4.6 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

This chapter describes the regulatory framework and existing conditions related to greenhouse gas (GHG) emissions, and the potential for future development that could occur by adopting and implementing the proposed Plan. Because no single project is large enough individually to result in a measurable increase in global concentrations of GHG emissions, global warming impacts of a project are considered on a cumulative basis. This section is based on the methodology recommended by the Bay Area Air Quality Management District (BAAQMD). The proposed Project is evaluated using BAAQMD's plan-level review criteria based on the preliminary information available. Transportation sector emissions are based on trip generation and average vehicle miles traveled (VMT) provided by Hexagon Transportation Engineers (Hexagon). The GHG emissions modeling are included in Appendix C, Air Quality and Greenhouse Gas Emissions Modeling, of this Draft EIR.

The City of Palo Alto took an early leadership role in 2007 as one of the first U.S. cities to develop a *Climate Protection Plan* (also referred to as a Climate Action Plan by other cities), which described measures that could be taken to reduce the City's GHG emissions and set GHG reduction goals. The City also has a wide range of sustainability initiatives, spanning all City departments, aimed at minimizing the impacts of human activity on the natural environment and reducing emissions of GHGs into the atmosphere. These initiatives are part and parcel of all programs approved by the City. The proposed Plan will address GHG emissions in the Natural Environment Element, as well as in the Land Use and Community Design Element and in the Transportation Element. The proposed Plan is expected to include policies and programs designed to minimize GHG emissions and improve overall air quality to the extent feasible. Mitigation measures in this section provide some suggested policies and programs for inclusion in the proposed Plan.

4.6.1 ENVIRONMENTAL SETTING

4.6.1.1 GREENHOUSE GASES AND CLIMATE CHANGE

GHG emissions are various gases that are released into the atmosphere largely as a byproduct of burning fossil fuels, including oil, natural gas, and coal, and can be emitted as methane during the production and transport of fossil fuels. Scientists have concluded that human activities are contributing to global climate change by adding large amounts of heat-trapping GHGs to the atmosphere. The Intergovernmental Panel on Climate Change (IPCC) has identified four major GHGs—water vapor, carbon dioxide (CO_2), methane (CH_4), and ozone (O_3)—that are the likely cause of an increase in global average temperatures observed in the 20th and 21st centuries. Other GHGs identified by the IPCC that contribute to global warming to a lesser extent are nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons, perfluorocarbons, and chlorofluorocarbons.[1,2,3] The major GHGs are briefly described below.

[1] Water vapor (H_2O) is the strongest GHG and the most variable in its phases (vapor, cloud droplets, ice crystals). However, water vapor is not considered a pollutant, but part of the feedback loop rather than a primary cause of change.

[2] Black carbon contributes to climate change both directly, by absorbing sunlight, and indirectly, by depositing on snow (making it melt faster) and by interacting with clouds and affecting cloud formation. Black carbon is the most strongly light-absorbing component of particulate

- **Carbon dioxide (CO_2)** enters the atmosphere through the burning of fossil fuels (e.g., oil, natural gas, and coal), solid waste, trees and wood products, and respiration, and also as a result of other chemical reactions (e.g., manufacture of cement). Carbon dioxide is removed from the atmosphere (i.e., sequestered) when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH_4)** is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, and from the decay of organic waste in landfills and water treatment facilities.
- **Nitrous oxide (N_2O)** is emitted during agricultural and industrial activities as well as during the combustion of fossil fuels and solid waste.
- **Fluorinated gases** are synthetic, strong GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances. These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as high global-warming-potential (GWP) gases. Fluorinated gases include the following:
  - **Chlorofluorocarbons (CFCs)** are GHGs covered under the 1987 Montreal Protocol and used for refrigeration, air conditioning, packaging, insulation, solvents, or aerosol propellants. Since they are not destroyed in the lower atmosphere (i.e., troposphere), CFCs drift into the upper atmosphere where, given suitable conditions, they break down the ozone layer. These gases are therefore being replaced by other compounds that are GHGs covered under the Kyoto Protocol.
  - **Perfluorocarbons (PFCs)** are a group of human-made chemicals composed of carbon and fluorine only. These chemicals (predominantly perfluoromethane [CF_4] and perfluoroethane [C_2F_6]) were introduced as alternatives, along with HFCs, to ozone-depleting substances. In addition, PFCs are emitted as by-products of industrial processes and are used in manufacturing. PFCs do not harm the stratospheric ozone layer, but they have a high GWP.
  - **Sulfur Hexafluoride (SF_6)** is a colorless gas that is soluble in alcohol and ether, and slightly soluble in water. SF_6 is a strong GHG used primarily in electrical transmission and distribution systems as an insulator.
  - **Hydrochlorofluorocarbons (HCFCs)** contain hydrogen, fluorine, chlorine, and carbon atoms. Although they are ozone-depleting substances, they are less potent than CFCs. They have been introduced as temporary replacements for CFCs.
  - **Hydrofluorocarbons (HFCs)** contain only hydrogen, fluorine, and carbon atoms. They were introduced as alternatives to ozone-depleting substances to serve many industrial, commercial, and

matter (PM) emitted from burning fuels such as coal, diesel, and biomass. Reducing black carbon emissions globally can have immediate economic, climate, and public health benefits. According to the California Air Resources Board, California has been an international leader in reducing emissions of black carbon, with close to 95 percent control expected by 2020 due to existing programs that target reducing PM from diesel engines and burning activities. However, State and national GHG inventories do not yet include black carbon due to ongoing work resolving the precise global warming potential of black carbon. Guidance for CEQA documents does not yet include black carbon.

[3] Intergovernmental Panel on Climate Change, Third Assessment Report: Climate Change 2001, New York: Cambridge University Press.

personal needs. HFCs are emitted as by-products of industrial processes and are also used in manufacturing. They do not significantly deplete the stratospheric ozone layer, but they are strong GHGs.[4,5]

The GWPs of GHGs are dependent on the lifetime or persistence of the gas molecule in the atmosphere. Some GHGs have a stronger greenhouse effect than others. As noted above, they are referred to as high GWP gases. The GWP of GHG emissions are shown in Table 4.6-1. The GWP is used to convert GHGs to CO_2-equivalence (CO_2e) to show the relative potential that different GHGs have to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. For example, under IPCC's Second Assessment Report (SAR) GWP value for CH_4, which is 21; a project that generates 10 metric tons (MT) of CH_4 would be equivalent to 210 MT of CO_2.[6]

4.6.1.2 REGULATORY FRAMEWORK

This section describes the federal, State, and local regulations applicable to GHG emissions.

Federal Regulations

United States Mandatory Report Rule for GHGs (2009)

In response to the endangerment finding, the US EPA issued the Mandatory Reporting of GHG Rule that requires substantial emitters of GHG emissions (e.g., large stationary sources) to report GHG emissions data. Facilities that emit 25,000 $MTCO_2e$ per year are required to submit an annual report.[7]

Update to Corporate Average Fuel Economy Standards (2010/2012)

The current Corporate Average Fuel Economy (CAFE) standards for model years 2011 to 2016 incorporate stricter fuel economy requirements promulgated by the federal government and California into one uniform standard. Additionally, automakers are required to cut GHG emissions in new vehicles by roughly 25 percent by 2016, which will result in a fleet average of 35.5 miles per gallon [mpg] by 2016. Rulemaking to adopt these new standards was completed in 2010. California agreed to allow automakers who show compliance with the national program to also be considered as compliant with State requirements. The federal government issued new standards in 2012 for model years 2017-2025, which will require a fleet average of 54.5 mpg in 2025.

[4] United States Environmental Protection Agency, Greenhouse Gas Emissions, 2015, http://www.epa.gov/climatechange/ghgemissions/gases.html, accessed on September 11, 2015.

[5] Intergovernmental Panel on Climate Change, Third Assessment Report: Climate Change 2001, New York: Cambridge University Press.

[6] CO_2-equivalence is used to show the relative potential that different GHGs have to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. The global warming potential of a GHG is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere.

[7] See http://www.ct.gov/deep/lib/deep/air/siprac/2009/finalmrroverview.pdf for more information. Accessed 12/4/15.

TABLE 4.6-1 GHG EMISSIONS AND THEIR RELATIVE GLOBAL WARMING POTENTIAL COMPARED TO CO_2

GHGs	Atmospheric Lifetime (Years)	Second Assessment Report (SAR) Global Warming Potential Relative to CO_2[a]	Fourth Assessment Report (AR4) Global Warming Potential Relative to CO_2[b]
Carbon Dioxide (CO_2)	50 to 200	1	1
Methane (CH_4)[c]	12 (±3)	21	25
Nitrous Oxide (N_2O)	114	310	298

Notes: The IPCC has published updated global warming potential (GWP) values in its Fifth Assessment Report (2013) that reflect new information on atmospheric lifetimes of GHGs and an improved calculation of the radiative forcing of CO_2 (radiative forcing is the difference of energy from sunlight received by the earth and radiated back into space). However, GWP values identified in the Second Assessment Report are still used to maintain consistency in GHG emissions modeling and thresholds used in BAAQMD's CEQA Guidelines. In addition, the 2008 Scoping Plan was based on the GWP values in the Second Assessment Report.
a. Based on 100-Year Time Horizon of the GWP of the air pollutant relative to CO_2. Intergovernmental Panel on Climate Change. 2001. Third Assessment Report: Climate Change 2001. New York: Cambridge University Press.
a. Based on 100-Year Time Horizon of the GWP of the air pollutant relative to CO_2. Intergovernmental Panel on Climate Change. 2007. Fourth Assessment Report: Climate Change 2001. New York: Cambridge University Press.
c. The methane GWP includes direct effects and indirect effects due to the production of tropospheric ozone and stratospheric water vapor. The indirect effect due to the production of CO_2 is not included.
Sources: Intergovernmental Panel on Climate Change, 2001, Third Assessment Report: Climate Change 2001, New York: Cambridge University Press; and Intergovernmental Panel on Climate Change, 2007, Fourth Assessment Report: Climate Change 2001, New York: Cambridge University Press.

US EPA Regulation of Stationary Sources Under the Clean Air Act (Ongoing)

Pursuant to its authority under the Clean Air Act (CAA), the US EPA has been developing regulations for new stationary sources of GHG such as power plants, refineries, and other large sources of emissions. Pursuant to the President's 2013 Climate Action Plan, the US EPA was directed to also develop regulations for existing stationary sources. [8]

State Laws

Current State of California guidance and goals for reductions in GHG emissions are generally embodied in Executive Order S-03-05, Executive Order B-30-15, Assembly Bill 32 (AB 32), and Senate Bill 375 (SB 375).

Executive Order S-03-05

Executive Order S-3-05, signed June 1, 2005, set the following GHG reduction targets for the State:

- Reduce statewide GHG emissions to 2000 levels by 2010.
- Reduce statewide GHG emissions to 1990 levels by 2020.
- Reduce statewide GHG emissions to 80 percent below 1990 levels by 2050.

[8] Power plants are the largest stationary source of carbon pollution in the US. See http://www2.epa.gov/sites/production/files/2015-08/documents/peg.pdf for more information about the Clean Air Act generally. Accessed 12/4/15

Executive Order B-30-15

Executive Order B-30-15, signed April 29, 2015, sets a goal to reduce GHG emissions within the state to 40 percent of 1990 levels by year 2030. Executive Order B-30-15 also directs CARB to update the Scoping Plan to quantify the 2030 GHG reduction goal for the state and requires state agencies to implement measures to meet the interim 2030 goal of Executive Order B-30-15 as well as the long-term goal for 2050 in Executive Order S-03-5. It also requires the Natural Resources Agency to conduct triennial updates to the California adaption strategy, Safeguarding California, in order to ensure climate change is accounted for in state planning and investment decisions.

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

AB 32, the Global Warming Solutions Act, was passed by the California State legislature on August 31, 2006, to place the State on a course to reduce its contribution of GHG emissions. AB 32 follows the 2020 tier of emissions reduction targets established in Executive Order S-3-05.

CARB Scoping Plan

AB 32 mandated CARB develop a plan, updated every five years, to describe the approach the State will take to reduce GHGs in order to meet the 2020 reduction goals. The *Scoping Plan* was adopted by CARB in 2008 with the first update approved in 2014.[9]

The *2008 Scoping Plan* identified that GHG emissions in California are anticipated to be approximately 596 $MMTCO_2e$ in 2020. In December 2007, CARB approved a 2020 emissions limit of 427 $MMTCO_2e$ (471 million tons) for the state. The 2020 target requires a total emissions reduction of 169 $MMTCO_2e$, 28.5 percent from the projected emissions of the business-as-usual (BAU) scenario for the year 2020 (i.e., 28.5 percent of 596 $MMTCO_2e$).[10]

Key elements of CARB's GHG reduction plan that may be applicable to the proposed Project include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards (adopted and cycle updates in progress).
- Achieving a mix of the State's energy generation in which 33 percent is from renewable sources (anticipated by 2020).

[9] The first update can be viewed here: http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm. Accessed 12/4/15.

[10] California Air Resources Board, 2008, Climate Change Scoping Plan: a Framework for Change. CARB defines BAU in its Scoping Plan as emissions levels that would occur if California continued to grow and add new GHG emissions but did not adopt any measures to reduce emissions. Projections for each emission-generating sector were compiled and used to estimate emissions for 2020 based on 2002–2004 emissions intensities. Under CARB's definition of BAU, new growth is assumed to have the same carbon intensities as was typical from 2002 through 2004.

- A California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system for large stationary sources (adopted 2011). The cap-and-trade program was expanded in 2013 to include the electricity sector, and then again in 2015 to include fuels (including natural gas and gasoline).
- Establishing targets for transportation-related GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets (several Sustainable Communities Strategies have been adopted).
- Adopting and implementing measures pursuant to State laws and policies, including California's clean car standards (amendments to the Pavley Standards adopted 2009; Advanced Clean Car standard adopted 2012), goods movement measures, and the Low Carbon Fuel Standard (LCFS) (adopted 2009).
- Creating target fees, including a public goods charge on water use, fees on high GWP gases, and a fee to fund the administrative costs of the State's long-term commitment to AB 32 implementation (in progress).

Table 4.6-2 shows the anticipated reductions from regulations and programs outlined in the *2008 Scoping Plan*. In recognition of the critical role local governments play in the successful implementation of AB 32, the 2008 Scoping Plan cited a GHG reduction goal for local governments that is 15 percent of current levels (from 2005 to 2008) by 2020 to ensure that municipal and community-wide emissions match the State's reduction target.[11] Measures that local governments take to support shifts in land use patterns are anticipated to emphasize compact, low-impact growth over development in greenfields, resulting in fewer VMT.[12]

In the *First Update to the Scoping Plan* (also referred to as the *2014 Scoping Plan*), CARB projects that statewide BAU emissions in 2020 would be approximately 509 million $MTCO_2e$.[13][14] Therefore, to achieve the AB 32 target of 431 million $MTCO_2e$ (i.e., 1990 emissions levels) by 2020, the State would need to reduce emissions by 78 million $MTCO_2e$ compared to BAU conditions, a reduction of 15.3 percent from BAU in 2020. The data from the First Update to the Scoping Plan regarding GHG emissions and reductions needed to achieve the 1990 emissions target are shown in Table 4.6-3.

[11] The Scoping Plan references a goal for local governments to reduce community GHG emissions by 15 percent from current (interpreted as 2008) levels by 2020, but it does not rely on local GHG reduction targets established by local governments to meet the State's GHG reduction target of AB 32.

[12] California Air Resources Board, 2008, Climate Change Scoping Plan: a Framework for Change.

[13] The GHG target identified in the 2008 Scoping Plan is based on IPCC's GWPs identified in the Second Assessment Report (see Table 4.6-1). IPCC's Fourth and Fifth Assessment Reports identified more recent GWP values based on the latest available science. CARB recalculated the 1990 GHG emission levels with the updated GWPs in the Fourth Assessment Report, and the 427 $MMTCO_2e$ 1990 emissions level and 2020 GHG emissions limit, established in response to AB 32, is slightly higher, at 431 $MMTCO_2e$

[14] The BAU forecast includes GHG reductions from Pavley and the 33% Renewable Portfolio Standard (RPS).

TABLE 4.6-2 2008 SCOPING PLAN GHG REDUCTION MEASURES AND REDUCTIONS TOWARD 2020 TARGET

Recommended Reduction Measures	Reductions Counted toward 2020 Target of 169 MMT CO_2e	Percentage of Statewide 2020 Target
Cap and Trade Program and Associated Measures		
California Light-Duty Vehicle GHG Standards	31.7	19%
Energy Efficiency	26.3	16%
Renewable Portfolio Standard (33 percent by 2020)	21.3	13%
Low Carbon Fuel Standard	15	9%
Regional Transportation-Related GHG Targets[a]	5	3%
Vehicle Efficiency Measures	4.5	3%
Goods Movement	3.7	2%
Million Solar Roofs	2.1	1%
Medium/Heavy Duty Vehicles	1.4	1%
High Speed Rail	1.0	1%
Industrial Measures	0.3	0%
Additional Reduction Necessary to Achieve Cap	34.4	20%
Total Cap and Trade Program Reductions	*146.7*	*87%*
Uncapped Sources/Sectors Measures		
High Global Warming Potential Gas Measures	20.2	12%
Sustainable Forests	5	3%
Industrial Measures (for sources not covered under cap and trade program)	1.1	1%
Recycling and Waste (landfill methane capture)	1	1%
Total Uncapped Sources/Sectors Reductions	*27.3*	*16%*
Total Reductions Counted toward 2020 Target	*174*	*100%*
Other Recommended Measures – Not Counted toward 2020 Target		
State Government Operations	1.0 to 2.0	1%
Local Government Operations[b]	To Be Determined	NA
Green Buildings	26	15%
Recycling and Waste	9	5%
Water Sector Measures	4.8	3%
Methane Capture at Large Dairies	1	1%
Total Other Recommended Measures – Not Counted toward 2020 Target	*42.8*	*NA*

TABLE 4.6-2 2008 SCOPING PLAN GHG REDUCTION MEASURES AND REDUCTIONS TOWARD 2020 TARGET

Recommended Reduction Measures	Reductions Counted toward 2020 Target of 169 MMT CO_2e	Percentage of Statewide 2020 Target

Notes: The percentages in the right-hand column add up to more than 100 percent because the emissions reduction goal is 169 MMTCO2e and the Scoping Plan identifies 174 $MTCO_2e$ of emissions reductions strategies. Based on the Second Assessment Report (SAR) GWPs.
$MMTCO_2e$: million metric tons of CO_2e
a. Reductions represent an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target.
b. According to the Measure Documentation Supplement to the Scoping Plan, local government actions and targets are anticipated to reduce vehicle miles by approximately two percent through land use planning, resulting in a potential GHG reduction of two million metric tons of CO_2e (or approximately 1.2 percent of the GHG reduction target). However, these reductions were not included in the Scoping Plan reductions to achieve the 2020 target.
Source: California Air Resources Board, 2008, Climate Change Scoping Plan: A Framework for Change.

TABLE 4.6-3 STATE BAU FORECAST IN THE FIRST UPDATE TO THE SCOPING PLAN (2014)

Category	2020 Million $MTCO_2e$ – Fourth Assessment Report GWPs
AB 32 Baseline 2020 Forecast Emissions (2020 BAU) – With Pavley I and the Renewable Electricity Standard (RPS)	539
AB 32 Baseline 2020 Forecast Emissions (2020 BAU)[a]	509
Expected Reductions from Sector-Based Measures	
Energy	25
Transportation	23
High-GWPs	5
Waste	2
Cap-and-Trade Reductions[b]	23
2020 Limit	431
Percent Reduction from BAU with Pavley I and RPS	20.0%
Percent Reduction from BAU without Pavley and RPS	15.3%

a. The total projected emissions in the 2020 BAU scenario accounts for reductions anticipated from Pavley I and the Renewable Electricity Standard (30 million $MTCO_2e$ total).
b. The cap-and-trade reductions depend on the emissions forecast.
Sources: CARB 2014, First Update to the Climate Change Scoping Plan: Building on the Framework, Pursuant to AB 32, The California Global Warming Solutions Act of 2006, May 15.

The update highlights California's progress toward meeting the near-term 2020 GHG emission reduction goals defined in the original 2008 Scoping Plan. As identified in the *2014 Scoping Plan*, California is on track to meet the goals of AB 32. However, the *2014 Scoping Plan* also addresses the State's longer-term GHG goals within a post-2020 element. The post-2020 element provides a high-level view of a long-term strategy

for meeting the 2050 GHG goals, including a recommendation for the State to adopt a mid-term target. According to the *2014 Scoping Plan*, local government reduction targets should chart a reduction trajectory that is consistent with, or exceeds, the trajectory created by Statewide goals.[15]

According to the *2014 Scoping Plan*, reducing emissions to 80 percent below 1990 levels will require a fundamental shift to efficient, clean energy in every sector of the economy. Progressing toward California's 2050 climate targets will require significant acceleration of GHG reduction rates. Emissions from 2020 to 2050 will have to decline several times faster than the rate needed to reach the 2020 emissions limit.[16]

The new Executive Order B-30-15 requires CARB to prepare another update to the Scoping Plan to address the 2030 target for the state. It is anticipated the Scoping Plan will be updated within the next five years to address the new 2030 interim target to achieve a 40 percent reduction below 1990 levels by 2030.

Senate Bill 375

In 2008, SB 375, the Sustainable Communities and Climate Protection Act, was adopted to connect the GHG emissions reductions targets established in the Scoping Plan for the transportation sector to local land use decisions that affect travel behavior. Its intent is to reduce GHG emissions from light-duty trucks and automobiles (excluding emissions associated with goods movement) by aligning regional long-range transportation plans, investments, and housing allocations with local land use planning to reduce VMT and vehicle trips. Specifically, SB 375 required CARB to establish GHG emissions reduction targets for each of the 18 regions in California managed by a metropolitan planning organization (MPO). The Metropolitan Transportation Commission (MTC) is the MPO for the nine-county San Francisco Bay Area region. MTC's targets include a seven percent per capita reduction in GHG emissions from 2005 by 2020, and a 15 percent per capita reduction from 2005 levels by 2035.[17]

Assembly Bill 1493

California vehicle GHG emission standards were enacted under AB 1493 (Pavley I). Pavley I, a clean-car standard, reduces GHG emissions from new passenger vehicles (i.e., light-duty auto to medium-duty vehicles) from 2009 through 2016 and is anticipated to reduce GHG emissions from new passenger vehicles by 30 percent during the same time. California implements the Pavley I standard via waiver granted to California by the EPA. In 2012, the EPA issued a Final Rulemaking that sets even more stringent fuel economy and GHG emissions standards for model years 2017 through 2025 among light-duty vehicles (see also the discussion on the update to the CAFE standards under Federal Laws, above). In January 2012, CARB approved the Advanced Clean Cars program (formerly known as Pavley II) for model years 2017

[15] California Air Resources Board (CARB), 2014. *First Update to the Climate Change Scoping Plan: Building on the Framework, Pursuant to AB 32, The California Global Warming Solutions Act of 2006, May 15.*

[16] California Air Resources Board (CARB), 2014. *First Update to the Climate Change Scoping Plan: Building on the Framework, Pursuant to AB 32, The California Global Warming Solutions Act of 2006, May 15.*

[17] California Air Resources Board, 2010, Staff Report Proposed Regional Greenhouse Gas Emission Reduction Targets for Automobiles and Light Trucks Pursuant to Senate Bill 375, August.

through 2025. The program combines the control of smog, soot, and global warming gases and requirements for greater numbers of zero-emission vehicles into a single package of standards. Under California's Advanced Clean Car program, by 2025, new automobiles will emit 34 percent fewer global warming gases and 75 percent fewer smog-forming emissions.[18]

Executive Order S-01-07

On January 18, 2007, the State set a new low carbon fuel standard (LCFS) for transportation fuels sold within the State. Executive Order S-1-07 sets a declining standard for GHG emissions measured in carbon dioxide equivalent gram per unit of fuel energy sold in California. The LCFS requires a reduction of 2.5 percent in the carbon intensity of California's transportation fuels by 2015 and a reduction of at least 10 percent by 2020. The standard applies to refiners, blenders, producers, and importers of transportation fuels, and would use market-based mechanisms to allow these providers to choose how they reduce emissions during the "fuel cycle" using the most economically feasible methods.

Executive Order B-16-2012

On March 23, 2012, the State directed CARB, the California Energy Commission (CEC), the Public Utilities Commission, and other relevant agencies to work with the Plug-in Electric Vehicle Collaborative and the California Fuel Cell Partnership to establish benchmarks to accommodate zero-emissions vehicles in major metropolitan areas, including infrastructure to support them (e.g., electric vehicle charging stations). The executive order also directs the number of zero-emission vehicles in California's State vehicle fleet to increase through the normal course of fleet replacement so that at least 10 percent of fleet purchases of light-duty vehicles are zero-emission by 2015, increasing to at least 25 percent by 2020. The executive order also establishes a target for the transportation sector to reduce GHG emissions to 80 percent below 1990 levels by 2050.

Senate Bills 1078, 107, and 350 and Executive Order S-14-08

A major component of California's Renewable Energy Program is the renewable portfolio standard (RPS) established most recently in 2015 through SB 350 (De León). Under earlier versions of the RPS, certain retail sellers of electricity were required to increase the amount of renewable energy each year. In 2015, the State legislature adopted the highest RPS rules to date via SB 350, the "Clean Energy and Pollution Reduction Act of 2015." This Act establishes targets to increase the State's RPS to 50 percent by 2030 with interim targets of 40 percent by 2024 45 percent by 2027. Renewable sources of electricity include wind, small hydropower, solar, geothermal, biomass, and biogas. The increase in renewable sources for electricity

[18] See also the discussion on the update to the CAFE standards under Federal Laws, above. In January 2012, CARB approved the Advanced Clean Cars program (formerly known as Pavley II) for model years 2017 through 2025. The program combines the control of smog, soot and global warming gases and requirements for greater numbers of zero-emission vehicles into a single package of standards. Under California's Advanced Clean Car program, by 2025, new automobiles will emit 34 percent fewer global warming gases and 75 percent fewer smog-forming emissions.

production will decrease indirect GHG emissions from development projects because electricity production from renewable sources is generally considered carbon neutral.

California Building Code – Building and Energy Efficiency Standards

Energy conservation standards for new residential and nonresidential buildings were originally adopted by the California Energy Resources Conservation and Development Commission (CEC) in June 1977. The standards require the design of building shells and components to conserve energy and are updated about every three years to allow for consideration of new energy efficiency technologies and methods. In 2012, the CEC adopted the 2013 Building and Energy Efficiency Standards, which went into effect on July 1, 2014. Buildings that are constructed in accordance with the 2013 Building and Energy Efficiency Standards are 25 percent (residential) to 30 percent (nonresidential) more energy efficient than the 2008 standards as a result of changes in requirements for windows, insulation, lighting, ventilation systems, and other features that reduce energy consumption in homes and businesses.

Most recently, the CEC adopted the 2016 Building and Energy Efficiency Standards. The 2016 Standards will continue to improve upon the current 2013 Standards for new construction of, and additions and alterations to, residential and nonresidential buildings. These standards will go into effect on January 1, 2017. Under the 2016 Standards, residential buildings are 28 percent more energy efficient than the 2013 Standards while non-residential buildings are five percent more energy efficient than the 2013 Standards.[19]

The 2016 standards will not result in zero net energy (ZNE). However, the standards will result in reductions that will be close to the State's goal and make important steps toward changing residential building practices in California. The 2019 standards will take the final step to achieve ZNE for newly constructed residential buildings throughout California.[20]

California Building Code – California Green Building Standards Code (CALGreen)

On July 17, 2008, the California Building Standards Commission adopted the nation's first green building standards. The California Green Building Standards Code (Part 11, Title 24, known as "CALGreen") was adopted as part of the California Building Standards Code (Title 24, CCR). CALGreen established planning and design standards for sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and indoor air contaminants.[21] The mandatory provisions of CALGreen became effective January 1, 2011 and were updated most recently in 2013. The building efficiency standards are enforced through the local building permit process.

[19] California Energy Commission, 2015, 2016 Building Energy Efficiency Standards, Adoption Hearing Presentation. http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2015-06-10_hearing/2015-06-10_Adoption_Hearing_Presentation.pdf, accessed on October 28, 2015.

[20] California Energy Commission (CEC). 2015. 2016 Building Energy and Efficiency Standards Frequently Asked Questions. http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_FAQ.pdf

[21] The green building standards became mandatory in the 2010 edition of the code.

2015 Appliance Efficiency Regulations

The current Appliance Efficiency Regulations were adopted by the CEC in May 2015 and were effective in July 2015. The regulations apply mostly to appliances sold or offered for sale in California and require manufacturers to certify energy efficiency data. [22]

Senate Bill 350 – Building Energy Efficiency Requirements

Besides the RPS standard increase to 50 percent by 2030 discussed above, SB 350, the Clean Energy and Pollution Reduction Act of 2015, establishes targets to "double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation" and to codify the targets "to ensure they are permanent, enforceable, and quantifiable". By November 1, 2017, the California Energy Commission (CEC) must establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030. SB 350 also states that "it is the policy of the state and the intent of the Legislature to encourage transportation electrification as a means to achieve ambient air quality standards and the state's climate goals."The CEC will direct electric utilities to establish "programs and investments to accelerate widespread transportation electrification to reduce dependence on petroleum, meet air quality standards, and reduce emissions of greenhouse gases to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050."

Regional Regulations

Plan Bay Area: Strategy for a Sustainable Region

Plan Bay Area is the long range transportation and land use strategy through 2040. The Plan includes two elements: (1) a regional Sustainable Communities Strategy (SCS), and (2) 2040 Regional Transportation Plan (RTP). Plan Bay Area was adopted jointly by the Association of Bay Area Governments (ABAG) and MTC on July 18, 2013. The SCS lays out a development scenario for the region, which, when integrated with the transportation network and other transportation measures and policies, would reduce GHG emissions from transportation (excluding goods movement) beyond the per capita reduction targets identified by CARB. The Plan meets a 16 percent per capita reduction of GHG emissions by 2035 and a 10 percent per capita reduction by 2020 from 2005 conditions.

As part of the implementing framework for Plan Bay Area's SCS elements, local governments have identified Priority Development Areas (PDAs) to focus growth. PDAs are transit-oriented infill development opportunity areas within existing communities. Overall, well over two-thirds of total regional growth in the Bay Area by 2040 is allocated within PDAs. PDAs are expected to accommodate 80 percent (over 525,570

[22] The regulations can be sound here: http://www.energy.ca.gov/2015publications/CEC-400-2015-021/CEC-400-2015-021.pdf. Accessed 12/5/15.

units) of new housing and 66 percent (744,230) of new jobs in the region.[23] Plan Bay Area includes the following PDA in Palo Alto:

- Palo Alto California Avenue Transit Neighborhood PDA is envisioned as a vibrant, pedestrian-oriented neighborhood with a diversity of uses that supports the economic vitality of California Avenue and nearby businesses while encouraging the use of public transportation and other non-vehicular transportation modes.[24,25]

ABAG and MTC are currently in the process of preparing an update to the nine-county RTP/SCS, Plan Bay Area 2040, to reflect the updated priorities of the Bay Area. The housing, population, and employment forecasts prepared by ABAG will be integrated into the scenario modeling tools used to develop Plan Bay Area 2040 in order to build upon earlier efforts to develop an efficient transportation network and grow in a financially and environmentally responsible way. The update will identify long-term goals to reduce GHG emissions from cars and light-duty trucks, house the region's projected population, improve public health, maintain the region's transportation infrastructure, and preserve open space.[26]

Bay Area Air Quality Management District

BAAQMD is the agency responsible for assuring that the National and California ambient air quality standards (AAQS) are attained and maintained in the San Francisco Bay Area Air Basin. Building on state and other regional climate protection efforts, BAAQMD has adopted a resolution to reduce GHG emissions through the following actions:

- Setting a goal for the Bay Area region to reduce GHG emissions by 2050 to 80 percent below 1990 levels.
- Developing a Regional Climate Protection Strategy to make progress towards the 2050 goal, using the Air District's Clean Air Plan to initiate the process.
- Developing a 10-point work program to guide the Air District's climate protection activities in the near-term.[27]

BAAQMD is working on a *Regional Climate Protection Strategy* to make progress toward achieving the 2050 goal for GHG emission reductions which complements existing planning efforts at the state, regional, and

[23] Metropolitan Transportation Commission and Association of Bay Area Governments, 2013, Plan Bay Area: Strategy for a Sustainable Region, July 18.

[24] Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG), 2013. Final Priority Development Area Development Feasibility and Readiness Assessment, July.

[25] Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG), 2013. *Plan Bay Area,* http://gis.abag.ca.gov/website/PDAShowcase/.

[26] Association of Bay Area Governments, and Metropolitan Transportation Commission, 2015, Plan Bay Area 2040, The Plan: The Context. http://planbayarea.org/the-plan/the-context.html

[27] Bay Area Air Quality Management District (BAAQMD), 2013. Resolution No. 2013-11: Resolution Adopting a Greenhouse House Gas Reduction Goal and Commitment to Develop a Regional Climate Protection Strategy. http://www.baaqmd.gov/~/media/files/planning-and-research/climate-protection-program/climateresolution.pdf?la=en

local levels, utilizing the Air District's *Draft Clean Air Plan* to initiate the process. Based on BAAQMD's 10-Point Climate Action Work Program, the *Regional Climate Protection Strategy* will include an updated GHG emissions inventory and forecast and GHG reduction goals and interim targets for the Bay Area.[28]

Bay Area Conservation and Development Commission

The San Francisco Bay Area Conservation and Development Commission (BCDC) is the agency responsible for carrying out the *San Francisco Bay Plan*. Its mission is to protect San Francisco Bay as a great natural resource for the benefit of present and future generations and to develop the Bay and its shoreline to the highest potential with a minimum of Bay filling. BCDC's jurisdiction includes all sloughs, marshlands between mean high tide and five feet above mean sea level, tidelands, submerged lands, and land within 100 feet of the Bay shoreline.[29]

Since the issuance of the Governor's Executive Order S-13-2008 on November 2008, BCDC has followed other Natural Resource Agencies in planning for two sea level rise scenarios: 16 inches by mid-century and 55 inches by the end of the century. In April 2009, BCDC published its report with maps indicating zones that could be flooded due to sea level rise and that were based on existing elevations.[30] In May 2011, BCDC published a revised draft of its proposed amendments to its master planning document, the *Bay Plan*. This received considerable public review and environmental review, and was adopted on October 6, 2011.[31,32] These amendments include revised findings and policies to adapt to the effects of sea level rise.

In the latest amendment to the *Bay Plan* (October 2011), BCDC added new climate change findings and policies and has revised the sea level rise scenarios. A 2011 BCDC document titled *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline* reports that by 2050 sea levels could rise by 10 to 17 inches, and that by 2100 sea levels could rise from 31 to 50 inches under low scenarios and 43 to 69 inches under high scenarios.[33] However, data on sea level rise is evolving and BCDC uses the 55-inch sea level rise scenario (the average of the 43- to 69-inch high scenario) in the Bay Plan when assessing long-term impacts. The previous policy language recommended that new development not be approved in low-lying areas that are in danger of flooding now or in the future unless the development was elevated above possible flood levels. The new BCDC policies require sea level rise risk assessments to be conducted when planning

[28] Bay Area Air Quality Management District (BAAQMD), 2014. 10-Point Climate Action Work Program. http://www.baaqmd.gov/~/media/files/planning-and-research/climate-protection-program/10-point-work-program-pdf.pdf?la=en, March 25.

[29] Bay Area Conservation and Development Commission, 2011. *San Francisco Bay Plan.* Available online at: http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan.shtml, accessed on October 20, 2015.

[30] Bay Area Conservation and Development Commission, 2009, Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline.

[31] Bay Area Conservation and Development Commission (BCDC), 2011, Staff Report, Revised Preliminary Recommendation and Environmental Assessment for Proposed Bay Plan Amendment No. 1-08 Concerning Climate Change.

[32] Bay Area Conservation and Development Commission (BCDC), 2011, Resolution No. 11-08, Adoption of Bay Plan Amendment No. 1-08 Adding New Climate Change Findings and Policies to the Bay Plan; And Revising the Bay Plan Tidal Marsh and Tidal Flats; Safety of Fills; Protection of the Shoreline; and Public Access Findings and Policies.

[33] San Francisco Bay Conservation and Development Commission, 2011, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*, http://www.bcdc.ca.gov/BPA/LivingWithRisingBay.pdf,.page 21.

shoreline areas or designing large shoreline projects within BCDC jurisdiction. The risk assessment should be prepared by a qualified engineer and should be based on the estimated 100-year flood elevation that takes into account the best estimates of future sea level rise and current and planned flood protection. A range of sea level projections for mid-century and end of century should be used in the risk assessment and inundation maps should be prepared. The risk assessment should identify all types of potential flooding, degrees of uncertainty, consequences of defense failures, and risks to existing habitat from proposed flood protection devices. All projects should be designed to be resilient to a mid-century sea level rise projection. If it is likely that the project will remain in place longer than mid-century, an adaptive management plan should be developed to address the long-term impacts that will arise, based on the risk assessment. Shoreline protection projects, such as levees and seawalls, must be designed to withstand the effects of projected sea level rise and to be integrated with adjacent shoreline protection. Whenever feasible, projects must integrate hard shoreline protection structures with natural features, such as marsh or upland vegetation, that enhance the Bay ecosystem.[34]

Association of Bay Area Governments Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area

The federal Disaster Mitigation Act of 2000 (DMA) requires all cities, counties, and special districts to adopt a Local Hazard Mitigation Plan (LHMP) to receive disaster mitigation funding from the Federal Emergency Management Agency (FEMA). The DMA provides that a local agency may adopt a Local Hazard Mitigation Plan or participate in the preparation of and adopt a Multi-Jurisdictional Hazard Mitigation Plan. ABAG received funds from FEMA to serve as the lead agency in the creation of a Multi-Jurisdictional Hazard Mitigation Plan for the nine-county Bay Area. With participation from the City of Palo Alto and other local agencies, ABAG created an umbrella Hazard Mitigation Plan entitled "*Taming Natural Disasters*."

Santa Clara County Hazard Mitigation Plan

Pursuant to the Disaster Mitigation Act (2000), the Santa Clara County's Office of Emergency Services prepared an annex to the 2010 ABAG Local Hazard Mitigation Plan (LHMP) to serve as Santa Clara County's Local Hazard Mitigation Plan. The LHMP emerged from a collaborative planning effort that involved the assembly of a Local Planning Team comprised of representatives from County departments, private sector businesses, stakeholders, and 13 of the 15 incorporated cities in Santa Clara County, including Palo Alto. The LHMP identifies and prioritizes potential and existing hazards across jurisdictional borders, including hazards that may be further amplified by climate change. In an effort to guide the County's ongoing hazard mitigation efforts through the life of the LHMP, the following priority mitigation objectives were identified:

- Collaborate as a County and create a county-wide Community Wildfire Protection Plan (CWPP).
- Reduce number of unreinforced masonry/soft-story buildings through demolition or seismic retrofitting.

[34] San Francisco Bay Conservation and Development Commission, 2014, *New Sea Level Rise Policies Fact Sheet*.

- Implement a combination of financial incentives and regulated mandates in order to mitigate the clear and present danger of soft-story buildings pervading Santa Clara County.
- Engage infrastructure providers in a cooperative partnership with County government to develop a responsible middle ground sharing the most critical infrastructure information with those stakeholders that have a need to know.
- Collaborate as a County and verify or create the plan for replacing and/or upgrading localized flooding pump systems, including the generation of alternate power to operate these systems.
- Establish a siren system targeted specifically for catastrophic dam failure to provide a complete public warning system in Santa Clara County.

In order to meet these priority mitigation objectives, the LHMP further identifies and prioritizes specific actions for each objective. In addition, the responsible departments, potential funding sources, and target completion date are identified for each mitigation action with the highest priority to guide their implementation.

Local Regulations and Policies

The City of Palo Alto has a wide range of policies and programs that target GHG emissions reductions in City operation and the community at large. This section describes some of the principal plans, policies, and regulations.

Palo Alto Municipal Code

The City of Palo Alto Municipal Code outlines several requirements for new development that would reduce GHG emission impacts and climate change impacts:

- **Title 5: Health and Sanitation**
  - Chapter 5.30, Expanded Polystyrene and Non-Recyclable Food Service Containers: Prohibits food vendors from provided prepared food in disposable containers made of polystyrene or non-recyclable plastic in order to reduce waste sent to landfills.
  - Chapter 5.35, Retail and Food Service Establishment Checkout Bag Requirements: Prohibits retail establishments in Palo Alto from providing single-use plastic bags at checkout (with limited exceptions).
- **Title 8: Tree and Vegetation.** Chapter 8.10, Tree Preservation and Management Regulations: Prohibits removal of protected trees unless they are dead, hazardous, or a detriment to or crowding of an adjacent protected tree.
- **Title 10: Vehicles and Traffic.** Chapter 10.70, Trip Reduction and Travel Demand: This ordinance requires the City to adopt and implement a trip reduction and travel demand ordinance. While this code

section references the now rescinded BAAQMD Regulation 13, Rule 1, BAAQMD has since adopted a new Rule (Regulation 14, Rule 1) known as the Bay Area Commuter Benefits Program, which requires employers with 50 or more full-time employees in the Bay Area to provide commuter benefits to their employees.

- **Title 12: Public Works and Utilities.** Chapter 12.32, Water Use Regulations: Palo Alto requires residents and business in the City to use water in a sustainable, efficient manner and prohibits potable water run-off into gutters, driveways, sidewalks, streets, and other landscape areas; use of a hose without a shut-off valve; and requires broken landscaping systems to be repaired as soon as possible.
- **Title 16: Building Regulations.** Chapter 16.52, Flood Hazard Regulations Ordinance: This ordinance outlines methods and provisions that minimize loss of life, damage to private land development, public facilities and utilities, the need for rescue and relief efforts, business interruptions, and future blighted areas caused by flooding. This ordinance also requires property owners to construct new and substantially improved buildings in the special flood hazard area by employing construction standards such as anchoring, elevating, and flood proofing in order to reduce the risk of flood damage.

Palo Alto Green Building Program

The City of Palo Alto requires compliance with the local Green Building Ordinance, which is encompassed in Chapter 16.14 of the Palo Alto Municipal Code. The Green Building Ordinance includes the mandatory measures of CALGreen (Title 24, Part 11), including the City's landscape water efficiency standards adopted under the Model Water Efficient Landscape Ordinance (WELO); and also requires projects in the City to adhere to even more stringent sustainability measures by expanding the types of projects that are covered under CALGreen.

Among other sustainability features, these building programs require enhanced building energy efficiency measures that may exceed the requirements specified in California's Building and Energy Efficiency Standards (Title 24, Part 6),[35] which reduces heating and cooling requirements of a building and, therefore, also reduces GHG emissions. The City also requires the use of the Voluntary (Tier 1 and Tier 2) requirements for certain residential and non-residential new construction, additions, and alterations:[36]

- Residential building additions or alterations exceeding 1,000 square feet must meet the CALGreen Tier 1 requirements.
- New residential construction must meet the CALGreen Tier 2 requirements.
- Nonresidential alternations of 5,000 square feet or greater (including tenant improvements or renovations) that include replacement or alternation of at least two of the following: HVAC system,

[35] CALGreen requires compliance with the latest Building and Energy Efficiency Standards (Title 24, Part 6). The 2013 Building and Energy Efficiency Standards went into effect July 1, 2014.

[36] Note: under CALGreen, multi-family buildings (residential) are regulated under the non-residential standards, not the residential standards.

building envelope, hot water system, or lighting system, must comply with the CALGreen Tier 1 requirements.

- Nonresidential additions of 1,000 square feet or more must comply with the CALGreen Tier 2 requirements.
- New nonresidential construction must meet the CALGreen Tier 2 requirements.

Construction Demolition Debris Ordinance

The City of Palo has adopted a construction and demolition debris ordinance that is consistent with the new requirements under CALGreen for mandatory construction recycling (Palo Alto Municipal Code Chapter 5.24, Construction and Demolition Debris Diversion Facilities). Pursuant to the City's Municipal Code, all projects in the City are required to recycle or salvage for reuse a minimum of 80 percent of the non-hazardous construction and demolition debris and calculate the amount of materials diverted by weight.[37] In addition, 100 percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing, and inert solids such as concrete and asphalt, are required to be reused or recycled.

For residential projects covered under the City's local Green Building Ordinance, the City requires 100 percent of asphalt and concrete materials to be diverted and 80 percent (by weight) of remaining materials. To assist developers in the City in meeting the City's construction and demolition debris requirements, the City of Palo Alto Development Services department has deployed the Green Halo System, an online software program that ensures contractors are in compliance with the City's construction demolition debris diversion ordinance.

City of Palo Alto Utilities (CPAU)

The City of Palo Alto runs its own community-owned utilities, including electricity, natural gas, fiber optic, water, and wastewater. In March 2013, the City approved the Carbon Neutral Electric Resource Plan for Palo Alto's electric utility. As of 2013, the utility derives the majority of its electric power from renewable energy sources and is 100 percent carbon-neutral by offsetting the non-renewable portion of its portfolio with renewable energy certificates (RECs). With 50 percent of the electric needs met by carbon-free large hydroelectric resources and a Renewable Portfolio Standard (RPS) of over 50 percent by 2017, City of Palo Alto Utilities (CPAU) electricity will be carbon neutral without RECs (except as may be required in dry hydro years). In addition, the City's utility is projected to achieve the statewide mandate to achieve a 33 percent RPS by 2020. The City's energy utility offers several programs to reduce electricity and natural gas use through the City including energy audits (Green@Home and Keep your Cool), home energy report, interest free loans for qualifying energy efficiency improvements, Residential Energy Assistance Program (REAP), energy rebates for appliances (Smart Energy Program), energy rebates for hotel-related efficiency

[37] Exceptions to this requirement include excavated soil, land-clearing debris, and inert solids; or alternative waste reduction methods if facilities capable of compliance for the materials in question do not exist.

measures through Synergy (Hospitality Program), energy rebates for labs through Willdan Energy Solutions (Labs Efficiency), energy rebates for business equipment (Commercial Advantage Program and Right Lights+ Program), and financial incentives to exceed the current Title 24 energy standards by 20 percent.

PaloAltoGreen Program

Since 2003, CPAU has offered the voluntary PaloAltoGreen (PAG) Program that provided residential and commercial customers with the opportunity to "green up" their use of electricity. Under the PAG Program, CPAU purchases RECs on behalf of participants in order to provide 100 percent renewable supplies for the participant's electric usage. Since CPAU's entire electric supply became carbon neutral in 2013, the PAG Program became redundant and the program was terminated in 2014 for residential customers, but commercial customers can still participate to be in compliance with corporate sustainability goals, U.S. EPA recognition programs, or to maintain LEED certifications.

PaloAltoGreen Gas Program

The 2010 Council-approved Gas Utility Long-term Plan (GULP) included a strategy to reduce the carbon intensity of the gas portfolio by designing and implementing a voluntary retail program using reasonably priced non-fossil fuel gas resources.

In April 2014, Council approved a voluntary PaloAltoGreen (PAG) Gas Program that provides residential and commercial customers with the opportunity to "green up" their use of gas. Under the PAG Gas Program, CPAU purchases high quality environmental offsets on behalf of participants in order to reduce or eliminate the impact of greenhouse gas (GHG) emissions associated with each customer's gas usage. CPAU will limit purchases under the PAG Gas Program to specific categories of offsets from a preferred set of offset providers, and favor, wherever possible and economic, offset projects based in California. The PAG Gas Program is expected to increase costs for the average participating residential customer by about $2.20 per month in the summer and $6.50 per month in the winter. Commercial customers will be able to purchase blocks of offsets to "green up" gas usage to a level and economic impact they deem appropriate. The PAG Gas program was launched in January 2015. As of the end of October 2015, there were over 900 PAG Gas customers, representing four percent of the City's natural gas needs. As of July 2015, City facilities are PAG Gas participants for 100 percent of their needs. The goal of the program is to attain participation levels representing 10 percent of the City's gas needs, which would indicate a 10 percent reduction in the GHG emissions from the City's use of natural gas.

Cap and Trade

Since 2013, Palo Alto's electric utility has been required to participate in CARB's Cap and Trade program, with the gas utility participating starting in 2015. In December 2012, the Council adopted a policy for the

use of cap-and-trade revenues for the electric utility.[38] In January 2015, Council updated that policy to add the gas utility.[39]

Palo Alto Climate Protection Plan (CPP) and Draft Sustainability and Climate Action Plan (S/CAP)

Since adoption of the *Climate Protection Plan* (CPP) by Council in December 2007, and adoption of updated goals in 2010, the City of Palo Alto's municipal operations (City) and the Palo Alto Community (Community) have made considerable progress in reducing their carbon footprint and adopting sustainable practices.[40]Based on data for the calendar year 2014, Palo Alto has cut its overall GHG emissions by an estimated 32 percent from 2005 levels and 37 percent from 1990 levels. The main driver of the GHG emissions reductions include bold actions such as achieving carbon neutral electricity, and systematic improvements ranging from water conservation and electric vehicle (EV) readiness to green building ordinances and safe routes to schools.[41]

But, like most cities, Palo Alto must take additional action to meet the long-term GHG emissions reduction challenge to reduce GHG emissions 80 percent below 1990 levels by 2050 identified within Executive Order S-03-05. Therefore, in coordination with the proposed Plan, **t**he City is developing a Sustainability and Climate Action Plan (S/CAP). The S/CAP evaluates GHG emissions within the City boundaries and actions the City can take to achieve its own and the State's GHG emissions reduction goals.

Some of the key strategies under evaluation for Palo Alto's pathway to a low-carbon—or no carbon—future include radical resource efficiency, comprehensive electrification ("fuel switching" from fossil fuels to carbon-neutral electricity), local renewable energy generation and distributed energy storage, rethinking mobility to provide more convenient transportation with less congestion, forthrightly facing water risk, bringing municipal operations—from facilities to fleets—in line with Council policy and community vision, exploring future business implications for CPAU as it adapts to new conditions, and broadening our focus from "sustainability" —a broad notion of "do no harm"—to "adaptation" —expanding Palo Alto's capacity to respond and thrive in the face of shocks and stresses like drought and sea level rise—to "regeneration" — building the health and vitality and the ecosystems, both local and far-flung, that support it.

Palo Alto Annex to the Santa Clara County Local Hazard Mitigation Plan

The City of Palo Alto prepared an annex to the Santa Clara County's LHMP in 2012. The purpose of the annex to the LHMP is to identify essential facilities and structures throughout Palo Alto that are susceptible to natural and human-caused hazards. The facilities identified are of particular concern because they are

[38] The policy can be found here: http://www.cityofpaloalto.org/civicax/filebank/documents/32288 (accessed Nov. 30, 2015)
[39] The policy can be found here: https://www.cityofpaloalto.org/civicax/filebank/documents/45537 (accessed Nov. 30, 2015)
[40] Palo Alto, 2015. City Council Information Report ID# 5693, Annual Earth Day Report Study Session and Sustainability/Climate Action Plan (S/CAP) Update. April 20.
[41] Palo Alto, 2015. City Council Information Report ID# 5693, Annual Earth Day Report Study Session and Sustainability/Climate Action Plan (S/CAP) Update. April 20.

essential to the overall function and infrastructure of the city. For example, the potential loss of fire and police stations located in the floodplain could severely compromise the City's ability to respond to emergency calls. The City conducted an overlay analysis using geographic information systems (GIS) in order to identify the critical facilities exposed to mappable hazards such as earthquake related hazards, wildfire, flooding, and sea level rise. The overlay analyses revealed that Palo Alto's most critical facilities are exposed to potential ground shaking, many of the facilities are at risk of flooding, and many facilities are located in potential dam inundation areas. In addition, several facilities are exposed to liquefaction risk, landslides, and wildfire risk.

City of Palo Alto Threat and Hazard Identification and Risk Assessment

In 2014, the City of Palo Alto's Office of Emergency Services prepared the *Threat and Hazard Identification and Risk Assessment* (THIRA) report to evaluate the City's capability of addressing natural and non-natural hazard events. The THIRA serves to inform ongoing planning efforts in the City of Palo Alto and establish risk reduction measures. The City of Palo Alto Office of Emergency Services highlights the threat of increased flood risk in the City of Palo Alto due to seal level rise and stresses the need for continued collaboration between city planners and regional organizations that have initiated studies on SLR in the vicinity of Palo Alto, such as the Santa Clara Valley Water District (SCVWD), San Francisquito Joint Powers Authority (SFCJPA), United States Army Corps of Engineers, and the California State Coastal Conservancy, in order to mitigate these impacts. Specifically, the SFCJPA has initiated a feasibility study to identify different alignments of infrastructure alternatives to protect Palo Alto and surrounding areas against extreme tides and sea level rise.

4.6.1.3 EXISTING CONDITIONS

California's Greenhouse Gas Sources and Relative Contribution

California is the tenth largest GHG emitter in the world, and the second largest emitter of GHG in the United States, surpassed only by Texas; however, California also has over 12 million more people than the state of Texas.[42] Because of more stringent air emission regulations, in 2001 California ranked fourth lowest in carbon emissions per capita and fifth lowest among states in CO_2 emissions from fossil fuel consumption per unit of Gross State Product (total economic output of goods and services).[43]

The California Air Resources Board (CARB)'s latest update to the statewide GHG emissions inventory using the IPCC's *Second Assessment Report* (SAR) GWPs was conducted in 2012 for year 2009 emissions.[44] In 2009,

[42] California Energy Commission, 2005, Climate Change Emissions Estimates from Bemis, Gerry and Jennifer Allen, Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2002 Update, California Energy Commission Staff Paper CEC-600-2005-025, Sacramento, California, June.

[43] California Energy Commission, 2006, Inventory of California Greenhouse Gas Emissions and Sinks 1990 to 2004, Report CEC-600-2006-013-SF, December.

[44] Methodology for determining the statewide GHG inventory is not the same as the methodology used to determine statewide GHG emissions under Assembly Bill 32 (AB 32) (2006).

California produced 457 million metric tons (MMT) of CO_2-equivalent (CO_2e) GHG emissions. California's transportation sector is the single largest generator of GHG emissions, producing 37.9 percent of the State's total emissions. Electricity consumption is the second largest source, comprising 22.7 percent. Industrial activities are California's third largest source of GHG emissions, comprising 17.8 percent of the state's total emissions. Other major sectors of GHG emissions include commercial and residential, recycling and waste, high global warming potential GHGs, agriculture, and forestry.[45,46]

In 2015, the statewide GHG emissions inventory was updated for 2000 to 2013 emissions using the GWPs in IPCC's *Fourth Assessment Report* (AR4). Based on these GWPs, California produced 459 million metric tons (MMT) CO_2e GHG emissions in 2013. California's transportation sector remains the single largest generator of GHG emissions, producing 36.8 percent of the State's total emissions. Electricity consumption made up 19.7 percent, and industrial activities produced 20.2 percent. Other major sectors of GHG emissions include commercial and residential, recycling and waste, high global warming potential GHGs, and agriculture.[47]

Human Influence on Climate Change

For approximately 1,000 years before the Industrial Revolution, the amount of GHGs in the atmosphere remained relatively constant. During the 20th century, however, scientists observed a rapid change in the climate and climate change pollutants that is attributable to human activities. The amount of CO_2 has increased by more than 35 percent since preindustrial times and has increased at an average rate of 1.4 parts per million (ppm) per year since 1960, mainly due to combustion of fossil fuels and deforestation.[48] These recent changes in climate change pollutants far exceed the extremes of the ice ages, and the global mean temperature is rising at a rate that cannot be explained by natural causes alone.[49] Human activities are directly altering the chemical composition of the atmosphere through the buildup of climate change pollutants.[50]

Projections of climate change depend heavily on future human activity. Therefore, climate models are based on different emission scenarios that account for historical trends in emissions as well as observations on the climate record that assess the human influence of the trend and projections for extreme weather events.

[45] CO_2-equivalence is used to show the relative potential that different GHGs have to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. The global warming potential of a GHG is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere.

[46] California Air Resources Board, 2012, California Greenhouse Gas Inventory for 2000–2009: By Category as Defined by the Scoping Plan, April.

[47] California Air Resources Board (CARB), 2015. California Greenhouse Gas Inventory for 2000–2013: By Category as Defined by the Scoping Plan, April 24.

[48] Intergovernmental Panel on Climate Change, Fourth Assessment Report: Climate Change 2007, New York: Cambridge University Press.

[49] At the end of the last ice age, the concentration of CO_2 increased by around 100 ppm (parts per million) over about 8,000 years, or approximately 1.25 ppm per century. Since the start of the industrial revolution, the rate of increase has accelerated markedly. The rate of CO_2 accumulation currently stands at around 150 ppm/century—more than 200 times faster than the background rate for the past 15,000 years.

[50] California Climate Action Team, 2006. Climate Action Team Report to Governor Schwarzenegger and the Legislature, March.

Climate-change scenarios are affected by varying degrees of uncertainty, including uncertainty regarding the magnitude of the direction of the following trends:

- warmer and fewer cold days and nights over most land areas;
- warmer and more frequent hot days and nights over most land areas;
- an increase in frequency of warm spells/heat waves over most land areas;
- an increase in frequency of heavy precipitation events (or proportion of total rainfall from heavy falls) over most areas;
- a shift in percentage of precipitation as snowfall rather than rainfall, which could affect snowpack and hydroelectric resources;
- areas affected by drought increases;
- an increase in intense tropical cyclone activity; and
- increased incidence of extreme high sea level (excludes tsunamis).

IPCC's 2007 IPCC *Fourth Assessment Report* projects that the global mean temperature increase from 1990 to 2100 under different climate-change scenarios will range from 1.4 to 5.8 degrees Celsius (°C; 2.5 to 10.4 degrees Fahrenheit [°F]). In the past, gradual changes in the Earth's temperature changed the distribution of species, availability of water, etc. However, human activities are accelerating this process so that environmental impacts associated with climate change no longer occur in a geologic time frame, but within a human lifetime.[51]

Potential Climate Change Impacts for California and Palo Alto

Like the variability among projections of the expected increase in global surface temperatures, the environmental consequences of gradual changes in the Earth's temperature are hard to predict. In California and western North America, observations of the climate have shown: 1) a trend toward warmer winter and spring temperatures, 2) a smaller fraction of precipitation falling as snow, 3) a decrease in the amount of spring snow accumulation in the lower and middle elevation mountain zones, 4) an advance snowmelt of five to 30 days earlier in the springs, and 5) a similar shift (from five to 30 days earlier) in the timing of spring flower blooms.[52] According to the California Climate Action Team, a committee of State agency secretaries and the heads of agencies, boards and departments led by the Secretary of the California Environmental Protection Agency (Cal/EPA), even if actions could be taken to immediately curtail climate change emissions, the potency of emissions that have already built up, their long atmospheric lifetimes, and the inertia of the Earth's climate system could produce as much as 0.6°C (1.1°F) of additional warming. Consequently, some impacts from climate change are now considered unavoidable. Global climate change

[51] Intergovernmental Panel on Climate Change, Fourth Assessment Report: Climate Change 2007, New York: Cambridge University Press.

[52] California Climate Action Team, 2006, Climate Action Team Report to Governor Schwarzenegger and the Legislature, March.

risks to California are shown in Table 4.6-4 and include public health impacts, water resources impacts, agricultural impacts, coastal sea level impacts, forest and biological resource impacts, and energy impacts.

Different scenarios and models used to predict sea level rise result in different estimates in the magnitude of sea level rise. Most shoreline damage from flooding will occur as a result of storm activity in combination with higher sea levels. The key factors that contribute to coastal flooding include high tides, storm surge, high waves, and high runoff rates from rivers and creeks.[53]

The National Oceanic and Atmospheric Administration (NOAA) has produced a sea level rise scenario map for long range planning that considers sea level rise ranging from one to six feet.[54] Figure 4.8-4 shows the projected two-foot (or 24-inch) and six-foot (or 72-inch) sea level rise scenarios for the city of Palo Alto. As discussed above, BCDC's most current *Bay Plan* references projections of a 69-inch rise in sea level by 2100. However, data on sea level rise is evolving and BCDC uses the 55-inch sea level rise scenario in the Bay Plan when assessing long-term impacts. More information on sea level rise is provided in Chapter 4.8, Hydrology and Water Quality. As shown in Figure 4.8-4, virtually all of Palo Alto east of Middlefield Road and south of Embarcadero Road is vulnerable to sea level rise under a 55-inch scenario.

Specific climate change impacts that could affect Palo Alto are further discussed below.

Palo Alto's Vulnerability to Climate Change

The environmental consequences of global warming are far-reaching, long lasting, and, as described above, already evident throughout California and western North America. As the Earth's temperature continues to rise the effects become increasingly more pervasive. Higher temperatures are expected to result in extreme weather patterns, continued snow cap melt, flooding events, prolonged drought periods, ecosystem disruption, and more frequent and destructive wildfires.

Cities along the San Francisco Bay, such as Palo Alto, are particularly vulnerable to rising sea levels. The IPCC estimates that global sea levels will rise three to six feet by the year 2100.[55] A 2011 BCDC document titled *Living with a Rising Bay:Vulnerability and Adaptation in San Francisco Bay and on its Shoreline* reports that by 2050 sea levels could rise by 10 to 17 inches, and that by 2100 sea levels could rise from 31 to 50 inches under low scenarios and 43 to 69 inches under high scenarios.[56]

[53] San Francisco Bay Conservation and Development Commission, 2011, Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline.

[54] National Oceanic and Atmospheric Administration, 2015, *Sea Level Rise and Coastal Flooding Impacts,* http://coast.noaa.gov/slr/, accessed on October 21, 2015.

[55] The Intergovernmental Panel of Climate Change, Fourth Assessment Report: Climate Change 2007: The AR4 Synthesis Report, Geneva: IPCC.

[56] San Francisco Bay Conservation and Development Commission, 2011, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*, http://www.bcdc.ca.gov/BPA/LivingWithRisingBay.pdf,.page 21.

TABLE 4.6-4 SUMMARY OF GHG EMISSIONS RISKS TO CALIFORNIA

Impact Category	Potential Risk
Public Health Impacts	Poor air quality made worse More severe heat
Water Resources Impacts	Decreasing Sierra Nevada snow pack Challenges in securing adequate water supply Potential reduction in hydropower Loss of winter recreation
Agricultural Impacts	Increasing temperature Increasing threats from pests and pathogens Expanded ranges of agricultural weeds Declining productivity Irregular blooms and harvests
Coastal Sea Level Impacts	Accelerated sea level rise Increasing coastal floods Worsened impacts on infrastructure
Forest and Biological Resource Impacts	Increased risk and severity of wildfires Lengthening of the wildfire season Movement of forest areas Conversion of forest to grassland Declining forest productivity Increasing threats from pest and pathogens Shifting vegetation and species distribution Altered timing of migration and mating habits Loss of sensitive or slow-moving species
Energy Demand Impacts	Potential reduction in hydropower Increased energy demand

Sources: California Energy Commission, 2006, Our Changing Climate: Assessing the Risks to California, 2006 Biennial Report, California Climate Change Center, CEC-500-2006-077; California Energy Commission, 2008, The Future Is Now: An Update on Climate Change Science, Impacts, and Response Options for California, CEC-500-2008-0077.

Rising sea levels pose a significant threat to Palo Alto due the increased risk of inundation of critical structures located in a floodplain and along the shoreline. As described in the City of Palo Alto Annex to the Santa Clara County LHMP, critical facilities at risk to sea level rise include stormwater pump stations, the Regional Water Quality Control Plant, utility control center, municipal services center, and natural gas Station 4.[57] These facilities are located along or near the shoreline and are of particular concern because they provide essential public services, and their compromise during a hazardous event could further aggravate the situation. Sea level rise could also lead to increased flooding events inundating parts of the city and infiltrating freshwater resources. Shoreline protection projects, such as levees, are also vulnerable to the effects of projected sea level rise.[58]

[57] City of Palo Alto, 2012, Palo Alto Annex to the Santa Clara Local Hazard Mitigation Plan, pages 18-54 and18-55.
[58] San Francisco Bay Conservation and Development Commission, 2014, *New Sea Level Rise Policies Fact Sheet*,

Extreme weather events have become more frequent over the past 40 to 50 years, and the trend of extreme weather events is projected to continue. Changes in rainfall distribution and intensity are expected to significantly affect coastal communities, including portions of Santa Clara County. Extreme weather patterns could lead to changes in rainfall distribution and intensity, resulting in fewer but more intense rainfall events followed by prolonged dry periods. More intense heat waves may cause more heat-related illnesses, droughts, and wildfire events, and disruption of outdoor employment.[59] Fewer but more intense rainfall events could cause flash flooding,[60] and more intense storms can result in storm-related injuries and property damage. Prolonged dry periods in Palo Alto could contribute to the evaporative loss of potable water and exacerbate drought conditions. Drier environmental conditions can further contribute to soil moisture depletion, vegetative loss, and accelerated soil erosion of undeveloped open space in Palo Alto. Soil moisture depletion can result in large scale vegetation die-offs which create prime kindling for high intensity wildfires. Acceleration of soil erosion could contribute to landslides and cause significant property damage.

Climate change is expected to contribute to rising global temperatures, which can result in increased energy demand for air conditioning, and exacerbate air pollution by increasing the frequency, duration, and intensity of conditions that lead to air pollution formation. Rising temperatures contribute to higher levels of ground-level ozone, further deteriorating air quality in Palo Alto, which may pose a serious health risk.

Communitywide Greenhouse Gas Emissions

Table 4.6-5 shows existing community-wide GHG emissions in the City and SOI. The GHG emissions inventory follows ICLEI's *U.S. Community Protocol for Accounting and Reporting of GHG Emissions* for sources that are under the jurisdictional control of the City of Palo Alto. The GHG emissions inventory is based on activity data for energy use (natural gas and electricity), solid waste, and water use and wastewater generation for the City of Palo Alto and the SOI provided by CPAU. Transportation emissions are based on origin-demand travel data for Palo Alto and SOI residents and employees compiled by Hexagon Transportation Consultants, Inc., as modeled using the VTA regional transportation demand model (see Appendix H, Transportation Impact Analysis). The inventory also includes an estimate of GHG emissions from off-road equipment based on county-level data. For further discussion of the emissions inventory methodology, see Section 4.6.3, Methodology.

Stationary sources of GHG emissions are not under the direct control of the City of Palo Alto because they require a permit from BAAQMD. However, because this data is available from BAAQMD for the City of Palo Alto and provides a more complete snapshot of the sources of emissions within the City, Table 4.6-5 includes emissions from stationary source emissions as well. However, these emissions are not traditionally considered in local GHG emissions target setting for GHG emissions planning purposes because they are regulated separately by BAAQMD and CARB.

[59] Santa Clara County, 2011, *Santa Clara County Hazard Mitigation Plan*, pages 4-1 and 4-44.
[60] Santa Clara County, 2011, *Santa Clara County Hazard Mitigation Plan*, page 4-44.

TABLE 4.6-5 BASELINE YEAR (2014) GHG EMISSIONS (CITY OF PALO ALTO SPHERE OF INFLUENCE)

Sector	City 2014 $MtCO_2e$	City + SOI 2014 $MtCO_2e$	% of Inventory
Transportation[a]	329,296	394,661	66%
Residential (Natural Gas and Electricity)[b]	57,265	66,342	11%
Non-residential (Natural Gas and Electricity)[b]	96,869	102,319	17%
Waste[c]	6,300	7,101	1%
Water/Wastewater[d]	823	1,012	<1%
Other – Off-road Equipment[e]	28,964	29,573	5%
Total Community Emissions	519,517	601,008	100%
Service Population[f]	161,145	181,635	—
$MtCO_2e$/SP	3.22	3.31	—
BAAQMD Permitted Sources[g]			
City Facilities		12,932	—
Stanford University		234,097	—
Total Permitted		247,029	—

Notes: Emissions may not total to 100 percent due to rounding. Based on GWPs in the IPCC Second Assessment Report (SAR).
Sources:
a. Based on on-road VMT provided by Hexagon and modeled using EMFAC2014-PL.
b. Based on electricity and natural gas use provided by CPAU. According to CPAU, CPAU electricity is carbon neutral. GHG emissions from natural gas use are based on the LGOP.
c. Based on fugitive emissions generated by solid waste disposal in the City obtained from CalRecycle and modeled using CARB's Landfill Emissions Tool. Does not include lifecycle emissions, including solid waste diverted from landfills.
d. Based on water demand and wastewater generation provided by CPAU. According to CPAU, CPAU electricity is carbon neutral. Fugitive GHG emissions from wastewater treatment use are based on the LGOP emissions factors.
e. GHG emissions from off-road equipment use are based on OFFROAD2007.
f. Based on 64,685 people and 95,460 employees in the city in 2014. Based on 80,805 people and 100,830 employees in the city and SOI in 2014.
g. These emissions are not regulated by the City but provided for informational purposes. Includes GHG emissions from permitted sources in the city and Stanford University provided by BAAQMD for 2011, which is the latest data available on BAAQMD's website. Excludes permitted emissions from the City of Palo Alto Landfill and the Palo Alto Regional Water Quality Control Plant to avoid double-counting with the community-wide GHG emissions inventory.

The GHG emissions inventory compiled for the proposed Plan also differs slightly from the Earth Day inventories conducted by the City (Attachment C of the 2015 Earth Day Report). In order to more accurately account for year-to-year changes in energy, water, and solid waste disposal associated (e.g., associated with fluctuations in temperature and precipitation), activity data was averaged over several years. This methodology is consistent with BAAQMD's GHG Plan Level Guidance. The proposed Plan GHG emissions inventory for solid waste includes only GHG emissions from waste generated by City of Palo Alto and SOI residents rather than total waste-in-place, which includes waste disposed of by residents and businesses in other jurisdictions. Additionally, Hexagon Transportation Consultants, Inc. has revised the transportation modeling for the proposed Plan since the 2015 Earth Day Report.

For CEQA purposes, the GHG emissions inventory for the proposed Plan is not a consumption-based emissions inventory. As part of BAAQMD's *Climate Protection Program Pathway to 2050*, BAAQMD is compiling an update of emissions sources and emissions in the Bay Area, which is based on a consumption-based methodology. A consumption based inventory supplements the geographic/production-based inventory by including upstream and downstream emissions from consumption of materials (i.e., a lifecycle analysis) and shifts emissions attributable from producers of the emissions to consumers of emissions. While the S/CAP may address lifecycle pre-consumer emissions embodied in purchase of consumer goods, the proposed Plan and this EIR are not required to do so.

4.6.2 STANDARDS OF SIGNIFICANCE

Appendix G of the California Environmental Quality Act (CEQA) Guidelines contains standards of significance for the evaluation of a project's impacts. Section 15064.7 of the CEQA Guidelines encourages each public agency to develop and publish its own thresholds of significance that the agency uses in evaluating the significance of environmental effects for projects in its jurisdiction. The City of Palo Alto prepared its *Environmental Criteria Used by the City of Palo Alto* in 2007. In determining which standards of significance to use for evaluating the GHG emissions and climate change impacts of the proposed Plan, Appendix G of the CEQA Guidelines, the City's published environmental criteria, BAAQMD Guidelines, and ongoing climate change planning efforts were considered. As part of this review, some of the City's criteria were determined to be outdated for used in this EIR due to changes in the CEQA and BAAQMD guidelines have been enacted since the City's criteria were prepared (see Appendix B for more information on the City's thresholds). Based on this consideration, the analysis in Section 4.6.3 uses the following standards of significance. The proposed Plan would result in a significant GHG emissions impact if it would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.
- Expose people or structures to the physical effects of climate change, including but not limited to flooding, public health, wildfire risk, or other impacts resulting from climate change.

Application of these criteria is based on BAAQMD guidance as described below.

BAAQMD CEQA Guidelines

The BAAQMD CEQA Air Quality Guidelines were prepared to assist in the evaluation of air quality and GHG emissions impacts of projects and plans proposed within the Bay Area. The guidelines provide recommended procedures for evaluating potential air impacts during the environmental review process, consistent with CEQA requirements, and include recommended thresholds of significance, mitigation measures, and background air quality information. They also include recommended assessment methodologies for air toxics, odors, and GHG emissions. In June 2010, the BAAQMD's Board of Directors

adopted CEQA thresholds of significance and an update of the CEQA Guidelines. In May 2011, the updated BAAQMD CEQA Air Quality Guidelines were amended to include a risk and hazards threshold for new receptors and modified procedures for assessing impacts related to risk and hazard impacts.

On March 5, 2012, the Alameda County Superior Court issued a judgment finding that the BAAQMD had failed to comply with CEQA when it adopted the thresholds of significance in the BAAQMD CEQA Air Quality Guidelines. The court did not determine whether the thresholds of significance were valid on their merits, but found that the adoption of the thresholds was a project under CEQA. The court issued a writ of mandate ordering the BAAQMD to set aside the thresholds and cease dissemination of them until the BAAQMD complied with CEQA.

Following the court's order, the BAAQMD released revised CEQA Air Quality Guidelines in May of 2012 that include guidance on calculating air pollution emissions, obtaining information regarding the health impacts of air pollutants, and identifying potential mitigation measures, and which set aside the significance thresholds. The BAAQMD recognizes that lead agencies may rely on the previously recommended Thresholds of Significance contained in its CEQA Guidelines adopted in 1999. The Alameda County Superior Court, in ordering BAAQMD to set aside the thresholds, did not address the merits of the science or evidence supporting the thresholds. Despite the Superior Court's ruling, and in light of the subsequent case history discussed below, the science and reasoning contained in the BAAQMD 2011 CEQA Air Quality Guidelines provide the latest state-of-the-art guidance available.

On August 13, 2013, the First District Court of Appeal ordered the trial court to reverse the judgment and upheld the BAAQMD's CEQA Guidelines. *California Building Industry Association versus Bay Area Air Quality Management District,* Case No. A135335 and A136212 (Court of Appeal, First District, August 13, 2013). On December 27, 2015, the Supreme Court of California issued a ruling on the question of "Under what circumstances, if any, does CEQA require an analysis of how existing environmental conditions will impact future residents or users (receptors) of a proposed project?"[61] The Supreme Court ruled that EIRs are generally not required to analyze the impact of existing environment on a project's future users or residents. However, when a proposed project risks exacerbating existing environmental hazards or conditions, an EIR must analyze the potential impact of such hazards on future users or residents.

In addition, CEQA grants local agencies broad discretion to develop their own thresholds of significance, or to rely on thresholds previously adopted or recommended by other public agencies or experts so long as they are supported by substantial evidence. Accordingly, the City is using the BAAQMD's 2011 thresholds to evaluate project impacts in order to evaluate the potential effects of the project on GHG emissions.

[61] Supreme Court of California, 2015, http://www.courts.ca.gov/opinions/documents/S213478.PDF, accessed on December 30, 2015.

The BAAQMD CEQA Guidelines include methodology and thresholds for GHG impacts for general plan analyses that are consistent with the GHG reduction goals of AB 32. Therefore, the impact of a general plan is less than significant if it:[62]

1. Reduces emissions to 1990 GHG emission levels by 2020; or
2. Reduces emissions to 15 percent below 2008 or earlier emission levels by 2020; or
3. Meets the plan efficiency threshold of 6.6 $MTCO_2e$ per service population per year.

For general plan level analyses, BAAQMD CEQA Guidelines recommend that GHG emissions from direct and indirect community-wide emission sources be quantified for the baseline year, the year 2020 (for consistency with AB 32), and the projected year of buildout. Direct sources of emissions include on-site combustion of energy such as natural gas used for heating and cooking, emissions from industrial processes, and fuel combustion from mobile sources. Indirect emissions are emissions produced off-site from energy production and water conveyance due to a project's energy use and water consumption. Biogenic CO_2 emissions are not included in the quantification of a project's GHG emissions impacts because biogenic CO_2 is derived from living biomass (e.g., organic matter present in wood, paper, vegetable oils, animal fat, food, animal, and yard waste) as opposed to fossil fuels. Pursuant to guidance from the Governor's Office of Planning and Research and the California Air Pollution Control Officer's Association, lifecycle emissions are also not included in the quantification of a project's GHG emissions impacts for CEQA.[63]

The City of Palo Alto has provided an estimate of GHG emissions generated in the City in 1990 based on data compiled for the City's Earth Day Reports. Transportation emissions generated in the City were identified by Fehr & Peers in the 2015 Earth Day Report as 331,840 $MTCO_2e$ while electricity and natural gas were identified as 380,000 $MTCO_2e$ by the CPAU in 1990, resulting in a 1990 emissions inventory of 711,840 $MTCO_2e$.[64] To achieve the 2030 target under Executive Order B-30-15, the City would need to reach 427,104 $MTCO_2e$. To achieve the 2050 target under Executive Order S-03-05, the City would need to reach 142,368 $MTCO_2e$.

BAAQMD's third criterion (see list above) that evaluates the efficiency of the plan was also used to determine potential impacts of the proposed Project. The proposed Project horizon year is 2030; therefore, the BAAQMD efficiency target has been extrapolated to 2030 based on the GHG reduction goal of

[62] BAAQMD's CEQA Guidelines also allow cities to tier from plans adopted to mitigate the effects of GHG emissions on a city/town level, consistent with AB 32 goals. Palo Alto does not currently have a qualified GHG reduction strategy. Therefore, the analysis of the Comprehensive Plan below does not rely on this threshold.

[63] Lifecycle emissions include indirect emissions associated with materials manufacture. However, these indirect emissions involve numerous parties, each of which is responsible for GHG emissions of their particular activity. The California Resources Agency, in adopting the CEQA Guidelines Amendments on GHG emissions found that lifecycle analyses was not warranted for project-specific CEQA analysis in most situations, for a variety of reasons, including lack of control over some sources, and the possibility of double-counting emissions (see Final Statement of Reasons for Regulatory Action, December 2009). Because the amount of materials consumed during the operation or construction of the proposed project is not known, the origin of the raw materials purchased is not known, and manufacturing information for those raw materials are also not known, calculation of life cycle emissions would be speculative. A life-cycle analysis is not warranted.

[64] To ensure consistency between the community emissions inventory conducted for the Comprehensive Plan, the "Other" emissions category was not included in the total above; and therefore, the 1990 level identified above is conservative because it does not include emissions from the off-road, waste, and water/wastewater sectors.

Executive Order B-30-15, which is to reduce GHG emissions 40 percent below 1990 levels by 2030, and Executive Order S-03-05, which is to reduce GHG emissions 80 percent below 1990 levels by 2050, as described below:

- The City's 2020 GHG estimated efficiency target would be 6.6 $MTCO_2e$ per service population, per year, to align with BAAQMD's CEQA Guidelines.
- The City's 2030 GHG estimated efficiency target would be 4.0 $MTCO_2e$ per service population, per year, to align with the mid-term GHG reduction goal of Executive Order B-30-15.
- The City's 2050 GHG estimated efficiency target would be 1.3 $MTCO_2e$ per service population, per year, to align with the long-term GHG reduction goals of Executive Order S-03-05.

It is important to note that these targets specifically respond to the requirements in BAAQMD's CEQA Guidelines for the purpose of evaluating GHG emissions under CEQA. These targets are not the same as municipal or communitywide GHG emission reduction targets that may be established through the City's ongoing S/CAP process.

4.6.3 IMPACT DISCUSSION

The remaining sections of this chapter provide an analysis of the potential project impacts, including impacts from growth expected to occur during the life of the proposed Plan, as well as cumulative GHG impacts that could occur as a result of the implementation of the proposed Plan when combined with projects outside of Palo Alto.

All potential impacts described below would be the same for all four scenarios. As such, although the discussion below addresses the differences among the scenarios, the scenarios are not distinguished in separate impact discussions below.

GHG emissions related to the proposed Project are not confined to a particular air basin but are dispersed worldwide. Therefore, this section analyzes both Comp Plan impacts and potential cumulative impacts to GHG emissions.

Methodology

Community-wide GHG emissions for the proposed Project, which includes growth in the City and SOI, follows BAAQMD's *GHG Plan Level Guidance*[65] and ICLEI's *US Community Protocol for Accounting and Reporting of GHG Emissions*[66] and includes the following sectors:

[65] Bay Area Air Quality Management District (BAAQMD), 2012. GHG Plan Level Guidance, May. http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/GHG%20Quantification%20Guidance%20May%202012.ashx?la=en.

[66] ICLEI – Local Governments for Sustainability USA, 2012. US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.0, October.

- **On-Road Transportation:** On-road transportation emissions from passenger vehicles and trucks generated by land uses in the City and SOI are based on daily VMT data provided by Hexagon for existing conditions (2014) and year 2030 conditions for the four proposed Plan scenarios. Accounting of VMT is based on the recommendations of CARB's Regional Targets Advisory Committee (RTAC) created under Senate Bill 375 (SB 375).[67] GHG emissions associated with the VMT provided by Hexagon were modeled using CARB's EMFAC2014-PL.[68] Consistent with CARB's methodology within the *Climate Change Scoping Plan Measure Documentation Supplement*, daily VMT was multiplied by 347 days per year to account for reduced traffic on weekends and holidays to determine annual emissions.[69] The emissions forecast include the GHG emissions reductions from federal and State regulations included in EMFAC2014 including, the Pavley I fuel efficiency standards, the California Advanced Clean Car Standards, the LCFS, on-road diesel fleet rules, and the Smartway/Phase I Heavy Duty Vehicle Greenhouse Gas Regulation.
- **Residential and Non-residential Energy:** Purchased electricity and natural gas use for residential and non-residential land uses in the City and SOI are based on data provided by CPAU. To account for fluctuation in annual energy use as a result of natural variations in climate between inventory years, BAAQMD recommends averaging energy use over several years.[70] Therefore, residential natural gas and electricity use are normalized based on four years of electricity and natural gas usage data (2014, 2013, 2012, and 2011) for the baseline inventory. Electricity use is then multiplied by the carbon intensity of Palo Alto's electricity. The City's electricity is currently carbon neutral (i.e., zero emissions), which means that the utility was able to offset GHG emissions generated from any non-renewable supplies with purchases of RECs. GHG emissions from natural gas use are based on emissions rates in CARB's Local Government Operations Protocol (LGOP), Version 1.1. For the Residential Sector, total electricity use and natural gas use in the baseline year are forecasted based on the percent increase in housing units from the baseline year for each of the proposed Plan development scenarios. For the Non-residential Sector, total electricity use and natural gas use in the baseline year are forecasted based on the percent increase in employment from the baseline year for each of the proposed Plan development scenarios. This means that under the business-as-usual (BAU) conditions, the emissions forecasts for the Residential and Non-residential sectors do not include reductions in average annual building energy use (non-plug load) associated new buildings from the triennial updates to the Title 24 Building Code or energy efficiency improvements that reduce electricity use in existing buildings.

[67] For accounting purposes, there are three types of trips: (1) Vehicle trips that originated and terminated within the City of Palo Alto (Internal-Internal, I-I). Using the accounting rules established by RTAC, 100% of the length of these trips, and their emissions, are attributed to the City of Palo Alto. (2) Vehicle trips that either originated or terminated (but not both) within the City of Palo Alto (Internal-External or External-Internal, I-X and X-I). Using the accounting rules established by RTAC, 50 percent of the trip length for these trips is attributed to Palo Alto. (3) Vehicle trips that neither originated nor terminated within the City of Palo Alto. These trips are commonly called pass-through trips (External-External, X-X). Using the accounting rules established by RTAC, these trips are not counted towards the City's VMT or emissions.

[68] California Air Resources Board (CARB), 2014. EMFAC2014-PL.

[69] California Air Resources Board (CARB), 2008. Climate Change Proposed Scoping Plan, a Framework for Change, October.

[70] Bay Area Air Quality Management District (BAAQMD), 2012. *GHG Plan Level Guidance,* May. http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/GHG%20Quantification%20Guidance%20May%202012.ashx?la=en.

- **Water/Wastewater:** GHG emissions from this Sector include indirect GHG emissions from the embodied energy associated with water use and wastewater generation and fugitive GHG emissions from processing wastewater. Existing water demand by land use type in the City and total wastewater generation treated at the Palo Alto Wastewater Treatment Plant was provided by CPAU for years 2011-2014. In order to account for fluctuations in annual water use due to meteorological conditions (e.g., some years are drier, some years are warmer, and some years are cooler and wetter), annual water demand and wastewater generation was averaged over the last four years (from 2011 through 2014) in order to obtain average annual water use for the City. Total water demand was adjusted to account for additional residential and non-residential water use in the SOI. The increase in water demand for the City and SOI associated with the proposed Plan scenarios is estimated based on the Palo Alto's 2010 Urban Water Management Plan (UWMP) SBX7-7 baseline and 2020 water conservation goals, which are measured in gallons per capita per day. Because the proposed Plan scenarios account for changes in both residential and non-residential growth, per capita water estimates are adjusted for employment generating land uses in order to obtain a water demand rate that is based on service population (SP: population plus employees) rather than per capita (population only). Using this methodology, the additional population and employment generated by buildout of each of the scenarios was multiplied by a rate of 73.1 gallons per service population per day and added to the existing annual average water demand. Electricity use from water use is estimated using energy rates identified by the CEC[71] and from CPAU for wastewater.[72] Then energy is multiplied by Palo Alto's carbon intensity of energy. Because the City's electric supplies are carbon neutral, no net GHG emissions are assumed to be generated from electricity used for treating water and wastewater. Wastewater treatment also results in fugitive GHG emissions from wastewater processing. Total wastewater processed in the City was obtained from CPAU and averaged over the last four years (from 2011 through 2014). For the forecast years, total treated wastewater is based on the ratio of wastewater to total water demand provided by CPAU for the baseline year (approximately 90 percent of total water use). Therefore, the analysis conservatively assumes the majority of total water use is ultimately treated at the Palo Alto Wastewater Treatment Plant. Fugitive emissions from wastewater treatment in the city were calculated using the emission factor's in CARB's LGOP, Version 1.1.[73]
- **Waste:** GHG emissions from solid waste disposed of by residents and employees in the City and SOI is based on the waste-in-place (WIP) method. This method assumes that the degradable organic component (degradable organic carbon, DOC) in waste decays slowly throughout a few decades, during which CH_4 and biogenic CO_2 are formed. If conditions are constant, the rate of CH_4 production depends solely on the amount of carbon remaining in the waste. As a result, emissions of CH_4 from waste deposited in a disposal site are highest in the first few years after deposition, then gradually decline as the degradable carbon in the waste is consumed by the bacteria responsible for the decay. Significant CH_4 production typically begins one or two years after waste disposal in a landfill and

[71] California Energy Commission (CEC), 2006. Refining Estimates of Water-Related Energy Use in California. CEC-500-2006-118. Prepared by Navigant Consulting, Inc., December. Based on the electricity use for Northern California.
[72] Eric Keniston, City of Palo Alto, April 2014 and April 2015. Average 2011 to 2014 kwh/MG energy required to treat wastewater.
[73] California Air Resources Board (CARB), 2010. Local Government Operations Protocol (LGOP), Version 1.1, May.

continues for 10 to 60 years or longer. BAAQMD recommends averaging waste disposal over several years to account for fluctuations in average annual solid was disposal.[74] Waste generated in the City and SOI is averaged over a three-year period (2011-2013),[75] based on data obtained from CalRecycle, to provide an estimate of GHG emissions for existing conditions (baseline year).[76] GHG emissions from solid waste disposal in the baseline year were modeled using CARB's Landfill Emissions Tool Version 1_2013, which includes waste characterization data from CalRecycle.[77] Because the landfill gas captured is not under the jurisdiction of Palo Alto, the landfill gas emissions from the capture system are not included in Palo Alto's inventory. Only fugitive sources of GHG emissions from landfill are included. Modeling assumes a 75 percent reduction in fugitive GHG emissions from the landfill's Landfill Gas Capture System. The Landfill gas capture efficiency is based on CARB's LGOP, Version 1.1.[78] Total GHG emissions from waste disposal in the baseline year are forecasted based on the percent increase in service population. The emissions forecast do not account for reductions from increasing waste diversion.

- **Other – Off-Road Equipment:** OFFROAD2007[79] was used to obtain a rough estimate of GHG emissions from landscaping equipment, light commercial equipment, and construction equipment in the City and SOI. OFFROAD2007 is a database of equipment use and associated emissions for each county compiled by CARB. Annual emissions were compiled using OFFROAD2007 for the County of Santa Clara for year 2014. In order to determine the percentage of emissions attributable to the City of Palo Alto, landscaping and light commercial equipment is estimated based on population, (Landscaping),[80] employment (Light Commercial Equipment),[81] and construction building permits (Construction)[82] for Palo Alto as a percentage of Santa Clara County. Daily off-road construction emissions are multiplied by 347 days per year to account for reduced/limited construction activity on weekends and holidays. Annual average construction emissions are assumed to be similar to historic conditions. Total GHG emissions from landscaping equipment and commercial equipment in the baseline year are forecasted based on the percent increase in population and employment growth, respectively. The emissions forecast for the Other Sector included GHG reductions from the LCFS.

[74] Bay Area Air Quality Management District (BAAQMD), 2012. *GHG Plan Level Guidance,* May. http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/GHG%20Quantification%20Guidance%20May%202012.ashx?la=en.

[75] 2014 data is not available from CalRecycle.

[76] CalRecycle, 2014, Disposal Reporting System, Jurisdiction Reporting by Facility, Palo Alto. http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx

[77] California Department of Resources Recycling and Recovery (CalRecycle), Disposal Reporting System, 2014. *2012-2010 Palo Alto Jurisdiction Disposal By Facility with Reported Alternative Daily Cover (ADC) and Alternative Intermediate Cover (AIC).* Accessed April, http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx.

[78] California Air Resources Board (CARB), 2010. Local Government Operations Protocol (LGOP), Version 1.1, May.

[79] Although there is a new OFFROAD Model, the 2011 update did not categorize emissions at the county-level, only statewide in the new model update. Therefore, GHG emissions from this sector are a conservative estimate from off-road equipment.

[80] U.S. Census Bureau, 2010.

[81] U.S. Census Bureau. 2010. *Longitudinal Employer-Household Dynamics.* http://lehd.ces.census.gov/.

[82] U.S. Census Bureau, 2010. Building Permits, http://censtats.census.gov/bldg/bldgprmt.shtml.

GHG-1 The proposed Plan would not generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment. (Less than Significant– All Four Scenarios)

Summary: Development under the proposed Project would contribute to climate change through direct and indirect emissions of GHG. The horizon year of the proposed Plan is 2030. GHG emissions associated with buildout of the proposed Plan development scenarios in year 2030 would be offset by GHG emissions reductions from State, federal, and local regulations and programs, resulting in a net decrease in GHG emissions compared to existing conditions in the city and the city and SOI, ranging from 18 to 20 percent lower. Furthermore, the proposed Plan scenarios would achieve or exceed the BAAQMD efficiency metric for year 2030 and would ensure the City maintains a trajectory that is consistent with the GHG reduction target of Executive Order B-30-15. Therefore, the proposed Plan would not generate GHG emissions that would have a significant impact on the environment.

An estimate of GHG emissions in the City of Palo Alto in year 2020 is included in Table 4.6-6, which is based on the ABAG population and employment projections for the City of Palo Alto and SOI.[83] Compared to the existing baseline emissions inventory, the proposed Plan would experience a decrease of GHG emissions in 2020 as a result of State and federal regulations adopted to reduce GHG emissions and turnover of California's on-road vehicle fleets. Based on the City's 1990 emissions inventory conducted for the Earth Day Report[84] the City would surpass the goal for 2020 of 711,810 $MTCO_2e$. Additionally, the City would achieve BAAQMD's year 2020 efficiency metric of 6.6 $MTCO_2e$/SP, which is consistent with the GHG reduction targets of AB 32.

To ensure that the City maintains a trajectory that is consistent with the State's long-term GHG reduction goals, the planning scenarios analyzed in this EIR also include the following sustainability initiatives that would reduce GHG emissions from residential and non-residential development:

- Paid transit passes for employees in workplaces with over 50 employees (all scenarios).
- Employer incentives for carpooling and bicycling (Scenarios 2 through 4).
- Unbundled parking costs for multi-family units (Scenarios 3 and 4).
- Parking charges for workplaces with over 50 employees (Scenario 4).
- Paid parking in Downtown and California Avenue areas (Scenario 4).
- Free transit passes for all Palo Alto residents in transit-accessible areas (Scenario 4).

[83] ABAG projections for housing and population are larger than the City's own projections for housing and population growth within the City boundaries.

[84] To ensure consistency between the community emissions inventory conducted for the Comprehensive Plan, the "Other" emissions category was not included in the total above; and therefore, the 1990 level identified above is conservative because it does not include emissions from the off-road, waste, and water/wastewater sectors.

TABLE 4.6-6 2020 PALO ALTO PROPOSED PLAN COMMUNITY GHG EMISSIONS INVENTORY

	GHG Emissions ($MtCO_2e$/Year)					
Category	2014 Existing City Only	Year 2020 Forecast City Only	Change from Existing City Only	2014 Existing City + SOI	Year 2020 Forecast City + SOI	Change from Existing City + SOI
Transportation[a]	329,296	284,141	-45,154	394,661	302,989	-91,672
Residential (Natural Gas and Electricity)[b]	57,265	58,398	1,133	66,342	72,803	6,461
Non-residential (Natural Gas and Electricity)[b]	96,869	106,368	9,498	102,319	112,081	9,762
Waste[c]	6,300	6,854	554	6,300	7,782	681
Water/Wastewater[d]	823	810	-13	1,012	1,073	61
Other – Off-road Equipment[e]	28,964	26,671	-2,293	29,573	27,282	-2,291
Total Community Emissions	**519,517**	**483,242**	**-36,275**	**600,207**	**524,010**	**-76,998**
Percent Change from Existing	—	—	-7%	—	—	-13%
Service Population[f]	181,635	175,320	—	181,635	199,050	—
$MtCO_2e$/SP	3.22	2.76	—	3.30	2.63	—
BAAQMD GHG 2030 Efficiency Target	NA	6.6	—	NA	6.6	—
Achieves BAAQMD GHG Plan-Level Threshold?	—	Yes	—	—	Yes	—
Achieves 1990 Emissions of 711,840 $MtCO_2e$ (City only)[g]		Yes		NA	—	—

Notes: Emissions may not total to 100 percent due to rounding. Based on GWPs in the IPCC Second Assessment Report (SAR).
Sources:
a. Based on on-road VMT provided by Hexagon and modeled using EMFAC2014-PL.
b. Based on electricity and natural gas use provided by CPAU. According to CPAU, CPAU electricity is carbon neutral. GHG emissions from natural gas use are based on the LGOP. The table includes the natural gas use provided by City of Palo Alto Utilities, both for residential and non-residential uses in the city and SOI. Customers may participate in the PaloAltoGreen Gas (PAGG) program, which would reduce community emissions. Palo Alto expects that about 10 percent of the city's gas load (both for residential and non-residential) will participate in PAGG in 2020. In addition, electrification of gas appliances (e.g., water heaters, space heaters, dryers, and cooktops) would also reduce natural gas use and increase carbon neutral electric use. The EIR is conservative and does not include additional local reductions from participation in the PAGG program or conversion of natural gas appliances to electric appliances.
c. Based on solid waste disposal in the city obtained from CalRecycle and modeled using CARB's Landfill Emissions Tool.
d. Based on water demand and wastewater generation provided by CPAU. According to CPAU, CPAU electricity is carbon neutral. Fugitive GHG emissions from wastewater treatment use are based on the LGOP emissions factors.
e. GHG emissions from off-road equipment use are based on OFFROAD2007.
f. Based on ABAG population and employment for Palo Alto + SOI in year 2020 (88,600 population and 110,450 employees) and for Palo Alto in year 2020 (70,500 population and 104,820 employees).
g. Based on the 2015 Palo Alto Earth Day Report and updated transportation emissions inventory prepared by Fehr & Peers for 1990.

The community-wide GHG emissions inventory for the proposed Plan scenarios is included in Table 4.6-7. Emissions generated by additional growth in the City and SOI would be offset by a reduction in existing emissions from implementation of federal, State, and local regulations and programs adopted to reduce GHG emissions and from turnover of California's on-road vehicle fleets. Compared to the existing baseline emissions inventory, the proposed Plan would experience a decrease of GHG emissions in 2030. As identified by the California Natural Resources Agency's "Final Statement of Reasons for Regulatory Action, Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to Senate Bill 97" (2009), the CEQA Guidelines do not establish a zero emissions threshold of significance because there is no "one molecule rule" in CEQA, meaning that a project that does not generate an increase emissions or generates a net decrease in emissions does not result in a significant impact (i.e., the impact threshold should be set at some point above zero). GHG emissions in the City and the City and SOI would range from approximately 18 percent to 20 percent less than the baseline community GHG emissions. Scenario 2 would result in the lowest total emissions, since it includes the lowest overall amount of future growth. However, Scenario 4 would have the lowest emissions per service population.

BAAQMD has not adopted a 2030 per capita GHG threshold for operation-related GHG emissions. However, for the purposes of this EIR analysis, a 2030 efficiency target was derived for the proposed Project based on the 2030 goal established in Executive Order B-30-15, which is a 40 percent reduction from 1990 levels by 2030. Table 4.6-7 also shows that all the Scenarios would achieve the BAAQMD efficiency metric for year 2030 that would ensure the City maintains a trajectory that is consistent with the GHG reduction target of Executive Order B-30-15.

The City's 1990 emissions inventory conducted for the Earth Day Report[85] was used to estimate the GHG target for the City in year 2030 consistent with the interim target established in Executive Order B-30-15. Based on the City's 1990 inventory, the City would need to achieve a goal of 427,104 $MTCO_2e$ by 2030. As shown in Table 4.6-7, City emissions for all proposed Plan scenarios would achieve the 2030 goal based on the City's 1990 emissions inventory.

The proposed Plan establishes the framework for future growth and development in Palo Alto. A general plan does not directly result in development without additional approvals. Before any development can occur in the City, it is required to be analyzed for consistency with the proposed Plan, zoning requirements, and other applicable local and state requirements; comply with the requirements of CEQA; and obtain all necessary clearances and permits. As identified in Table 4.6-7, all four proposed Plan scenarios would result in a decrease in emissions from existing conditions and would achieve the 2030 performance criteria that would ensure the City is on a trajectory to achieve the GHG reductions targets of Executive Order B-30-15 for year 2030. Consequently, GHG emissions impacts of the proposed Plan are *less than significant*.

[85] To ensure consistency between the community emissions inventory conducted for the Comprehensive Plan, the "Other" emissions category was not included in the total above; and therefore, the 1990 level identified above is conservative because it does not include emissions from the off-road, waste, and water/wastewater sectors.

TABLE 4.6-7 2030 PALO ALTO PROPOSED PLAN COMMUNITY GHG EMISSIONS INVENTORY

	GHG Emissions ($MtCO_2e$/Year)							
Category	Scenario 1 (2030 BAU) City Only	Scenario 2 City Only	Scenario 3 City Only	Scenario 4 City Only	Scenario 1 (2030 BAU) City + SOI	Scenario 2 City + SOI	Scenario 3 City + SOI	Scenario 4 City + SOI
Transportation[a]	209,599	206,278	210,486	207,903	265,088	256,873	260,962	258,102
Residential (Natural Gas and Electricity)[b]	62,721	62,721	64,376	66,132	74,126	74,126	75,791	77,536
Non-residential (Natural Gas and Electricity)[b]	112,578	112,578	109,813	112,578	118,423	118,423	115,658	118,423
Waste[c]	7,163	6,943	7,128	7,314	8,089	7,869	8,054	8,240
Water/Wastewater[d]	810	810	810	810	1,073	1,073	1,073	1,073
Other – Off-road Equipment[e]	27,043	26,728	26,920	27,106	27,658	27,343	27,535	27,721
Total Community Emissions	**419,914**	**416,058**	**419,533**	**421,842**	**494,458**	**485,707**	**489,074**	**491,095**
Change from Existing	-99,603)	-103,459-	-99,984-	-97,675	-106,550	-115,301	-111,934	-109,913
Percent Change from Existing	-19%	-20%	-19%	-19%	-18%	-19%	-19%	-18%
Service Population[f]	183,225	177,595	182,335	187,080	206,910	201,280	206,020	210,765
$MtCO_2e$/SP	2.29	2.34	2.30	2.25	2.39	2.41	2.37	2.33
BAAQMD GHG 2030 Efficiency Target	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Achieves BAAQMD GHG Plan-Level Threshold?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Achieves 1990 Emissions of 427,104 $MTCO_2e$ (City Only)[g]	Yes	Yes	Yes	Yes	—	—	—	—

Notes: Emissions may not total to 100 percent due to rounding. Based on GWPs in the IPCC Second Assessment Report (SAR).
Sources:
a. Based on on-road VMT provided by Hexagon and modeled using EMFAC2014-PL.
b. Based on electricity and natural gas use provided by the CPAU. According to CPAU, CPAU electricity is carbon neutral. GHG emissions from natural gas use are based on the LGOP. The table includes the natural gas use provided by City of Palo Alto Utilities, both for residential and non-residential uses in the city and SOI. Customers may participate in the PaloAltoGreen Gas (PAGG) program, which would reduce community emissions. Palo Alto expects that about 10 percent of the City's gas load (both for residential and non-residential) will participate in PAGG in 2020 (an estimate is not yet available for the 2030 horizon). In addition, electrification of gas appliances (e.g., water heaters, space heaters, dryers, and cooktops) would also reduce natural gas use and increase carbon neutral electric use. The EIR is conservative and does not include additional local reductions from participation in the PAGG program or conversion of natural gas appliances to electric appliances.
c. Based on solid waste disposal in the city obtained from CalRecycle and modeled using CARB's Landfill Emissions Tool.
d. Based on water demand and wastewater generation provided by CPAU. According to CPAU, CPAU electricity is carbon neutral. Fugitive GHG emissions from wastewater treatment use are based on the LGOP emissions factors.
e. GHG emissions from off-road equipment use are based on OFFROAD2007.
f. Based on the following for the City + SOI: Scenario 1: 90,210 people and 116,700 employees; Scenario 2: 90,210 people and 111,070 employees; Scenario 3, 92,045 people and 113,975 employees, Scenario 4: 94,065 people and 116,700 employees, as detailed in Chapter 3, Project Description, of this EIR. Based on the following for the City only: Scenario 1: 72,285 people and 110,940 employees; Scenario 2: 72,285 people and 105,310 employees; Scenario 3, 74,120 people and 108,215 employees, Scenario 4: 70,500 people and 104,820 employees, as detailed in Chapter 3, Project Description, of this EIR.
g. Based on the 2015 Palo Alto Earth Day Report and updated transportation emissions inventory prepared by Fehr & Peers for 1990.

Applicable Regulations:

- California Global Warming Solutions Act (AB 32)
- Sustainable Communities and Climate Protection Act (SB 375)
- Greenhouse Gas Emission Reduction Targets (Executive Order S-3-05)
- Clean Car Standards – Pavley (AB 1493)
- Renewable Portfolio Standards (SB 1078)
- Clean Energy and Pollution Reduction Act of 2015 (SB 350)
- California Integrated Waste Management Act of 1989 (AB 939)
- California Mandatory Commercial Recycling Law (AB 341)
- California Advanced Clean Cars CARB/ Low-Emission Vehicle Program – LEV III (Title 13 CCR)
- Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction Measure (Title 17 CCR)
- Low Carbon Fuel Standard (Title 17 CCR)
- California Water Conservation in Landscaping Act of 2006 (AB 1881)
- California Water Conservation Act of 2009 (SBX7-7)
- Statewide Retail Provider Emissions Performance Standards (SB 1368)
- Airborne Toxics Control Measure to Limit School Bus Idling and Idling at Schools (13 CCR 2480)
- Airborne Toxic Control Measure to Limit Diesel-Fuel Commercial Vehicle Idling (13 CCR 2485)
- In-Use Off-Road Diesel Idling Restriction (13 CCR 2449)
- Building Energy Efficiency Standards (Title 24, Part 6)
- California Green Building Code (Title 24, Part 11)
- Appliance Energy Efficiency Standards (Title 20)

Significance before Mitigation: As identified in Table 4.6-7, all four proposed Plan scenarios would result in a decrease in emissions from existing conditions and would achieve the 2030 performance criteria that would ensure the City is on a trajectory to achieve the GHG reductions targets of Executive Order B-30-15 for year 2030 (the horizon year for the Plan). Consequently, GHG emissions impacts of the proposed Plan are less than significant.

GHG-2	**The proposed Plan could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases, requiring mitigation. (Significant and Unavoidable – All Four Scenarios)**

Summary: The State's GHG emissions reductions objectives are embodied in AB 32, Executive Order B-30-15, Executive Order S-03-05, and SB 375. ABAG and MTC have prepared Plan Bay Area, the Bay Area's first SCS, to address the per capita passenger vehicle GHG reduction targets identified in SB 375. The First Update to the Scoping Plan identifies that the State is on track to achieve the GHG reductions identified in AB 32. Additionally, CARB is tasked with updating the Scoping Plan to address the near-term GHG reduction targets of Executive Order B-30-15 for 2030. However, there is no current plan for 2030

or the long-term GHG reduction goals for 2050 identified in Executive Order S-03-05. While the proposed Plan would ensure the City is on a trajectory to achieve the mid-term 2030 target, additional GHG reductions would be necessary to achieve the more aggressive GHG reduction targets of an 80 percent reduction below 1990 levels by 2050. Consequently, long-term GHG emissions impacts are conservatively considered significant, requiring mitigation to ensure the City of Palo Alto takes all reasonable steps to aid in achievement of the State's long-term GHG emission reduction objectives.

CARB's Scoping Plan

In accordance with AB 32, CARB developed the *2008 Scoping Plan* to outline the State's strategy to achieve 1990 level emissions by year 2020. To estimate the reductions necessary, CARB projected statewide 2020 BAU GHG emissions (i.e., GHG emissions in the absence of statewide emission reduction measures). CARB identified that the State as a whole would be required to reduce GHG emissions by 28.5 percent from year 2020 BAU to achieve the targets of AB 32.[86] The GHG emissions forecast was updated as part of the First Update to the Scoping Plan. In the First Update to the Scoping Plan, CARB projected that statewide BAU emissions in 2020 would be approximately 509 million $MTCO_2e$.[87] Therefore, to achieve the AB 32 target of 431 million $MTCO_2e$ (i.e., 1990 emissions levels) by 2020, the State would need to reduce emissions by 78 million $MTCO_2e$ compared to BAU conditions, a reduction of 15.3 percent from BAU in 2020.[88,89]

Statewide strategies to reduce GHG emissions identified in the *2008 Scoping Plan* include the LCFS; California Appliance Energy Efficiency regulations; California Building Standards (i.e., CALGreen and the 2008 Building and Energy Efficiency Standards); California Renewable Energy Portfolio standard (33 percent RPS); changes in the corporate average fuel economy standards (e.g., Pavley I and Pavley II which is now known as the California Advanced Clean Cars Program); and other measures that would ensure the State is on target to achieve the GHG emissions reduction goals of AB 32. Statewide GHG emissions reduction measures that are being implemented would apply to future development and vehicle travel allowed under the updated Comp Plan and would therefore reduce the City's future GHG emissions.

In 2014, CARB adopted its *First Update to the Scoping Plan*. As identified in the update, as California continues to build its climate policy framework, there is a need for local government climate action planning to adopt mid-term and long-term reduction targets that are consistent with scientific assessments and the statewide goal of reducing emissions 80 percent below 1990 levels by 2050. CARB identifies that local government reduction targets should chart a reduction trajectory that is consistent with, or exceeds, the trajectory created by statewide goals. CARB is also in the process of updating the Scoping Plan to address the new interim GHG reduction target for 2030 under Executive Order B-30-15.

[86] California Air Resources Board (CARB). 2008. October. *Climate Change Proposed Scoping Plan, a Framework for Change.*

[87] The BAU forecast includes GHG reductions from Pavley and the 33% Renewable Portfolio Standard (RPS).

[88] California Air Resources Board (CARB), 2014. *First Update to the Climate Change Scoping Plan: Building on the Framework, Pursuant to AB 32, The California Global Warming Solutions Act of 2006, May 15.*

[89] If the GHG emissions reductions from Pavley I and the Renewable Electricity Standard are accounted for as part of the BAU scenario (30 million $MTCO_2e$ total), then the State would need to reduce emissions by 108 million $MTCO_2e$, which is a 20 percent reduction from BAU.

While the proposed Plan would achieve efficiency targets for 2030, as identified in Table 4.6-7, additional GHG reductions would be necessary to achieve the more aggressive GHG reduction targets of an 80 percent reduction below 1990 levels by 2050. As described in Section 4.6.1.1 above, the City is currently developing an S/CAP that would create roadmap for emissions reductions necessary to align the City with the even longer-term GHG reduction goals of Executive Order S-03-05. The following draft measures are being considered for inclusion in the S/CAP to reduce emissions:

- T-FAC-1: Expand bicycle network and infrastructure. This strategy focuses on leveraging the Palo Alto *Bicycle + Pedestrian Transportation Plan* to support the City in meeting a goal of doubling the rate of bicycling for both local and total work commutes to 15 percent and five percent, respectively, by 2020. The S/CAP project will assess additional targets associated with specific actions to evaluate the potential greenhouse gas emissions savings for 2025, 2030, and 2050.
- T-FAC-2: Expand transit facilities and services. This strategy identifies transit agency expansion and improvement plans underway, associated opportunities to improve service frequency, speed, reliability and capacity. However, to implement these transit expansion strategies, the key action of the City is to collaborate with neighboring jurisdictions in Santa Clara County and along the entire San Francisco Peninsula to advocate for major public investment in transit service and infrastructure and to define these projects in a way that maximizes future capacity, ridership, convenience, reliability and frequency of service.
- T-FAC-3: Facilitate shared transport options. This strategy focuses on facilitating the use of shared travel options, including transportation network companies (TNCs) for conventional carpooling as well as dynamic ridesharing particularly along the US 101 corridor and for first mile/last mile travel options.
- T-INC-1: Provide universal transit access. Beginning in 2014, the City of Palo Alto offered a free Caltrain Go-Pass to all of its benefits-eligible employees working at downtown locations. As a condition of development, the City of Palo Alto currently requires developers to provide transit passes for full-time employees as a part of their Transportation Demand Management (TDM) plan where appropriate. Also, there is the potential to pursue a bulk-discount VTA eco-pass program for residents and/or employees in transit served areas. This strategy assumes additional significant and widespread adoption of a universal transit pass including all transit agency programs (Caltrain Go-Pass, SamTrans Way2GoPass, and VTA EcoPass).
- T-INC-2: Utilize parking pricing and management. The price and availability of parking at one's destination is a key factor in travel mode choice, with free on-street parking and required off-street parking (i.e., parking minimums) creating an effective subsidy for travel by cars. The City is currently undertaking a study of paid parking and related issues for the downtown. This strategy focuses on actions such as unbundling parking costs from lease/sale of commercial and residential units and requiring employers to offer the option of receiving transportation benefits instead of parking benefits (e.g., feebate program).
- T-EV-1: Convert vehicles to electric vehicles. In addition to reducing vehicle-miles traveled, reducing the carbon content of vehicle fuels is another important strategy for overall reductions in transportation

emissions. Electric vehicle technology continues to improve rapidly, with significant uptake regionally and in Palo Alto. This strategy assesses strategies to increase the rate of adoption of electric vehicles, and the GHG impact of different rates of adoption of electric vehicles.

- NG-RES-1: Electrify residential water heating. For existing homes, identify and implement actions to reduce fuel switching costs, and consider encouraging or requiring upgrades from natural gas fueled water heaters to efficient electric water heaters (air source heat pumps) at key leverage points (e.g., time-of-sale and/or major renovation); also, make it easy for the community to find appropriate products for their needs.
- NG-RES-2: Electrify residential space heating. For existing homes, identify and implement actions to reduce fuel switching costs from gas-fired furnaces to efficient electric technologies (e.g., air source heat pumps), consider encouraging or requiring upgrades at key leverage points (e.g., time or permitting or time-of-sale); also, make it easy for the community to find appropriate products for their needs.
- NG-COMM-1: Electrify commercial water heating. This strategy focuses on the estimated GHG emissions savings potential of electrifying commercial water heating. The S/CAP project assumes that small commercial buildings have a gas storage tank water heater that could be replaced by an air source heat pump water heater. Large commercial buildings with gas boilers could also replace those with solar hot water, heat pumps, or and electric resistance heating.
- NG-COMM-2: Electrify commercial space heating. This strategy focuses on the estimated GHG emissions savings potential of electrifying commercial space heating. The S/CAP project assumes that small commercial buildings had gas-pack furnaces that would be replaced by a packaged heat pump heater. This also assumes that large commercial buildings have gas boilers that would be replaced with heat recovery chillers.
- NG-COOK-1: Electrify commercial cooking. Commercial cooking equipment is notoriously inefficient, with additional challenges associated with "user experience" and impacts on final product that need to be considered in retrofitting with electric equipment. For the purposes of the S/CAP analysis, this strategy focuses on opportunities to replace gas cooking equipment with electric cooking equipment in restaurants currently using gas cooking equipment. Cooking equipment considered includes combination ovens, convection ovens, fryers, griddles, steamers, and induction ranges.
- NG-GAS-1: Eliminate natural gas use through zero net energy new construction. Natural gas usage in new construction and major remodels would be reduced over the life of the plan. This strategy focuses on restrictions on natural gas usage in the new construction sector being tied to California's zero net energy goals. Specifically, this analysis assumes that certain percentages of new commercial construction and new residential construction are built to a net zero standard - relying on rooftop PV to provide 100 percent of energy needs and electrification—relying on air source heat pumps and heat pump hot water heater to provide all space and water heating needs.

Despite the aggressive actions identified in the draft S/CAP, additional state and federal actions are necessary to ensure that State and federally regulated sources (i.e., sources outside the City's jurisdictional control) take similar aggressive measures to ensure the deep cuts needed to achieve the 2050 target. Emissions from 2020 to 2050 will have to decline several times faster than the rate needed to reach the 2020 emissions limit.[90] According to the California Council on Science and Technology's (CCST) 2011 report, this includes switching from gasoline-powered cars and trucks to plug-in hybrids, all electric vehicles, or alternative fuels (hydrogen-fuel and/or biofuels); switching from fossil fuel to electricity to heat building space; de-carbonizing electricity[91] while maintaining a reliable electricity grid; and aggressive efficiency measures.[92] According to the CCST, emissions reductions of 80 percent can be achieved with feasible technology implementation plus research, development, and innovation. Approximately 60 percent of emissions reductions below 1990 levels can be achieved with current technology is use or in demonstration phase.

The remainder of the emission cuts to obtain the full 80 percent reduction below 1990 levels will require development and deployment of new or currently un-deployed technology. Achieving this second cut will thus require a substantial commitment to technology development and innovation. Several subsequent studies have also highlighted the variables that drive future scenario studies and challenges to meeting the 2050 target.[93,94,95] Because no single technological approach will allow the State to accomplish its 2050 goal, obtaining an 80 percent reduction below 1990 levels will require a portfolio of solutions.[96]

While the proposed Plan and concurrent preparation of the S/CAP support substantial progress toward these long term-goals, and the City is on track to meet State goals for reducing GHG emissions to 40 percent below 1990 levels by 2030, it cannot yet be demonstrated that Palo Alto will achieve GHG emissions reductions that are consistent with an 80 percent reduction below 1990 levels by the year 2050 based on existing technologies and currently adopted policies and programs.

[90] California Air Resources Board (CARB), 2014. *First Update to the Climate Change Scoping Plan: Building on the Framework, Pursuant to AB 32, The California Global Warming Solutions Act of 2006,* May 15.

[91] In general, there are three ways to de-carbonize electricity: nuclear power, fossil fuel with carbon storage, and renewable energy.

[92] California Council on Science and Technology, 2011, California's Energy Future – The View to 2050. http://www.ccst.us/publications/2011/2011energy.pdf, May.

[93] Greenblatt J.B. and Long J., 2012. California's Energy Future – Portraits of Energy Systems for Meeting Greenhouse Gas Reduction Requirements, California Council on Science and Technology, September, http://ccst.us/publications/2012/2012ghg.pdf.

[94] Morrison, Geoff M., Sonia Yeh, Anthony R. Eggert, Christopher Yang, James H. Nelson, 3 Alphabetic: Jeffery B. Greenblatt, Raphael Isaac, Mark Z. Jacobson, Josiah Johnston, Daniel M. Kammen, Ana Mileva, Jack Moore, David Roland-Holst, Max Wei, John P. Weyant, James H. Williams, Ray Williams, Christina B. Zapata. Long-term Energy Planning In California: Insights and Future Modeling Needs. UC-Davis Institute of Transportation Studies. Research Report – UCD-ITS-RR-14-08, http://www.its.ucdavis.edu/research/publications/publication-detail/?pub_id=2217.

[95] Energy+Environmental Economics (E3), 2015, Summary of the California State Agency's PATHWAYS Project: Long-term Greenhouse Gas Reduction Scenarios, http://www.energy.ca.gov/commission/fact_sheets/documents/E3_Project_Overview_20150130.pdf, January 26.

[96] California Council on Science and Technology, 2011, California's Energy Future – The View to 2050, http://www.ccst.us/publications/2011/2011energy.pdf, May.

MTC's Plan Bay Area

Plan Bay Area is the Bay Area's SCS, adopted to reduce GHG emissions from land use and transportation, as required by SB 375. As explained in Section 4.6.1.1, above, the Plan Bay Area land use concept plan for the region concentrates the majority of new population and employment growth in the region in locally-designated PDAs. PDAs are transit-oriented, infill development opportunity areas within existing communities. In Palo Alto, Plan Bay Area includes the Palo Alto California Avenue Transit Neighborhood PDA, which is envisioned as a vibrant, pedestrian-oriented neighborhood with a diversity of uses that supports the economic vitality of California Avenue and nearby businesses while encouraging the use of public transportation and other non-vehicular transportation modes. All proposed Plan scenarios would encourage development consistent with the goals and objectives for this PDA because all would maintain the existing Pedestrian and Transit Oriented Development (PTOD) zoning.

The proposed Plan also includes policies and strategies that, once adopted, would reduce GHG emissions from transportation sources to the maximum extent practicable. The proposed Plan includes the following Sustainability Initiatives that would reduce GHG emissions from transportation sources:

- Paid transit passes for employees in workplaces with over 50 employees (All scenarios).
- Employer incentives for carpooling and bicycling (Scenarios 2 through 4).
- Unbundled parking costs for multi-family units (Scenarios 3 and 4).
- Parking charges for workplaces with over 50 employees (Scenario 4).
- Paid parking in Downtown and California Avenue areas (Scenario 4).
- Free transit passes for all Palo Alto residents in transit-accessible areas (Scenario 4).

These strategies, which encourage use of alternative modes of transportation, would strengthen support for future development within Palo Altos' PDA, consistent with the objectives of *Plan Bay Area*. Therefore, all scenarios would be consistent with the land use concept plan for Palo Alto that is identified in *Plan Bay Area*.

Conclusion

The City of Palo Alto is projected to achieve the interim GHG emissions reduction target of a 40 percent below 1990 levels by 2030 and will achieve substantial progress toward the long-term GHG reductions goals for 2050. However, CARB has not yet drafted a plan to achieve the statewide GHG emissions goals established in Executive Order S-03-05. In addition to the local measures included in the proposed Plan, CPP, and Draft S/CAP, additional state and federal measures beyond Palo Alto's control are necessary to achieve the more aggressive targets established for 2050 in Executive Order S-03-05. Therefore, GHG impacts for consistency with the more aggressive targets of Executive Order S-30-15 are conservatively considered to be *significant*, requiring mitigation.

Applicable Regulations:

- California Global Warming Solutions Act (AB 32)
- Sustainable Communities and Climate Protection Act (SB 375)

- Greenhouse Gas Emission Reduction Targets (Executive Order S-3-05)
- Clean Car Standards – Pavley (AB 1493)
- Renewable Portfolio Standards (SB 1078)
- Clean Energy and Pollution Reduction Act of 2015 (SB350)
- California Integrated Waste Management Act of 1989 (AB 939)
- California Mandatory Commercial Recycling Law (AB 341)
- California Advanced Clean Cars CARB/ Low-Emission Vehicle Program – LEV III (Title 13 CCR)
- Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction Measure (Title 17 CCR)
- Low Carbon Fuel Standard (Title 17 CCR)
- California Water Conservation in Landscaping Act of 2006 (AB 1881)
- California Water Conservation Act of 2009 (SBX7-7)
- Statewide Retail Provider Emissions Performance Standards (SB 1368)
- Airborne Toxics Control Measure to Limit School Bus Idling and Idling at Schools (13 CCR 2480)
- Airborne Toxic Control Measure to Limit Diesel-Fuel Commercial Vehicle Idling (13 CCR 2485)
- In-Use Off-Road Diesel Idling Restriction (13 CCR 2449)
- Building Energy Efficiency Standards (Title 24, Part 6)
- California Green Building Code (Title 24, Part 11)
- Appliance Energy Efficiency Standards (Title 20)

Significance before Mitigation: Based on current technologies and adopted policies, it is unclear whether the City of Palo Alto will be able to achieve the State's long-term goal of reducing GHG emissions 80 percent below 1990 levels by 2050. As a result, this impact is considered significant, requiring mitigation.

Mitigation Measure

Mitigation Measure GHG-2: To ensure that Palo Alto's GHG emissions are reduced consistent with the State's long-term goals, the proposed Plan should contain the following policy and program, or equally effective language, articulating these goals and ensuring steady progress towards their achievement:

- Policy: Strive to achieve and exceed target reductions in greenhouse gas emission levels set forth by Executive Order S-03-05.
- Program: Adopt an updated GHG emission reduction plan as part of the S/CAP aimed at achieving or exceeding the State's goals, and monitor the City's progress on an annual basis.

GHG reduction policies included in the S/CAP, which is being prepared in conjunction with proposed Plan, would ensure substantial progress toward the long-term GHG reduction goals of Executive Order S-03-05. However, at this time, additional State and federal actions, as well as advances in technology, are necessary to achieve the deep cuts required to meet the 2050 emissions target. These actions are

beyond the jurisdiction of the City of Palo Alto and therefore it is unclear whether the City alone can mitigate this impact to a less-than-significant level.

Significance after Mitigation: Significant and Unavoidable.

GHG-3	**The proposed Plan would expose people or structures to the physical effects of climate change, including but not limited to flooding, extreme temperatures, public health, wildfire risk, or other impacts resulting from climate change, requiring mitigation. (Significant and Unavoidable – All Four Scenarios)**

Summary: Development under all four scenarios could expose people and structures to the physical effects of climate change, including, but not limited to flooding associated with sea level rise; inundation due to levee failure; extreme weather events such as intensified droughts, heat waves, and storms; wildfires; and landslides. While the THIRA, Santa Clara County LHMP, and the City of Palo Alto LHMP represent substantial progress toward mitigating the physical effects of climate change, all four scenarios would allow development and redevelopment throughout the Plan Area that could expose people and structures to the effects of climate change. Therefore, all four scenarios would have a significant impact, requiring mitigation.

Pursuant to the December 2015 ruling in the *California Building Industry Association (CBIA) v BAAQMD*, impacts of the environment on the project are not considered impacts under CEQA. However, this analysis has been incorporated into the environmental assessment in order for the City to consider potential health and welfare implications from siting future development in areas that could be affected by climate change in the future.

The proposed Plan would have a significant impact if it would allow future development that would expose people or structures to the physical effects of climate change, such as flooding associated with sea level rise, inundation due to levee failure, extreme weather events (such as intensified droughts, heat waves, and storms), increased wildfire threats, and landslides.

As described in Section 4.6.1.2, Potential Climate Change Impacts for California and Palo Alto, climate change is expected to cause global sea levels to rise three to six feet by the year 2100, with sea level rise of up to 69 inches along the San Francisco Bay.[97,98] Data on sea level rise is evolving and BCDC uses the 55-inch sea level rise scenario in the Bay Plan when assessing long-term impacts. Rising sea levels pose a significant threat to Palo Alto due the increased risk of inundation of critical structures located in a floodplain and along the shoreline. As shown on Figure 4.8-4, virtually all of Palo Alto east of Middlefield Road and south of Embarcadero Road is vulnerable to sea level rise under a 55-inch scenario, suggesting the

[97] The Intergovernmental Panel of Climate Change, Fourth Assessment Report: Climate Change 2007: The AR4 Synthesis Report, Geneva: IPCC.

[98] San Francisco Bay Conservation and Development Commission, *Resolution No. 11-08: Adoption of Bay Plan Amendment Adding New Climate* Change *Findings and Policies to the Bay Plan.*

need for major investments in levees or other strategies over the next several generations, as well as increased development restrictions and relocation of critical infrastructure. All four scenarios would allow for job growth in existing employment districts located along East Bayshore and East Meadow Circle. The proposed development under these scenarios could significantly increase the amount of people that are present at these locations at any given time, thus exposing them to potential flooding hazards. Scenarios 1 and 2 would perpetuate housing sites on San Antonio east of Middlefield. The new housing units on these sites would increase the amount of individuals residing in an area that is vulnerable to sea level rise, thus exposing them to potential flooding hazards. All four scenarios would allow redevelopment throughout the city, including in areas subject to inundation associated with sea level rise, which would expose new structures, residents, and workers to potential flooding hazards that could be exacerbated by climate change.

Climate change is also likely to contribute to diminished air quality, thereby negatively impacting public health in Palo Alto. As described in Section 4.6.1.2, climate change is expected to exacerbate air pollution by increasing the frequency, duration, and intensity of conditions that lead to air pollution formation. As described in Chapter 4.2, Air Quality, all four scenarios would allow development and redevelopment throughout the city, which could site sensitive receptors in areas that exceed ozone or particulate matter air quality standards. Therefore, all four scenarios would expose new structures, residents, and workers to potential public health risks associated with air pollution that could be exacerbated by climate change.

As described in Section 4.6.1.2, climate change is expected to significantly alter rainfall distribution and intensity, resulting in fewer but more intense rainfall events followed by prolonged dry periods. This could result in flooding and inundation events during the brief rainy season and intensified drought conditions between precipitation events. Drier environmental conditions can further contribute to soil moisture depletion, vegetative loss, increased wildfire risk in urban/wildland interface areas, evaporation of potable water, and accelerated soil erosion of undeveloped open space in Palo Alto. Conversely, extreme storms could lead to dam or levee failure, flooding events, landslides, storm-related injuries and property damage, and heat-related illnesses. Wildfire risks will be addressed in the proposed Plan under all four scenarios in compliance with Government Code Section 65302.5(b). All four scenarios would allow development and redevelopment throughout the city, including in areas near undeveloped open space and in the 100-year flood plain, which would expose new structures, residents, and workers to potential storm and drought hazards that would be exacerbated by climate change.

Despite existing plans and studies that have examined potential climate change impacts for Palo Alto and the surrounding region and plan for ways to address related hazards, all four scenarios would allow development and redevelopment throughout the EIR Study Area that could expose people and structures to the effects of climate change described above. Therefore, all four scenarios would have a *significant* impact.

Applicable Regulations:

- Association of Bay Area Governments' Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area

- Santa Clara County Local Hazard Mitigation Plan
- City of Palo Alto Local Hazard Mitigation Plan

Significance before Mitigation: Development assumed during the life of the proposed Plan would add to the population (residents and employees and others) that could be exposed to the effects of climate change. For this reason, Impact GHG-3 is considered significant, requiring mitigation.

Mitigation Measure

Mitigation Measure GHG-3: To address the potential impacts associated with exposing additional people to the effects of climate change, the proposed Plan should include the following policies and programs, or equally effective language, to ensure that future development would address potential risks and that the City would work with other agencies to coordinate strategies for minimizing risk, ensuring appropriate response/recovery, and planning for resiliency:

- Policy: Monitor and respond to the risk of flooding caused by climate change that may result in changes to precipitation patterns, sea level rise, and storm surges.
- Policy: Promote and participate in cooperative planning with other public agencies and regional and adjacent jurisdictions, especially regarding issues related to climate change, such as water supply, sea level rise, fire protection services, emergency medical services, and emergency response planning.
- Program: Develop and implement "green infrastructure" practices to mitigate flooding through improved permeability or paved areas, and storm water capture and storage.
- Program: Regularly coordinate with regional, State, and federal agencies on rising sea levels in the San Francisco Bay and major tributaries to determine if additional adaptation strategies should be adopted to address flooding hazards from increased sea levels for existing or new development and infrastructure. This includes monitoring Federal Emergency Management Agency flood map updates to identify areas in the city susceptible to sea level rise, addressing changes to State and regional sea and bay level rise estimates, and coordinating with adjacent municipalities on flood control improvements as appropriate.
- Program: Prepare response strategies that address sea level rise and increased flooding, and other events related to climate change, such as increased flooding, landslides, soil erosion, wildfires, and storm events. Include response strategies to address sea level rise on Palo Alto's levee system.
- Program: Develop new development requirements for shoreline development to ensure that new development is designed and located to provide protection from potential impacts of flooding resulting from sea level rise and significant flood events. Requirements may include: new setbacks to ensure to structures are set back far enough inland that they will not be endangered by erosion; limits on subdivisions and lot line adjustments in areas vulnerable to sea level rise to avoid the creation of new shoreline lots; incentive or transfer of development rights (TDR) programs to

relocate existing development away from high risk areas; and/or triggers for relocation or removal of existing structures based on changing site conditions and other factors.

Significance after Mitigation: Significant and Unavoidable. Compliance with the proposed Plan policies and programs listed above, or equally effective programs and policies, would reduce the impact to the extent feasible. However, City actions alone cannot halt the onset of climate change and its effects, or ensure that future development would not expose people and structures to the effects of climate change in Palo Alto. Therefore, the impact is significant and unavoidable.

4.6.4 CUMULATIVE IMPACTS

The proposed Plan would have a significant cumulative impact if, along with other projects in the Bay Area region, it would allow future development that would expose people or structures to the physical effects of climate change, such as flooding associated with sea level rise, inundation due to dam or levee failure, extreme weather events (such as intensified droughts, heat waves, and storms), increased wildfire threats, and landslides.

Impact GHG-3 describes the ways in which future development and redevelopment allowed by the proposed Plan would expose people and structures to increased hazards associated with climate change. Cumulative development in Santa Clara County and the Bay Area region would also expose people and structures to these same effects.

Although existing plans and studies, such as ABAG's *Multi-Jurisdictional Local Hazard Mitigation Plan for the San Francisco Bay Area*, address climate change and plan for its potential effects, future development and redevelopment throughout the region would expose people and structures to the effects of climate change described above. Therefore the proposed Plan would result in a *significant* cumulative impact.

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