses
	LU-9.7	Town Center Planning and Design
	LU-9.8	Village Connectivity and Compatibility with Adjoining Areas
	LU-9.10	Internal Village Connectivity
	LU-10.1	Residential Connectivity
	LU-10.4	Commercial and Industrial Development
	LU-11.1	Location and Connectivity
	LU-11.3	Pedestrian-Oriented Commercial Centers
	LU-11.6	Office Development
	LU-11.8	Permitted Secondary Uses
Mobility	M 1.2	Interconnected Road Network
	M-3.1	Public Road Rights-of-Way
	M-3.2	Traffic Impact Mitigation
	M-4.1	Walkable Village Roads
	M-4.2	Interconnected Local Roads
	M-4.3	Rural Roads Compatible with Rural Character
	M-5.1	Regional Coordination
	M-6.5	Adaptive Reuse of Abandoned Rail Lines
	M-8.1	Transit Service for Transit-Dependent Populations
	M-8.2	Transit Service to Key Community Facilities and Services
	M-8.3	Transit Stops That Facilitate Ridership
	M-8.4	Transit Amenities
	M-8.5	Improved Transit Facilities
	M-8.6	Park and Ride Facilities
	M-8.7	Inter-Regional Travel Modes
	M-9.1	Transportation Systems Management
	M-9.2	Transportation Demand Management
	M-9.3	Preferred Parking
	M-9.4	Park-and-Ride Facilities
	M-10.1	Parking Capacity
	M-10.2	Parking for Pedestrian Activity
	M-10.3	Parking for Pedestrian Activity
	M-10.5	Reduced Parking
	M-10.6	On-Street Parking
	M-11.1	Bicycle Facility Design

	M-11.2	Bicycle and Pedestrian Facilities in Development
	M-11.3	Bicycle Facilities on Roads Designated in the Mobility Element
	M-11.4	Bicycle Network Connectivity
	M-11.5	Funding for Bicycle Network Improvements
	M-11.6	Coordination for Bicycle and Pedestrian Facility Connectivity
	M-11.7	Bicycle and Pedestrian Facility Design
	M-11.8	Coordination with the County Trails Program
	M-12.1	County Trails System
	M-12.2	Trail Variety
	M-12.3	Trail Planning
	M-12.4	Land Dedication for Trails
	M-12.5	Future Trails
	M-12.6	Trail Easements, Dedications, and Joint-Use Agreements
	M-12.7	Funding for Trails
	M-12.8	Trails on Private Lands
Conservation and Open Space	COS-14.1	Land Use Development Form
	COS-14.2	Villages and Rural Villages
	COS-14.3	Sustainable Development
	COS-14.4	Sustainable Technology and Projects
	COS-14.9	Significant Producers of Air Pollutants
	COS-14.10	Low-Emission Construction Vehicles and Equipment
	COS-14.13	Incentives for Sustainable and Low GHG Development
	COS-15.1	Design and Construction of New Buildings
	COS-15.2	Upgrade of Existing Buildings
	COS-16.1	Alternative Transportation Modes
	COS-16.2	Single-Occupancy Vehicles
	COS-16.3	Low Emission Vehicles
	COS-21.5	Connections to Trails and Networks
	COS-23.2	Regional Coordination
Housing	H-1.2	Development Intensity Relative to Permitted Density
	H-1.3	Housing near Public Services
	H-1.4	Special Needs Housing near Complementary Uses
	H-1.5	Senior and Affordable Housing near Shopping and Services
	H-1.6	Land for All Housing Types Provided in Villages
	H-1.7	Mix of Residential Development Types in Villages
Strategy A-2: Reduce non-renewable electrical and natural gas energy consumption and generation (energy efficiency)		
Land Use	LU-5.2	Sustainable Planning and Design
Conservation and Open Space	COS-6.5	Best Management Practices
	COS-14.4	Sustainable Technology and Projects
	COS-14.5	Building Siting and Orientation in Subdivisions
	COS-14.6	Solar Access for Infill Development
	COS-14.7	Alternative Energy Sources for Development Projects
	COS-14.12	Heat Island Effect
	COS-15.1	Design and Construction of New Buildings
	COS-15.2	Upgrade of Existing Buildings
	COS-15.3	Green Building Programs
	COS-15.4	Title 24 Energy Standards
	COS-15.5	Energy Efficiency Audits

Strategy A-3: Increase generation and use of renewable energy sources		
Land Use	LU-4.6	Planning for Adequate Energy Facilities
	LU-5.2	Sustainable Planning and Design
Conservation and Open Space	COS-6.5	Best Management Practices
	COS-14.4	Sustainable Technology and Projects
	COS-14.5	Building Siting and Orientation in Subdivisions
	COS-14.6	Solar Access for Infill Development
	COS-14.7	Alternative Energy Sources for Development Projects
	COS-15.2	Upgrade of Existing Buildings
	COS-15.3	Green Building Programs
	COS-16.4	Alternative Fuel Sources
	COS-17.5	Methane Recapture
	COS-18.1	Alternate Energy Systems
	LU-18.2	Energy Generation from Waste
Strategy A-4: Reduce water consumption		
Land Use	LU-5.2	Sustainable Planning and Design
	LU-6.4	Sustainable Subdivision Design
	LU-6.8	Development Conformance with Topography
Conservation and Open Space	COS-4.1	Water Conservation
	COS-4.2	Drought-Efficient Landscaping
	COS-6.5	Best Management Practices
	COS-14.4	Sustainable Technology and Projects
	COS-14.11	Native Vegetation
	COS-15.1	Design and Construction of New Buildings
	COS-15.2	Upgrade of Existing Buildings
	COS-15.3	Green Building Programs
Strategy A-5: Reduce and maximize reuse of solid wastes		
Land Use	LU-5.2	Sustainable Planning and Design
	LU-6.1	Environmental Sustainability
	LU-6.4	Sustainable Subdivision Design
	LU-16.3	New Waste Management Facilities
Conservation and Open Space	COS-10.7	Recycling of Debris
	COS-14.4	Sustainable Technology and Projects
	COS-15.1	Design and Construction of New Buildings
	COS-15.2	Upgrade of Existing Buildings
	COS-15.3	Green Building Programs
	COS-17.1	Reduction of Solid Waste Materials
	COS-17.2	Construction and Demolition Waste
	COS-17.4	Composting
	COS-17.6	Recycling Containers
	COS-17.7	Material Recovery Program
	COS-18.2	Energy Generation from Waste
Strategy A-6: Promote carbon dioxide consuming landscapes		
Land Use	LU-1.5	Development Patterns
	LU-2.4	Greenbelts to Define Communities
	LU-5.2	Sustainable Planning and Design
	LU-5.3	Rural Land Preservation
	LU-6.1	Environmental Sustainability

	LU-6.2	Reducing Development Pressures
	LU-6.3	Conservation-Oriented Project Design
	LU-6.6	Integration of Natural Features into Project Design
	LU-6.8	Development Conformance with Topography
	LU-7.1	Agricultural Land Development
	LU-7.2	Parcel Size Reduction as Incentive for Agriculture
	LU-9.10	Internal Village Connectivity
Conservation and Open Space	COS-14.4	Sustainable Technology and Projects
	COS-14.11	Native Vegetation
Strategy A-7: Maximize preservation of open spaces, natural areas, and agricultural lands		
Land Use	LU-1.5	Development Patterns
	LU-1.6	Village Expansion
	LU-1.8	Conversion of Public Lands to Private Ownership
	LU-3.3	Complete Neighborhoods
	LU-5.2	Sustainable Planning and Design
	LU-5.3	Rural Land Preservation
	LU-6.1	Environmental Sustainability
	LU-6.2	Reducing Development Pressures
	LU-6.3	Conservation-Oriented Project Design
	LU-6.4	Sustainable Subdivision Design
	LU-6.6	Integration of Natural Features into Project Design
	LU-6.7	Open Space Network
	LU-6.8	Development Conformance with Topography
	LU-7.1	Agricultural Land Development
	LU-7.2	Parcel Size Reduction as Incentive for Agriculture
	LU-9.11	Integration of Natural Features in Villages
	LU-10.2	Development—Environmental Resource Relationship
Mobility	M-2.3	Environmentally Sensitive Road Design
Conservation and Open Space	COS-1.1	Coordinated Preserve System
	COS-1.2	Minimize Impacts
	COS-1.3	Management
	COS-1.4	Collaboration with other Jurisdictions
	COS-1.5	Regional Collaboration
	COS-2.1	Restoration and Enhancement
	COS-2.2	Development Siting and Design
	COS-3.1	Wetland Protection
	COS-3.2	Minimize Impacts of Development
	COS-7.2	Open Space Easements
	COS-14.11	Native Vegetation
	COS-23.2	Regional Coordination
	COS-24.1	Park and Recreation Contributions
	COS-24.2	Funding Opportunities
Housing	H-2.2	Projects with Open Space Amenities in Villages

Implementation Strategies

1. Update the County Green Building Program to increase effectiveness at encouraging development that is energy efficient and conserves resources through incentives and education.

2. Prepare a County Climate Change Action Plan with an updated baseline inventory of GHG emissions from all sources, more detailed GHG emissions reduction targets and deadlines, and comprehensive and enforceable GHG emissions reduction measures. Once prepared, implementation of the plan will be monitored and progress reported on a regular basis.

3. Work with SANDAG to achieve regional goals in reducing GHG emissions associated with land use and transportation.

4. Review traffic operations to implement measures that improve flow and reduce idling such as improving traffic signal synchronization and decreasing stop rate and time.

5. Coordinate with the San Diego County Water Authority and other water agencies to better link land use planning with water supply planning with specific regard to potential impacts from climate change and continued implementation and enhancement of water conservation programs to reduce demand. Also support water conservation pricing (*e.g.,* tiered rate structures) to encourage efficient water use.

6. Implement and expand County-wide recycling and composting programs for residents and businesses. Require commercial and industrial recycling.

7. Incorporate the California ARB's recommendations for a climate change CEQA threshold into the County Guidelines for Determining Significance for Climate Change. These recommendations will include energy, waste, water, and transportation performance measures for new projects in order to reduce GHG emissions. Should the recommendation not be released in a timely manner, the County will prepare its own threshold.

8. Revise County Guidelines for Determining Significance based on the Climate Change Action Plan. The revisions will include guidance for proposed projects to achieve greater energy, water, waste, and transportation efficiency.

9. Coordinate with APCD, SDG&E, and the California Center for Sustainable Energy to research and possibly develop a mitigation credit program. Under this program, mitigation funds will be used to retrofit existing buildings for energy efficiency to reduce GHG emissions.

10. Continue to implement the County Groundwater Ordinance, Watershed Protection Ordinance (WPO), Resource Protection Ordinance (RPO), Multiple

Species Conservation Program (MSCP) and prepare MSCP Plans for North and East County in order to further preserve wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas and other open space that provide carbon sequestration benefits and to restrict the use of water for cleaning outdoor surfaces and vehicles. The WPO also implements low-impact development practices that maintain the existing hydrologic character of the site to manage storm water and protect the environment. (Retaining storm water runoff on-site can drastically reduce the need for energy-intensive imported water at the site.)

11. Revise the Ordinance Relating to Water Conservation for Landscaping to further water conservation to:

    - Create water-efficient landscapes and use water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls.
    - Use reclaimed water for landscape irrigation.
    - Restrict watering methods (e.g., prohibit systems that apply water to non-vegetated surfaces) and control runoff.
    - Provide education about water conservation and available programs and incentives.

12. Continue to coordinate with resource agencies, CALFIRE, and fire districts to minimize potential wildfire risks in the County and to plan for the potential increase in future risk that may result from Climate Change.

13. Continue to implement and revise as necessary the Regional Trails Plan as well as the Community Trails Master Plan to connect parks and publicly accessible open space through shared pedestrian/bike paths and trails to encourage walking and bicycling.

14. Provide public education and information about options for reducing GHG emissions. In addition to addressing land development, education should also address purchasing, conservation, and recycling.

15. Reduce vehicle miles traveled and encourage alternative modes of transportation by implementing the following measures:

    - During Community Plan updates, establish policies and design guidelines that: encourage commercial centers in compact walkable configurations and discourage "strip" commercial development
    - Expand community bicycle infrastructure.
    - Revise the Off-Street Parking Design Manual to include parking placement concepts that encourage pedestrian activity and concepts for providing shared parking facilities.

- Establish comprehensive planning principles for transit nodes such as the Sprinter Station located in North County Metro.
- Continue to locate County facilities near transit facilities whenever feasible.
- Coordinate with SANDAG, Caltrans, and tribal governments to maximize opportunities to locate park and ride facilities.
- Continue to coordinate with SANDAG, Caltrans, and transit agencies to expand the mass transit opportunities in the unincorporated county and to review the location and design of transit stops. Establish a DPLU transit coordinator to ensure land use issues are being addressed.
- Update the Zoning Ordinance to require commercial, office, and industrial development to provide preferred parking for carpools, vanpools, electric vehicles, and flex cars.

16. Develop and implement a Strategic Energy Plan to increase energy efficiency in existing County buildings and set standards for any new County facilities that will ultimately reduce GHG emissions. This will include implementation of the following measures as will be detailed within the Plan:
    - Improve energy efficiency within existing operations through retrofit projects, updated purchasing policies, updated maintenance/operations standards, and education.
    - Improve energy efficiency of new construction and major renovations by applying design criteria and participating in incentive programs.
    - Provide energy in a reliable and cost-effective manner and utilize renewable energy systems where feasible.
    - Monitor and reduce energy demand through metering, building controls, and energy monitoring systems.
    - Increase County fleet fuel efficiency by acquiring more hybrid vehicles, using alternative fuels, and by maintaining performance standards for all fleet vehicles.
17. Develop and implement a County Operations Recycling Program. This will include implementation of the following measures as will be detailed within the Program:
    - Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).
    - Provide interior and exterior storage areas for recyclables and green waste and adequate recycling containers located in public areas.
    - Recover by-product methane to generate electricity.
    - Provide education and publicity about reducing waste and available recycling services.

18. Develop and implement a County Operations Water Conservation Program.

C. PROJECTED REDUCTIONS AND ASSUMPTIONS

Tables 9 and 10, show the projected emission reductions associated with each category of the County's inventory. These reductions are based on general assumptions described below related to the implementation of the above General Plan policies and implementation strategies, as well as other efforts occurring at the state and regional levels. The Greenhouse Gas Reduction/Climate Action Plan, which will be prepared as an implementation strategy, will further detail the County's GHG emissions and how those reductions will occur. All reductions in the following sections are based on the 2020 business as usual projection.

County Operations Reductions

A reduction of approximately 29,200 metric tons of CO_2e associated with County buildings was calculated for implementation of the County Strategic Energy Plan which aims to reduce annually energy consumption by 1 percent on a kBTU/Square Foot/Year.

GHG emission reductions from the County fleet will occur through lower emissions fuels, hybridization and more efficient vehicles replacing older vehicles, along with an increase of the use of alternatively fueled vehicles. Table 9 includes a reduction of 7,000 metric tons of CO_2e, approximately a 25% reduction. This takes into consideration the 22% reduction of GHG emissions from the implementation of CAFE standards and the low carbon fuel standard (LCFS). The additional 3% reduction included in this analysis takes into consideration the hybridization of the County Fleet along with the increased use of alternative fuels. This conversion of the County Fleet is supported by County policy and the County's Energy Strategy and will likely occur faster than assumed.

Employee commute emissions have been reduced by 22% based on the CAFE standards and LCFS, as discussed above. Further reductions are anticipated (but not included) from the County's policies to promote carpools, transit use, and alternative forms of transportation, as well as use of telecommuting and satellite offices.

General estimates were made for the water and waste reductions that are included in Table 9. The estimates assume greater implementation of the County's policies to retrofit toilets and faucets for low to zero water use and to alter landscaping to reduce consumption. For waste, the estimate assumes a formalized recycling program for all County operations.

Table 9. County Operation Estimated GHG Emissions Reductions (metric tons of CO_2e)

Category	2020 Business - as-Usual	Assumed Reductions	2020 with Reductions	1990 Estimates
Buildings	71,022	-29,199	41,823	48,399
Vehicle Fleet	29,696	-7,424	22,272	22,071
Employee Commute	70,201	-15,444	54,757	63,255
Water	2,939	-1,000	1,939	1,799
Waste	1,751	-500	1,251	1,680
Total	**175,609**	**-53,567**	**122,042**	**137,204**

Community Reductions

Table 10, shows the projected emission reductions associated with each section in the community category. GHG emission reductions associated with electricity and water usage were estimated based on both region wide initiatives such as achieving the Renewable Portfolio Standard goals, replacement of plants, purchase of cleaner fossil fuel electricity and an increase in region wide cogeneration capacity. A 22% reduction was included which is equivalent to the GHG reductions that would occur (according to the EPIC Study) with the implementation of the 20% renewable portfolio standard for a savings of 417,421 metric tons of CO_2e. An additional 6% (113,842 metric tons of CO_2e) is reduced with inclusion of replacing the Boardman Contract, the California solar initiative, increase cogeneration (combined heat and power) by 200 megawatts (MW) on a regional level consistent with the EPIC Study strategies. A 10% reduction in per capita electricity consumption was also included consistent with the EPIC Study which translates to a 9% reduction in CO_2e or 170,763 metric tons. A number of the County's policies and implementation measures, in addition to other State and regional programs and standards, will support achievement of this reduction.

GHG emissions related to natural gas were only reduced by 8%, consistent with the EPIC Study. As discussed in the study, the 8% reduction correlates with a mid-range scenario for an SDG&E service area energy efficiency program. The CPUC's policy for all new construction to be zero net energy by 2020 supports that such a program, or other similar programs, are likely to be funded.

Almost 50% of the GHG emissions in the County of San Diego are a result from on-road transportation. Although the County has no jurisdiction over vehicle emissions, certain land use decisions can contribute to a reduction in vehicle miles traveled. The unincorporated area, however, has only a very limited ability to link future development to public transportation because the majority of its lands are located away the urban areas that have the access to public transportation. The proposed General Plan Update focuses the growth in village centers. These higher density neighborhoods with

pedestrian-oriented commercial centers will provide a focal point for commercial and civic life, which will also help reduce vehicle miles traveled. However, such reductions are difficult to quantify and are therefore not included at this time.

The reductions associated with on-road transportation emissions assume a 22% reduction similar to the government operations for CAFE standards and the low carbon fuel standard. Additional reductions are anticipated associated with implementation of the requirements set forth in SB 375, which requires metropolitan planning organizations (MPOs) to include sustainable communities strategies (SCS), as defined in their regional transportation plans (RTPs) for the purpose of reducing GHG emissions, aligns planning for transportation and housing, and creates specified incentives for the implementation of the strategies. Additional reductions will also be achieved as the use of hybrid and alternative fuel vehicles rises with are reflected with a additional 4% reduction. Several County programs and policies will support this increased use through incentives and facilitating the deployment of necessary infrastructure.

Off-road vehicle and equipment emissions were reduced by 37.5% incorporating two of the reductions strategies from the EPIC Study. The low carbon fuel standard accounted for a reduction of 12.5% and increased fuel economy of vehicles and equipment accounted for a reduction of 25%.

For waste, the EPIC study assumed a 33% reduction in GHG emissions from a 13% increase in the capture of landfill gas. This reduction does not account for other reductions that will likely be achieved through the County's policies and efforts to encourage recycling and diversion of waste from the landfills.

Other fuels were reduced by 25% with the assumption that manufacturing resulted in the majority of the emissions. State regulatory programs to control emissions from point sources are anticipated to be the primary driver of these reductions.

D. CONCLUSIONS

As shown above, achievement of the reductions in GHG emissions for the County required by AB 32 is possible. While the above calculated reductions rely heavily on existing and anticipated State programs and mandates, regional efforts, or other action by entities outside the control of the County of San Diego, the County maintains a significant role in supporting the needed reductions in order to meet its target.

County programs that will have the greatest effect in its operations and the community at large are those related to reducing vehicle miles traveled, increased use in hybrid and alternative fuel vehicles, and energy efficiency of new and existing homes and businesses. The County's General Plan Update goals and policies and implementing programs support these concepts and many more. Further, planning and analysis will assist the County in better identifying and tracking the effectiveness of its programs.

Through the creation of a Greenhouse Gas Reduction/Climate Action Plan, programs can be more thoroughly defined, quantified, prioritized, and tracked.

Table 10. Community Projected GHG Emissions Reductions for Unincorporated County

Category	2020 Business - as-Usual	Assumed Reductions	2020 with Reductions	1990 Estimates
Electricity (includes water usage)	1,897,370	-702,026	1,195,344	1,035,005
Natural Gas	620,957	-49,676	571,281	477,695
On-Road Vehicles	3,471,505	-902,591	2,568,914	2,740,000
Off-Road Vehicles & Equipment	275,981	-103,493	172,488	175,889
Waste	155,239	-51,229	104,010	143,308
Other Fuels	224,235	-56,059	168,176	222,924
Wildfire	300,000	--	300,000	200,000
Agriculture (Livestock)	30,000	--	30,000	145,000
Total	**6,975,287**	**-1,865,074**	**5,110,213**	**5,139,821**

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