4.6 GREENHOUSE GAS EMISSIONS

4.6.1 Setting

a. Climate Change and Greenhouse Gases. Global climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans along with other significant changes in climate (such as wind patterns, precipitation, and storms) over an extended period of time. The term "global climate change" is often used interchangeably with the term "global warming," but "global climate change" is preferred to "global warming" because it helps convey that there are other changes in addition to rising temperatures. The baseline, against which these changes are measured, originates in historical records identifying temperature changes that have occurred in the past, such as during previous ice ages. The global climate is continuously changing, as evidenced by repeated episodes of substantial warming and cooling documented in the geologic record. The rate of change has typically been incremental, with warming or cooling trends occurring over the course of thousands of years. The past 10,000 years have been marked by a period of incremental warming, as glaciers have steadily retreated across the globe. However, scientists have observed acceleration in the rate of warming during the past 150 years. Per the United Nations Intergovernmental Panel on Climate Change (IPCC, 2007), the understanding of anthropogenic warming and cooling influences on climate has led to a high confidence (90% or greater chance) that the global average net effect of human activities since 1750 has been one of warming. The prevailing scientific opinion on climate change is that most of the observed increase in global average temperatures, since the mid-20th century, is likely due to the observed increase in anthropogenic GHG concentrations (IPCC, 2007).

Gases that absorb and re-emit infrared radiation in the atmosphere are called greenhouse gases (GHGs). GHGs are present in the atmosphere naturally, are released by natural sources, or are formed from secondary reactions taking place in the atmosphere. The gases that are widely seen as the principal contributors to human-induced global climate change include carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), flourinated gases such as hydroflourocarbons (HFCs) and perflourocarbons (PFCs), and sulfur hexaflouride (SF_6). Water vapor is excluded from the list of GHGs because it is short-lived in the atmosphere and its atmospheric concentrations are largely determined by natural processes, such as oceanic evaporation.

GHGs are emitted by both natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices and landfills. Man-made GHGs, many of which have greater heat-absorption potential than CO_2, include fluorinated gases and sulfur hexafluoride (SF_6) (California Environmental Protection Agency [CalEPA], 2006). Different types of GHGs have varying global warming potentials (GWPs). The GWP of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified timescale (generally, 100 years). Because GHGs absorb different amounts of heat, a common reference gas (CO_2) is used to relate the amount of heat absorbed to the amount of the gas emissions, referred to as "carbon dioxide equivalent" (CO_2E or CDE), and is the amount of a GHG emitted multiplied by its GWP. Carbon dioxide has a GWP of one. By

contrast, methane (CH_4) has a GWP of 21, meaning its global warming effect is 21 times greater than carbon dioxide on a molecule per molecule basis.

The accumulation of GHGs in the atmosphere regulates the earth's temperature. Without the natural heat trapping effect of GHG, Earth's surface would be about 34° C cooler (CalEPA, 2006). However, it is believed that emissions from human activities, particularly the consumption of fossil fuels for electricity production and transportation, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

Greenhouse Gas Inventory – Statewide and Worldwide. Worldwide anthropogenic emissions of GHG were approximately 40,000 million metric tons (MMT) CO_2E in 2004, including ongoing emissions from industrial and agricultural sources, but excluding emissions from land use changes (i.e., deforestation, biomass decay) (IPCC, 2007). CO_2 emissions from fossil fuel use accounts for 56.6% of the total emissions of 49,000 million metric tons CO_2E (includes land use changes) and all CO_2 emissions are 76.7% of the total. Methane emissions account for 14.3% of GHG and N_2O emissions for 7.9% (IPCC, 2007).

Total U.S. GHG emissions were 7,282 million metric tons CO_2E in 2007 (DOE EIA, December 2008), or about 14% of worldwide GHG emissions. U.S. emissions rose by 16.7% from 1990 to 2007. The residential and commercial end-use sectors accounted for 17% and 15%, respectively, of CO_2 emissions from fossil fuel combustion in 2007 (DOE EIA, December 2008). Both sectors rely heavily on electricity for meeting energy demands, with 72% and 79%, respectively, of their emissions attributable to electricity consumption for lighting, heating, cooling, and operating appliances. The remaining emissions were due to the consumption of natural gas and petroleum for heating and cooking.

Based upon the California Air Resources Board (ARB) *California Greenhouse Gas Inventory for 2000-2008* (http://www.arb.ca.gov/cc/inventory/data/data.htm), California produced 478 MMT CO_2E in 2008. The major source of GHG in California is transportation, contributing 37% of the state's total GHG emissions. Electricity generation is the second largest source, contributing 24% of the state's GHG emissions (California Energy Commission [CEC], June 2010). California emissions are due in part to its large size and large population compared to other States. By contrast, California had the fourth lowest CO_2 emissions per capita from fossil fuel combustion in the country in 2004, due in part to the success of its energy-efficiency and renewable energy programs and commitments that have lowered the state's GHG emissions rate of growth by more than half of what it would have been otherwise (CEC, 2006). Another factor that reduces California's per capita fuel use and GHG emissions, as compared to other states, is its relatively mild climate. ARB staff has projected statewide unregulated GHG emissions for the year 2020, which represent the emissions that would be expected to occur in the absence of any GHG reduction actions, will be 596 MMT CO_2E (ARB, 2007).

Greenhouse Gas Inventory – San Luis Obispo County. As part of adoption of the Conservation and Open Space Element (COSE) in 2010, the Board of Supervisors also approved the 2006 Baseline Greenhouse Gas (GHG) Emissions Inventory. The inventory found that unincorporated San Luis Obispo County emitted approximately 917,953 metric tons (MT) of carbon dioxide equivalent (CO_2E) in calendar year 2006. The inventory identifies the primary sources of GHGs within the unincorporated County. Not surprisingly, the figures are in relative alignment with the California-wide estimates. The largest contributor towards greenhouse gases

in the County is the transportation sector, at 40 percent. Commercial/industrial energy use and residential energy use ranked second (24 percent) and third (15 percent), respectively. On November 22, 2011, the County adopted a Climate Action Plan, which will identify actions the County should undertake to reduce the growth in emissions of greenhouse gases over the next 25 years.

Effects of Global Climate Change. Globally, climate change has the potential to affect numerous environmental resources through potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. A warming of about 0.2°C (0.36°F) per decade is projected, and there are identifiable signs that global climate change could be taking place, including substantial ice loss in the Arctic (IPCC, 2007).

According to the California Energy Commission's (CEC) Draft Climate Action Team Biennial Report, potential impacts in California of global climate change may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CEC, March 2009). Below is a summary of some of the potential effects reported by an array of studies that could be experienced in California as a result of climate change.

Air Quality. Higher temperatures, which are conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter, rather than drier conditions, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thereby ameliorating the pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (CEC, March 2009).

Water Supply. Uncertainty remains with respect to the overall impact of global climate change on future water supplies in California. Studies have found that, "considerable uncertainty about precise impacts of climate change on California hydrology and water resources will remain, until we have more precise and consistent information about how precipitation patterns, timing, and intensity will change" (California Department of Water Resources [DWR], 2006). For example, some studies identify little change in total annual precipitation in projections for California (California Climate Change Center [CCCC], 2006). Other studies show significantly more precipitation (DWR, 2006). Even assuming that climate change leads to long-term increases in precipitation, analysis of the impact of climate change is further complicated by the fact that no studies have identified or quantified the runoff impacts that such an increase in precipitation would have in particular watersheds (CCCC, 2006). Also, little is known about how groundwater recharge and water quality will be affected (Ibid.). Higher rainfall could lead to greater groundwater recharge, although reductions in spring runoff and higher evapotranspiration could reduce the amount of water available for recharge (Ibid.).

The California Department of Water Resources (DWR) (2006) report on climate change and effects on the State Water Project (SWP), the Central Valley Project, and the Sacramento-San Joaquin Delta concludes that "[c]limate change will likely have a significant effect on California's future water resources… [and] future water demand." DWR also reports that "much uncertainty about future water demand [remains], especially [for] those aspects of future demand that will be directly affected by climate change and warming. While climate change is expected to continue through at least the end of this century, the magnitude and, in some cases, the nature of future changes is uncertain" (DWR, 2006).

This uncertainty serves to complicate the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood (DWR, 2006). DWR adds that "[i]t is unlikely that this level of uncertainty will diminish significantly in the foreseeable future." Still, changes in water supply are expected to occur, and many regional studies have shown that large changes in the reliability of water yields from reservoirs could result from only small changes in inflows (Kiparsky, 2003; DWR, 2006; Cayan, 2006, Cayan, D., et al, 2006).

Hydrology. As discussed above, climate changes could potentially affect: the amount of snowfall, rainfall, and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise may be a product of climate change through two main processes: expansion of sea water as the oceans warm and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events.

Agriculture. California has a $30 billion agricultural industry that produces half of the country's fruits and vegetables. Higher CO_2 levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase; crop-yield could be threatened by a less reliable water supply; and greater ozone pollution could render plants more susceptible to pest and disease outbreaks. In addition, temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen, and thereby affect their quality (CCCC, 2006).

Ecosystems and Wildlife. Climate change and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. Increasing concentrations of GHGs are likely to accelerate the rate of climate change. Scientists expect that the average global surface temperature could rise as discussed previously: 1.0-4.5°F (0.6-2.5°C) in the next 50 years, and 2.2-10°F (1.4-5.8°C) in the next century, with substantial regional variation. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Sea level could rise as much as two feet along most of the U.S. coast. Rising temperatures could have four major impacts on plants and animals: (1) timing of ecological events; (2) geographic range; (3) species' composition within communities; and (4) ecosystem processes, such as carbon cycling and storage (Parmesan, 2004; Parmesan, C. and H. Galbraith, 2004).

While the above-mentioned potential impacts identify the possible effects of climate change at a global and potentially statewide level, in general scientific modeling tools are currently unable to predict what impacts would occur locally.

b. Regulatory Framework. The following regulations address both climate change and GHG emissions.

International and Federal Regulations. The United States is, and has been, a participant in the United Nations Framework Convention on Climate Change (UNFCCC) since it was produced by the United Nations in 1992. The objective of the treaty is "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." This is generally understood to be achieved by stabilizing global greenhouse gas concentrations between 350 and 400 ppm, in order to limit the global average temperature increases between 2 and 2.4°C above pre-industrial levels (IPCC 2007). The UNFCC itself does not set limits on greenhouse gas emissions for individual countries or enforcement mechanisms. Instead, the treaty provides for updates, called "protocols," that would identify mandatory emissions limits.

Five years later, the UNFCC brought nations together again to draft the *Kyoto Protocol* (1997). The Protocol established commitments for industrialized nations to reduce their collective emissions of six greenhouse gases (carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons) to 5.2% below 1990 levels by 2012. The United States is a signatory of the Protocol, but Congress has not ratified the it and the United States has not bound itself to the Protocol's commitments (UNFCCC, 2007).

The United States is currently using a voluntary and incentive-based approach toward emissions reductions in lieu of the Kyoto Protocol's mandatory framework. The Climate Change Technology Program (CCTP) is a multi-agency research and development coordination effort (led by the Secretaries of Energy and Commerce) that is charged with carrying out the President's National Climate Change Technology Initiative (USEPA, December 2007; http://www.epa.gov/climatechange/policy/cctp.html).

However, recent court cases may change the voluntary approach to address global climate change and greenhouse gas emissions. The U.S. Supreme Court in *Massachusetts et al. v. Environmental Protection Agency et al.* ([2007] 549 U.S. 05-1120) held that the United States Environmental Protection Agency (EPA) has the authority to regulate motor-vehicle GHG emissions under the federal Clean Air Act.

California Regulations. Assembly Bill (AB) 1493 (2002), referred to as Pavley I, requires CARB to develop and adopt regulations to achieve "the maximum feasible and cost-effective reduction of GHG emissions from motor vehicles." On June 30, 2009, EPA granted the waiver of Clean Air Act preemption to California for its greenhouse gas emission standards for motor vehicles beginning with the 2009 model year.

In 2005, Governor Schwarzenegger issued Executive Order S-3-05, establishing statewide GHG emissions reduction targets. Executive Order (EO) S-3-05 provides that by 2010, emissions shall be reduced to 2000 levels; by 2020, emissions shall be reduced to 1990 levels; and by 2050, emissions shall be reduced to 80% of 1990 levels (CalEPA, 2006). In response to EO S-3-05,

CalEPA created the Climate Action Team (CAT), which in March 2006, published the Climate Action Team Report (the "2006 CAT Report") (CalEPA, 2006). The 2006 CAT Report identified a recommended list of strategies that the state could pursue to reduce GHG emissions. These are strategies that could be implemented by various state agencies to ensure that the emission reduction targets in EO S-3-05 are met and can be met with existing authority of the state agencies. The strategies include the reduction of passenger and light duty truck emissions, the reduction of idling times for diesel trucks, an overhaul of shipping technology/ infrastructure, increased use of alternative fuels, increased recycling, and landfill methane capture, etc.

California's major initiative for reducing GHG emissions is outlined in Assembly Bill 32 (AB 32), the "California Global Warming Solutions Act of 2006," signed into law in 2006. AB 32 codifies the Statewide goal of reducing GHG emissions to 1990 levels by 2020 (essentially a 25% reduction below 2005 emission levels; the same requirement as under S-3-05), and requires ARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHGs to meet the 2020 deadline. In addition, AB 32 requires ARB to adopt regulations to require reporting and verification of statewide GHG emissions.

After completing a comprehensive review and update process, the ARB approved a 1990 statewide GHG level and 2020 limit of 427 MMT CO_2E. The Scoping Plan was approved by ARB on December 11, 2008, and includes measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. The Scoping Plan includes a range of GHG reduction actions that may include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms.

Executive Order S-01-07 was enacted on January 18, 2007. The order mandates that a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020.

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In December 2009, the California Resources Agency (Resources Agency) adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts.

Senate Bill (SB) 375, signed in August 2008, enhances the State's ability to reach AB 32 goals by directing ARB to develop regional greenhouse gas emission reduction targets to be achieved from vehicles for 2020 and 2035. SB 375 directs each of the state's 18 major Metropolitan Planning Organizations (MPO) to prepare a "sustainable communities strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the Regional Transportation Plan (RTP). On September 23, 2010 ARB adopted final regional targets. for reducing greenhouse gas emissions in 2020 and 2035.

ARB Resolution 07-54 establishes 25,000 metric tons of GHG emissions as the threshold for identifying the largest stationary emission sources in California for purposes of requiring the annual reporting of emissions. This threshold is just over 0.005% of California's total inventory of GHG emissions for 2004.

For more information on the Senate and Assembly bills, Executive Orders, and reports discussed above, and to view reports and research referenced above, please refer to the following websites: www.climatechange.ca.gov and http://www.arb.ca.gov/cc/cc.htm.

Local Regulations and CEQA Requirements. Pursuant to the requirements of SB 97, the Resources Agency adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions on March 16, 2010. The adopted CEQA Guidelines provide regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents, while giving lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts. To date, the Bay Area Air Quality Management District (BAAQMD), the South Coast Air Quality Management District (SCAQMD), and the San Joaquin Air Pollution Control District (SJVAPCD) have adopted quantitative significance thresholds for GHGs. Quantitative significance thresholds for this topic have not been adopted by the San Luis Obispo APCD (SLOAPCD); however, the County of San Luis Obispo General Plan Conservation and Open Space Element Goal 4 sets forth a countywide GHG emissions reduction target to reduce emissions to 15% below 2006 levels by the year 2020. In addition, Implementation Strategy AQ 4.2.5 requires that the County develop and implement a Climate Action Plan beginning in the year 2010 in order to achieve the reduction target. Pursuant to the requirements of SB 97, the Resources Agency adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions in December, 2009.

In addition, in an effort to guide professional planners, land use officials, and CEQA practitioners, OPR prepared *CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act (CEQA)*. This document offers informal guidance regarding the steps lead agencies should take to address climate change in CEQA documents. This guidance was developed in cooperation with the Resources Agency, Cal EPA, and the ARB.

In addition, on November 22, 2011, the San Luis Obispo County adopted a Climate Action Plan.. The Climate Action Plan includes goals and strategies that the County, residents, visitors, and business owners can implement to reduce their contribution of GHGs into the atmosphere from human-caused activities in San Luis Obispo County in balance with the County's vision for economic growth. The Climate Action Plan provides the community with a comparison of two different scenarios for the future: a business-as-usual scenario of projected GHG emissions, and a second scenario showing projected GHG emissions after the implementation of the Climate Action Plan's GHG reduction measures.

4.6.2 Impact Analysis

a. Methodology and Significance Thresholds. Pursuant to the requirements of SB 97, the Resources Agency adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions in March 2010. These guidelines, in conjunction with guidance from the local APCD discussed below, are used in evaluating the cumulative significance of GHG emissions from the proposed project. According to the adopted CEQA Guidelines, impacts related to GHG emissions would be significant if development facilitated by the proposed program would:

- *Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.* Refer to Impact GHG-1, below.
- *Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.* As described below, since the County has not adopted local thresholds of significance for GHG emissions, the analysis in Impact GHG-1, below, relies on the Bay Area Air Quality Management District' recently-adopted quantitative GHG emissions thresholds (May, 2010).

The vast majority of individual projects do not generate sufficient GHG emissions to create a project-specific impact through a direct influence to global climate change; therefore, the issue of climate change typically involves an analysis of whether a project's contribution towards an impact is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines, Section 15355).

For future projects, the significance of GHG emissions may be evaluated based on locally adopted quantitative thresholds, or consistency with a regional GHG reduction plan (such as a Climate Action Plan). However, because neither the SLOAPCD nor the County of San Luis Obispo has adopted GHG emissions thresholds, and no GHG emissions reduction plan with established GHG emissions reduction strategies has yet been adopted, the proposed Agricultural Cluster Subdivision Program is evaluated based on its compliance with the Bay Area Air Quality Management District's (BAAQMD) recently-adopted quantitative GHG emissions thresholds (May, 2010). The BAAQMD standards are scientifically-based and fully vetted. The BAAQMD is made up of nine counties in the San Francisco Bay Area, which include several counties having similar demographics as San Luis Obispo County in terms of land use patterns, General Plan policies and commute patterns. Because of these similarities, the methodology used by BAAQMD to develop it's GHG emissions significance thresholds, as well as the thresholds themselves, have applicability to San Luis Obispo County and represent the best available interim standards for San Luis Obispo County.

The BAAQMD has set a threshold for stationary sources of 10,000 metric tons CO_2E/year. For projects that are not stationary sources, there are three ways to evaluate significance. First the BAAQMD has set a bright-line threshold of 1,100 metric tons CO_2E/year, and has developed a list of "screening level" standards that can be used to assess whether a project would fall below the 1,100 metric ton limit. Second, a project would not have a significant impact if it is consistent with a local GHG reduction plan that meets the requirements of the State CEQA Guidelines. Third, the BAAQMD has also established two "efficiency" thresholds that are intended to avoid penalizing large projects that incorporate emissions-reducing features and/or that are located in a manner that results in relatively low vehicle miles traveled. These thresholds establish a maximum allowable quantity of emissions per capita or per "service population," defined as residents plus employees. One threshold – 6.6 metric tons CO_2E/year per service population – applies to large, programmatic projects that are comprised of a variety of types of land use-related emissions, such as a General Plan update. A second and lower threshold – 4.6 metric tons CO_2E/year per capita – applies to a project-specific level of review.

In the case of the Agricultural Cluster Subdivision Program, the threshold of 4.6 MT CO_2E is proposed to be used, despite this EIR being programmatic in nature. The rationale for choosing the project-level threshold in a programmatic document is as follows:

- The "plan level" of review referenced in BAAQMD's quantitative thresholds is intended to account for multiple contributing sectors to greenhouse gas emission (e.g. transportation, residential energy, commercial/industrial energy, etc.). As a result, this threshold is appropriate for use on General Plan updates, community plans, specific plans, and other comprehensive long-range plans that affect multiple sectors.
- The Agricultural Cluster Subdivision program affects one type of development in one land use category. Additionally, because the program area and density are defined, the number of residential dwelling units that could be developed as a result of this program is a known quantity. This allows the greenhouse gas analysis to be considered with a level of detail similar to that of a defined project.

Based on these criteria, the proposed Agricultural Cluster Subdivision's contribution to cumulative impacts to GHG emissions and global climate change would be cumulatively considerable if the future development facilitated by the program would produce in excess of 4.6 metric tons CO_2E/year per capita, and is more conservative than using the plan level threshold of 6.6 metric tons.

Study Methodology. Calculations of CO_2, CH_4, and N_2O emissions are provided to identify the magnitude of potential project effects. The analysis focuses on CO_2, N_2O, and CH_4 because these make up 98.9% of all GHG emissions by volume (IPCC, 2007) and are the GHG emissions that the project would emit in the largest quantities. Fluorinated gases, such as HFCs, PFCs, and SF_6, were also considered for the analysis. However, because the program facilitates rural residential development, the quantity of fluorinated gases would not be significant since fluorinated gases are primarily associated with industrial processes. Emissions of all GHGs are converted into their equivalent weight in CO_2 (CO_2E). Minimal amounts of other main GHGs (such as chlorofluorocarbons [CFCs]) would be emitted, and these other GHG emissions would not substantially add to the calculated CO_2E amounts. Calculations are based on the methodologies discussed in the CAPCOA *CEQA and Climate Change* white paper (January 2008) and included the use of the California Climate Action Registry (CCAR) General Reporting Protocol (January 2009).

On-Site Operational Emissions. Operational emissions of CO_2 associated with space heating and architectural coatings were quantified using the URBEMIS 2007 (version 9.2.4) software model. CO_2 emissions associated with electricity generation, as well as N_2O and CH_4 emissions, were quantified using the CCAR General Reporting Protocol (January 2009) indirect emissions factors for electricity use (see Appendix F for calculations). The calculations and emission factors contained in the General Reporting Protocol have been selected based on technical advice provided to the CCAR by the California Energy Commission. This methodology has been subjected to peer review by numerous public and private stakeholders, and in particular by the California Energy Commission, and is recommended by CAPCOA (January 2008). Emissions of CO_2 from transportation sources were quantified using the URBEMIS 2007 (version 9.2.4) computer model based on annual Vehicle Miles Traveled (VMT). N_2O and CH_4 emissions were quantified using the CCAR General Reporting Protocol (January 2009) direct emissions factors

for mobile combustion (see Appendix F for calculations). Total annual mileage was calculated in URBEMIS 2007. Emission rates were based on the vehicle mix output generated by URBEMIS 2007, and the emission factors found in CCAR General Reporting Protocol.

It should be noted that one of the limitations to a quantitative analysis is that emission models, such as URBEMIS, evaluate aggregate emissions and do not demonstrate, with respect to a global impact, what proportion of these emissions are "new" emissions, specifically attributable to the proposed program. For most projects, the main contribution of GHG emissions is from motor vehicles and the total VMT, but the quantity of these emissions appropriately characterized as "new" is uncertain. Traffic associated with a project may be relocated trips from other locales, and consequently, may result in either higher or lower net VMT. In this instance, it is likely that some of the GHG emissions associated with traffic and energy demand would be truly "new" emissions. However, it is also likely that some of the emissions represent diversion of emissions from other locations. Thus, although GHG emissions are associated with the proposed Agricultural Cluster Subdivision Program, it is not possible to discern how much diversion is occurring or what fraction of those emissions represents global increases. In the absence of information regarding the different types of trips generated by the program, the VMT estimate generated by URBEMIS is used as a reasonable worst-case estimate.

The transport and decomposition of landfill waste and the flaring of landfill gas all produce GHG emissions. Decomposition of waste produces methane, a GHG which has a global warming potential over 20 times that of CO_2. The transport of waste from the site of generation to the landfill produces GHG emissions from the combustion of the fuel used to power the vehicle.

Construction Emissions. Emissions of CO_2 from construction were quantified using the URBEMIS 2007 (version 9.2.4) computer model. The URBEMIS 2007 model does not calculate N_2O or CH_4 emissions from construction sources. Therefore, because CO_2 makes up the majority of GHG emissions, it is considered to be a reasonable metric for total construction emissions. Construction emissions are short-term, one-time emissions. However, GCC is a long-term impact based on worldwide concentrations of GHGs. In order to more accurately account for this, construction emissions are amortized over an assumed 20-year planning horizon for the Agricultural Cluster Subdivision Program by dividing construction CO_2 emissions by 20 and adding this result to the annual operational phase emissions.

b. Project Impacts and Mitigation Measures.

Impact GHG-1 **Build-out under the proposed Agricultural Cluster Subdivision Program would accommodate new rural residential units that would generate greenhouse gas emissions and incrementally contribute to climate change. These emissions would represent a substantial reduction compared to the emissions that could result from the existing ordinance. However, the anticipated emissions under build-out of the program would exceed the 4.6 metric tons CO_2E/year per capita threshold compared to existing conditions. Impacts compared to development potential under the existing ordinance would be Class III, *less than significant.* Impacts compared to existing conditions would be Class I, *significant and unavoidable.***

As noted in the inventory methodology, above, a GHG emissions inventory was conducted for the proposed Agricultural Cluster Subdivision Program to identify the magnitude of potential emissions from the program, and represents a reasonable worst-case estimate of emissions from development under the program. These calculations are described below.

Proposed Ordinance: On-Site Operational Emissions. On-site operational emissions include emissions from consumption of electricity and natural gas as part of building operation and heating/cooling. The generation of electricity would occur at power plants, much of which would be generated by the combustion of fossil fuels that yields substantial amounts of CO_2, and to a smaller extent N_2O and CH_4. Operation of development facilitated by the proposed Agricultural Cluster Subdivision Program would consume an estimated 2,926,000 kilowatt-hours [kWh]/year of electricity.

As discussed above, GHG emissions from the generation of electricity can be calculated using emissions factors from the CCAR General Reporting Protocol. CO_2 emissions estimates using the URBEMIS model take into account emissions from operational sources such as natural gas used for space heating. GHG emissions from solid waste disposal are quantified using EPA's Waste Reduction Model (WARM) following the methodology established in CAPCOA's *GHG Quantification Report*. Based on this analysis, solid waste generated by future residents of agricultural cluster subdivisions would increase annual GHG emissions by 90 CO_2E. Table 4.6-1 shows the total operational emissions of GHGs associated with the proposed Agricultural Cluster Subdivision Program, estimated at 2,320 metric tons per year.

Table 4.6-1: Proposed Agricultural Cluster Subdivision Program Annual On-site Operational Emissions of Greenhouse Gases upon Build-out (418 residential units)

Emission Source	Annual Emissions	
	Emissions	CO_2E
Carbon Dioxide (CO_2)[1, 2, 3]	2,405.45 metric tons	2,405.45 metric tons
Methane (CH_4)[2]	0.04 metric tons	0.84 metric tons
Nitrous Oxide (N_2O)[2]	0.01 metric tons	3.33 metric tons
Total On-Site Operational Emissions		**2,409.62 metric tons**

Source:
[1] *Area Source Emissions from URBEMIS 2007 (version 9.2.4).*
[2] *CCAR General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1, January 2009, page 33-40.*
[3] *Based on the EPA's Waste Reduction Model (WARM), the proposed program would generate 90 CO_2E for the disposal of solid waste. This includes both CO_2 and Methane (CH_4) as the primary emissions; however, in this table, these emissions appear in the CO_2 row only because WARM does not provide a breakdown of CO_2 and CH_4 emissions.*
See Appendix F for GHG emission factor assumptions and calculations.

Proposed Ordinance: Emissions from Mobile Combustion. Mobile source GHG emissions were estimated using the total annual VMT estimate generated by the URBEMIS 2007 model (version 9.2.4), increased to account for the distance to URLs that would be allowed (up to five miles), which would result in longer than average trip lengths compared to default model values. The URBEMIS 2007 model estimates that the development facilitated by the proposed Agricultural Cluster Subdivision Program would generate approximately 18,994,235 annual

VMT. Table 4.6-2 shows the estimated mobile emissions of GHGs based on these vehicle miles traveled, estimated at 7,977.87 metric tons per year.

Proposed Ordinance: Construction Emissions. Construction emissions were estimated using the total CO_2 construction emissions generated by the URBEMIS 2007 model. The URBEMIS 2007 model estimated that development potential under the Agricultural Cluster Subdivision Program (418 residential units) would generate 1,133 metric tons of CO_2 emissions, or approximately 51 metric tons of CO_2 per year over a 20-year planning horizon. It should be noted, however, that upon build-out (i.e. once construction of all residences are complete), construction emissions would then be negligible for the remainder of the life of the project. Operational and mobile source emissions, however, would continue to stay stable beyond build-out.

Table 4.6-2: Proposed Agricultural Cluster Subdivision Program Annual Mobile Emissions of Greenhouse Gases upon Build-out (418 new residences)

Emission Source	Annual Emissions	
	Emissions	CO_2E
Carbon Dioxide (CO_2)[1]	7,572.94 metric tons	7,572.94 metric tons
Methane (CH_4)[2]	1.07 metric tons	22.46 metric tons
Nitrous Oxide (N_2O)[2]	1.23 metric tons	382.47 metric ton
Total Mobile Emissions		**7,977.87 metric tons**

Source:
[1] Mobile Emissions from URBEMIS 2007 (version 9.2.4).
[2] California Climate Action Registry General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1,January 2009, page 41-48.
See Appendix F for GHG emission factor assumptions and calculations.

Proposed Ordinance: Combined On-Site Operational, Mobile Source, and Construction Emissions. Table 4.6-3 combines the on-site operational, mobile, and construction GHG emissions associated with full development potential of the proposed Agricultural Cluster Subdivision Program, which would average 5,504.82 metric tons per year of CO_2E, depending on how rapidly build-out occurs. This total represents less than 0.001% of California's 2006 emissions of 480 MMT. These emission projections indicate that the majority of the project GHG emissions are associated with vehicular travel (76%). It should be noted that mobile emissions are in part a redirection of existing travel to other locations, and so may already be a part of the total California GHG emissions.
Table 4.6-3, below, is derived from modeling greenhouse gas emissions for full build-out of the agricultural cluster subdivision program over a 20-year build-out period.[1] The "maximum" represents the amount of annual emissions that would be produced at the end of the 20 year planning period, after the last unit is constructed. The "minimum" represents the amount of emissions that would be produced during the construction of the first unit.

[1] Given the restrictive provisions of the proposed program and the elimination of the density bonus, it is unlikely for the program to reach build-out in less than 20 years. Even under the existing ordinance, which includes up to a 100 percent density bonus for major cluster projects, only 367 units were approved in the past 25 years.

Table 4.6-3: Combined Annual Emissions of Greenhouse Gases, over the Development Life of the Agricultural Cluster Subdivision Program

Emission Source	Annual Emissions (metric tons/year CO_2E)		
	Average	Max	Min
Carbon Dioxide (CO_2)[1, 2, 3]	5,290.04	10,029.78	550.31
Methane (CH_4)[2]	12.23	23.30	1.16
Nitrous Oxide (N_2O)[2]	202.55	385.80	19.29
TOTAL	**5,504.82**	**10,438.88**	**570.76**

Sources:
[1] *Area Source Emissions from URBEMIS 2007 (version 9.2.4).*
[2] *CCAR General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1, January 2009, page 33-40.*
[3] *Based on the EPA's Waste Reduction Model (WARM), the proposed program would generate 90 CO_2E related to the disposal of solid waste. This includes both CO_2 and Methane (CH_4) as the primary emissions; however, in this table, these emissions appear in the CO_2 row only because WARM does not provide a breakdown of CO_2 and CH_4 emissions.*
See Appendix F for GHG emission factor assumptions and calculations.

The thresholds established by the BAAQMD protocol are to be measured in annual metric tons per service population (i.e. per capita). The rationale for this approach is that large development that employ strategic growth should reflect lower greenhouse gas emission rates than developments occurring at lower densities in rural fringe areas. As discussed above, a threshold of 4.6 MT/SP CO_2E is to be used for analysis of the Agricultural Cluster Subdivision Program. Table 4.6-4 estimates the emissions per service population based on a likely 20 year build-out scenario.

Table 4.6-4: Proposed Agricultural Cluster Subdivision Program Combined Annual Emissions of Greenhouse Gases (20-year Build-out)

Statistic	Annual Emissions	Emissions per Capita
Minimum	570.76 MT	0.59 MT
Average	5,504.82 MT	5.68 MT
Maximum	10,438.88 MT	10.77 MT

Sources: Operational Emissions from URBEMIS 2007 (version9.2.4).
California Climate Action Registry General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1, January 2009.

To allow for a comparison of the proposed Agricultural Cluster Subdivision Program with build-out potential under the existing ordinance, the annual emissions associated with the existing ordinance were also calculated. These calculations are described below.

Existing Ordinance: Combined On-Site Operational, Mobile Source, and Construction Emissions
Annual emissions that could occur under the existing ordinance (calculated using the same methodologies as above) are shown in Table 4.6-5.

Table 4.6-5: Existing Ordinance Combined Annual Emissions of Greenhouse Gases

Emission Source	Annual Emissions
Operational	25,427.88 metric tons CO_2E
Mobile	87,451.16 metric tons CO_2E
Construction	418.39 metric tons CO_2E
Project Total	**113,297 metric tons CO_2E**
Per Capita	**10.67 metric tons CO_2E**

Sources: Operational Emissions from URBEMIS 2007 (version9.2.4).
California Climate Action Registry General Reporting Protocol, Reporting Entity-Wide Greenhouse Gas Emissions, Version 3.1, January 2009.

Compared to Development Potential under the Existing Ordinance

The following proposed program revisions would reduce overall development potential in agricultural areas of the county: elimination of minor agricultural clusters, elimination of agricultural cluster subdivision as an option in the RL category, reducing the distance to URLs for agricultural cluster eligibility, elimination of agricultural cluster development associated with properties under Williamson Act contract, and elimination of the density bonus. The result of these revisions would be that 4,163 fewer residential units could be constructed. This represents a 91 percent reduction in build-out compared to the existing ordinance, and a 71.2 percent reduction in greenhouse gas emissions generated by vehicle trips, operations, and construction.

As shown in Table 4.6-5, development potential under the existing ordinance would generate approximately 113,297 metric tons CO_2E per each year. As shown in Table 4.6-4, build-out under the proposed amendments would generate a maximum of 10,439 metric tons CO_2E annually. This difference is attributable to the significant reduction in development potential that would result from the proposed ordinance revisions. The overall impact of the proposed program when compared to development potential under the existing ordinance would be Class III, *less than significant.*

Compared to Existing Conditions

The proposed Agricultural Cluster Subdivision Program would facilitate the development of up to 418 new residential units, which would generate an estimated 969 additional residents (based on an average household size of 2.318 persons [Department of Finance, 2010]). The total volume of GHG emissions anticipated under the Agricultural Cluster Subdivision Program equates to between approximately 0.59 and 10.77 metric tons CO_2E per capita (as shown in Table 4.6-4). Emissions could therefore exceed the 4.6 metric tons CO_2E/year per capita threshold by up to 6.17 metric tons CO_2E per capita.

Mitigation Measures. Although the proposed Agricultural Cluster Subdivision Program would result in fewer impacts compared to potential build-out under the existing agricultural cluster subdivision ordinance, CEQA requires that potential impacts be compared to the existing baseline physical conditions. As noted above, the proposed program would result in potentially significant impacts compared to existing conditions. Mitigation measures AQ-2(a) and AQ-2(b) in

Section 4.2, *Air Quality,* would reduce GHG emissions for projects generating more than 25 pounds-per-day of criteria pollutants. Based on the URBEMIS model used in this analysis, these mitigation measures would be triggered for projects constructing 60 or more new residential units. However, given the proposed 40-acre minimum parcel size, it is not anticipated that any single agricultural cluster project would reach this size.[2] Nevertheless, by the time the first agricultural cluster subdivision is approved, SLOAPCD will have adopted local GHG emission thresholds. Individual agricultural cluster projects will be referred to APCD and will be evaluated against these thresholds. Individual projects that exceed the GHG thresholds will be required to implement SLOAPCD's standard mitigation packages in order to reduce their GHG impacts to less than significant levels.

San Luis Obispo County's Air Pollution Control District has developed standard mitigation measures to reduce GHG emissions for individual development projects. Additionally, both the County and the State are in the process of developing programmatic solutions to address GHG emissions on a regional level. These mitigations are intended to reduce the significance of the impact to the greatest degree feasible:

GHG-1(a) **SLOAPCD Standard Mitigation Measures.** Agricultural cluster subdivisions shall apply all applicable and feasible standard mitigation measures listed in Table 3-5 of the Air Pollution Control District's *2009 CEQA Air Quality Handbook* in order to reduce their project-specific greenhouse gas impacts or contribution towards a cumulative impact to a level of insignificance.

GHG-1(b) **Local Programmatic Solutions.** The County has committed to implementing programmatic solutions over time. While not all of the implementing regulations are presently in place, it is anticipated that implementation will occur within the next three years. The County intends to reduce greenhouse gas emissions from land use sources through the following programs:

- ***Cal Green Code***. The Cal Green Code was put into effect in January 2011. Compliance with this code is required for all new building permits. The code requires consideration of energy and water efficiency in building design. Compliance would reduce electricity consumption beyond what would otherwise be required. The County is also considering crafting a local-based green code to tailor specifications and requirements to our own County's needs.

- ***Climate Action Plan.*** On November 22, 2011, the County adopted a Climate Action Plan, referred to as the "EnergyWise Plan." The Climate Action Plan includes a number of implementing actions that the County and private sector will need to undertake in order to curb the growth in greenhouse gas emissions. Examples include policies encouraging energy conservation, use of renewable energy, reduction

[2] Based on a 40-acre minimum parcel size, a 60-unit agricultural cluster subdivision would require a minimum of 2,400 acres of irrigated agricultural land; yet, the largest single parcel in the project area is 1,709 acres.

of solid waste, strategic implementation of land use and transportation plans, water conservation, and improvement of agricultural practices. The plan will be implemented over time though the adopting of specific implementing ordinances. Because agricultural cluster subdivisions would be developed over a 20 or more year time span, it is likely that most projects would be subject to these provisions.

GHG-1(c) **Statewide Programmatic Solutions.** In order to fulfill explicit mandates from Assembly Bill 32 and Senate Bill 375, the state has had to embark on a number of plans to reduce greenhouse gas emissions on a statewide level. Again, not all of these plans have been completed, but most are underway. Because of the very strict timelines established in Assembly Bill 32, it is reasonable to conclude that new regulations will be forthcoming to help reduce greenhouse gas emissions in the state. It is anticipated that individual cluster subdivision projects occurring as a result of the Agricultural Cluster Subdivision Program would also be subject to one or more state programs to reduce greenhouse gas generation and emission.

- ***Renewable Portfolio Standard (RPS)***. The renewable portfolio standard (RPS) is a standard specifying which percentage of electricity should come from renewable sources by a target date. AB 32 initially set this standard at 20 percent renewable energy by 2012. In April 2011, Governor Jerry Brown signed SB2X into law, which re-establishes California's RPS at 33 percent renewable energy by 2030. This mandate applies to all public and private electricity providers in the state.

- ***Assembly Bill 32 Scoping Plan***. The California Air Resource Board (CARB) is presently developing scoping plan to focus California's actions on reducing greenhouse gas emissions in order to achieve the goals established in Assembly Bill 32 and clarified in Senate Bill 375. Some of the programs proposed for implementation under this draft scoping plan include, but are not limited to, the following:

    - Developing a cap and trade system linked to cap and trade systems in other western state and provincial governments.
    - Reducing emissions from passenger vehicles by: 1) reducing greenhouse gas emissions; 2) reducing carbon content in fuel; and 3) reducing vehicle miles traveled.
    - Increasing energy efficiency requirements for buildings, appliances, and new technologies.
    - Increasing the Renewable Portfolio Standard to 33 percent (*already in effect*).
    - Developing and adopting a low-carbon fuel standard.
    - Developing greenhouse gas emission reduction targets on a regional basis.

- Increasing the efficiency of light-duty vehicles.
- Increasing efficiency of movement of goods, such as requiring ships to use port electricity.
- An incentive program for solar roofs.
- Increasing the efficiency of medium and heavy duty vehicles.
- Inventory and control greenhouse gas emissions from industrial operations.
- Support a statewide high speed rail network.
- Expand the use of green building practices.
- Limit use of high Global Warming Potential (GWP) gases, such as fluorocarbons.
- Reduce methane emissions from landfills by increasing waste diversion, reuse, and commercial recycling.
- Preserve forests for the value in carbon sequestration; consider forests as a source of biomass for energy generation.
- Encourage efficient use of water.
- Consider requiring the use of manure digesters or other forms of methane capture for livestock industries.
- Create incentive programs and encourage voluntary reduction.

GHG-1(d) **Review for Compliance with Air Pollution Control District (APCD).** The Air Pollution Control District has not yet adopted CEQA thresholds for greenhouse gas emissions. Adoption of such thresholds is, however, anticipated within the next year. As each agricultural cluster subdivision goes through the discretionary review process, referrals will be provided to the Air Pollution Control District. Once the thresholds are formally established, the District will be able to identify if a project exceeds impact thresholds for greenhouse gas emissions and recommend mitigation strategies accordingly to reduce impacts as much as practicable. The County continues to use Bay Area Air Quality Management District thresholds in the interim. It is anticipated that the bulk of development that could occur under the Agricultural Cluster Subdivision Program will not be acted on by a Review Authority until the final APCD thresholds are in place. In either circumstance, each project may be evaluated and mitigation may be applied as part of the project-specific environmental review process based on either threshold.

Residual Impacts. When compared to development potential under the existing ordinance, impacts would be Class III, *less than significant,* because overall greenhouse gas emissions would be reduced under this proposal. As illustrated in Table 4.6-4, this program does, however, have the potential to exceed the annual 4.6 MT CO_2E per capita annual emission rate for greenhouse gases. As such, staff anticipates the possibility of a Class I, *significant and unavoidable*, impact pertaining to greenhouse gas emissions.

c. Cumulative Impacts. Cumulative impacts of the proposed Agricultural Cluster Subdivision Program compared to development potential under the existing ordinance and compared to existing conditions are described below.

Compared to Development Potential under the Existing Ordinance

Greenhouse gases and climate change are, by definition, cumulative impacts. Refer to Impact GHG-1 for discussion of climate change and GHG emissions. As noted therein, the program would have Class III, *less than significant,* impacts when compared to development potential under the existing ordinance. Cumulative impacts would therefore also be less than significant.

Compared to Existing Conditions

As noted under Impact GHG-1, the proposed Agricultural Cluster Subdivision Program would have Class I, *significant and unavoidable,* impacts when compared to existing conditions. Cumulative impacts would therefore also be significant and unavoidable.