

4.6 GREENHOUSE GAS EMISSIONS

4.6.1 Introduction

This section discusses existing global, national, and statewide GHG and climate change conditions, and it evaluates the potential global climate impacts from development under the proposed 2014 LRDP. The section identifies the applicable federal, state, regional, and local agencies that regulate, monitor, and control GHG emissions. The proposed project GHG emissions calculations, estimates, and supporting technical data are in Appendix B.

Public and agency NOP comments related to greenhouse gas emissions are summarized below:

- The RBC development should reduce its vehicle miles traveled per capita as much as possible. Bicycling should be emphasized as an important transit option. A plan and strategies to reduce greenhouse gas emissions from transportation to and from the new campus should be prepared.
- The host city’s climate action plan (CAP) should be analyzed and respected in the RBC design.
- The RBC development should minimize total vehicle miles traveled (VMT) generated by inter-campus travel, especially by private automobile.
- The RBC development should minimize total VMT generated by workers commuting by private vehicles, especially from solo driving along freeway corridors.
- The RBC development should provide significant access to both regional and local transit and contribute to general improvements in local and regional transit infrastructure to offset any increase in project-related VMT.
- The RBC development should recommend affirmative ideas and effective programs to encourage dense worker housing near new RBC jobs; the proposed project should also ensure that the host city or cities have an adequately supportive certified Housing Element in their general plans.
- The RBC development should support meaningful “traffic demand management” programs such as car share and vanpooling.
- The RBC development should reduce the predominance of free employee parking by under-sizing parking facilities compared with traditional office-park standards.
- The RBC development should avoid the collateral construction of “attractor” shopping malls or similar developments that encourage more regional VMT.
- The University should comply with the CAPs that all of the potential host cities have separately been implementing. The proposed project should also incorporate the California state goals and policies intended to reduce greenhouse gases and encourage “complete communities,” consistent with Senate Bill (SB) 275 and Assembly Bill (AB) 32.
- The RBC development should mesh its bicycle/pedestrian network seamlessly with the Bay Trail and other surrounding access points.
- The RBC development should provide secure, indoor bicycle storage for employees who commute by bicycle and bike-sharing facilities at convenient locations so that visitors and employees may borrow RBC bicycles for running errands, visiting nearby retail stores and restaurants, or recreating during work breaks.

4.6.2 Environmental Setting

Background

Global climate change refers to any significant change in climate measurements, such as temperature, precipitation, or wind, lasting for an extended period (i.e., decades or longer) (EPA 2008a). Climate change may result from:

- Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- Natural processes in the climate system (e.g., changes in ocean circulation, reduction in sunlight from the addition of atmospheric gases and particles from volcanic eruptions, forest fires, etc.); and
- Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, and desertification).

The primary effect of global climate change has been a rise in the average global tropospheric²⁶ temperature of 0.2 degree Celsius (°C) per decade, determined from meteorological measurements worldwide between 1990 and 2005. Climate change modeling using 2000 emission rates shows that further warming is likely to occur, which would induce further changes in the global climate system during the current century (IPCC 2007). Changes to the global climate system and ecosystems, and specifically the changes in California, could include:

- Declining sea ice and mountain snowpack levels, thereby increasing sea levels and sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures (IPCC 2007);
- Rising average global sea levels primarily due to thermal expansion and the melting of glaciers, ice caps, and the Greenland and Antarctic ice sheets (model-based projections of global average sea level rise at the end of the 21st century (2090–2099) range from 0.18 meter to 0.59 meter or 0.59 foot to 1.94 feet) (IPCC 2007);
- Changing weather patterns, including changes to precipitation, ocean salinity, and wind patterns, and more energetic aspects of extreme weather including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones (IPCC 2007);
- Declining Sierra snowpack levels, which account for approximately half of the surface water storage in California, by 70 percent to as much as 90 percent over the next 100 years (Cal/EPA 2006);
- Increasing the number of days conducive to tropospheric ozone formation by 25 to 85 percent (depending on the future temperature scenario) in high ozone areas in southern California and the San Joaquin Valley by the end of the 21st century (Cal/EPA 2006);
- Increasing the potential for California's coastline erosion and sea water intrusion into the Sacramento and San Joaquin Delta and associated levee systems from the rise in sea level (Cal/EPA 2006);

²⁶The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth's surface from 6 to 7 miles).

- Increasing pest infestation, making California more susceptible to forest fires (Cal/EPA 2006);
- Increasing electricity demand by 1 to 3 percent by 2020 due to rising temperatures; this would result in hundreds of millions of dollars in extra expenditures (Cal/EPA 2006); and
- Summer warming projections in the first 30 years of the 21st century ranging from about 0.5 to 2 °C (0.9 to 3.6 °F) and by the last 30 years of the 21st century, from about 1.5 to 5.8 °C (2.7 to 10.5 °F) (Cal/EPA 2006).

The natural process through which heat is retained in the troposphere is called the “greenhouse effect.” The greenhouse effect traps heat in the troposphere through a threefold process: (1) short-wave radiation in the form of visible light emitted by the sun is absorbed by the earth as heat; (2) long-wave radiation is re-emitted by the earth; and (3) greenhouse gases in the upper atmosphere absorb or trap the long-wave radiation and re-emit it back toward the earth and into space. This third process is the focus of current climate change actions.

Gases that absorb or trap long-wave radiation are called “greenhouse gases” because of their role in producing the greenhouse effect. While water vapor and carbon dioxide (CO₂) are the most abundant GHGs, other trace GHGs have a greater ability to absorb and re-radiate long-wave radiation. To gauge the potency of GHGs in intercepting long-wave radiation, scientists have established a Global Warming Potential (GWP) for each GHG based on its ability to absorb and re-emit long-wave radiation over a specific time period. The GWP of a gas is determined using carbon dioxide as the reference gas, with a GWP of 1 over 100 years (IPCC 1996).²⁷ For example, a gas with a GWP of 10 is 10 times more potent than carbon dioxide over 100 years. The use of GWP allows GHG emissions to be reported using carbon dioxide as a baseline. The sum of each GHG multiplied by its associated GWP is referred to as “carbon dioxide equivalent” (CO₂e). This essentially means that 1 metric ton of a GHG with a GWP of 10 has the same climate change impacts as 10 metric tons of carbon dioxide.

Greenhouse Gases

State law defines GHGs to include:

- Carbon Dioxide (CO₂). Anthropogenic, or human-caused carbon dioxide primarily is generated by fossil fuel combustion from stationary and mobile sources. Due to the emergence of industrial facilities and mobile sources over the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent (US EPA 2008b). Carbon dioxide is the most widely emitted GHG and is the reference gas (GWP of 1) for determining the GWP of other GHGs. In 2004, 82.8 percent of California’s GHG emissions were carbon dioxide (CEC 2007).
- Methane (CH₄). Methane is emitted from biogenic sources (i.e., resulting from the activity of living organisms), incomplete combustion in forest fires, landfills, manure management, and leaks in natural gas pipelines. In the United States, the top three sources of methane are landfills, natural gas systems, and enteric fermentation (EPA n.d.[a]). Methane is the primary component of natural gas used for space and water heating, steam production, and power generation. The GWP of methane is 21.
- Nitrous Oxide (N₂O). Nitrous oxide is produced by natural and human-related sources. Primary human-related sources include agricultural soil management, animal manure

²⁷ All Global Warming Potentials are given as 100-year values.

management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of nitrous oxide is 310.

- Hydrofluorocarbons (HFCs). HFCs typically are used as refrigerants in both stationary refrigeration and mobile air conditioning. HFC use for cooling and foam blowing is growing, particularly as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) use is phasing out. The GWP of HFCs ranges from 140 for HFC-152a to 6,300 for HFC-236fa.
- Perfluorocarbons (PFCs). Perfluorocarbons are compounds consisting of carbon and fluorine. They are primarily an aluminum production and semiconductor manufacturing byproduct. PFCs are potent GHGs with a GWP several thousand times that of carbon dioxide, depending on the specific PFC. Another area of concern regarding PFCs is their long atmospheric lifetime (up to 50,000 years) (Energy Information Administration 2007). The GWPs of PFCs range from 5,700 to 11,900.
- Sulfur Hexafluoride (SF₆). Sulfur hexafluoride is a colorless, odorless, nontoxic, nonflammable gas. It is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity. Sulfur hexafluoride is the most potent GHG that has been evaluated by the United Nations Intergovernmental Panel on Climate Change (IPCC) with a GWP of 23,900. However, its global warming contribution is not as high as the GWP would indicate due to its low mixing ratio, as compared to carbon dioxide (4 parts per trillion in 1990 versus 365 ppm of CO₂) (EPA n.d.[b]).

Contributions to Greenhouse Gas Emissions

Global

Worldwide anthropogenic (man-made) GHG emissions are tracked for industrialized nations (referred to as Annex I) and developing nations (referred to as Non-Annex I). Man-made GHG emissions for Annex I nations are available through 2007. Man-made GHG emissions for Non-Annex I nations are available through 2005. The sum of these emissions totaled approximately 42,133 million metric tons of CO₂e (MMTCO₂e).²⁸ Global emissions inventory data are not all from the same year and may vary depending on the source of the emissions inventory data.²⁹ The top five countries and the European Union accounted for approximately 55 percent of the total global GHG emissions according to the most recently available data.

United States

The United States was the number two producer of global GHG emissions as of 2007, the most current year of IPCC Assessment reporting. The primary GHG emitted by human activities in the United States was CO₂, representing approximately 84 percent of total GHG emissions (EPA 2008a). Carbon dioxide from fossil fuel combustion, the largest source of GHG emissions, accounted for approximately 80 percent of US GHG emissions (EPA 2008a).

²⁸ The CO₂ equivalent emissions commonly are expressed as “million metric tons of carbon dioxide equivalent (MMTCO₂e).” The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP, such that MMTCO₂e = [million metric tons of a GHG] x [GWP of the GHG]. For example, the GWP for methane is 21. This means that the emission of one million metric tons of methane is equivalent to the emission of 21 million metric tons of CO₂.

²⁹ The global emissions are the sum of Annex I and non-Annex I countries, without counting land use, land-use change and forestry (LULUCF). For countries without 2005 data, the UNFCCC data for the most recent year were used. United Nations Framework Convention on Climate Change, “Annex I Parties – GHG total without LULUCF,” http://unfccc.int/ghg_emissions_data/ghg_data_from_unfccc/time_series_annex_i/items/3841.php and “Flexible GHG Data Queries” with selections for total GHG emissions excluding LULUCF/LUCF, all years, and non-Annex I countries, <http://unfccc.int/di/FlexibleQueries/Event.do?event=showProjection>. n.d.

State of California

ARB compiles GHG inventories for the State of California. Based on the 2008 GHG inventory data (i.e., the latest year for which data are available), California emitted 474 MMTCO_{2e} including emissions from imported electrical power in 2008 (ARB 2010). Based on the ARB inventory data and GHG inventories compiled by the World Resources Institute, California's total statewide GHG emissions rank second in the United States (Texas is number one) with emissions of 417 MMTCO_{2e} excluding emissions related to imported power (ARB 2010). The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and other sources, including commercial and residential activities.

Between 1990 and 2008, the population of California grew by approximately 7.3 million (from 29.8 to 37.9 million) (US Census 2009). This represents an increase of approximately 27.2 percent from 1990 population levels. In addition, the California economy, measured as gross state product, grew from \$788 billion in 1990 to \$1.8 trillion in 2008 representing an increase of approximately 128 percent (more than twice the 1990 gross state product) (California Department of Finance 2009). Despite the population and economic growth, California's net GHG emissions grew only by approximately 11 percent. The California Energy Commission (CEC) attributes the slow rate of growth to the success of California's renewable energy programs and its commitment to clean air and clean energy (CEC 2006a).

4.6.3 Regulatory Considerations

Federal

In *Massachusetts vs. EPA*, the Supreme Court held that the EPA has the statutory authority under Section 202 of the CAA to regulate GHGs from new motor vehicles. The court did not hold that the EPA was required to regulate GHG emissions; however, it indicated that the agency must decide whether GHGs from motor vehicles cause or contribute to air pollution that is reasonably anticipated to endanger public health or welfare. Upon the final decision, the President signed Executive Order 13432 on May 14, 2007, directing the EPA, along with the Departments of Transportation, Energy, and Agriculture, to initiate a regulatory process that responds to the Supreme Court's decision.

In December 2007, the President signed the Energy Independence and Security Act of 2007, which sets a mandatory Renewable Fuel Standard requiring fuel producers to use at least 36 billion gallons of biofuel in 2022. The Act also sets a national fuel economy standard of 35 miles per gallon by 2020. The Act contains provisions for energy efficiency in lighting and appliances and for green building technology implementation in federal buildings. On July 11, 2008, the EPA issued an Advanced Notice of Proposed Rulemaking on regulating GHGs under the CAA. The Advanced Notice of Proposed Rulemaking reviews the various CAA provisions that may be applicable to the regulation of GHGs and presents potential regulatory approaches and technologies for reducing GHG emissions. On April 10, 2009, the EPA published the Proposed Mandatory Greenhouse Gas Reporting Rule in the *Federal Register* (EPA 2009). The rule was adopted on September 22, 2009 and covers the approximately 10,000 facilities nationwide that account for 85 percent of US GHG emissions.

On September 15, 2009, the EPA and the Department of Transportation's (DOT) National Highway Traffic Safety Administration jointly established a national program that set new standards to reduce GHG emissions and improve fuel economy; these standards apply to model year 2012 through 2016 light-duty vehicles. The proposed standards would be phased in and would require passenger cars and light-duty trucks to comply with a declining emissions standard. In 2012, passenger cars and light-duty trucks had to meet an average standard of 295 grams of

CO₂ per mile and 30.1 miles per gallon. By 2016, the vehicles would have to meet an average standard of 250 grams of CO₂ per mile and 35.5 miles per gallon.³⁰ These standards were formally adopted by the EPA and DOT on April 1, 2010.

On October 5, 2009, the President signed Executive Order 13514 that provides a strategy for sustainability and greenhouse gas reductions for federal agencies. The Executive Order has a number of requirements for agencies to achieve, including:

- Setting a GHG emissions reduction target to be achieved by 2020,
- 50 percent recycling and waste diversion by 2015,
- Drafting a sustainability plan,
- Reporting GHG emissions, and
- 30 percent reduction in petroleum consumption in agency fleets by 2020.

On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHGs under section 202(a) of the CAA:

- **Endangerment Finding:** The Administrator finds that the current and projected concentrations of the six key well-mixed GHGs (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The Administrator finds that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

While these findings do not impose additional requirements on industry or other entities, this action was a prerequisite to finalizing the EPA and DOT jointly proposed GHG emissions standards for light-duty vehicles. On April 1, 2010, the EPA and National Highway Traffic Safety Administration issued final rules requiring that by the 2016 model-year, manufacturers must achieve a combined average vehicle emission level of 250 grams of CO₂ per mile, which is equivalent to 35.5 miles per gallon as measured by EPA standards. These agencies are currently in the process of developing similar regulations for the 2017-2025 model years.

State

Title 24 Building Standards Code

The California Energy Commission first adopted Energy Efficiency Standards for Residential and Nonresidential Buildings (California Code of Regulations, Title 24, Part 6) in 1978 in response to a legislative mandate to reduce statewide energy consumption. Although not originally intended to reduce GHG emissions, increased energy efficiency and reduced electricity, natural gas, and other fuels consumption would result in fewer GHG emissions from buildings subject to the standards. The standards are updated periodically to allow for the consideration and inclusion of new energy efficiency technologies and methods. The latest revisions were adopted in 2008 and became effective on January 1, 2010.

³⁰The CO₂ emission standards and fuel economy standards stated are based on EPA formulas.

Part 11 of the Title 24 Building Standards Code is referred to as the California Green Building Standards Code (CALGreen Code). The purpose of the CALGreen Code is to “improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of building concepts having a positive environmental impact and encouraging sustainable construction practices in these categories: (1) planning and design, (2) energy efficiency, (3) water efficiency and conservation, (4) material conservation and resource efficiency, and (5) environmental air quality (California Building Standards Commission 2009). The CALGreen Code is not intended to substitute for or be identified as meeting the certification requirements of any green building program that is not established and adopted by the California Building Standards Commission (CBSC). The CBSC released a *2010 Draft California Green Building Standards Code* on its website (California Building Standards Commission 2010). The update to Part 11 of the Title 24 Building Standards Code became effective on January 1, 2011. Unless otherwise noted in the regulation, all newly constructed buildings in California are subject to the requirements of the CALGreen Code.

Assembly Bill 1493

In response to the transportation sector’s contribution of more than half of California’s CO₂ emissions, AB 1493 was enacted on July 22, 2002. AB 1493 requires ARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles whose primary use is noncommercial personal transportation. ARB adopted the standards in September 2004. The new standards will be phased in during the 2009–2016 model years. When fully phased in, the near term (2009–2012) standards will result in a reduction of about 22 percent in GHG emissions compared to the emissions from the 2002 fleet, while the midterm (2013–2016) standards will result in a reduction of about 30 percent.

Before these regulations may go into effect, the EPA must grant California a waiver under the federal CAA that ordinarily preempts state regulation of motor vehicle emission standards. On June 30, 2009, the EPA formally approved California’s waiver request. In light of the September 15, 2009 announcement by the EPA and National Highway Traffic Safety Administration regarding the national program to reduce vehicle GHG emissions, California—and states adopting California emissions standards—have agreed to defer to the proposed national standard through model year 2016 if granted a waiver by the EPA. The 2016 endpoint of the two standards is similar, although the national standard ramps up slightly more slowly than required under the California standards. The Pavley standards require additional reductions in CO₂ emissions beyond 2016 (referred to as Phase II standards). While the Phase II standards have yet to be fully developed, ARB has made it clear that the state intends to pursue additional reductions from motor vehicles in the 2017 through 2020 timeframe under the California Global Warming Solutions Act of 2006 or AB 32, discussed in detail below.

Executive Order S-3-05 and the Climate Action Team

In June 2005, Governor Schwarzenegger established California’s GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established these targets: GHG emissions should be reduced to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The Secretary of the California Environmental Protection Agency (Cal/EPA) is required to coordinate efforts of various agencies to collectively and efficiently reduce GHGs. Some of the agency representatives involved in the GHG reduction plan include the Secretary of the Business, Transportation and Housing Agency; the Secretary of the Department of Food and Agriculture; the Secretary of the Resources Agency; the Chairperson of ARB; the Chairperson of the CEC; and the President of the Public Utilities Commission.

Representatives from each of the aforementioned agencies comprise the Climate Action Team. The Cal/EPA secretary is required to submit a biannual progress report from the Climate Action

Team to the governor and state legislature disclosing the progress made toward GHG emission reduction targets. Another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, coastline, and forests, and reporting possible mitigation and adaptation plans to combat these impacts. Some strategies currently being implemented by state agencies include ARB's vehicle climate change standards and diesel anti-idling measures, the CEC's building and appliance efficiency standards, and Cal/EPA's green building initiative. The Climate Action Team also recommends future emission reduction strategies, such as using only low-GWP refrigerants in new vehicles, developing ethanol as an alternative fuel, reforestation, solar power initiatives for homes and businesses, and investor-owned utility energy efficiency programs. According to the report, implementation of current and future emission reduction strategies has the potential to achieve the goals in Executive Order S-3-05.

Assembly Bill 32

In furtherance of the goals established in Executive Order S-3-05, the legislature enacted AB 32, the California Global Warming Solutions Act of 2006 that Governor Schwarzenegger signed on September 27, 2006. AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries with penalties for noncompliance. AB 32 requires the state to undertake several actions; the major requirements are discussed below.

ARB Early Action Measures. ARB is responsible for carrying out and developing the programs and requirements necessary to achieve the goal of AB 32—the reduction of California's GHG emissions to 1990 levels by 2020. The first action under AB 32 resulted in ARB's adoption of a report listing three specific early-action greenhouse gas emission reduction measures on June 21, 2007. On October 25, 2007, ARB approved six additional early-action GHG reduction measures under AB 32. ARB has adopted regulations for all early action measures. The early-action measures are divided into three categories:

- Group 1 – GHG rules for immediate adoption and implementation
- Group 2 – Several additional GHG measures under development
- Group 3 – Air pollution controls with potential climate co-benefits

The original three adopted early-action regulations meeting the narrow legal definition of “discrete early-action GHG reduction measures” include:

- A low-carbon fuel standard to reduce the “carbon intensity” of California fuels;
- Reduction of refrigerant losses from motor vehicle air conditioning system maintenance to restrict the sale of “do-it-yourself” automotive refrigerants; and
- Increased methane capture from landfills to require broader use of state-of-the-art methane capture technologies.

The six additional early-action regulations adopted on October 25, 2007, also meeting the narrow legal definition of “discrete early-action GHG reduction measures,” are:

- Reduction of aerodynamic drag, and thereby fuel consumption, from existing trucks and trailers through retrofit technology;
- Reduction of auxiliary engine emissions of docked ships by requiring port electrification;
- Reduction of perfluorocarbons from the semiconductor industry;

- Reduction of propellants in consumer products (e.g., aerosols, tire inflators, and dust removal products);
- The requirement that all tune-up, smog check, and oil change mechanics ensure proper tire inflation as part of overall service to maintain fuel efficiency; and
- Restriction on the use of sulfur hexafluoride from non-electricity sectors if viable alternatives are available.

State of California Greenhouse Gas Inventory and 2020 Limit. As required under AB 32, on December 6, 2007, ARB approved the 1990 greenhouse gas emissions inventory, thereby establishing the emissions limit for 2020. The 2020 emissions limit was set at 427 MMTCO₂e. ARB also projected the state's 2020 GHG emissions under "business as usual" conditions—that is, emissions that would occur without any plans, policies, or regulations to reduce GHG emissions. ARB used an average of the state's GHG emissions from 2002 through 2004 and projected the 2020 levels based on population and economic forecasts. The projected net emissions totaled approximately 596 MMTCO₂e. Therefore, the state must reduce its 2020 "business as usual" emissions by approximately 29 percent to meet the 1990 target.

The inventory revealed that in 1990, transportation, with 35 percent of the state's total emissions, was the largest single sector, followed by industrial emissions, 24 percent; imported electricity, 14 percent; in-state electricity generation, 11 percent; residential uses, 7 percent; agriculture, 5 percent; and commercial uses, 3 percent. AB 32 does not require individual sectors to meet their individual 1990 GHG emissions levels; the total statewide emissions are required to meet the 1990 threshold by 2020.

AB 32 Climate Change Scoping Plan. AB 32 requires ARB to adopt a scoping plan indicating how reductions in significant GHG sources will be achieved through regulations, market mechanisms, and other actions. After receiving public input on their draft scoping plan, the ARB Governing Board approved the Climate Change Scoping Plan on December 11, 2008. Key elements of the Scoping Plan include these recommendations:

- Expanding and strengthening existing energy efficiency programs and building and appliance standards;
- Achieving a statewide renewable energy mix of 33 percent;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state's long-term commitment to AB 32 implementation.

Under the Scoping Plan, approximately 85 percent of the state's emissions are subject to a cap-and-trade program where covered sectors are placed under a declining emissions cap. The emissions cap incorporates a margin of safety whereas the 2020 emissions limit will still be achieved even if uncapped sectors do not fully meet their anticipated emission reductions.

Emissions reductions will be achieved through regulatory requirements and the option to reduce emissions further or purchase allowances to cover compliance obligations. It is expected that emission reduction from this cap-and-trade program will account for a large portion of the reductions required by AB 32.

Senate Bill 97 (CEQA Guidelines)

In August 2007, the legislature enacted SB 97 (Dutton) that directed the Governor's Office of Planning and Research (OPR) to develop guidelines under CEQA for the mitigation of greenhouse gas emissions. A number of actions have taken place under SB 97; they are discussed below.

OPR Climate Change Technical Advisory. On June 19, 2008, OPR issued a technical advisory as interim guidance regarding the analysis of GHG emissions in CEQA documents (OPR 2008). The advisory indicated that a project's GHG emissions, including those associated with vehicular traffic and construction activities, should be identified and estimated, and recommended that the lead agency determine significance of the impacts and impose all mitigation measures that are necessary to reduce GHG emissions to a less than significant level. The advisory did not recommend a specific significance threshold. Instead, OPR requested that ARB recommend a method for setting thresholds that lead agencies may adopt (OPR 2009).

CEQA Guideline Amendments. In its work to formulate CEQA Guideline Amendments for GHG emissions, OPR submitted the Proposed Draft CEQA Guideline Amendments for Greenhouse Gas Emissions to the Secretary for Natural Resources on April 13, 2009. The Natural Resources Agency conducted formal rulemaking procedures in 2009 and adopted the CEQA Guideline Amendments on December 30, 2009. They became effective in March 2010.

Local

Bay Area Air Quality Management District

On June 2, 2010, BAAQMD adopted updated CEQA Air Quality Guidelines. These guidelines contain GHG operational emissions significance thresholds and recommended methodologies and models for use in assessing the impacts of a project's GHG emissions on global climate change (BAAQMD 2010a). The updated CEQA Air Quality Guidelines recommend that significance thresholds for GHG emissions should be related to AB 32's GHG reduction goals or the state's strategy to achieve the 2020 GHG emissions limit, and also provide recommended mitigation measures for reducing GHG emissions from land use development projects and stationary sources.

The CBIA filed a lawsuit alleging that the District had violated CEQA by failing to review the potential environmental impacts of the revised thresholds before adopting them. On March 5, 2012, the Alameda County Superior Court issued a judgment finding that BAAQMD had failed to comply with CEQA when it adopted the June 2010 thresholds of significance. However on July 13, 2013, the court of appeal ruled that adoption of the thresholds was not subject to CEQA. Although this decision may be appealed by the CBIA, the University has determined that in this circumstance it will use the methodological approach and emissions thresholds in the BAAQMD guidelines to evaluate the impacts of the proposed project. The thresholds for the evaluation of GHG impacts from the BAAQMD CEQA Air Quality Guidelines are presented below in Section 4.6.4.

Local Plans and Policies

City of Richmond 2030 General Plan. The proposed RBC site is a University property that conducts work within the University’s mission on land that is owned or controlled by The Regents. As a state entity created by Article IX, Section 9 of the California State Constitution, the University is exempt under the state constitution from compliance with local land use regulations, including local plans and policies. However, the University seeks to cooperate with local jurisdictions. The RBC site is in the City of Richmond. The City of Richmond has adopted a resolution committing to the emissions targets in AB 32, and has adopted an Energy and Climate Change element as part of its General Plan 2030.

The City of Richmond 2030 General Plan includes an Energy and Climate Change Element (Element 8). The greenhouse gas policies relevant to the 2014 LRDP are:

Goal EC1 – Leadership in Managing Climate Change. Take steps to address climate change and to manage its effects. This entails not only pursuing ground-breaking programs and innovative strategies, but educating residents and businesses about these actions and actively monitoring results to ensure progress in critical areas. Partner with other jurisdictions and organizations to develop effective regional solutions and regulation at regional, state and federal levels. Collaborate with residents, businesses, public agencies and neighboring jurisdictions, in order to meet or exceed state requirements for reductions in greenhouse gas emissions.

Goal EC2 – Clean and Efficient Transportation Options. Expand the City’s green transportation network by encouraging the use of climate-friendly technology, planning growth around multiple modes of travel and reducing automobile reliance. In addition to promoting improved public transit, partner with private developers to undertake citywide improvements that make active modes of travel, such as walking and bicycling, more comfortable and preferable options.

Goal EC3 – Sustainable and Efficient Energy Systems. Reduce the City’s consumption of energy by encouraging energy conservation, and supporting the consumption of energy produced by climate-friendly technologies. Reduce the City’s overall waste stream by reducing the City’s consumption of goods and materials, and by adopting a zero-waste philosophy.

Goal EC4 – Sustainable Development. Reduce energy consumption by promoting sustainable land uses and development patterns. Pursue infill development opportunities and encourage the construction of higher-density, mixed-use projects around existing public transit infrastructure, schools, parks, neighborhood-serving retail and other critical services. Incorporate ecologically sustainable practices and materials into new development, building retrofits and streetscape improvements.

Goal EC5 – Community Revitalization and Economic Development. Transform Richmond into a healthy community where green industries and businesses can flourish. Support sustainable businesses and practices that provide both community and environmental benefits while stimulating job and revenue growth.

Goal EC6 – Climate-Resilient Communities. While the impacts of climate change on local communities are uncertain, to the extent possible, prepare to respond to and protect residents and businesses from increased risks of natural disasters such as flooding or drought.

The General Plan element also contains a range of policies and implementing actions that support each goal.

The 2030 General Plan EIR determined that the effects of GHG emissions from future development within the City pursuant to the General Plan would be significant and unavoidable. The EIR noted that the City was in the process of developing a Climate Action Plan which would provide reduction strategies for the City to attain, at a minimum, the AB 32 goal of emissions reduction by 20 percent below business as usual. The EIR also noted that the incorporation of the state measures, General Plan policies and actions, and mitigation measures would reduce the impacts from operational emissions, but even with the reduction, the emissions would exceed the BAAQMD threshold and the impact would be significant and unavoidable.

Richmond Bay Campus. The applicable local plan or policy would be a greenhouse gas reduction plan or a CAP adopted or proposed by the University for the RBC. While the University plans to adopt a CAP, it has not been developed for the RBC. BAAQMD's Clean Air Plan is a multi-pollutant plan that includes GHGs but specifically states that it is not to be considered a GHG reduction plan. Therefore, consistent with BAAQMD's CEQA guidance on GHG emissions, which is designed to meet AB 32 requirements in the region, AB 32 is the applicable plan. AB 32 establishes GHG reduction goals for the state through 2020. Because the time horizon for campus development under the proposed 2014 LRDP is 2050, in addition to AB 32, other state requirements also provide the planning framework. This is discussed further in the sections below.

4.6.4 Impacts and Mitigation Measures

Standards of Significance

The impacts related to 2014 LRDP implementation GHG emissions would be considered significant if they would exceed the following significance criteria, in accordance with Appendix G of the *2013 State CEQA Guidelines*:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

Section 15064.4 of the amended *2013 State CEQA Guidelines* states that, when making a GHG emissions significance determination, a lead agency shall have discretion to determine whether to: (1) Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use; or (2) Rely on a qualitative analysis or performance based standards.

Section 15064.4 also states that a lead agency should consider these factors when assessing the significance of GHG emissions on the environment: (1) the extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting; (2) whether the project emissions exceed a significance threshold that the lead agency determines applies to the project; and (3) the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

The first Appendix G criterion may be evaluated by directly calculating the proposed project GHG emissions and comparing the emissions with the available significance thresholds. BAAQMD has operational GHG emissions significance thresholds in its CEQA Air Quality Guidelines. There are no significance thresholds for construction emissions of GHGs, although BAAQMD recommends that emissions be quantified, reported, and evaluated. BAAQMD's significance thresholds for operational-related GHG emissions are:

- Compliance with a Qualified GHG Reduction Strategy,
- Annual emissions less than 1,100 MTCO₂e, or
- Annual emissions of 4.6 MTCO₂e/service person/year (where service persons are residents plus employees).

BAAQMD has a stationary sources emissions threshold of 10,000 MMTCO₂e per year. Stationary source emissions are to be assessed separately from area and mobile sources associated with a project's operation.

The BAAQMD emissions thresholds are specifically designed to bring the region into compliance with AB 32 requirements.

The 2014 LRDP has a projected full implementation date of 2050, which is beyond the final AB 32 target date. Therefore, the BAAQMD threshold of 4.6 MTCO₂e/service person could not be used to evaluate the emissions from full LRDP development. AB 32 mandates reduction of GHG emissions to 1990 levels by 2020, with no targets beyond that date. Executive Order S-3-05 includes the same 2020 target, and includes a 2050 target of an 80 percent reduction from 1990 levels. BAAQMD was consulted to develop a significance threshold with which the University could evaluate the GHG emissions effect of full RBC development. The BAAQMD recommended that the LRDP should show progress toward the Executive Order S-3-05 target, and that interpolation between the 2020 and 2050 targets would be an acceptable manner to develop a significance threshold to evaluate the emissions associated with the full 2014 LRDP implementation.

Using California Department of Finance projections of state population in 2050 and by reducing 1990 emissions of GHG by 80 percent, the 2050 target was estimated to be 0.81 MTCO₂e/service person/year. This threshold is used in this EIR to evaluate the operational GHG emissions from the full 2014 LRDP implementation. The stationary emissions threshold for 2050 would remain at 10,000 MTCO₂e/year per BAAQMD guidance.

The second Appendix G criterion may be evaluated by demonstrating compliance with plans, policies, or regulations adopted by local governments to control GHG emissions. According to the Natural Resources Agency:

Provided that such plans contain specific requirements with respect to resources that are within the agency's jurisdiction to avoid or substantially lessen the agency's contributions to GHG emissions, both from its own projects and from private projects it has approved or will approve, such plans may be appropriately relied on in a cumulative impacts analysis (Natural Resources Agency 2009).

Under CEQA, "the determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data" (CEQA Section 15064). CEQA grants agencies the general authority to adopt criteria for determining whether a given impact is "significant" (California Public Resources Code Section 21082). When there is no CEQA guidance, the agency may look to and assess general compliance with comparable regulatory schemes. The BAAQMD's Clean Air Plan represents a comparable regulatory scheme, but specifically states that it is not to be considered a GHG reduction plan. As AB 32 is the basis for the BAAQMD's regulations to control GHG emissions, it is a relevant policy for this analysis. Because the LRDP full development is projected to occur well past the final target date for AB 32, Executive Order S-3-05 becomes relevant.

Based on the above, the proposed project's GHG emissions significance and its global climate impacts are assessed based on the BAAQMD's GHG significance thresholds and the interpolated thresholds based on Executive Order S-3-05 targets. Full 2014 LRDP implementation is assessed relative to Executive Order S-3-05 and with the interpolated thresholds.

Analytical Methods

OPR in its technical advisory has recommended that GHG emissions from project-related traffic, energy consumption, water usage, and construction activities be identified and estimated, to the extent that data are available to calculate them. ARB staff has considered extensively the value of indirect emissions in a mandatory reporting program. ARB believes that indirect energy usage provides a more complete picture of a facility's emissions footprint. According to ARB, "As facilities consider changes that would affect their emissions – addition of a cogeneration unit to boost overall efficiency even as it increases direct emissions, for example – the relative impact on total (direct plus indirect) emissions by the facility should be monitored. Annually reported indirect energy usage also aids the conservation awareness of the facility ..." For these reasons, ARB has proposed requiring the calculation of direct and indirect GHG emissions as part of the AB 32 reporting requirements, and the analysis in this EIR address both types of emissions (ARB 2007).

The California Air Pollution Control Officers Association (CAPCOA) stated that the information needed to characterize GHG emissions from manufacture, transport, and end-of-life of construction materials (often referred to as lifecycle emissions) would be speculative at the CEQA analysis level (CAPCOA 2008). Since accurate and reliable data do not exist for estimating project lifecycle emissions, the analysis does not assess them.

The data sources and tools used to evaluate the proposed project's operational GHG impacts include the CalEEMod and calculation algorithms supported by the sources listed above. The CalEEMod model uses the EMFAC2007 emissions factor model for on-road motor vehicle sources and the OFFROAD2007 emissions factor model for off-road equipment. Site-specific or project-specific data were used in the CalEEMod model where available. Where information was not available for the project, model default values were selected. CalEEMod calculates GHG emissions from a project based on Bay Area-specific data and assumptions, and includes corrections for future applicable regulatory requirements, such as the Low Carbon Fuel Standard, the Renewable Fuels Portfolio standards, and others.

Additional sources consulted for this analysis include data and guidance from the EPA, the US Energy Information Administration, ARB, the CEC, the California Climate Action Registry's General Reporting Protocol, and other GHG and global climate change data as referenced. Emission calculations for the proposed project are in Appendix B.

RBC 2014 LRDP Policies

The RBC 2014 LRDP policies related to GHG emissions include the following:

- S1 – Sustainability Policy on Decision Making: Sustainability choices will be given equal weight with other planning, programming, cost, and design factors for facilitating scientific research and facility operations.
 - Include deliberate steps during early planning, design, and construction to encourage communication and integrated design across all disciplines to identify coordinated, low-cost means to fully satisfy occupant needs with minimized resource use.
- S2 – Sustainability Policy on Living Laboratory: The RBC will be cultivated as a living laboratory, in which planning, operating practices and infrastructure, facilities

performance monitoring data, and sustainability goals are leveraged to engage, apply, and strengthen research.

- Install energy, water and other performance monitoring systems to facilitate efficient use of those resources.
- Develop infrastructure and resources for the campus based on state-of-the-practice research in sustainability fields. Make and prioritize decisions based on scientific research and outcomes and lifecycle costing whenever possible.
- S3 – Sustainability Policy on Site Development: Embody environmental stewardship and respect the unique character of the RBC in site development.
 - Draw on the neighborhood context and prominently feature the natural assets including climate, wetlands, and proximity to the San Francisco Bay and the Bay Trail.
 - Actively promote sustainability as a core value at the campus and provide practical opportunities for innovation and education in sustainable design.
 - Manage soil contamination as a component of each construction project.
 - Control construction dust by implementing the BMPs defined in the BAQMD CEQA Guidelines.
- S4 – Sustainability Policy on Energy and Climate: Pursue energy efficiency targets and renewable energy use consistent with leading-edge best practices in mitigating climate change.
 - Develop, track, and pursue energy efficiency goals that include annual consumption and peak demand targets for all buildings and infrastructure.
 - Use building orientation and passive design strategies to minimize energy use.
 - Maximize on-site generation of renewable energy.
 - Purchase grid power from 100 percent renewable sources where available at reasonable cost.
 - Directly address the challenge of high energy use in laboratory research facilities by exploring innovative design and making use of the mild climate at the RBC site to minimize energy use.
 - Develop projections for infrastructure and resources to serve the campus that are measured relative to benchmarks from best practice scenarios.
 - Prepare a CAP to guide RBC development and operations and publically report greenhouse gas emissions using standard protocols.
- S5 – Sustainability Policy on Transparency: Operate transparently in sustainability efforts by setting targets, measuring performance, and regularly reporting results.
 - Establish a multi-stakeholder committee that periodically evaluates sustainability goals and progress made towards those goals in a transparent process.
 - Make the cost for future flexibility, redundancy, and spare capacity explicit and subject to budgeting processes.
- S6 – Sustainability Policy on Green Building: New construction projects exceeding \$5 million will target certification through the US Green Building Council of LEED Gold® at a minimum.
 - In addition to the LEED Gold requirement, laboratory and data center spaces and buildings will be designed to an equivalent "Gold" level using the LBNL

- Environmental Performance Criteria (EPC) or equivalent rating system for each building type.
- Buildings will be designed to comply with the UC Sustainable Practices Policy, the UC Berkeley Campus Sustainability Plan, the LBNL Policy on Sustainability Standards for New Construction, and any future sustainability policies, as applicable.
 - S7 – Sustainability Policy on Reduced Total Costs: Plan and manage use of all resources to minimize lifecycle costs.
 - Implement integrated design approaches that manage first costs and minimize life cycle costs for all facility and infrastructure investments.
 - S8 – Sustainability Policy on Waste Minimization: Waste minimization and diversion planning for the RBC will target 100 percent diversion of municipal solid waste to composting and recycling by 2020, while simultaneously minimizing all waste streams.
 - Take advantage of opportunities to minimize the overall amount of material handled either as compost, recycle, or landfill waste identified through ongoing evaluation of activities.
 - Apply acquisition policies to minimize waste and environmental impacts.
 - S9 – Sustainability Policy on Health and Wellness: RBC development will promote health and wellness of the community, including employees, visitors, and ecosystems associated with the site.
 - The on-campus transportation system will encourage walking and bicycling between buildings on the campus, minimizing the levels of greenhouse gases produced for local travel.
 - Provide an outdoor recreation area suitable for physical exercise.
 - Provide walkways with signs interpreting the ecological value of the grassland and marsh areas.
 - Provide health-conscious food choices at on-site eating amenities.
 - S10 – Sustainability Policy on Local Connections: The RBC procurement policies will embody the University’s commitment to sustainability and improving the quality of life of citizens in the local communities.
 - Food and other goods and services will be sourced from local growers and vendors to the degree practicable.
 - Recognize that potable water is a shared resource that must be conserved through building design, utility and landscape approaches.

LRDP Impacts and Mitigation Measures

LRDP Impact GHG-1: Development under the 2014 LRDP would generate GHG emissions that would result in a significant impact on the environment. (Potentially Significant; Significant and Unavoidable)

Construction GHG Emissions

During construction, the proposed project would generate GHGs from the exhaust of construction equipment and construction workers’ vehicles. The manufacture of construction materials used by the project would indirectly generate GHG emissions (upstream emission source). Upstream emissions are generated during the manufacture of construction materials (e.g., cement, steel, and materials transport). This project’s upstream GHG emissions, which may include

perfluorocarbons and sulfur hexafluoride, are not estimated in this impact analysis because they are not under the University's control and the lack of data precludes their quantification without speculation.

The BAAQMD does not provide any guidance on project-level analysis of construction GHG emissions impacts. It recommends that construction GHG emissions be estimated, reported, and evaluated. While the exact construction schedule is not currently known, it is possible to estimate the maximum amount of construction that would occur during any one year and estimate emissions based on that maximum activity level. This was done using CalEEMod to estimate GHG emissions during a theoretical 12-month maximum construction activity period. Carbon dioxide emissions associated with these maximum construction activities are approximately 450 metric tons. Emissions in other LRDP development years would be less than or equal to this maximum annual total. This annual amount is too small to have a measureable effect on global climate and is well below the threshold of 1,100 MTCO₂e developed by the BAAQMD for evaluating the significance of the impact from a project's operational GHG emissions. The impact from LRDP-level construction emissions would be less than significant.

Operational GHG Emissions

Campus development under the proposed LRDP would generate direct operational GHG emissions. Most of these emissions—primarily carbon dioxide, methane, and nitrous oxide—would be from fuel combustion from building heating systems and motor vehicles. Building and motor vehicle air conditioning systems may use HFCs (and HCFCs and CFCs to the extent that they have not been completely phased out at later dates); these emissions are not quantified because they would only occur through accidental leaks. It is not possible to estimate the frequency of accidental leaks without speculation. ARB drafted a proposed Regulation for Management of High Global Warming Potential Refrigerants that would reduce stationary refrigeration and air conditioning systems emissions by requiring persons subject to the rule to reclaim, recover, or recycle refrigerant and to properly repair or replace faulty refrigeration and air conditioning equipment (ARB 2009).

Non-Stationary Source Emissions. Non-stationary sources include mobile sources and area sources. Mobile sources include motor vehicles, as well as gas-powered yard tools, construction equipment, and trains. Mobile source emissions were calculated using CalEEMod, which uses emission and Bay Area-specific consumption factors to calculate GHG emissions from projects within BAAQMD's jurisdiction. For estimating GHG emissions, the proposed project was assumed to fall under the CalEEMod land use category of Research and Development. Mobile emissions were calculated using trip rates from the transportation study (Fehr & Peers 2013).

Area sources include emissions from activities such as landscaping, natural gas and electricity consumption for heating and lighting, water use and wastewater generation, and solid waste disposal. Rates of electricity and natural gas consumption, water and wastewater generation, and solid waste production were based on information provided by the University. Emissions were calculated using emission factors from CalEEMod, with the exception of electricity that was calculated using emission factors reported by PG&E,³¹ the local utility.

Stationary Source Emissions. Stationary sources associated with the proposed project include boilers and emergency generators. Boilers emissions were calculated using estimated fuel

³¹ It is possible that the University would obtain electricity from other energy providers that may include a higher proportion of renewable energy in their power mix than PG&E. Therefore the use of PG&E emission factors provides a conservative estimate of emissions.

consumption rates provided by the University in combination with emission factors found in the Code of Federal Regulations (40 CFR Part 98 Subparts A and C). Emergency generators emissions were calculated using fuel consumption rates found in AP-42 (the EPA’s compilation of air pollution emission factors), an assumed carbon content for diesel fuel of 87 percent, and the assumption that 100 percent of the carbon content becomes carbon dioxide during combustion.

Summary of Emissions. Table 4.6-1 summarizes total net estimated GHG emissions per year at full 2014 LRDP implementation and compares the resulting emission rate to the significance threshold based on Executive Order S-3-05. The service person figure for this analysis was assumed to be 10,000 persons.

**Table 4.6-1
Estimated Operational GHG Emissions – LRDP**

GHG Emissions Source	Emissions (metric tons CO ₂ e/year)
Total Non-Stationary Source Emissions	44,723
Total Operational GHG Emissions per Service Person	4.5
Threshold based on EO S-3-05	0.8
Exceeds Threshold?	Yes
Total Stationary Source Emissions	31,880
BAAQMD Threshold	10,000
Exceeds Threshold?	Yes

Source: Golder Associates 2013. Emissions calculations are provided in Appendix B.

As shown in Table 4.6-1, the proposed project’s operational emissions would exceed the stationary and non-stationary source thresholds. The impact of GHG emissions from stationary and non-stationary sources would be significant. For stationary sources, the primary source of emissions is the boilers that are used for heating. For non-stationary sources, the emissions are relatively evenly split between electricity use and vehicle travel.

UC Berkeley has adopted the 2009 CAP plan to reduce GHG emissions and the 2009 Sustainability Plan to reduce overall resource use on the UC Berkeley campus. LBNL has also developed a Sustainability Plan to minimize its impact on the environment. CAPs provide a framework for reducing site-wide facility or campus emissions. That is, while each individual project on a campus may not meet AB 32 or Executive Order S-3-05 targets, the CAP’s facility-wide programs help the facility meet its aggregate emissions targets. The 2014 LRDP includes policies to develop a CAP for the RBC, minimize energy and water use, and minimize waste. The CAP has not been developed yet, and its effectiveness to reduce the impact of the proposed LRDP cannot be evaluated.

Implementing LRDP MM GHG-1 would reduce this impact. However, it is uncertain if the Executive Order S-3-05 targets would be achieved. Therefore conservatively, the impact is determined to be significant and avoidable.

LRDP MM GHG-1: The University will develop a CAP for the RBC site within three years of the adoption of the 2014 LRDP or before construction on the first project under the 2014 LRDP commences, whichever comes first. The CAP will include campus-wide GHG reduction measures

as well as a suite of project-level GHG reduction measures that will be incorporated into each building project, as appropriate, during the planning, design and construction of the project.

The CAP will include target emission rates per service person that are consistent with AB 32 and Executive Order S-3-05 emissions targets. The CAP will also implement specific control measures and programs to achieve these targets. These control measures and programs will be developed specifically for each project based on its siting and design needs, but they would at minimum address these general topics:

- **Energy Efficiency:** minimize energy consumption to the extent possible through measures such as design guidelines for new buildings that require specific levels of energy efficiency, incentive programs for employees or departments to reduce energy use, programs to track energy use and discover opportunities to reduce waste, and landscaping or other features that provide shade or otherwise help reduce energy use.
- **Renewable Energy Generation:** investigate and develop opportunities for renewable energy generation on campus, whether solar, wind, or other sources.
- **Vehicle Trip Minimization:** encourage the use of carpools, shuttles, bicycles, or public transportation that provide resources for employees to access and use alternative transportation, and provide infrastructure that allows employees to interact or conduct meetings and business without traveling.
- **Renewable Fuel Vehicles:** encourage or require the use of renewable fuel vehicles such as by providing electric vehicle charging and compressed natural gas fueling stations, purchasing renewable fuel vehicles for the campus fleet, and providing preferential parking or other incentives for drivers using renewable fuel or hybrid vehicles.
- **Waste Reduction:** implement waste reduction, aggressive recycling goals with incentives, composting systems for general buildings and dining areas, guidelines for low waste construction and purchasing, and educational programs.

LRDP Impact GHG-2: Development under the 2014 LRDP would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. (*Potentially Significant; Significant and Unavoidable*)

AB 32 and Executive Order S-3-05 are the basis for GHG emissions reductions in California. Local agencies such as BAAQMD base their planning and regulations on the AB 32 requirements, including a reduction of GHG emissions to 1990 rates by 2020. BAAQMD adopted its GHG significance thresholds specifically to meet AB 32 requirements in its jurisdiction, and so projects meeting those thresholds can be assumed to meet the requirements of AB 32. Projects

that exceed the timeline in AB 32 that ends in 2020 will be expected to comply with Executive Order S-3-05, which requires an 80 percent reduction from 1990 emission rates by 2050. Because the estimated rate of emissions associated with the proposed project exceeds the threshold based on Executive Order S-3-05, the proposed project would conflict with the applicable regulation and the impact is considered significant.

If emissions were reduced to levels meeting the Executive Order S-3-05 goal, an 80 percent reduction from 1990 levels by 2050, the proposed project would be in compliance with the relevant regulation. Because there is uncertainty whether GHG reduction achieved pursuant to LRDP MM GHG-2 would be sufficient to meet the Executive Order S-3-05 goal, this impact is considered significant and unavoidable.

LRDP MM GHG-2: Implement LRDP MM GHG-1.

4.6.5 References

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