4.14 CLIMATE CHANGE

This section includes a discussion of existing climate conditions, climate change, and greenhouse gas (GHG) emissions sources in California and Sutter County; a summary of applicable regulations; and a description of potential impacts of the 2030 General Plan related to climate change.

4.14.1 REGULATORY SETTING

GREENHOUSE GAS EMISSIONS

Federal Plans, Policies, Regulations, and Laws

Supreme Court Ruling

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for implementing the Federal Clean Air Act (CAA). The Supreme Court of the United States ruled on April 2, 2007 that carbon dioxide (CO_2) is an air pollutant as defined under the CAA, and that EPA has the authority to regulate GHG emissions. However, there are no federal regulations or policies regarding GHG emissions applicable to the proposed project as of the writing of this document.

EPA Actions

In response to the mounting issue of climate change, EPA has taken actions to regulate, monitor, and potentially reduce GHG emissions.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of carbon dioxide (CO_2) per year. This publically available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost-effective emissions reduction strategies. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases, along with vehicle and engine manufacturers, will report at the corporate level. An estimated 85% of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act

On April 23, 2009, EPA published their Proposed Endangerment and Cause or Contribute Findings for GHGs under the CCA (Endangerment Finding) in the Federal Register. The Endangerment Finding is based on Section 202(a) of the CAA, which states that the Administrator (of EPA) should regulate and develop standards for "emission[s] of air pollution from any class of classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The proposed rule addresses Section 202(a) in two distinct findings. The first addresses whether or not the concentrations of the six key GHGs (i.e., CO_2, methane [CH_4], nitrous oxide [N_2O], hydrofluorocarbons [HFCs], perflurorocarbons [PFCs], and sulfur hexafluoride [SF_6]) in the atmosphere threaten the public health and welfare of current and future generations. The second addresses whether or not the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs and therefore the threat of climate change.

The EPA Administrator proposed the finding that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CAA. The evidence supporting this finding consists of human activity resulting in "high atmospheric levels" of GHG emissions, which are very likely responsible for increases in average temperatures and other climatic changes. Furthermore, the observed and projected results of climate change (e.g., higher likelihood of heat waves, wild fires, droughts, sea level rise, higher intensity storms) are a threat to the public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations.

The EPA Administrator also proposed the finding that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare. The proposed finding cites that in 2006, motor vehicles were the second largest contributor to domestic GHG emissions (24% of total) behind electricity generation (nationwide). Furthermore, in 2005, the U.S. was responsible for 18% of global GHG emissions. Therefore, GHG emissions from motor vehicles and motor vehicle engines were found to contribute to air pollution that endangers public health and welfare.

State Plans, Policies, Regulations, and Laws

Various statewide and local initiatives to reduce the state's contribution to GHG emissions have raised awareness that, even though the various contributors to and consequences of global climate change are not yet fully understood, global climate change is underway, and that there is a real potential for severe adverse environmental, social, and economic effects in the long term. Because every nation emits GHGs and therefore makes an incremental cumulative contribution to global climate change, cooperation on a global scale will be required to reduce the rate of GHG emissions to a level that can help to slow or stop the human-caused increase in average global temperatures and associated changes in climatic conditions.

Statutes

Assembly Bill 1493 (2002)

In 2002, then-Governor Gray Davis signed Assembly Bill (AB) 1493. AB 1493 requires that the California Air Resources Board (ARB) develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles determined by ARB to be vehicles whose primary use is noncommercial personal transportation in the state."

To meet the requirements of AB 1493, in 2004 ARB approved amendments to the California Code of Regulations (CCR) adding GHG emissions standards to California's existing standards for motor vehicle emissions. Amendments to CCR Title 13, Sections 1900 and 1961 (13 CCR 1900, 1961), and adoption of Section 1961.1 (13 CCR 1961.1) require automobile manufacturers to meet fleet-average GHG emissions limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes (i.e., any medium-duty vehicle with a gross vehicle weight rating less than 10,000 pounds that is designed primarily for the transportation of persons), beginning with the 2009 model year.

In December 2004, a group of car dealerships, automobile manufacturers, and trade groups representing automobile manufacturers filed suit against ARB to prevent enforcement of 13 CCR Sections 1900 and 1961 as amended by AB 1493 and 13 CCR 1961.1 (*Central Valley Chrysler-Jeep et al. v. Catherine E. Witherspoon, in Her Official Capacity as Executive Director of the California Air Resources Board, et al.*). The auto-makers' suit in the U.S. District Court for the Eastern District of California, contended California's implementation of regulations that, in effect, regulate vehicle fuel economy violates various federal laws, regulations, and policies.

On December 12, 2007, the Court found that if California receives appropriate authorization from EPA (the last remaining factor in enforcing the standard), these regulations would be consistent with, and have the force of federal law, thus, rejecting the automakers' claim. This authorization to implement more stringent standards in California was requested in the form of a CAA Section 209, subsection (b) waiver in 2005. Since that time, EPA

failed to act on granting California authorization to implement the standards. Governor Schwarzenegger and Attorney General Edmund G. Brown filed suit against EPA for the delay. In December 2007, EPA Administrator Stephen Johnson denied California's request for the waiver to implement AB 1493. Johnson cited the need for a national approach to reducing GHG emissions, the lack of a "need to meet compelling and extraordinary conditions", and the emissions reductions that would be achieved through the Energy Independence and Security Act of 2007 as the reasoning for the denial (Office of the White House 2009).

The state of California filed suit against EPA for its decision to deny the CAA waiver. The recent change in presidential administration directed EPA to reexamine its position for denial of California's CAA waiver and for its past opposition to GHG emissions regulation. California received the waiver from EPA on June 30, 2009.

Renewable Energy Portfolio Standards (Senate Bills 1078 and 107 and Executive Orders S-14-08 and S-21-09)

Senate Bill (SB) 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20% of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010.

In November 2008 Governor Schwarzenegger signed Executive Order S-14-08, which expands the state's Renewable Energy Standard to 33% renewable power by 2020. On September 15, 2009, Governor Schwarzenegger signed Executive Order S-21-09 directing ARB to adopt regulations increasing California's Renewable Portfolio Standard to 33 % by 2020.

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

According to Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC), "Avoiding Dangerous Climate Change" means: *"stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."* Dangerous climate change was defined based on several key indicators including the potential for severe degradation of coral reef systems, disintegration of the West Antarctic Ice Sheet, and shut down of the large-scale, salinity- and thermally-driven circulation of the oceans. "Avoiding dangerous climate change" is expected to be achieved by stabilizing global average temperatures at a minimum of 2°C above pre-industrial levels. In order to stabilize at a global equilibrium temperature of 2-2.4°C above pre-industrial levels, CO_2 concentrations must stabilize at 350–400 ppm. Ambient global CO_2 concentrations in 1990 were approximately 353 ppm (UNFCCC 2009).

In September 2006, Governor Schwarzenegger signed AB 32 (Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006, which enacted Sections 38500–38599 of the California Health and Safety Code. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires reduction of statewide GHG emissions to 1990 levels by 2020 (an approximately 15% reduction from existing statewide GHG emissions). This reduction will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then ARB should develop new regulations to control GHG emissions from vehicles under the authorization of AB 32.

AB 32 requires ARB to adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.

Climate Change Scoping Plan

In December 2008, ARB adopted its Climate Change Scoping Plan, which contains the main strategies California will implement to achieve reduction of approximately 169 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), or approximately 30% from the state's projected 2020 emission level of 596 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 42 MMT CO_2e, or almost 10%, from average emissions between 2002 and 2004). The Scoping Plan also includes ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2e),
- the Low-Carbon Fuel Standard (15.0 MMT CO_2e),
- energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2e), and
- a renewable portfolio standard for electricity production (21.3 MMT CO_2e).

ARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the *Scoping Plan* does state that land use planning and urban growth decisions will play an important role in the state's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions. (Meanwhile, ARB is also developing an additional protocol for community emissions.) ARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The Scoping Plan states that the ultimate GHG reduction assignment to local government operations is to be determined (ARB 2008). With regard to land use planning, the Scoping Plan expects approximately 5.0 MMT CO_2e will be achieved associated with implementation of SB 375, which is discussed further below.

Senate Bill 1368 (2006)

Senate Bill (SB) 1368 (Chapter 598, Statutes of 2006) is the companion bill of AB 32 and was signed by Governor Schwarzenegger in September 2006. SB 1368 required the California Public Utilities Commission (CPUC) to establish a GHG emission performance standard for base-load generation from investor-owned utilities by February 1, 2007. Similarly, the California Energy Commission (CEC) was tasked with establishing a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the GHG emission rate from a base-load, combined-cycle natural-gas-fired plant. The legislation further requires that all electricity provided to California, including imported electricity, be generated from plants that meet the standards set by CPUC and CEC. In January 2007, CPUC adopted an interim GHG Emissions Performance Standard, which requires that all new long-term commitments for base-load generation entered into by investor-owned utilities have emissions no greater than a combined-cycle gas turbine plant (i.e., 1,100 pounds [lb] of CO_2 per megawatt-hour). A "new long-term commitment" refers to new plant investments (new construction), new or renewal contracts with a term of five years or more, or major investments by the utility in its existing base-load power plants.

In May 2007, CEC approved regulations that prohibit the state's publicly owned utilities from entering into long-term financial commitments with plants that exceed the standard adopted by CPUC of 1,100 lb of CO_2 per megawatt-hour.

Senate Bill 97 (2007)

SB 97, signed in August of 2007 (Chapter 185, Statutes of 2007; Public Resources Code, Sections 21083.05 and 21097), acknowledges that climate change is a prominent environmental issue that requires analysis under CEQA. This bill directs the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Natural Resources Agency by July 1, 2009, guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA. The California Natural Resources Agency is required to certify and adopt those 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 for GHG emissions, as required by SB 97. These proposed CEQA Guideline amendments would provide guidance to public agencies regarding analysis, significance conclusions, and mitigation, for the effects of GHG emissions in CEQA documents. The Natural Resources Agency will conduct formal rulemaking in 2009, prior to certifying and adopting the amendments, as required by SB 97. Draft CEQA Guidelines amendments are in public review as of the writing of this document.

This bill also removes, both retroactively and prospectively, as legitimate causes of action in litigation any claim of inadequate CEQA analysis of effects of GHG emissions associated with environmental review for projects funded by the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 (Proposition 1B) or the Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E). This provision will be repealed by operation of law on January 1, 2010; at that time such projects, if any remain unapproved, will no longer enjoy protection against litigation claims based on failure to adequately address issues related to climate change. This bill would protect only a handful of public agencies from CEQA challenges on certain types of projects for a few years' time.

Senate Bill 375 (2008)

SB 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets, and fair-share housing allocations under state housing law. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS) to address GHG reduction targets in the context of that MPO's Regional Transportation Plan (RTP). ARB, in consultation with MPOs, will provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every eight years, but can be updated every four years if advancements in emissions technologies affect the reduction strategies to achieve the targets. ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned targets. If MPOs do not meet the GHG reduction targets, transportation projects would not be eligible for funding programmed after January 1, 2012.

This bill also extends the minimum time period for the Regional Housing Needs Allocation (RNHA) cycle to create a closer match with the timelines for revising RTPs (for the Metropolitan Planning Organizations affected by the bill). The RHNA is used to guide the amount of housing to be accommodated for the full range of household incomes in mandatory local housing plans (Housing Elements).

City or County land use policies (including General Plans) are not required to be consistent with the RTP (and associated SCS or APS). However, new provisions of CEQA would create streamlining for certain projects that are consistent with an approved SCS or APS. Residential or mixed-use projects that are consistent with the SCS/APS and incorporate mitigation measures from relevant prior CEQA document/s are not required to reference, describe, or discuss growth-inducing impacts or impacts of cars and light-duty truck trips on climate change or on the regional transportation network. "Transit priority projects," as defined in this legislation and future RTPs would be exempt from CEQA review. Transit priority projects that do not qualify for a complete exemption could be subject to environmental review under a Sustainable Communities Environmental Assessment (SCEA), which is envisioned to be similar to the process under CEQA for a negative declaration.

Executive Orders

Executive Order S-20-04 (2004)

Governor Schwarzenegger signed Executive Order S-20-04, the California Green Building Initiative, on December 14, 2004, establishing the state's priority for energy and resource–efficient high-performance buildings. The executive order sets a goal of reducing energy use in state-owned and private commercial buildings by 20% in 2015, using nonresidential Title 20 and Title 24 standards adopted in 2003 as the baseline. The California Green Building Initiative also encourages retrofitting, construction, and operation of private commercial buildings in compliance with the state's Green Building Action Plan.

Executive Order S-3-05 (2005)

Executive Order S-3-05, which was signed by Governor Schwarzenegger on June 1, 2005, proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra Nevada's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established targets for total GHG emissions. Specifically, emissions are to be reduced to the 2000 level by 2010, to the 1990 level by 2020, and to 80% below the 1990 level by 2050.

The Executive Order directed the secretary of the California Environmental Protection Agency to coordinate a multiagency effort to reduce GHG emissions to the target levels. The secretary will also submit biannual reports to the governor and legislature describing progress made toward reaching the emission targets; impacts of global warming on California's resources; and mitigation and adaptation plans to combat these impacts. To comply with the executive order, the Secretary of the California Environmental Protection Agency created the California Climate Action Team, made up of members of various state agencies and commissions. The California Climate Action Team released its first report in March 2006. The report proposed to achieve the targets by building on voluntary actions of California businesses and actions by local governments and communities, as well as through state incentive and regulatory programs.

Executive Order S-1-07 (2007)

Executive Order S-1-07, which was signed by Governor Schwarzenegger in 2007, proclaims that the transportation sector is the main source of GHG emissions in California, at over 40% of statewide emissions. It establishes a goal that carbon intensity of transportation fuels sold in California should be reduced by a minimum of 10% by 2020. This order also directed ARB to determine if this Low Carbon Fuel Standard (LCFS) could be adopted as a discrete early action measure pursuant to meeting the mandates in AB 32.

Regional and Local Plans, Policies, Regulations, and Ordinances

There are currently no regional or local policies, regulations, or laws specifically pertaining to GHG emissions.

Attributing Greenhouse Gas Emissions and Land Use Linkages

Land use decisions and development projects are not their own GHG emissions sectors. In other words, land use development projects can generate GHG emissions from several sectors (e.g., transportation, electricity, waste) described in more detail below. Therefore, land use decisions and development projects can affect the generation of GHG emission from multiple sectors that result from their implementation. Development projects can result in direct or indirect GHG emissions that would occur on- or off-site. For example, electricity consumed in structures within a project would indirectly cause GHGs to be emitted at a utility provider. The people who reside in and the visitors to a development project would drive vehicles that generate on- and off-site GHG emissions, which are associated with the transportation sector.

The following sections describe the major GHG emission sectors that can and cannot be affected by local government actions. In addition, a description of the existing state of climate change science is provided for informational purposes.

GHG Emission Sectors

The Scoping Plan identifies the main GHG emission sectors that account for the majority of GHG emissions generated within California. A brief description of each of the GHG emission sectors is provided below:

- **Transportation:** This sector represents the GHG emissions associated with on-road motor vehicles, recreational vehicles, aviation, ships, and rail.
- **Electricity:** This sector represents the GHG emissions associated with use and production of electrical energy. Approximately 25% of electricity consumed in California is imported, thus, GHG emissions associated with out-of-state electricity production are also included as part of this sector.
- **Industry:** This sector represents the GHG emissions associated with industrial land uses (e.g., manufacturing plants, refineries). Industrial sources are predominately comprised of stationary sources (e.g., boilers, engines) associated with process emissions.
- **Commercial and Residential:** Commercial and residential GHG emission sources include area sources such as landscape maintenance equipment, fireplaces, and natural gas consumption for space and water heating.
- **Agriculture:** This sector represents the GHG emissions associated with agricultural processes. Agricultural sources of GHG emissions include off-road farm equipment, irrigation pumps, residue burning, livestock, and fertilizer volatilization.
- **High Global Warming Potential:** This sector represents the generation of high global warming potential GHGs. Examples of high global warming potential GHG sources include refrigerants (e.g., HFCs and PFCs), and electrical insulation (e.g., SF_6). Although these GHGs are typically generated in much smaller quantities than CO_2, their high global warming potential results in considerable CO_2e.
- **Recycling and Waste:** This sector represents the GHG emissions associated with waste management facilities and landfills.

State-Wide Reduction of Greenhouse Gas Emission Sources

The GHG emission sectors described above would experience varying degrees of state regulation and would be reduced overall on a state-wide level. As discussed above, legislation already in effect will achieve state-wide reductions of GHG emissions associated with electricity production, industry, vehicle miles traveled (VMT), and motor vehicles. It is anticipated that future legislation and regulations at the state and federal levels would further reduce GHG emissions, with different reduction potential available for each sector.

Local Government Reduction of GHG Emission Sources

Projects approved at the local level could generate GHG emissions associated with each of the emission sectors described above. However, the ability of local governments to reduce those GHG emissions would vary by sector. As discussed above, certain GHG emission sectors will be regulated by the implementation of state-wide emission reduction programs that address standards beyond the control of local government (e.g., vehicle emissions standards, renewable energy portfolio standards).

Land use entitlement authority, which largely rests at the local government level, influences development patterns, community design, transportation facilities planning, and other factors known to influence VMT, which

in turn influences GHG emissions associated with the transportation sector (Ewing 2001). However, local government does not have control over vehicle emissions technology or fuel economy standards. Both of these parameters (i.e., land use/transportation planning and regulation of emission standards and fuel economy) are important components for achieving the emission reductions mandates set in AB 32. Similarly, local government standards can influence solar orientation of buildings and other components related to energy efficiency, while energy generation, renewable energy requirements, and other issues related to energy sources are outside of local government's control.

Local governments, such as the City, will play a role in achieving the emission reduction goals mandated in AB 32. The ability to influence land use decisions and reduce VMT, provide services to its population (e.g., recycling service, waste management, and waste water treatment), and provide public education and incentives (e.g., energy and water conservation) to its citizens are options for local governments to reduce GHG emissions generated in their jurisdictions.

4.14.2 ENVIRONMENTAL SETTING

CLIMATE

Climate is the accumulation of daily and seasonal weather events over a long period of time, whereas weather is defined as the condition of the atmosphere at any particular time and place (Ahrens 2003). Sutter County is located in a climatic zone characterized as dry-summer subtropical or Mediterranean in the Köppen climate classification system. The Köppen system's classifications are based primarily on annual and monthly averages of temperature and precipitation.

The Northern Sacramento Valley Air Basin (NSVAB), which includes the City of Live Oak, is relatively flat, bordered by mountains to the east, west, and north. The climate is characterized by hot, dry summers and cool, rainy winters. Periods of dense and persistent low-level fog that are most prevalent between storms are characteristic of winter weather in the NSVAB. The extreme summer aridity of the Mediterranean climate is caused by sinking air of subtropical high-pressure regions. The ocean has less influence in the NSVAB than in the coastal areas, giving the interior Mediterranean climate more seasonal temperature variation (Ahrens 2003).

Most precipitation in the area results from air masses that move in from the Pacific Ocean during the winter months. These storms usually move from the west or northwest. More than half the total annual precipitation falls during the winter rainy season (November–February). The average winter temperature is a moderate 49°F. During the summer, daily temperatures range from 50°F to more than 100°F.

ATTRIBUTING CLIMATE CHANGE—GREENHOUSE GASES

Greenhouse Gases

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface, and a smaller portion of this radiation is reflected back toward space. The absorbed radiation is then emitted from the earth, not as high-frequency solar radiation, but lower frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency (longer wavelength) radiation. Most solar radiation passes through GHGs; however, infrared radiation is selectively absorbed by GHGs. As a result, infrared radiation released from the earth that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the "greenhouse effect," is responsible for maintaining a habitable climate on Earth. Without the greenhouse effect, Earth would not be able to support life as we know it.

Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated compounds. Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for intensifying the greenhouse effect and have led to a trend of unnatural warming of the earth's climate, known as global climate change or global warming. It is extremely unlikely that global climate change over the past 50 years can be explained without the contribution from human activities (Intergovernmental Panel on Climate Change [IPCC] 2007).

According to overwhelming scientific consensus, climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants (TACs), which are pollutants of regional and local concern. Whereas pollutants with localized air quality effects have relatively short atmospheric lifetimes (about 1 day), GHGs have long atmospheric lifetimes (1 year to several thousand years). GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the exact lifetime of any particular GHG molecule is dependent on multiple variables and cannot be pinpointed, it is understood that more CO_2 is currently emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO_2 emissions, approximately 54% is sequestered through ocean uptake, uptake by northern hemisphere forest regrowth, and other terrestrial sinks within a year, whereas the remaining 46% of human-caused CO_2 emissions remains stored in the atmosphere (Seinfeld and Pandis 1998).

Similarly, impacts of GHGs are borne globally, as opposed to localized air quality effects of criteria air pollutants and TACs. The quantity of GHGs that it takes to ultimately result in climate change is not precisely known, although the quantity would be enormous, and no single project would be expected to measurably contribute to a noticeable incremental change in the global average temperature, or to global, local, or micro climate.

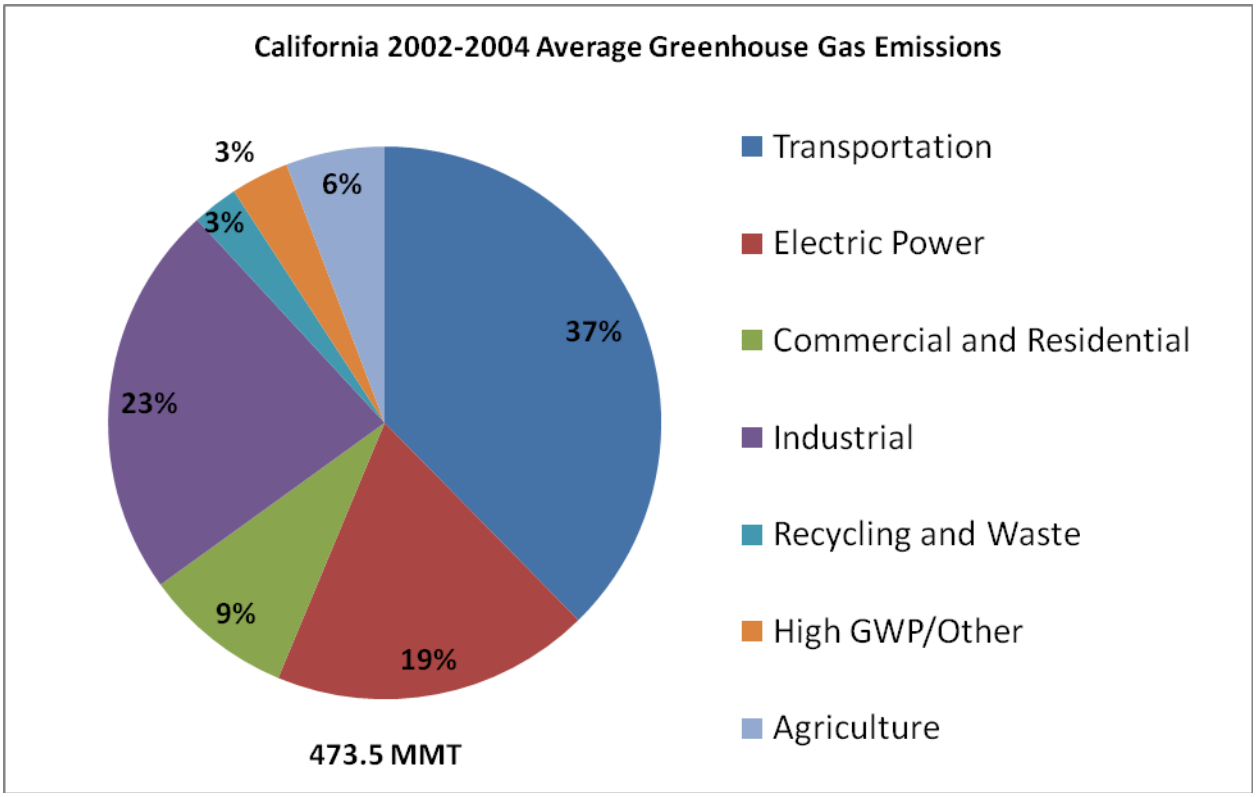
Greenhouse Gas Emissions Sources and Inventory

California

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial and agricultural sectors (ARB 2009f). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (ARB 2009f). See Exhibit 4.14-1 for California's GHG emissions inventory sectors.

Emissions of CO_2 are byproducts of fossil fuel combustion. CH_4, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) is largely associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management. CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution, respectively, two of the most common processes of CO_2 sequestration.

California is the 12th to 16th largest emitter of CO_2 in the world (CEC 2006a). California produced 484 million gross metric tons of CO_2e in 2004 (ARB 2009f). CO_2e is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, as described in Appendix C, "Calculation References," of the General Reporting Protocol of the California Climate Action Registry (CCAR 2009), 1 ton of CH_4 has the same contribution to the greenhouse effect as approximately 23 tons of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2. Expressing emissions in CO_2e takes the contributions of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted.



Notes: GWP = global warming potential; MMT = Million metric tons.

Source: ARB 2008

California's Greenhouse Gas Emissions by Economic Sector (2002–2004 Average) Exhibit 4.14-1

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2004, accounting for 38% of total GHG emissions in the state (ARB 2008). This sector was followed by the electric power sector (including both in-state and out-of-state sources) (22%) and the industrial sector (20%) (ARB 2008).

Climate Change Vulnerabilities and Adaptation

Global average ambient concentrations of CO_2 have increased dramatically since preindustrial times, from approximately 280 parts per million (ppm) to approximately 353 ppm in 1990 and approximately 380 ppm in 2000. Global average temperature has risen approximately 0.76°C since 1850; if global CO_2 emissions were to be curbed today, it would continue to rise an additional 0.5°C by the end of this century. This phenomenon is caused by the inertia of the climate system and time scale of the main sequestration mechanism in the carbon cycle—the ocean. In other words, global climate is committed to an additional 0.5°C of warming associated with human activities that have already occurred. Because GHG emissions associated with fossil fuel combustion, population growth, technological advances, and current standards of living will continue to occur, a more likely range of scenarios for global average temperature rise would be 1.8–4.0°C by the end of the century, depending on the global emissions scenario that ultimately occurs. (For example, the IPCC's B1 scenario—low population growth, clean technologies, and low emissions—is the best-case scenario; its A2 scenario—high population growth, fossil-fuel dependence, and high emissions—is the worst-case scenario; and its A1B scenario is a moderate scenario.)

Impacts associated with the incremental increase in global temperature have already begun to occur. Such impacts are projected to occur in numerous forms: sea level rise, reduction in the extent of polar and sea ice, changes to

ecosystems, changes in precipitation patterns, reduced snowpack, agricultural disruption, increased intensity and frequency of storms and temperature extremes, increased risk of floods and wildfires, increased frequency and severity of drought, effects on human health from vectorborne disease, species extinction, and acidification of the ocean.

It is accepted that some level of climate change impacts will occur as a result of human-caused climate change. However, international treaties on the subject of climate change attempt to avoid "dangerous" climate change—in other words, to manage the risk of foreseeable impacts to a "tolerable" level of climate change that would avoid most catastrophic impacts. For this to occur, CO_2 concentrations should be stabilized at 350–400 ppm, with an associated global average temperature increase of no more than 2°C–2.4°C above preindustrial times. Timing is also a key issue, because of the very long lifetimes of GHGs. To avoid "dangerous" climate change, global CO_2 emissions would be required to peak during the 2000–2015 period (IPCC 2007).

Climate change has the potential to affect environmental conditions in California through a variety of mechanisms. Resource areas other than air quality and atmospheric temperature could be indirectly affected by the accumulation of GHG emissions. For example, an increase in the global average temperature is expected to result in a decreased volume of precipitation falling as snow in California and an overall reduction in snowpack in the Sierra Nevada. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of supply for the state. According to the CEC (2006b), the snowpack portion of the water supply could potentially decline by 30–90% by the end of the 21st century. A study cited in a report by the California Department of Water Resources (DWR) projects that approximately 50% of the statewide snowpack will be lost by the end of the century (Knowles and Cayan 2002). Although current forecasts are uncertain, it is evident that this phenomenon could lead to significant challenges in securing an adequate water supply for a growing population. An increase in precipitation falling as rain rather than snow could also lead to increased potential for floods because water that would normally be held in the Sierra Nevada snowpack until spring could flow into the Central Valley concurrently with winter storm events. This scenario would place more pressure on California's levee/flood control system (DWR 2006a).

Another mechanism for indirect impacts on the environment in California is sea level rise. Sea level rose world wide approximately 7 inches during the last century (CEC 2006b), and it is predicted to rise an additional 7–22 inches by 2100, depending on the future levels of GHG emissions (IPCC 2007). However, the Governor-appointed Delta Vision Blue Ribbon Task Force has recommended the State plan for a scenario of 16 inches of sea level rise by 2050, and 55 inches by 2100 (California Natural Resources Agency 2008). Resultant effects of sea level rise could include increased coastal flooding, saltwater intrusion (especially a concern in the low-lying Sacramento–San Joaquin River Delta, where pumps delivering potable water could be threatened), and disruption of wetlands (CEC 2006b). Some low-lying populated areas throughout the Central Valley and Sacramento-San Joaquin River Delta inundated by sea level rise could experience population displacement and economic disruption.

As the existing climate throughout California changes over time, the ranges of various plant and wildlife species could shift or be reduced, depending on the favored temperature and moisture regimes of each species. In the worst cases, some species would become extinct or be extirpated from the state if suitable conditions are no longer available. Additional concerns associated with climate change are a reduction in the snowpack, leading to less overall water storage in the mountains, the largest "reservoir" in the state, and increased risk of wildfire caused by changes in rainfall patterns and plant communities.

Impacts on California and Live Oak

Historical Trends and Future Predictions

Temperature

IPCC stated that Earth's climate has warmed since the preindustrial era and that it is very likely that at least some of this change is attributable to the activities of humans (IPCC 2007). Global average near-surface air temperatures and ocean surface temperatures increased by 0.74°C ± 0.18°C (1.33°F ± 0.32°F) during the 20th century (IPCC 2007).

Climate change projections can be developed on a regional basis using techniques to downscale from the results of global models (although increased uncertainty results from the downscaling). Based on the results of a variety of regional climate models, it is reasonably foreseeable that some increase in annual average temperatures will occur in California during the next 100 years. Although a temperature increase is expected, the amount and timing of the increase is uncertain. In general, predictions put an increase in the range of 2 to 5°C (3.6 to 9°F) over the next 50–100 years (IPCC 2007, Kim et al. 2002, Snyder et al. 2002, Dettinger 2005). Temperature increases are expected to be greater in the summer compared to the winter and more pronounced for inland areas compared to coastal areas (Cayan et al 2009). There are direct public-health related effects associated with increased temperatures and increased periods of temperature extremes, including heat stroke, heat exhaustion, and the exacerbation of existing medical conditions, with particular problems for the elderly, infants, those with pre-existing illnesses, and those that lack access to air conditioning or cooling spaces (California Natural Resources Agency 2009).

Indirect effects of increased temperature include changes in precipitation patterns, runoff, snowpack, sea level, water supply, agriculture, wildfire, extreme events (e.g., flooding and drought), biological resources, and public health in California. Effects on precipitation and snowpack would affect runoff and surface water, and would have potential to affect the physical conditions of the Delta. These topic areas are also discussed below.

An increase in annual average temperature is a reasonably foreseeable effect of future climate change, but this environmental change alone is independent of the proposed project. Indirect effects associated with warmer temperatures are evaluated further in the following sections.

Precipitation

Former State Climatologist James Goodridge compiled an extensive collection of longer-term precipitation records from throughout California. These data sets were used to evaluate whether there has been a changing trend in precipitation in the State over the past century (DWR 2006a). Long-term runoff records in selected watersheds in the State were also examined. Based on a linear regression of the data, the long-term historical trend for statewide average annual precipitation appears to be relatively flat (no increase or decrease) over the entire record. However, it appears that there might be an upward trend in precipitation toward the latter portion of the record.

When these same precipitation data are sorted into three regions—Northern, Central, and Southern California—trends show that precipitation in the northern portion of the State appears to have increased slightly from 1890 to 2002, and precipitation in the central and southern portions of the state show slightly decreasing trends. All changes were in the range of 1–3 inches annually (DWR 2006a).

Although existing data indicate some level of change in precipitation trends in California, more analysis is likely needed to determine whether changes in California's regional annual precipitation totals have occurred as the result of climate change or other factors (DWR 2006a).

Increased variability in precipitation and extreme heat events in California presents increased risk of drought, which in turn, presents increased risk of wildfire hazards. However, Live Oak is bounded by agricultural land that is actively farmed or fallow, and is not directly adjacent to any wild lands. Though indirect impacts of climate change may increase risk of wildfire in northern California, the 2030 General Plan would not be anticipated to site sensitive receptors in harm's way with respect to wildfire.

Similarly, increased variability of precipitation and extreme storm events in California presents increased risk of flooding. The Planning Area is located outside of the 100-year floodplain currently defined by the Federal Emergency Management Agency with the exception of one small area in the central portion of the City associated with the Live Oak Slough. The rest of the City is outside the 500-year floodplain. The Planning Area is not, as of the writing of this document, within the 200-year floodplain shown on the Best Available Maps from the California Department of Water Resources. Increased flood events that could occur as a result of climate change could place increased pressure on the current levee system and could cause a wider seasonal variation in flow volumes. This presents the potential to affect future flood elevations in the Sacramento Valley, including the Planning Area.

Snowpack

California's annual snowpack, on average, has the greatest accumulations from November though the end of March. The snowpack typically melts from April through July. California's reservoir managers (including State Water Project [SWP] and Central Valley Project [CVP] facilities) use snowmelt to help fill reservoirs once the threat of large winter and early spring storms and related flooding risks have passed.

An analysis of the effect of rising temperatures on snowpack conducted by DWR (2006) shows that a 3°C (5.4°F) rise in average annual temperature would likely cause snowlines to rise approximately 1,500 feet. This would result in an annual loss of approximately 5 million acre-feet (maf) of water storage in snowpack. Released and/or purchased waters stored in upstream reservoirs, will largely depend on regional annual average precipitation accumulations. Greater management of upstream reservoirs would be required to account for seasonal variations in precipitation type and intensity, and to maintain the same level of flood protection currently enjoyed. Furthermore, rainfall and winter snowpack in the Sierra Nevada provide Sutter County with significant surface water flows and associated groundwater recharge as surface water traverses the county (DWR 2006b). Reduced groundwater recharge from smaller snowpack has the potential to reduce the available water supply in Live Oak's aquifer, eventually affecting the City's water supply.

Runoff

Runoff is directly affected by changes in precipitation and snowpack. Changes in both the amount of runoff and the seasonality of the hydrologic cycle have the potential to greatly affect the heavily managed water systems of the western U.S. Hydrology in the Sacramento-San Joaquin Delta is highly dependent on the interaction between Sierra Nevada snowpack, runoff, and management of reservoirs. Runoff patterns in the Delta depend not just on how climatic conditions might change, but also on a wide range of human actions and management decisions.

Water Supply

Much uncertainty also exists with respect to how climate change will affect future demand on water supply (DWR 2006a). 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 reservoir inflows (Kiparsky and Gleick 2005, Cayan et al. 2006).

It is foreseeable that the SWP and CVP would experience delivery reliability issues as a result of effects on the hydrologic cycle associated with climate change and Delta pumping restrictions (Anderson 2008, DWR 2007). Most water scarcity would be felt by agricultural users in Southern California, however, it is expected that

southern California urban users will also experience some scarcity. As required by law, Delta water quality standards must be met prior to occurrence of any south-of-Delta water deliveries.

Currently, water use in the Planning Area is from groundwater wells, and not from the SWP or CVP. The proposed project would require an increase in groundwater to serve a larger population, occurring steadily throughout the year, including both wet and dry seasons. As discussed above, climate change may reduce the effectiveness of groundwater recharge. This impact is discussed below in Impact 4.14-2.

To the extent that available data and projections suggest that climate change will intensify existing wet and dry patterns, resulting in more precipitation during the wet season and less during the dry season, the 2030 General Plan, which will rely on groundwater for potable water supply, could be less affected by these changes than the current agricultural water use regime. However, there is a great deal of uncertainty in respect to impacts of climate change on future water availability in California in terms of whether and where effect will occur as well as regarding the timing and severity of any such potential effect, making it impossible to draw a conclusion regarding significance without substantial speculation.

Sea Level Rise

One of the major areas of concern related to global climate change is sea level rise. Worldwide average sea level appears to have risen about 0.4 to 0.7 foot over the past century based on data collected from tide gauges around the globe, coupled with satellite measurements taken over approximately the last 15 years (IPCC 2007). Various gauge stations along the coast of California show an increase similar to the global trends. Data specific to the San Francisco tide gauge near the Golden Gate Bridge shows that the 19-year mean tide level (the mean tide level based on 19-year data sets) has increased by approximately 0.5 foot over the past 100 years. Rising average sea level over the past century has been attributed primarily to warming of the world's oceans and the related thermal expansion of ocean waters, and the addition of water to the world's oceans from the melting of land-based polar ice (IPCC 2007).

Various global climate models have projected a rise in worldwide average sea level of 0.6–1.9 feet by 2099 (IPCC 2007). Although these projections are on a global scale, the rate of relative sea level rise experienced at many locations along California's coast is relatively consistent with the worldwide average rate of rise observed over the past century. Therefore, it is reasonable to expect that changes in worldwide average sea level through this century will also be experienced by California's coast (DWR 2006a). For example, the Governor-appointed Delta Vision Blue Ribbon Task Force has recommended the State plan for a scenario of 16 inches of sea level rise by 2050, and 55 inches by 2100 (California Natural Resources Agency 2008).

A consistent rise in sea level has been recorded worldwide over the last 100 years. Recorded rises in sea level along the California coast correlate well with the worldwide data. Based on the results of various global climate change models, sea level rise is expected to continue. Based on the consistency in past trends, the consistency of future projections, and the correlation between data collected globally and data specific to California, it is reasonably foreseeable that some amount of sea level rise will occur along the California coast over the next 100 years. Although sea level rise is expected to occur, the amount and timing of the increase is uncertain. However, it is not expected that any foreseeable sea level rise would directly impact the Planning Area, which is located approximately 80 feet above mean sea level.

Agriculture

Climate change may reduce the suitability of agricultural lands in the vicinity of Live Oak for traditional crop types. While effects may occur, adaptation could allow farmers and ranchers to minimize any potential negative effect on agricultural incomes. Because the potential effects of global climate change on agricultural production are highly speculative at this time, it is not possible to reach a conclusion regarding significance.

Key Findings

Given the uncertainty associated with projecting the change in hydrology that would occur as a result of the variables described above, it would be too speculative to determine the reasonably foreseeable direct effects of climate change on physical hydrologic conditions in the Planning Area.

For California's water quality, the largest effect of sea level rise would likely be in the Delta (DWR 2005). Increased intrusion of salt water from the ocean to the Delta could degrade the quality of the fresh water that is pumped out for municipal, industrial, and agricultural purposes. This could lead to increased releases of water from upstream reservoirs or reduced pumping from the Delta to maintain compliance with water quality standards. Increased demand for stored surface water could affect other surface water supplies within the applicable watershed, however, because Live Oak does not rely on water pumped from the Delta, and until specific changes in demands occur, the effect on regional supplies remains speculative.

While climate change-induced sea level rise is reasonably certain, even the middle- to upper-range projections would not affect the Plan Area directly, because the Planning Area is well above sea level (i.e., elevation of approximately 80 feet). Projected sea-water rise associated with global climate change is in the range of 0.6–1.9 feet or up to 55 inches (4.6 feet) by the year 2099 (IPCC 2007, California Natural Resources Agency 2008).

In addition, current water quality conditions in regional surface waters depend in large part on human activities, and this would continue into the future. The effects of climate change on water quality could be alleviated by, exacerbated by, or overwhelmed by effects directly related to localized human actions.

Impacts that would occur on the proposed project that would result from climate change will be evaluated further in Impact 4.14-2, below.

4.14.3 Environmental Impacts and Mitigation Measures

Methodology

There is no available adopted or widely accepted methodology for evaluating GHG emissions from new development. In the case of the 2030 General Plan, CO_2 emissions associated construction and operations were modeled using the Urban Emissions (URBEMIS) 2007 computer model, Version 9.2.4. Indirect GHG emissions from increased electricity consumption and water consumption were estimated using methodologies from CCAR and assumptions from the CEC. See Appendix C for detailed GHG calculations and inputs.

It is important to note that CO_2 emissions consistent with buildout of the 2030 General Plan are not necessarily "new" emissions, given that the General Plan itself does not create "new" emitters (e.g., people) of GHGs. In other words, the 2030 General Plan would not create new people, and would not necessarily accommodate new activities. Rather, in most cases, the General Plan would accommodate movement in people, jobs, and activities from one location to another. Therefore, instead of reducing the total mass of community-generated GHG emissions, it is important to increase the GHG efficiency of the community, or the rate of GHG emissions per capita and per employee. The General Plan would need to accommodate population in a way that allows for a lower *rate* of GHG generation to achieve the state's goals for GHG emissions, as described in the text of AB 32 and directed by S-3-05. An example of such required rates are described below.

Thresholds of Significance

An impact related to global climate change is considered significant if the proposed project would:

- generate GHG , either directly or indirectly, that may have a significant impact on the environment; or

- conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

With regard to emissions of GHGs, no air district in California, including Feather River Air Quality Management District (FRAQMD), has adopted a significance threshold for analyzing project-generated emissions from plans or development projects or a methodology for analyzing impacts related to global warming as of the writing of this document. However, by adopting AB 32, the California Legislature has indicated that global climate change is a serious environmental issue and has identified a statewide GHG emissions target. To meet the goals of AB 32, California would need to generate fewer GHGs than current levels. It is recognized, however, that for most development projects, there is no simple metric available to determine whether the individual project would substantially increase or decrease overall emission levels of GHGs.

The legislation dealing with climate change in California (as well as international treaties and agreements on the subject) identifies goals for the rate of emissions of GHGs, relative to specific benchmark years. In the case of California, AB 32 requires 1990 GHG emission levels to be achieved by the year 2020, or about a 28% reduction from current emissions levels (ARB 2008). Neither state legislation nor executive order suggests that California intends to limit population growth to reduce the state's GHG emission levels. Therefore, the intent is to accommodate population growth in California, but achieve a lower *rate* of GHGs despite this larger population. In other words, California jurisdictions must become more GHG efficient.

With a statewide context for GHG emissions reductions established, GHG efficiency can be viewed independently from the jurisdiction in which the project or plan is located. In order to provide a meaningful basis to assess the GHG-related effects of a project or plan, the mass emission from land use-related sectors can be normalized. Dividing mass emissions by the population and or amount of employment allows an assessment of GHG efficiency of a plan or project. Normalizing this projected mass of emissions from land use-related emissions sectors (i.e., transportation, electricity, natural gas, wastewater) by unit related to what the plan itself is accommodating (e.g., population and employment) allows decision makers to consider the GHG efficiency of a project, and evaluate the project's consistency with AB 32 (and other relevant targets). Limiting the analysis to the land use-related sectors helps to maintain focus on what the lead agency is approving – in this case, long-range physical development of the community, with an emphasis on management of land use change.

For the purposes of this analysis, the sum of the number of jobs and the number of residents at a point in time is termed the "service population" (SP). GHG efficiency metrics were developed for the emissions rates at the state level that would accommodate estimated population and employment growth, and the emission rates needed to accommodate growth while allowing for consistency with the goals of AB 32 (i.e., 1990 GHG emissions levels by 2020). These emission rates show how GHG-efficient new development and existing development must be in order to achieve AB 32 targets for land use-related sectors.

When analyzing long-range plans, such as general plans, it is important to note that the planning horizon will often surpass the 2020 timeframe for implementation of AB 32. Executive Order S-3-05 establishes a more aggressive emissions reduction goal for the year 2050 of 80% below 1990 emissions levels. The year 2020 can be viewed as a milestone, and is the only year discussed in AB 32 with respect to an emissions target. However, communities may need also to consider planning in a way that does not preclude a trajectory toward the 2050 goal established in Executive Order S-3-05.

A 2030 interim benchmark was developed (see Table 4.14-2) for the purposes of this analysis since this would better coincide with the planning horizon of Live Oak's 2030 General Plan. The 2030 GHG efficiency benchmarks were estimated based on future expected growth in the state's population and economy, the mass emissions target mandated by AB 32 for the year 2020, and a linear interpolation for a 2030 mass emissions reduction target based on the GHG target for the year 2050 that is derived from the goal of Executive Order S-3-05 (i.e., 80% below the 1990 GHG emissions level by 2050). Assumptions were also made about which emissions sectors of the statewide GHG emissions inventory are affected by land use planning and development design

decisions. For instance, GHG emissions produced by the manufacturing industry sector are not accounted for in the metrics presented in Table 4.14-2 because the proposed land uses under consideration would not appreciably affect GHG emissions from manufacturing. This is consistent with the recommendations of OPR in its Technical Advisory *CEQA and Climate Change* (OPR 2008). These and other detailed assumptions and calculations used to estimate this benchmark are presented in Appendix C.

It is acknowledged that advances in technology and policy decisions at the state level will be needed to meet the aggressive GHG reduction goals in AB 32 and S-3-05. It is possible that federal legislation and regulations could be adopted during the General Plan time horizon that could affect emissions in Live Oak. However, neither the details of future regulations, nor the reduction potential associated with future regulation is knowable at this time. It is beyond the scope of the analysis tools available at this time to examine reasonable emissions reductions that may can be achieved in the year 2050.

To meet the requirements of AB 32 in the emissions sectors that are related to land use (e.g., on-road passenger and heavy-duty motor vehicles, commercial and residential area sources [i.e., natural gas], electricity generation/consumption, waste water treatment, and water consumption), 2020 projected population and employment would need to fit within the 1990 mass emissions limits. Table 4.14-1 summarizes 1990, present (2002–2004 average baseline), and projected 2020 GHG emissions from relevant emissions sectors from land use development projects. AB 32 has established the 1990 emissions limit as the legislative context for assessing future emissions. The 1990 emissions limit from these sectors is treated as 280 MMT CO_2e. As noted, ARB developed 2020 GHG emissions estimates based on population increase, demographic changes, economic development, and a wide variety of other factors, classified as the "business as usual" scenario. The business as usual estimate for land use-related GHG emissions sectors (i.e., transportation, electricity, natural gas, and wastewater) in California is approximately 370 MMT CO_2e in 2020.

Table 4.14-1
California's Greenhouse Gas Emissions Inventory, 1990 Emissions Limit, Base Year, and 2020 Projections from Land Use-Related Sectors

Sector	1990 Emissions (MMT CO_2e/yr)	2002-2004 Average (MMT CO_2e /yr)	2020 Emissions Projections (MMT CO_2e/yr)
Transportation	**137.992**	**168.657**	**209.101**
On-Road Passenger Vehicles	108.945	133.947	160.783
On-Road Heavy Duty	29.047	34.710	48.318
Electric Power	**95.385**	**88.970**	**107.401**
In-State Generation	33.808	32.152	55.039
Imported Electricity	61.577	56.818	52.362
Commercial and Residential	**44.220**	**41.579**	**47.970**
Residential Fuel Use	29.657	28.515	32.100
Commercial Fuel Use	13.462	11.704	13.755
Commercial Combined Heat and Power	1.101	1.360	2.115
Recycling and Waste[1]	**2.833**	**3.390**	**4.190**
Domestic Waste Water Treatment	2.833	3.390	4.190
Total Gross Emissions	**280.430**	**302.596**	**368.662**

Notes: MMT CO_2e /yr = million metric tons of carbon dioxide equivalent emissions per year.
[1] Landfills not included.
Please refer to Appendix C for detailed calculations.
Sources: Data compiled by EDAW 2009, ARB 2008, ARB 2009f, ARB 2009g.

Table 4.14-2 summarizes projected population and employment estimates for the state, and allocates the GHG emissions limit (i.e., 280 MMT CO_2e) from Table 4.14-1 to the projected population and projected SP in the year 2020. The per-capita target is 6.35 metric tons (MT) CO_2e and the target per service population (persons + jobs) is 4.36 MT CO_2e. By meeting these AB 32-derived GHG efficiency targets, the City would be able to demonstrate that the 2030 General Plan would accommodate growth in a manner that would not hinder the State's ability to achieve its fair share of GHG reduction targets adopted for the purpose of preventing dangerous climate change.

Table 4.14-2
California Greenhouse Gas Emissions, Population Projections, and Greenhouse Gas Efficiency Thresholds

	1990	2002–2004 Average	2020	2030 (Interpolated)[2]
Population	29,758,213	36,199,342	44,135,923	49,240,891
Employment	14,294,100	16,413,400	20,194,661	22,592,387
California Service Population (Population + Employment)	44,052,313	52,612,742	64,330,584	71,833,278
Projected GHG emissions(metric tons CO_2e)/capita[1]	9.42	8.36	8.35	-
Projected GHG emissions (metric tons CO_2e)/SP[1]	6.37	5.75	5.73	-
AB 32, S-3-05 Goal GHG emissions (metric tons CO_2e)/ capita[1]	9.42	7.75	6.35	**5.37**
AB 32, S-3-05 Goal GHG emissions (metric tons CO_2e)/ SP[1]	6.37	5.33	4.36	**3.68**

Notes: AB = Assembly Bill; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; SP = service population; "-" = no data.

[1] Greenhouse gas efficiency levels were calculated using only the "land use-related" sectors of ARB's emissions inventory. See Table 4.14-1.

[2] 2030 GHG/capita and GHG/SP goals were calculated based on a linear interpolation between the AB 32 GHG goal (i.e., 1990 mass emissions level achieved by year 2020) and the S-3-05 target (i.e., 80% below 1990 mass emission levels by year 2050).

Please refer to Appendix C for detailed calculations.

Sources: Data compiled by EDAW 2009, ARB 2008, ARB 2009f, DOF 2009, EDD 2009.

Since the 2030 General Plan planning horizon extends beyond 2020, GHG efficiency metrics were also calculated for year 2030 based on a linear interpolation between the AB 32 and S-3-05 GHG reduction targets and benchmark years. If the 2030 General Plan demonstrates that it could meet the GHG efficiency metrics proposed in this section as measured in the year 2030 (either 5.4 MT CO_2e/capita or 3.7 MT CO_2e/SP), the amount of GHG emissions associated with the Plan would not conflict with the reduction targets identified by Executive Order S-3-05.

IMPACT ANALYSIS

IMPACT 4.14-1 Increases in Greenhouse Gas Emissions. *Project-generated GHG emissions would not be anticipated to conflict with AB 32 (i.e., an agency-adopted regulation for the purpose of reducing GHG emissions) due to the 2030 General Plan's policies and programs designed to reduce GHG emissions. In addition, the 2030 General Plan would accommodate growth in a more GHG-efficient manner than would buildout of the existing 1994 General Plan (i.e., the No Project Alternative). However, buildout of the 2030 General Plan would result in substantially higher GHG emissions compared with existing levels. Climate change attributable to human-caused GHG emissions is a significant cumulative impact. Projected 2030 General Plan GHG mass emissions could be cumulatively considerable when compared to existing mass emissions in the Planning Area. For this reason, this impact is considered* ***significant****.*

Effects of the General Plan on Greenhouse Gas Emissions

Long-term growth anticipated under the 2030 General Plan would generate direct emissions of GHGs from area and mobile sources, and indirect stationary-source GHG emissions associated with offsite electricity production.

Mobile-source emissions of GHGs would include vehicle trips associated with employee commutes, errands, recreation, and other trips in passenger vehicles of future residents of and visitors to the City. Such emissions would also include commercial trucking activity associated with moving goods to and from proposed commercial and industrial uses.

Area-source emissions would be associated with activities such as landscaping and maintenance of proposed land uses, and distribution of natural gas to heat spaces and water. Increases in stationary-source emissions could occur at off-site utility providers that would supply electricity to the proposed uses within the City.

GHG emissions would be predominantly in the form of CO_2. CO_2 emissions persist in the atmosphere for a much longer period of time than emissions of criteria air pollutants such as ozone and particulate matter. Although emissions of other GHGs, such as CH_4 and N_2O, are important with respect to global climate change, emissions levels of other GHGs are less dependent on the land use and circulation patterns associated with the General Plan than are levels of CO_2.

A primary focus of any general plan is on long-term physical development and conservation within the community. Although a general plan can also influence energy efficiency to some extent (e.g., site planning for proper solar orientation), the City does not have control over the sources of electricity used in buildings (supplied by Pacific Gas and Electric [PG&E]). General plans are by their nature less focused on the details of building construction and architecture and are more focused on overall physical development patterns and land uses.

GHG emissions attributable to the 2030 General Plan were analyzed and are presented in this section at a programmatic level of detail. The City cannot estimate the GHG reduction benefit of its various land use, transportation, and design policies. Various land use, community design, conservation, and circulation policies noted below (Table 4.14-4) would promote increased GHG efficiency in the Planning Area during General Plan buildout. Due to the nature of general plan policy, the fact that the City's policies and programs would be incorporated in a variety of land use changes and City actions over a long period of time, and because the City cannot predict the degree to which policies and programs would be incorporated into projects during the General Plan time horizon, the precise effect of these policies and programs is not knowable as of the writing of this document. To monitor the effectiveness of its policies and programs over time, the City has included Implementation Program Air-1 in the Conservation and Open Space Element. This program would result in preparation and implementation of a City-wide GHG reduction and monitoring program that would address community-wide and municipal GHG emissions. The GHG reduction program could include any necessary additional detailed plans, programs, and standards to implement the City's GHG reduction objectives. This could include land use, reuse, transportation, and streetscape plans, rehabilitation and energy conservation programs, regulations, incentive programs, revisions to the Municipal Code, public outreach efforts, and other measures. The City's GHG program is required to be consistent with AB 32 and monitored to allow the City to revise program components, as necessary. Please refer to the City's Conservation and Open Space Element for more detail on this program.

For other reasons noted previously, the main influences available to the City on community-generated GHG emissions relate to land use planning, transportation planning, and community design approaches that reduce local VMT. The City, through the General Plan, can influence density, land use mix, community design, the balance between jobs and housing, and other important factors that affect travel behavior. Mobile-source GHG emissions (vehicle trips) would be the primary source of GHG emissions attributable to implementation of the 2030 General Plan. Transportation is also the largest source of GHG emissions in California, representing approximately 38% of annual CO_2 emissions generated in the state (ARB 2008). VMT is the most direct indicator of CO_2 emissions

for most land use plans and development projects, and the 2030 General Plan is no exception. CO_2 emissions are the best indicator of total GHG emissions for most types of development projects and plans. Buildout of the 2030 General Plan is estimated to add approximately 121,000 new vehicle trips per day to the region. These trips would be the primary source of GHG emissions attributable to Plan implementation.

Implementation of the 2030 General Plan would generate an additional 230,033 MT (0.2 MMT) of CO_2e emissions annually for the lifetime of the Plan (see Table 4.14-3). New growth anticipated under the 2030 General Plan would generate a finite quantity of approximately 113,795 MT of CO_2 for the duration of construction activities (Table 4.14-3). Because operational emissions would occur for the lifetime of the built out community, these sources (rather than those attributable to construction) are much more important to understanding the Plan's overall GHG emissions.

According to the AB 32 Scoping Plan, to achieve the goal stated in AB 32 of 1990 emission levels by the year 2020, while accounting for population growth between now and 2020, California would need to reduce projected emissions by approximately 28%. To achieve 1990 emissions levels by 2020 from the emissions sectors related to land use (e.g., transportation, electricity, natural gas, wastewater), emissions would need to be reduced by approximately 24% compared to ARB estimates for 2020 under "business-as-usual" assumptions. As noted previously, in order to achieve 1990 emissions levels, both new and existing development in California will need to be more GHG efficient. The City has created efficiency metrics that allow "scaling" of AB 32 to the 2030 General Plan level. This allows for a meaningful comparison and consistency analysis between the 2030 General Plan and AB 32 targets.

The 2030 General Plan would enable Live Oak to accommodate approximately 36,000 to 44,000 new residents and 14,000 to 17,000 new local jobs (the analysis assumes 39,605 new residents and 15,258 new jobs). If the operational CO_2e emissions were distributed evenly on a per-unit basis, the new population of Live Oak would generate GHG emissions at an average rate of approximately 5.8 MT of CO_2e per person per year. New jobs and population in Live Oak would generate 4.2 MT CO_2e per SP per year. The land use change accommodated under the 2030 General Plan would meet the GHG-per-capita and GHG-per-SP benchmarks derived for the year 2020. Therefore, new development accommodated under the 2030 General Plan would match efficiency levels required statewide to achieve California's 2020 GHG target established under AB 32 (Exhibit 4.14-2). As noted previously, achieving 1990 emissions by 2020, as mandated under AB 32, is a goal tied to global GHG concentrations needed to stabilize GHG concentrations in the atmosphere at a level that would prevent dangerous human interference with the global climate.

While this EIR shows consistency with AB 32 and the related global climate goals, the City cannot demonstrate that the 2030 General Plan would meet the more aggressive GHG reduction goals described in the Governor's Executive Order S-3-05. Although this is an order from the Governor and not state legislation related to AB 32, for informational purposes, the City has derived a 2030 GHG emissions target based on linear interpolation of the AB 32 target for 2020 and the Executive Order S-3-05 target for 2050 (Exhibit 4.14-3). As shown, GHG emissions would be roughly 8% per capita and 14% per SP above an interpolated Executive Order S-3-05-based target.

Stationary- and Mobile-Source Measures and Regulations

Stationary- and mobile-source GHG regulations on the horizon would assist in further lowering GHG emissions during buildout of the 2030 General Plan. It is not known at this time what reductions are achievable from other emission sources through state regulatory measures, such as the AB 32 Early Action Measures (adopted in July 2007). Also not known at this time is whether additional GHG reductions for mobile sources might be available through legislation such as AB 1493, which would create more stringent vehicle emission standards for GHGs.

Table 4.14-3
Summary of Modeled Project-Generated, Construction- and Operation-Related Emissions of Greenhouse Gases

Source	Emissions (MT/yr CO_2e)[1]	Percent of Total
Buildout of Existing 1994 GP – (No Project Alternative)		
1994 General Plan Construction-Related Emissions (to occur over a 20-year buildout period)	5,690	-
Total Unmitigated	**113,795 tons**	-
Direct Operational Emissions		
Area Sources[2]	20,736	11%
Mobile Sources[3]	135,669	73%
Indirect Operational Emissions		
Stationary Sources (Electricity Generation)	25,290	14%
Stationary Sources (Water Consumption)	2,918	2%
Total Unmitigated Operational Emissions (1994 GP)	**184,612**	100%
Total Operational GHG Emissions Efficiency (1994 GP)	**9.1 MT/capita/yr** **5.1 MT/SP/yr**	-
Buildout of 2030 General Plan (New Emissions from the Project)		
2303 General Plan Construction-Related Emissions (to occur over a 20-year buildout period)	11,815	-
Total Unmitigated	**236,304 tons**	-
Direct Operational Emissions		
Area Sources[2]	46,666	20%
Mobile Sources[3]	126,888	55%
Indirect Operational Emissions		
Stationary Sources (Electricity Generation)	51,124	22%
Stationary Sources (Water Consumption)	5,354	2%
Total Unmitigated Operational Emissions (2030 General Plan)	**230,033**	100%*
Total Operational GHG Emissions Efficiency (2030 General Plan)	**5.8 MT/capita/yr** **4.2 MT/SP/yr**	-
Net Change in GHG Emissions Resulting from buildout of 2030 General Plan (GPU minus Existing On-the-Ground)	**230,033**	-
Net Change in GHG Emissions Relative to 1994 General Plan (Buildout of 2030 GPU minus Buildout of 1994 GP)[4]	**45,421**	**-3.3 MT/capita/yr** **-0.9 MT/SP/yr**

Notes: CO_2e = carbon dioxide equivalent; GP = General Plan; GPU = General Plan Update; MT/yr = metric tons per year; SP = service population; "=" = no data.

[1] Emissions modeled using the URBEMIS 2007 (Version 9.2.4) computer model, based on trip generation rates obtained from the analysis prepared for the General Plan; proposed land uses identified in Chapter 3, "Project Description," and Section 4.2, "Transportation and Circulation," of this EIR; recommendations from the Feather River Air Quality Management District for URBEMIS model inputs; and default model assumptions where detailed information was not available.

[2] For this estimate, FRAQMD-recommended model assumptions were used for the number of residences that would contain hearth features.

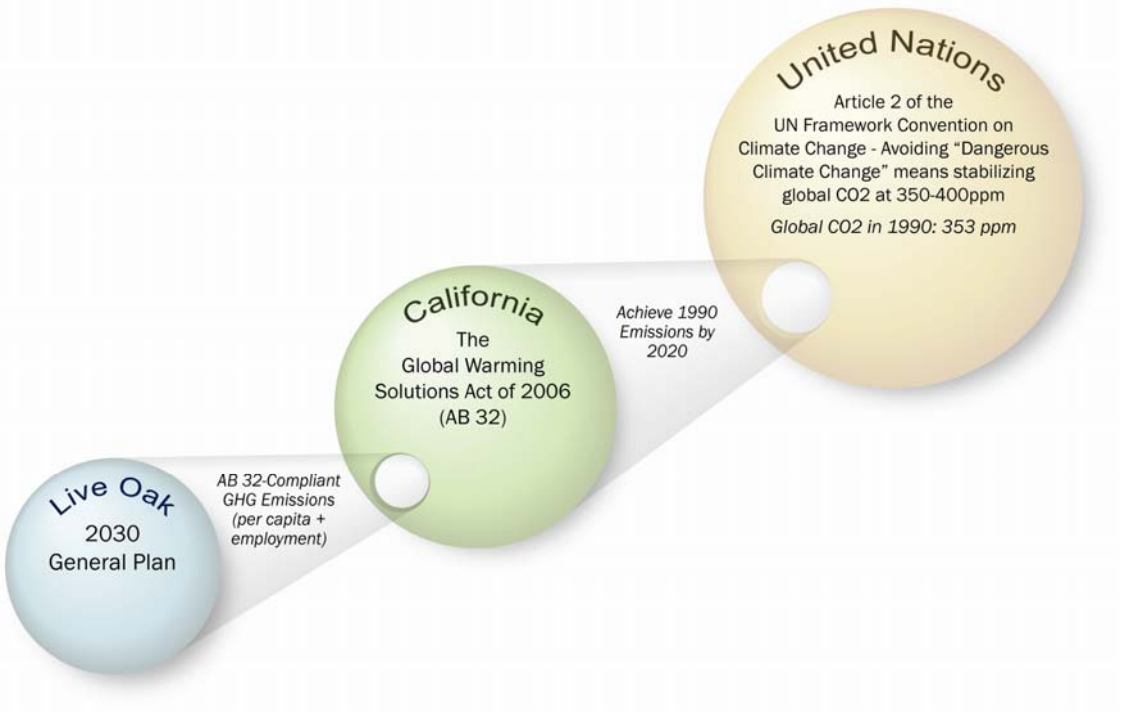
[3] Trip generation rates were obtained from the traffic analysis for the respective land uses (data provided by KdAnderson in 2008).

[4] Negative values for MT/capita/yr and MT/SP/yr mean that the GPU would improve GHG efficiency relative to buildout of the existing GP (i.e., the no project alternative).

*Totals may not add exactly due to rounding.

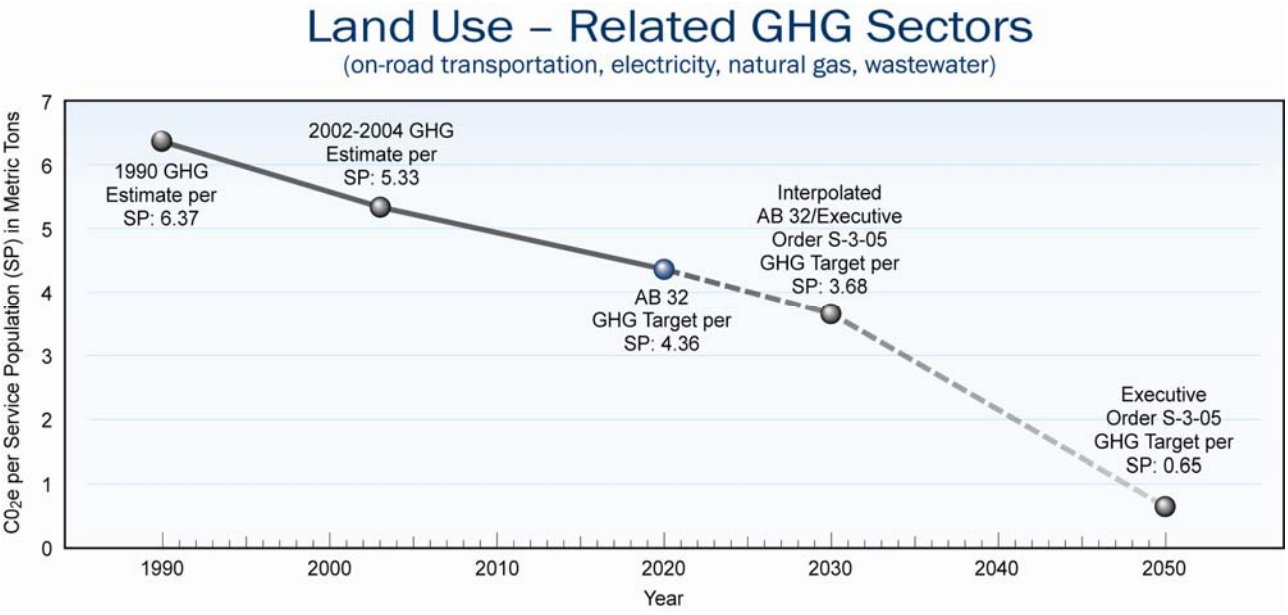
Refer to Appendix C for detailed assumptions and modeling output files.

Source: Data modeled by EDAW in 2009



Source: EDAW 2009

Consistency between 2030 General Plan, AB 32, and Global GHG Concentrations **Exhibit 4.14-2**



Source: The 1990 California GHG emissions inventory is from ARB (1990–2004 GHG Inventory, Version 1, November 2007). The 2002–2004 average GHG inventory estimate is from ARB's Greenhouse Gas Inventory Data - 2000 to 2006, last reviewed on May 22, 2009. 2050 GHG reduction targets are from the Governor's Executive Order S-3-05. Population and employment estimates and population forecasts are from the California Department of Finance. Interpolation of the Executive Order S-3-05 to 2030 and conversion of GHG estimates and targets into GHG efficiency (the service population metric) is from EDAW 2009.

Existing and Target GHG Emissions Levels Expressed per Service Population **Exhibit 4.14-3**

According to the AB 32 Scoping Plan, AB 1493 would be expected to result in approximately a 19.7% reduction in GHG emissions from on-road mobile sources (ARB 2008). Since a large portion of the 2030 General Plan GHG emissions result from mobile sources, this type of statewide regulation could have major GHG reduction potential.

It is not yet clear what the net GHG emissions would actually be under the buildout of the 2030 General Plan, given the uncertainty of future legislative and regulatory actions. Finally, market, demographic, and economic factors could affect the density and mix of land uses actually constructed. Therefore, actual CO_2 emission rates, as computed on a project-by-project basis, could vary. Many factors that would be used to calculate the net change in GHG emissions attributable to individual projects under the 2030 General Plan are either unknown at this time or outside the control of the City.

Relevant Goals, Policies, and Programs of the 2030 General Plan

As noted, the 2030 General Plan includes a variety of goals, policies, and programs aimed at addressing the threat of climate change. Importantly, the proposed Land Use Diagram (see Exhibit 3.2 in the Project Description, Section 3.0) supports and enables the implementation of these proposed policies. Specifically, the 2030 General Plan balances residential land uses with destination land uses and provides the opportunity for local employment (although the City cannot guarantee that a majority of residents will work locally). The General Plan creates new land use designations for "Neighborhood Center" and "Civic Center" development in support of creation of complete neighborhoods and diversity of land uses, including destination land uses within close proximity to residents. This type of development would enable residents to have easy access to daily amenities by walking, bicycle, or public transit instead of the need for a car. Table 4.14-4 summarizes the climate change-related policies and programs contained in the 2030 General Plan.

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Implementation Program Air-1	Following General Plan adoption, the City will develop a GHG reduction program… (See Proposed General Plan under separate cover for full text).	All
Orderly Growth/Complete Neighborhoods		
Goal LU-1.	Ensure orderly growth that provides homes and jobs for future residents.	Transportation
Policy LU-1.4	Lands within Centers should be developed in a coordinated fashion where multiple landowners are involved, wherever possible.	Transportation
Implementation Program LU-1.1	The City's zoning, subdivision, and other aspects of the City's Municipal Code will be revised following this General Plan update. As a part of these revisions, the City will specify the process for development of the Neighborhood Centers and Civic Centers (Centers). The City will create two or more zoning districts for Neighborhood Centers and Civic Centers. Projects within properties that have a Center will be required to show the required range of land uses on submitted plans and/or proposed subdivision maps…	Transportation
Goal LU-2.	Make improvements to existing developed areas as the city grows.	Transportation
Policy LU-4.5	The City will construct its new administrative facilities in the downtown core area, and other public agencies should construct any new administrative facilities in the downtown core area or in Centers.	Transportation
Infill Development		
Policy LU-2.1	The City will encourage the redevelopment of vacant and underutilized properties within the City.	Transportation
Policy LU-2.2	The City will encourage infill development, which is defined as development that has access to water and wastewater infrastructure in adjacent existing streets…	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Implementation LU-2.2	The City will update development impact fees, following the adoption of the 2030 General Plan update. The fees developed as a part of this update will take into account existing infrastructure availability. Infill development will have lower fees, where it is shown to have lower costs. Infill development is defined as development that has access to water and wastewater infrastructure in adjacent existing streets.	Transportation
Implementation Program LU-4.1	The City's water, wastewater, and drainage master plans will provide for infrastructure improvements designed to induce redevelopment in the downtown core area. The City will incorporate downtown infrastructure in capital improvements planning. The City will identify federal, state, and regional grant and loan programs for design, planning, and implementation of the City's polices for downtown core area redevelopment and revitalization, including infrastructure improvements. The City will consult with Sacramento Area Council of Governments to identify priority transit projects that serve development downtown.	Transportation
Implementation Program LU-4.2	The City will update the Zoning Code comprehensively following the 2030 General Plan update. As a part of these revisions, the City will identify flexibility in development standards in the downtown core area needed to encourage full redevelopment of targeted revitalization areas. For example, the City will reduce or eliminate off-street parking requirements, open-space requirements, off-street loading area requirements, and also will eliminate minimum parcel sizes and make other changes that may be needed to induce downtown development.	Transportation
Policy LU-5.2	The City will promote redevelopment of already-developed areas, such as downtown and properties along SR 99, where there is existing infrastructure, and where development can be accommodated without losing agricultural land to urban use.	Transportation
Policy Air-1.4	The City will encourage and provide incentives for infill development, defined as development that has water and sewer infrastructure available in adjacent streets and does not require extension of such infrastructure to serve the subject project.	Transportation
Jobs-Housing Balance		
Goal LU-3.	Provide a full-service community with a variety of employment, shopping, services, housing, and recreational opportunities.	Transportation
Policy LU-3.1	The City will encourage existing businesses to expand and new businesses to locate in Live Oak that provide high-quality employment opportunities for residents.	Transportation
Policy LU-3.2	The City will encourage a wide range of employment-generating land uses, such as business parks, office complexes, and other types of commercial, retail, and industrial facilities, to encourage the creation of jobs in the service, industrial, and professional sectors.	Transportation
Policy LU-3.3	New residential development shall provide for a broad range of housing types, including multi-family housing, attached single-family housing, small-lot single family detached housing, and larger-lot single-family detached housing in order to meet the needs of a diverse labor force and to improve the City's ability to attract future employers.	Transportation
Policy LU-3.4	A variety of housing sizes targeting different income and age groups should be encouraged in each neighborhood.	Transportation
Policy LU-3.5	Developments in areas designated for single-family development should provide a variety of lot sizes, while still accommodating production home development.	Transportation
Policy LU-4.6	The City will encourage affordable housing development around the downtown core area and in Centers, where people without a car can access services.	Transportation
Diversity of Land Uses		
Policy LU-3.6	Development in the downtown core area and in Neighborhood Centers should include a mix of office, retail, and commercial and public services.	Transportation
Goal LU-4.	Revitalize downtown with a variety of options for residents and visitors to gather, shop, eat, work, live, obtain commercial and public services, and recreate.	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Policy LU-4.1	The City will encourage mixed-use development in the downtown core area, with design elements intended to provide a comfortable and safe pedestrian environment.	Transportation
Policy LU-4.2	The City will encourage and provide incentives for redevelopment of the downtown core area with high-activity uses such as retail, public services, parks, professional offices, and high-density residential development.	Transportation
Policy LU-4.3	The City will encourage the development of visitor-oriented uses downtown that are also attractive to residents. These uses should be visible and easily accessible to visitors and residents alike.	Transportation
Parking		
Policy LU-4.4	To extent feasible, the City will provide on-street parking to serve the needs of downtown establishments and will minimize off-street parking requirements for downtown core area businesses and new high-density housing.	Transportation
Policy CIRC-4.1	Projects located in Neighborhood Centers, Civic Centers, and areas with the Downtown Mixed Use land use designation may have reduced off-street parking requirements.	Transportation
Goal CIRC-4.	Provide parking in a way that balances the needs of motorists, pedestrians, bicyclists, transit users, and community aesthetics.	Transportation
Policy CIRC-4.2	New development, especially in Centers and within the Downtown Mixed Use land use designation, should use shared parking, wherever possible, to meet the City's off-street parking requirements.	Transportation
Policy CIRC-4.3	New development will use on-street parking to meet parking needs, where feasible, to reduce or avoid the need for off-street parking.	Transportation
Policy CIRC-4.4	As funding is available, the City will paint additional on-street parking spaces along streets in existing developed areas to reduce the need for off-street parking.	Transportation
Implementation Program CIRC-5	Following adoption of the General Plan, the City will revise the off-street parking requirements, as necessary, based on policy in this Circulation Element. Since different land uses have different peak demand periods, it is often cost-effective in the short- and long-term for property owners, land developers, end users, and the City alike to encourage joint- or shared-use parking, particularly in mixed use areas…	Transportation
Policy DESIGN-6.4	For multi-family projects, the City will require convenient vehicular access and parking that neither limits pedestrian access nor endangers pedestrian safety and integrates parking areas with residential structures.	Transportation
Density		
Goal LU-5.	Establish environmentally and economically sustainable land-use patterns.	Transportation
Policy LU-5.1	Neighborhood Centers and Civic Centers will include higher-activity land uses, such as neighborhood retail and commercial services, offices, parks, civic buildings, schools, and higher-density housing, in order to accommodate walking, bicycling, and viable transit provision.	Transportation
Policy LU-5.3	New developments shall be designed to be compact and make efficient use of land in order to reduce up-front and ongoing infrastructure and service costs, minimize environmental impacts, and enhance the livability of the community…	Transportation
Implementation Program LU-5.1	Following adoption of the 2030 General Plan, the City will adopt changes to Municipal Code and Public Works Improvements Standards to accommodate more efficient use of land, consistent with the General Plan. For example, the City may revise the portion of the Municipal Code on Park Land Dedications/Fees to account for joint-use of parks for school and drainage. School impact fees and drainage impact fees should account for the cost savings related to joint-use of public lands and facilities, to the extent that these joint-use opportunities are realized.	Transportation
Implementation Program LU-5.2	The City will update development impact fees following the 2030 General Plan update. As a part of this update, the City will ensure that compact development has lower fees where it is shown to have lower costs.	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Policy DESIGN-8.4	The City will encourage multi-story buildings downtown.	Transportation
Connectivity		
Goal CIRC-1.	Develop a highly connected circulation system.	Transportation
Policy CIRC-1.1	New development shall provide highly connected street and pedestrian/bicycle networks, with many connections between neighborhoods, between new neighborhoods and older neighborhoods, and between Neighborhood and Civic Centers and the surrounding neighborhood.	Transportation
Policy CIRC-1.3	Where cul-de-sacs are allowed, they must allow emergency and bicycle/pedestrian through access, where appropriate.	Transportation
Policy CIRC-1.4	The maximum allowable length of a cul-de-sac is 500 feet unless an exception is approved by the Community Development Director in consultation with relevant emergency service providers.	Transportation
Policy CIRC-1.5	No property subdivision may have more than 25 percent of the total public street length in cul-de-sacs unless an exception is granted by the Community Development Director based on findings related to such issues as the small size of the subdivision, the infill location, or the location of the subdivision next to the railroad or Highway 99.	Transportation
Policy CIRC-2.3	The City will seek funding and consult with property owners to increase connectivity in existing neighborhoods by constructing new roads and/or bicycle/pedestrian paths at the end of dead-end streets and cul-de-sacs in the existing developed areas.	Transportation
Policy DESIGN 1.2	Civic Centers and Neighborhood Centers; parks; civic landmarks; and schools shall be connected by streets, multi-use trails, and pedestrian paths, so that people may comfortably and conveniently reach these destinations by foot, bicycle, car, and bus.	Transportation
Policy DESIGN 1.3	New development shall provide a well connected street system with simple and direct routes and connections to existing roadways and neighborhoods.	Transportation
Policy DESIGN 1.4	If cul-de-sacs are used, they should allow pedestrian and bicycle through connectivity to adjacent trails or streets.	Transportation
Policy DESIGN 1.5	The City will require block sizes based on location and land use to encourage pedestrian and bicycle travel, shorten vehicle trips, and ensure adequate emergency access.	Transportation
Policy DESIGN 1.6	If any soundwalls are used, they should provide frequent breaks for pedestrian and bicycle access to adjacent areas and incorporate screening and landscaping to minimize their visual impact.	Transportation
Policy Air-1.2	New development shall provide highly connected street networks, which provide many route choices between any given origin and destination point, encourage alternatives to vehicular travel, and shorten trip lengths for vehicular travel.	Transportation
Implementation Program CIRC-4	Following adoption of the General Plan, the City will revise the Zoning Ordinance, Subdivision Ordinance, and Public Works Improvement Standards, as necessary, to ensure a highly connected transportation system. Revisions to these implementing documents will be consistent with Circulation Element, and will include such item as: ► establish maximum block sizes in residential, mixed-use, and commercial areas; ► require stubbing of streets to adjacent planned development areas; ► establishment of a minimum connectivity index, particularly near Neighborhood Centers and Civic Centers, in order to ensure multiple route choices and emergency access; and, ► specify exceptions to connectivity standards.	Transportation
Bicycle, Pedestrian, Public Transit Infrastructure, Access, Design, and Safety		
Policy CIRC-1.2	Block length should be limited in new residential and mixed-use development areas to accommodate pedestrians and bicyclists, with smaller block lengths in and around Neighborhood and Civic Centers.	Transportation
Policy CIRC-1.6	New development shall contribute on a fair-share basis toward construction of an overcrossing of the railroad and SR 99.	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Goal CIRC-2.	Improve the convenience and safety for multi-modal travel in existing development.	Transportation
Policy CIRC-2.1	The City will seek funding for, and include pedestrian and bicycle improvements in Capital Improvements Planning, as feasible. Such improvements will include, but are not limited to construction of sidewalks where they do not currently exist, widening of sidewalks in high pedestrian traffic areas, installation of bike paths and lanes, and improved crossings of roads and the railroad for bicycles and pedestrians.	Transportation
Policy CIRC-2.2	The City and Redevelopment Agency will prioritize transportation investments that better connect neighborhoods to major destinations, with safer and more convenient pedestrian, bicycle, and transit stops and routes.	Transportation
Policy CIRC-2.4	The City will seek funding for and, as feasible, install traffic-calming measures, such as planted medians, landscaped planter strips, landscaped traffic circles, and other designs in areas with excessive traffic, as appropriate.	Transportation
Policy CIRC-2.5	The City and Redevelopment Agency will explore opportunities to construct new, or improve the safety of existing east-west crossings, or may require such improvements as a condition of new development, as appropriate.	Transportation
Policy CIRC-2.6	The City will consider its own operations and maximize opportunities to use, and encourage employees' use of pedestrian, bicycle, and transit facilities.	Transportation
Goal CIRC-3.	Ensure safe and convenient daily travel for pedestrians, bicyclists, transit users, and drivers as Live Oak grows.	Transportation
Policy CIRC-3.1	New development shall construct and dedicate streets that accommodate the full range of locally available travel modes.	Transportation
Policy CIRC-3.2	New development shall construct and dedicate and/or contribute to a connected bicycle/pedestrian network that is designed to promote travel to all schools, parks, and other major destinations.	Transportation
Policy CIRC-3.3	New development shall contribute on a fair-share basis to construct streets and bicycle/pedestrian paths in new growth areas that serve areawide or citywide travel needs.	Transportation
Policy CIRC-3.4	New development shall contribute on a fair-share basis to improve streets in existing developed areas affected by new development traffic.	Transportation
Policy CIRC-3.5	In areas with high pedestrian activity, streets should be relatively narrow and curb radii should be designed to promote pedestrian safety and convenience, while also ensuring adequate emergency access.	Transportation
Policy CIRC-3.6	Bicycle parking should be provided as a part of all non-residential development.	Transportation
Policy CIRC-4.5	Shade trees shall be provided in any proposed surface parking to achieve a minimum of 50 percent canopy coverage at maturity. A ratio of at least one tree for every six parking spaces is recommended, although 50 percent canopy coverage will require more of some tree species and fewer of other species.	Transportation
Goal CIRC-6.	Provide convenient public transit service for Live Oak residents and businesses.	Transportation
Policy CIRC-6.1	The City will consult with Yuba-Sutter Transit to maximize the availability of public transit options for Live Oak residents. This will include the development of local transit routes that provide frequent regular service to all areas of the city and transit connections to nearby communities of Gridley, Yuba City, and Marysville.	Transportation
Policy CIRC-6.2	The City will consult with Yuba-Sutter Transit to develop convenient commuter routes from Live Oak to major employment areas, such as Yuba City, Marysville, and Sacramento, and provide transit commuter routes serving Live Oak Employment areas, as it becomes feasible.	Transportation
Policy CIRC-6.3	The City will consult with Butte Regional Transit to develop a transit route that can stop in Live Oak on a regular basis and provide a connection to Butte County communities and employment centers.	Transportation
Policy CIRC-6.4	New development shall provide transit stops and bus pull-out lanes, consistent with City direction, long-range transit plans, and policies of local transit providers.	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Policy CIRC-6.5	Transit stops will be focused in Neighborhood Centers, Civic Centers, near schools, employment centers, retail establishments, parks, retirement communities, and in the downtown core area.	Transportation
Policy CIRC-6.6	Existing and future transit stops should have benches, covered sitting areas, and other amenities that make public transit more comfortable and attractive as a travel choice.	Transportation
Policy CIRC-6.7	The City will provide incentives to City employees for using public transit or ridesharing, such as free or discounted transit passes and priority parking areas.	Transportation
Policy CIRC-6.8	The City will consult with Yuba-Sutter Transit regarding possible sponsorship of bus routes for large employers in Live Oak.	Transportation
Policy CIRC-6.9	The City will provide incentives to local businesses that sponsor transit routes or create their own travel demand management programs. Incentives may include, but are not limited to, streamlined permitting, and reduction of parking requirements.	Transportation
Goal CIRC-7.	Redesign SR 99 within Live Oak to better meet local needs.	Transportation
Policy CIRC-7.1	The City will consult with Caltrans, SACOG, and other relevant agencies to plan, fund, and implement context-sensitive design solutions along SR 99 that calm traffic, enhance aesthetics, and improve pedestrian safety and convenience, consistent with this General Plan.	Transportation
Policy CIRC-7.2	The City will encourage and support narrower lanes for SR 99 between Kola Street and Archer Avenue, as one way to increase safety and encourage slower traffic.	Transportation
Policy CIRC-7.3	As development occurs along SR 99, this should include construction of separated sidewalks with street trees along property frontages.	Transportation
Policy CIRC-7.4	The City will limit new direct access points to SR 99 and will encourage new development along SR 99 to provide driveway access from local streets instead of the highway.	Transportation
Policy CIRC-7.5	The City will improve the safety and convenience of pedestrian activity along SR 99 and crossings of SR 99 in and around the downtown core area, as funding is available.	Transportation
Goal CIRC-8.	Ensure seamless and effective transportation throughout the Planning Area and the surrounding region.	Transportation
Policy CIRC-8.1	The City will consult with other local and regional transportation planning agencies, including Sutter County, Butte County, Caltrans, and the Sacramento Area Council of Governments, to ensure consistency among agencies' transportation systems and plans.	Transportation
Policy CIRC-8.2	The City will integrate local transportation planning with regional transportation planning and provide direction to the state and SACOG regarding community preferences for the design of regional transportation routes within Live Oak.	Transportation
Policy CIRC-8.3	The City will consult with the California Public Utilities Commission, Amtrak, Union Pacific Railroad Company, and any other relevant agencies to encourage and accommodate any future opportunities for future regional bus transit and rail stops in Live Oak.	Transportation
Implementation Program CIRC-1	The City will assess transportation impact fees and plan transportation improvements based, in part, on LOS analysis and standards described in this Circulation Element. The City will also explicitly consider the impact of traffic improvements on pedestrian, bicycle, and public transit safety and convenience. The City will allow exceedance of vehicular LOS for future development projects, if necessary…	Transportation
Implementation Program CIRC-2	The City will consult with the Sacramento Area Council of Governments to revise the local approach to traffic impact analysis to take advantage of emerging, more sophisticated, land use, density- and design-sensitive modeling techniques. The City will promote the use of land use/transportation modeling that is sensitive to not only land use, but also pedestrian-oriented design…	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Implementation Program CIRC-3	Following adoption of the 2030 General Plan, the City will revise its development impact fees based on a Nexus Study, including areawide serving transportation facilities, such as a railroad and Highway 99 overcrossing in the northern portion of the City.	Transportation
Implementation Program CIRC-7	Following adoption of the General Plan, the City will revise the Street Design Criteria, as necessary, to implement policy of this Circulation Element. As a part of these revisions, the City will consider pedestrian-friendly street standards, especially for areas where high pedestrian activity is anticipated….	Transportation
Implementation Program CIRC-8	The City will seek funding to work collaboratively with Caltrans (and SACOG, as appropriate) to prepare a conceptual corridor plan for SR 99. The plan should include such design components as wide, separated sidewalks, street trees and other landscaping, street furniture, and other amenities, as appropriate….	Transportation
Goal DESIGN-1.	Provide connected streets with features and amenities that accommodate many travel modes.	Transportation; Sequestration
Policy DESIGN 1.7	Alleys may be used in new development to provide access to nearby uses, to minimize street congestion, and to allow for the potential location of residential garages, secondary units (“granny flats”), and waste collection services off public streets.	Transportation
Policy DESIGN-1.8	Street intersections in areas with high pedestrian traffic or high vehicle traffic should have distinctive crosswalks with different paving patterns, painting, landscaping, and other aesthetic/safety enhancements.	Transportation
Policy DESIGN-1.9	The City encourages the use of traffic calming devices, such as bulb-outs, crosswalks, pedestrian refuges, planted medians, speed humps, traffic circles, and other passive speed control measures, where appropriate.	Transportation
Policy DESIGN-1.10	As funding permits, the City will seek to install traffic calming and pedestrian and bicycle improvements in existing neighborhoods and commercial areas where high traffic speeds are a problem.	Transportation
Goal DESIGN-2.	Design streetscapes to create attractive and comfortable spaces for people.	Transportation
Policy DESIGN 2.1	New streets shall provide comfortable travel areas for pedestrians, bicyclists, and drivers to facilitate multi-modal travel.	Transportation
Policy DESIGN 2.2	Local and minor collector streets should have narrower travel areas for vehicles than arterial streets in order to provide safe and comfortable environment for pedestrians and bicyclists.	Transportation
Policy DESIGN 2.3	Local streets and setbacks should not be overly wide. Street width should be proportional with building setbacks and heights to create “outdoor rooms,” emphasizing comfort of pedestrians and bicyclists.	Transportation
Policy DESIGN-2.4	New developments should attempt to preserve as many existing mature trees as feasible and plant additional street trees to eventually create a complete canopy.	Transportation; Sequestration
Policy DESIGN-2.5	The City will add street trees in existing developed areas, as feasible, with the goal of a complete tree canopy.	Transportation; Sequestration
Policy DESIGN-2.6	Trees in commercial areas should be located and selected to shade sidewalks.	Transportation
Policy DESIGN-2.7	Trees in residential areas should shade both the sidewalk and the street and provide a visual buffer between streets and homes.	Transportation
Goal DESIGN-4.	Neighborhoods that foster a sense of community and support pedestrian activity.	Transportation
Policy DESIGN-4.1	Residential sites and building frontages should create an attractive, pedestrian-friendly environment along neighborhood streets.	Transportation
Policy DESIGN-4.2	Residential developments should incorporate porches, stoops, active rooms, and operable windows that face and are visually prominent from the street.	Transportation
Policy DESIGN-4.3	The City will be flexible in allowing reduced front-yard setbacks with recessed garages, rear-lot garages, alley-loaded garages, and other approaches that promote an inviting human scale.	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Goal DESIGN-5.	Encourage quality single-family residential site design and architecture.	Transportation
Policy DESIGN-5.1	The City will allow a variety of lot configurations that accommodate higher densities and preserve yards and privacy.	Transportation
Policy DESIGN-5.2	The City will allow cottage, cluster, and attached single-family housing and will ensure that the development of such housing is in scale with the neighborhood context.	Transportation
Policy DESIGN-8.1	The City will maintain and enhance a strong pedestrian orientation downtown through the design of buildings, streets, and open spaces.	Transportation
Policy PUBLIC-7.1	The City will coordinate with the Live Oak Unified School District to determine appropriate locations for new schools. If possible, schools should be located within Civic Centers and within walking or biking distance of all homes within their attendance boundaries.	Transportation
Policy PUBLIC-7.5	The City will ensure that areas around planned school sites offer safe and convenient pedestrian and bicycle access from the surrounding neighborhood. New developments shall provide safe routes to and from school sites from surrounding planned neighborhoods.	Transportation
Implementation Program Air-2	The City will identify, pursue, and use federal and state funds for bicycle and transit improvements, transit-oriented planning and development, and other planning and improvement grant programs intended to encourage alternatives to automobile transportation.	Transportation
Policy PARKS-1.5	The City will seek opportunities to construct linear parks with pedestrian/bicycle pathways that connect homes and destinations and address existing deficiencies relative to the City's parkland acreage standards.	Transportation
Policy DESIGN-8.5	The City will require ground floor building façade treatments and activities that generate pedestrian interest and comfort. Large windows, canopies, appropriate signage, arcades, plazas and outdoor seating are examples of such amenities.	Transportation
Goal DESIGN-10.	New and existing commercial centers accommodate multiple travel modes.	Transportation
Policy DESIGN-10.1	The City will require a strong pedestrian orientation through the design of buildings, streets, and sidewalks in neighborhood centers and commercial and mixed-use projects.	Transportation
Policy DESIGN-10.2	Site and building access for pedestrians and bicyclists should be provided as directly as possible from sidewalks and parking areas to building entrances, while minimizing conflicts with motor vehicle traffic.	Transportation
Policy DESIGN-10.3	The City will encourage connected streets and shorter blocks in Neighborhood Centers and Civic Centers in order to create a pedestrian-scale street environment.	Transportation
Policy DESIGN-10.4	The City will require new development to incorporate design amenities into parking lots, including landscaping to screen views of parking areas, trees to provide shade, pedestrian paths to provide safe and convenient access, and treatment of surface parking areas.	Transportation
Policy DESIGN-10.8	Commercial projects and commercial development in Neighborhood Centers shall provide awnings and other forms of pedestrian shelter along building faces that front on sidewalks.	Transportation
Policy DESIGN-10.9	The City will require incorporation of architectural and landscape features that allow for secure locking of bicycles in locations easily observed from indoors. These features must be located to minimize interference with pedestrian areas, evacuation routes, cargo loading areas, and utilities accesses.	Transportation
Policy DESIGN-10.10	As demand for transit increases, the City will coordinate with Yuba-Sutter Transit to locate and provide attractive and distinctive shelters and seating for transit stops serving mixed-use areas.	Transportation
Policy DESIGN-12.2	The City will establish flexible setback requirements, including zero setbacks, to promote sidewalk activity in the downtown core area and to allow retail uses to face and open up to front sidewalks and plazas.	Transportation

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Policy DESIGN-12.4	The City will encourage, through incentives, streamlining, flexibility in development standards, and other means, infill buildings along vacant or underutilized sections of the highway designed to improve the environment for pedestrians.	Transportation
Policy DESIGN-13.1	Large buildings should decrease perceived size and scale through building articulation, breaking up building massing, organization of buildings, the use of different color and materials, and the use of landscape screening.	Transportation
Implementation Program DESIGN-6	The City will pursue streetscape improvements including sidewalks, street trees and additional landscaping throughout the existing developed community.	Transportation
Goal AIR-1.	Plan and design the community to encourage walking, bicycling, and use of transit.	Transportation
Policy Air-1.1	New neighborhoods will include a mix of land uses, including pedestrian-friendly Civic Centers and Neighborhood Centers ("Centers") that accommodate destination land uses (e.g., local-serving retail, neighborhood services, employment uses, and entertainment uses) to allow neighborhood residents to meet daily needs without the use of an automobile, and also to provide supportable locations for future transit stops. (See also the Land Use Element.)	Transportation
Policy Air-1.3	City administrative facilities and other government offices established in Live Oak should be located downtown or in Centers, to be accessible by transit, walking, and bicycling.	Transportation
Goal DESIGN-7.	Neighborhood design promotes safety and surveillance of public and semi-public spaces.	Transportation
Policy DESIGN-7.1	The City will incorporate Crime Prevention through Environmental Design (CPTED) strategies in new developments and in existing neighborhoods to improve safety for residents and visitors. CPTED principles emphasize traditional surveillance, territoriality, defensibility, access control, and target hardening to reduce opportunities for criminal behavior.	Transportation
Policy DESIGN-7.2	The City will encourage the use of porches, stoops, and other elements that provide a place to comfortably linger and thereby provide "eyes on the street," helping to maintain a sense of security within neighborhoods.	Transportation
Policy DESIGN-7.4	Bicycle and pedestrian paths shall be well lit and located where there is casual surveillance.	Transportation
Policy DESIGN-8.3	The City will encourage construction of continuous building facades downtown with minimal or no setback from sidewalks for most buildings.	Transportation
Low-Emissions Vehicles and Best Practices		
Policy DESIGN-8.2	Durable, high quality building materials should be used in buildings downtown to lower maintenance and replacement needs and ensure the aesthetic appeal of new development and rehabilitation.	Construction
Goal AIR-2.	Use construction practices and operational strategies that minimize air pollution.	Construction
Policy Air-2.1	New development shall implement standard emission control measures recommended by the Feather River Air Quality Management District for construction, grading, excavation, and demolition, to the maximum extent feasible.	Construction
Policy Air-2.2	The City will identify a preference for contractors that use low-emission equipment and other practices with air quality benefits (e.g., using locally produced and/or recycled construction materials, recovering demolition materials for reuse, or otherwise diverting refuse or waste from a landfill) for City-sponsored construction projects.	Construction
Policy Air-2.3	The City will encourage the prevailing local solid waste disposal provider to use low-emission vehicles and other equipment, and future contracting with solid waste handlers should identify a preference for solid waste contractors that use air quality best management practices.	Transportation
Policy Air-2.5	The City will replace its fleet vehicles with low-emission vehicles, as funding is available and as fleet turnover warrants.	Transportation
Policy DESIGN-14.2	The City will encourage the preservation of healthy, attractive vegetation during land development. Significant existing trees shall be preserved whenever possible.	Sequestration

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Energy Conservation		
Goal ENERGY-1.	Pursue energy-efficient technology, best practices, and materials.	Electricity; Natural Gas Consumption
Policy Energy-1.1	The City will encourage new developments to use building orientation and site design that optimizes opportunities for on-site solar generation. The City will encourage new developments to use street and lot orientation and lot dimensions that facilitate the use of solar energy and climatically appropriate design.	Electricity Consumption
Policy Energy-1.2	The City will encourage new developments to orient as many buildings as possible with the longer axis of the building, also known as the ridge line, oriented east-to-west, in order to maximize the potential for passive solar heating in the winter and to minimize heat gain from the afternoon summer sun.	Electricity; Natural Gas Consumption
Policy Energy-1.3	Shade trees or other appropriate plantings should be used in new lower-density residential development (e.g., trellises) to protect buildings from unwanted solar gain in summer months. Trees and plantings should be located on the east and west sides of each home. Shade trees should be located at an appropriate distance from buildings to provide adequate shading, while reducing potential damage to buildings. Shade trees need to be located so that active and passive solar energy systems are not diminished. Using deciduous trees on the southern side of the structure is encouraged, to allow cooling in the summer and solar gain in winter.	Electricity; Natural Gas Consumption
Policy Energy-1.4	Development plans should demonstrate preservation of solar access for residential buildings within and adjacent to the project. The City will waive this requirement in medium-density and higher-density residential projects and mixed-use projects if needed to achieve the densities allowed by the General Plan.	Electricity Consumption
Policy Energy-1.5	New buildings should enhance natural ventilation and promote effective use of daylight, to reduce use of energy. Designs should emphasize ventilation strategies such as natural convection and push-pull ventilators. Structures should be designed to provide abundant natural light through high-performance glazing systems, skylights, light ducts, light shelves, and other strategies.	Electricity Consumption
Policy Energy-1.6	The City will also provide incentives, such as expedited permitting or density bonuses to developers that design and construct net zero energy residential prior to 2020, and commercial and institutional buildings prior to 2030.	Electricity; Natural Gas Consumption
Policy Energy-1.7	New City-owned buildings and major remodels and additions should be designed to achieve the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) certification or better, where funding allows. Financial analysis of both first costs and long-term operational costs should guide the City's evaluation of LEED certification.	Electricity; Natural Gas Consumption
Policy Energy-1.8	The City will promote Build-it-Green or LEED–Homes certification of new single-family properties.	Electricity; Natural Gas Consumption
Policy Energy-1.9	The City will promote LEED or equivalent certification of multiple-family, commercial, and industrial properties.	Electricity; Natural Gas Consumption
Policy Energy-1.10	The City will provide incentives, such as expedited permitting or density bonuses to development with over 75 percent of the units achieving LEED-certification or equivalent performance standards achieving these performance standards.	Electricity; Natural Gas Consumption
Policy Energy-1.11	The City will encourage energy efficiency audits of existing buildings and help facilitate the implementation of identified efficiency improvements. The City will conduct energy efficiency audits of all City-owned buildings.	Electricity; Natural Gas Consumption
Policy Energy-1.12	The City will encourage the retrofitting of existing buildings throughout Live Oak with energy efficient systems, energy-efficient appliances, insulation, energy-efficient doors and windows, and other elements that conserve resources.	Electricity; Natural Gas Consumption

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Policy Energy-1.13	New commercial, institutional, and industrial development should reduce potential urban heat island effect by using U.S. Environmental Protection Agency–ENERGY STAR®-rated roofing materials and light colored paint, using light-colored paving materials for internal roads and parking, and by using shade trees to shade south and west sides of new or renovated buildings, to the greatest extent feasible.	Electricity Consumption
Policy Energy-1.14	New commercial, institutional, and industrial development shall incorporate shade trees or shade structures in any newly constructed surface parking areas. The minimum requirement is 50 percent shading (at maturity where trees are used) for all new parking lots.	Electricity Consumption
Goal ENERGY-2.	Support the use of renewable energy technologies within the City.	Electricity; Natural Gas Consumption
Policy Energy-2.1	The City will explore the installation of renewable energy systems on City buildings and properties.	Electricity Consumption
Policy Energy-2.2	New construction or major renovation of commercial and industrial buildings over 10,000 square feet shall incorporate renewable energy generation, where feasible, to provide for the project's energy needs.	Electricity Consumption
Policy Energy-2.3	The City will maximize the use of renewable energy in meeting City building energy needs with a goal of 50 percent or more renewable energy by General Plan buildout.	Electricity Consumption
Policy Energy-2.4	The City will evaluate the operational cost-savings and feasibility of installing solar hot water systems to heat the community swimming pool.	Natural Gas Consumption
Implementation Program Energy-1	The City will create permitting-related and other incentives for energy-efficient building projects. These should include, but are not be limited to giving projects that exceed Title 24 Standard by 10 percent or more priority in plan review, priority in processing and field inspection services, and density bonuses.	Electricity; Natural Gas Consumption
Implementation Program Energy-2	Amend subdivision standards to ensure that street and lot orientation facilitates buildings that incorporate solar design and renewable energy systems. Street and lots shall be designed in a way that allows residential lots to accommodate a building's long axis in an east-west direction.	Electricity; Natural Gas Consumption
Implementation Program Energy-3	The City will amend the zoning and subdivision ordinances to provide regulatory guidance for lot and building orientation to allow passive solar and renewable energy systems use.	Electricity; Natural Gas Consumption
Implementation Program Energy-4	The City will proactive identify and take advantage, where possible, of state and federal grants, low-interest financing, and other funding mechanisms for energy efficiency retrofits and alternative energy projects for civic, residential, and commercial buildings.	Electricity; Natural Gas Consumption
Implementation Program Energy-5	The City will allow solar financing programs designed to facilitate the installation of solar energy systems on residents' homes. Such programs would establish a sustainable energy financing district and would allow property owners to borrow money from the City to install solar energy systems. Property owners would voluntarily participate in the program and would repay the cost of the solar energy system over a 20-year period through a special annual tax on their property tax bill. Only property owners who participate in the program will pay the sustainable energy financing district tax. Non-participants would experience no change in taxes due to the program.	Electricity Consumption
Implementation Program Energy-6	The City will provide public outreach to support reduced energy consumption, the use of alternative and renewable energy sources, green building practices, recycling, and responsible purchasing.	Electricity; Natural Gas Consumption; Waste
Policy PUBLIC-15.8	The City will encourage and accommodate community renewable energy collection and use, and other renewable energy and energy conservation programs in all new and existing development.	Electricity Consumption

Table 4.14-4
Proposed General Plan Goals, Policies, and Implementation Strategies Designed to Reduce Greenhouse Gas Emissions in Live Oak

Element and Goal, Policy, or Strategy		Affected GHG Emissions Sector
Water Conservation		
Policy DESIGN-14.3	The City will encourage the use of site landscaping that uses appropriate native plant materials in order to enhance the natural character of the region; to reduce water and pesticide use; and to provide habitat to native species.	Water Consumption
Policy Air-2.4	City parks and open space will use low-maintenance, drought-tolerant landscaping, except in the case of playing fields. For landscape maintenance that is required, the City will encourage use of low-emission equipment.	Water Consumption
Policy Water-2.3	The City will encourage the use of native, drought-tolerant landscaping throughout the City to conserve water and filter runoff.	Water Consumption
Policy Water-2.4	Native and drought-tolerant landscaping should comprise at least 50 percent of landscapes in commercial and industrial projects and 100 percent of all medians and right-of-way landscaped areas along public streets.	Water Consumption
Policy Water-2.5	The City will require the use of water conservation technologies, such as low-flow toilets, efficient clothes washers, and more efficient water-using industrial equipment, in all new construction and retrofitted and substantially remodeled buildings, consistent with building code requirements.	Water Consumption
Policy Water-2.6	The City will support the retrofitting of existing buildings throughout Live Oak with water-saving fixtures.	Water Consumption
Policy Water-2.8	The City will adopt water conservation pricing (e.g., tiered rate structures) to encourage efficient water use.	Water Consumption
Implementation Program Water-2	The City will revise landscaping requirements to include drought-tolerant, low-maintenance plants.	Water Consumption
Policy PUBLIC-2.4	New development should install water-conserving appliances and faucets, drought-tolerant landscaping, recycled water systems, and other water conservation improvements and programs, to the greatest extent feasible.	Water Consumption
Policy PUBLIC-2.5	The City will encourage water conservation measures not required by state law, such as recycled water systems.	Water Consumption
Policy PUBLIC-2.6	The City will establish use-based water rates. The City will consider adopting relatively low rates for a basic water allocation, and higher water rates beyond this basic allocation.	Water Consumption
Policy PUBLIC-2.7	The City will provide education to residents and businesses on benefits and methods of water conservation.	Water Consumption
Solid Waste Reduction		
Goal PUBLIC-14.	Provide high-quality solid waste collection services and make use of environmental best practices to reduce the city's waste stream.	Waste
Policy PUBLIC-14.1	The cost of recycling and yard waste collection shall be substantially less than the same volume of garbage, as appropriate, to encourage recycling and composting of yard waste.	Waste
Policy PUBLIC-14.2	The City will encourage the use of compost in community gardens and other appropriate locations. The City will coordinate with the local solid waste collection provider to implement community or Citywide composting facilities for yard waste collected locally.	Waste
Policy PUBLIC-14.4	The City will pursue funding and grants to help fund solid waste reduction programs.	Waste
Policy PUBLIC-14.5	Construction and demolition waste from development projects should be recycled or reused to aid in reducing the City's overall waste stream.	Waste
Policy PUBLIC-14.6	The City will implement recycling education programs for city residents to promote source reduction, recycling, and composting to decrease the City's waste stream.	Waste

Conclusion

Implementation of the policies and programs summarized in Table 4.14-4 that are designed to reduce GHG emissions, including Conservation and Open Space Element Implementation Program Air-1 (City-wide GHG reduction program), would ensure consistency with the mandates of AB 32 (i.e., reduce statewide GHG emissions to 1990 levels by 2020). Implementation of the 2030 General Plan would not hinder California's AB 32 target, and, therefore, would not conflict with any relevant adopted plan, policy, or regulation related to GHG emissions or climate change.

However, because of the large amount of development and potential for simultaneous construction of multiple sites, taken together with modeled emissions (presented in Table 4.14-3), implementation of the 2030 General Plan could result in or substantially contribute to GHG emissions. This substantial quantity of GHG emissions would be cumulatively considerable, and would contribute to the significant cumulative impact of climate change. Although the City complies with applicable state legislation on climate change, this additional GHG emissions attributable to 2030 General Plan implementation are **cumulatively considerable** and this impact is considered **significant**.

Mitigation Measure 4.14-1

- Individual projects that would be constructed under the 2030 General Plan shall implement Mitigation Measure 4.3-3 (described in Section 4.3, "Air Quality"), which requires design and operational measures to reduce operational emissions of criteria air pollutants, would further reduce CO_2 emissions from the Plan's operation. Each individual project would also be required to implement site-level mitigation to reduce GHG emissions, as feasible.

- The City shall monitor the effectiveness of current and forthcoming regulations and legislation intended to reduce GHG emissions from mobile sources (e.g., AB 1493, SB 375), area sources (e.g., California Green Building Standards Code), and indirect sources (i.e., Renewable Energy Portfolio standards) on community and municipal GHG emissions. The City will implement related programs locally, where appropriate, to further reduce GHG emissions of 2030 General Plan buildout.

As noted, the framework of the 2030 General Plan, including the Land Use and Circulation Diagrams, is designed to achieve GHG reduction, among other social, economic, and environmental objectives of the City. All feasible mitigation is included as policy or as an implementation program in the 2030 General Plan. No additional feasible mitigation is available. The impact is considered **significant and unavoidable**.

IMPACT 4.14-2 Impacts of Climate Change on Live Oak. *Climate change is expected to result in a variety of effects that could potentially impact the vicinity of Live Oak: alterations to agricultural production, changes to terrestrial and aquatic ecosystems, increased energy demand, decreased water supply, increased risk of flooding, and increased frequency and intensity of wildfire. Substantial negative effects on residents, resources, structures, and the economy could result. However, substantial impacts either would not be anticipated to affect the Live Oak Planning Area or policies and programs included in the 2030 General Plan would reduce or avoid substantial adverse impacts. This impact would be* ***less than significant****.*

Effects of the Climate Change on the General Plan

As discussed previously in this section, human-induced increases in GHG concentrations in the atmosphere have led to increased global average temperatures (global warming) through the intensification of the greenhouse effect, and associated changes in local, regional, and global average climatic conditions.

Although there is a strong scientific consensus that global climate change is occurring and is influenced by human activity, there is less certainty as to the timing, severity, and potential consequences of the climate phenomena.

Scientists have identified several ways in which global climate change could alter the physical environment in California (IPCC 2007, CEC 2006b, DWR 2006). These include:

- increased average temperatures;
- modifications to the timing, amount, and form (rain vs. snow) of precipitation;
- changes in the timing and amount of runoff;
- reduced water supply;
- deterioration of water quality; and
- elevated sea level.

The changes listed above may translate into a variety of issues and concerns that may affect certain areas in the vicinity of Live Oak, including but not limited to:

- changed and potentially reduced agricultural production as a result of changing temperatures and precipitation patterns;
- changes in the composition, health, and distribution of terrestrial and aquatic ecosystems, particularly associated with increased saltwater intrusion into the Delta;
- reduced production of hydroelectric energy caused by changes in the timing and volume of runoff;
- increased energy demand associated with increased temperatures;
- increased air pollution and related effects on human health;
- decreased water supply, reliability, and quality;
- increased risk of flooding and landslide associated with changes to precipitation patterns;
- increased frequency and intensity of wildfire as result of changing precipitation patterns and temperatures; and
- inundation of low-lying areas associated with rising sea levels.

Although uncertainty exists as to the precise levels of these impacts, there is consensus regarding the range that can be expected.

Although climate change is an issue of global scale and the impacts described above would occur whether or not the 2030 General Plan is adopted, implementation of the Plan would influence the degree to which climate change affects Live Oak's residents, ecosystems, and economy. Development associated with buildout of the 2030 General Plan could subject an increased number of persons and structures to potential hazards, such as water supply issues. Because the Planning Area is located sufficiently far above sea level, it is not anticipated that the proposed project would be affected by sea level rise. Because land surrounding the Planning Area is largely agricultural and rural scale residential, and the Planning Area is not adjacent to wild lands, increased exposure to wildfire is not anticipated to substantially affect the Planning Area. Additionally, environmental impacts resulting from implementation of the 2030 General Plan (as identified throughout Section 4 of this EIR) could combine with climate change–associated impacts to intensify such impacts and exacerbate hardships for the City.

Although the 2030 General Plan may increase Live Oak's exposure to such risks and hardships, the Plan also includes a variety of policies and programs that would assist the City in avoiding, adapting to, and being resilient in the face of climate change–associated impacts.

Relevant Policies and Programs of the 2030 General Plan

The 2030 General Plan contains many goals, policies, and programs which have the potential to aid the City's adaptation to climate change (by reducing energy demand, reducing flood potential, and ensuring adequate water supply and increasing water conservation). These policies include:

- **Conservation and Open Space Policy Air-2.4:** City parks and open space will use low-maintenance, drought-tolerant landscaping, except in the case of playing fields. For landscape maintenance that is required, the City will encourage use of low-emission equipment.

- **Conservation and Open Space Policy Energy-1.3:** Shade trees or other appropriate plantings should be used in new lower-density residential development (e.g., trellises) to protect buildings from unwanted solar gain in summer months. Trees and plantings should be located on the east and west sides of each home. Shade trees should be located at an appropriate distance from buildings to provide adequate shading, while reducing potential damage to buildings. Shade trees need to be located so that active and passive solar energy systems are not diminished. Using deciduous trees on the southern side of the structure is encouraged, to allow cooling in the summer and solar gain in winter.

- **Conservation and Open Space Policy Energy-1.13:** New commercial, institutional, and industrial development should reduce potential urban heat island effect by using U.S. Environmental Protection Agency–ENERGY STAR®-rated roofing materials and light colored paint, using light-colored paving materials for internal roads and parking, and by using shade trees to shade south and west sides of new or renovated buildings, to the greatest extent feasible.

- **Conservation and Open Space Policy Energy-1.14:** New commercial, institutional, and industrial development shall incorporate shade trees or shade structures in any newly constructed surface parking areas. The minimum requirement is 50 percent shading (at maturity where trees are used) for all new parking lots.

- **Conservation and Open Space Policy Agriculture-1.5:** The City will work with farmers, property owners, extensions, agencies, and agricultural organizations to enhance the viability of agricultural uses and activities.

- **Conservation and Open Space Policy Water-1.2:** Existing swales and sloughs should be preserved, restored, and used for stormwater drainage whenever possible.

- **Conservation and Open Space Policy Water-1.3:** The City will require developments to use best management and design practices to reduce stormwater runoff levels, improve infiltration to replenish groundwater sources, and reduce pollutants close to their source. The City will require new development to use permeable surfaces for hardscape wherever possible. Impervious surfaces such as driveways, streets, and parking lots should be interspersed with vegetated areas that allow for infiltration of stormwater. LID techniques, such as rain gardens, filter strips, swales, and other natural drainage strategies, should be used to absorb stormwater, reduce polluted urban runoff, recharge groundwater, and reduce flooding (see Figure CO-8).

- **Conservation and Open Space Policy Water-2.1:** The City will incorporate into its entitlement review process compliance with portions of state law that require demonstration of adequate long-term water supply for large development projects (Senate Bills 610 and 221).

- **Conservation and Open Space Policy Water-2.2:** The City will condition approval of new development on the availability of sufficient water supply, storage, and fire flow (water pressure), per City standards.

- **Conservation and Open Space Policy Water-2.3:** The City will encourage the use of native, drought-tolerant landscaping throughout the City to conserve water and filter runoff.

- **Conservation and Open Space Policy Water-2.4:** Native and drought-tolerant landscaping should comprise at least 50 percent of landscapes in commercial and industrial projects and 100 percent of all medians and right-of-way landscaped areas along public streets.

- **Conservation and Open Space Policy Water-2.5:** The City will require the use of water conservation technologies, such as low-flow toilets, efficient clothes washers, and more efficient water-using industrial equipment, in all new construction and retrofitted and substantially remodeled buildings, consistent with building code requirements.

- **Conservation and Open Space Policy Water-2.6:** The City will support the retrofitting of existing buildings throughout Live Oak with water-saving fixtures.

- **Conservation and Open Space Policy Water-2.7:** The City will participate in regional groundwater basin planning and regional water-management planning efforts to ensure that future demand for water does not overdraft the groundwater supply.

- **Conservation and Open Space Policy Water-2.8:** The City will adopt water conservation pricing (e.g., tiered rate structures) to encourage efficient water use.

- **Safety Policy PS-2.1:** The City will coordinate with the Sutter Butte Flood Control Agency to ensure that flood control facilities protecting Live Oak's Planning Area from flood risks to the City are well maintained and capable of protecting existing and proposed structures from flooding, in accordance with state law.

- **Safety Policy PS-2.2:** The City will regulate development within floodplains according to state and federal requirements to minimize human and environmental risks and maintain the City's eligibility under the National Flood Insurance Program.

- **Safety Policy PS-2.3:** The City will require evaluation of potential flood hazards before approving development projects.

- **Safety Policy PS-2.4:** The City will require applicants for development to submit drainage studies that adhere to City stormwater design requirements and incorporate measures from the City's master drainage plan to prevent on- or off-site flooding.

- **Safety Policy PS-2.5:** New development shall be required to be consistent with regional flood control improvement efforts. New development shall contribute on a fair-share basis to regional solutions to improve flood protection to meet state and federal standards.

- **Safety Policy PS-2.6:** The City will use the most current flood hazard and floodplain information from state and federal agencies (such as the State Department of Water Resources, the Federal Emergency Management Agency, and the Army Corps of Engineers) as a basis for project review and to guide development in accordance with federal and state regulations.

- **Safety Policy PS-2.7:** As feasible, new development should incorporate stormwater treatment practices that allow percolation to the underlying aquifer and minimize off-site surface runoff (and therefore flooding).

- **Policy PUBLIC-1.5:** City approval of new development requires analysis and demonstration of secure and reliable water supply prior to approval. A formal water supply assessment, as defined in California Water Code Sections 10910-10912, will be required as part of City environmental review and project approval for projects that meet the minimum size requirements defined by this state law.

- **Policy PUBLIC-2.1:** The City will ensure that new groundwater well sites are located where the aquifer is stable enough to avoid long-term drawdown.

- **Policy PUBLIC-2.2:** The City will explore the use of recycled water from the City's wastewater treatment plant for landscape irrigation and other appropriate uses.

- **Policy PUBLIC-2.3:** The City will plan for, and new development shall be consistent with state law requirements for water conservation through the City's Urban Water Management Plan (California Water Code sections 10630–10656).

- **Policy PUBLIC-2.4:** New development should install water-conserving appliances and faucets, drought-tolerant landscaping, recycled water systems, and other water conservation improvements and programs, to the greatest extent feasible.

- **Policy PUBLIC-2.5:** The City will encourage water conservation measures not required by state law, such as recycled water systems.

- **Policy PUBLIC-2.6:** The City will establish use-based water rates. The City will consider adopting relatively low rates for a basic water allocation, and higher water rates beyond this basic allocation.

- **Policy PUBLIC-2.7:** The City will provide education to residents and businesses on benefits and methods of water conservation.

Conclusion

Implementation of the policies and strategies proposed in the 2030 General Plan would reduce the extent and severity of climate change–associated impacts on the Live Oak Planning Area by proactively planning for changes in climate and conditions, and providing methods for adapting to these changes. As a result, this impact is considered **less than significant**.