

## 4.4 GREENHOUSE GAS EMISSIONS

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### 4.4.1 Introduction

This section discusses the existing global, national, and statewide conditions for greenhouse gases (GHG) and global climate change and evaluates the potential impacts on global climate from the implementation of the proposed Solar Energy Research Center (SERC) project (proposed project), located centrally on the Lawrence Berkeley National Laboratory (LBNL) hill site. The section also provides discussion of the applicable federal, state, regional, and local agencies that regulate, monitor, and control GHG emissions. The impacts associated with the proposed project are compared with the thresholds of significance adopted by the Bay Area Air Quality Management District (BAAQMD). Copies of the modeling runs to estimate GHG emissions associated with the proposed project and supporting technical data are found in **Appendix 4.4**.

The following sources were used to prepare this section of the Draft EIR:

- Bay Area Air Quality Management District CEQA Air Quality Guidelines (BAAQMD 2010);
- Lawrence Berkeley National Laboratory (LBNL) 2006 Long Range Development Plan (LRDP) Environmental Impact Report (EIR) (LBNL 2007); and
- UC Policy on Sustainable Practices.

### 4.4.2 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) (U.S. EPA 2008b). 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 within the climate system (e.g., changes in ocean circulation, reduction in sunlight from the addition of GHG and other gases to the atmosphere from volcanic eruptions); and
- Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification).

The natural process through which heat is retained in the troposphere<sup>1</sup> is called the “greenhouse effect.” The greenhouse effect traps heat in the troposphere through a threefold process as follows: (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) GHGs in the upper atmosphere absorb or trap the long-wave radiation and re-emit it back towards the Earth and into space. This third process is the focus of current climate change actions.

While water vapor and carbon dioxide (CO<sub>2</sub>) 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, 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 period. The GWP of a gas is determined using CO<sub>2</sub> as the reference gas, which has a GWP of 1 over 100 years (IPCC 1996). For example, a gas with a GWP of 10 is 10 times more potent than CO<sub>2</sub> over 100 years. The use of GWP allows GHG emissions to be reported using CO<sub>2</sub> as a baseline. The sum of each GHG multiplied by its associated GWP is referred to as “carbon dioxide equivalents” (CO<sub>2</sub>e). 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 CO<sub>2</sub>.

### *Greenhouse Gases*

State law defines GHGs to include the following compounds:

- **Carbon Dioxide (CO<sub>2</sub>).** 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 (U.S. EPA 2008c). 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 (CH<sub>4</sub>).** 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 (U.S. EPA n.d.b.). Methane is the primary component of natural gas, which is used for space and water heating, steam production, and power generation. The GWP of methane is 21.
- **Nitrous Oxide (N<sub>2</sub>O).** Nitrous oxide is produced by natural and human-related sources. Primary human-related sources include agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of nitrous oxide is 310.

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<sup>1</sup> The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth’s surface to 10 to 12 kilometers).

- **Hydrofluorocarbons (HFCs).** HFCs typically are used as refrigerants in both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam-blowing is growing particularly as the continued phase-out of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) gains momentum. 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 created as a byproduct of aluminum production and semiconductor manufacturing. Perfluorocarbons 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) (EIA n.d.). The GWPs of PFCs range from 5,700 to 11,900.
- **Sulfur Hexafluoride (SF<sub>6</sub>).** 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 Intergovernmental Panel (IPCC) on Climate Change 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 [ppt] in 1990 versus 365 parts per million [ppm] of CO<sub>2</sub>) (U.S. EPA n.d.a.).

The primary GHGs of concern relative to the proposed project are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. These three GHGs are generally emitted from combustion activities. The other GHGs listed above are related to specific industrial uses and not anticipated to be emitted in measurable or substantial quantities by the project.

### *Contributions to Greenhouse Gas Emissions*

#### **Global**

Worldwide anthropogenic (man-made) GHG emissions are tracked for industrialized nations and developing nations. Man-made GHG emissions from industrialized and developing nations are available through 2007 and 2005, respectively. The sum of these emissions totaled approximately 43,363 million metric tons of CO<sub>2</sub> equivalents (MMTCO<sub>2</sub>e).<sup>2</sup> It should be noted that global emissions inventory data are not all from the same year and may vary depending on the source of the emissions inventory data. Emissions from the top five countries and the European Union accounted for approximately 59 percent of the total global GHG emissions, according to the most recently available data. (See **Table 4.4-1, Top Five GHG Producer Countries and the European Union**). The GHG emissions presented in **Table 4.4-1** are representative of currently available global inventory data.

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<sup>2</sup> The CO<sub>2</sub> equivalent emissions commonly are expressed as “million metric tons of carbon dioxide equivalent (MMTCO<sub>2</sub>E).” The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP, such that MMTCO<sub>2</sub>E = (million metric tons of a GHG) × (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 CO<sub>2</sub>.

**Table 4.4-1**  
**Top Five GHG Producer Countries and the European Union**

Emitting Countries	GHG Emissions (MMTCO <sub>2</sub> e)
China	7,265
United States	7,217
European Union (EU), 27 Member States	5,403
Russian Federation	2,202
India	1,877
Japan	1,412
<b>Total</b>	<b>25,376</b>

*Source: World Resources Institute, "Climate Analysis Indicators Tool (CAIT)," <http://cait.wri.org/>. 2010.*

*Excludes emissions and removals from land use, land-use change and forestry (LULUCF).*

*Note: Emissions for Annex I nations are based on 2007 data. Emissions for Non-Annex I nations (e.g., China, India) are based on 2005 data.*

### United States

As noted in **Table 4.4-1**, the United States was the number two producer of global GHG emissions as of 2005. The primary GHG emitted by human activities in the United States was CO<sub>2</sub>, representing approximately 84 percent of total GHG emissions. Carbon dioxide from fossil fuel combustion, the largest source of U.S. GHG emissions, accounted for approximately 80 percent of GHG emissions (U.S. EPA 2008c).

### State of California

The California Air Resources Board (CARB) compiles GHG inventories for the State of California. Based upon the 2006 GHG inventory data (i.e., the latest year for which data are available) for the 2000-2006 greenhouse gas emissions inventory, California emitted 484 MMTCO<sub>2</sub>e *including* emissions resulting from imported electrical power in 2006. Based on the CARB 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 434 MMTCO<sub>2</sub>e *excluding* emissions related to imported power (CARB 2009a).

A California Energy Commission (CEC) emissions inventory report placed CO<sub>2</sub> produced by fossil fuel combustion in California as the largest source of California's GHG emissions in 2004, accounting for 80 percent of the total GHG emissions. Emissions of CO<sub>2</sub> from other sources contributed 3.1 percent of the total GHG emissions; methane emissions 6.4 percent; nitrous oxide emissions 7.6 percent; and the

remaining 3.2 percent was composed of emissions of high-GWP gases. These high GWP gases are largely composed of refrigerants, with small contributions of SF<sub>6</sub> used in connection with insulating materials for electricity transmission and distribution (CEC 2006a).

**Table 4.4-2, GHG Emissions in California**, provides a summary of GHG emissions reported in California in 1990 and 2006 separated by categories defined by the United Nations Intergovernmental Panel on Climate Change (IPCC).

**Table 4.4-2  
GHG Emissions in California**

Source Category	1990 (MMTCO <sub>2e</sub> )	Percent of Total	2006 (MMTCO <sub>2e</sub> )	Percent of Total
<b>ENERGY</b>	<b>386.41</b>	<b>89.2%</b>	<b>419.32</b>	<b>86.7%</b>
Energy Industries	157.33	36.3%	160.82	33.2%
Manufacturing Industries & Construction	24.24	5.6%	19.03	3.9%
Transport	150.02	34.6%	184.78	38.2%
Other (Residential/Commercial/Institutional)	48.19	11.1%	48.36	10.0%
Non-Specified	1.38	0.3%	0.00	0.0%
Fugitive Emissions from Oil & Natural Gas	2.94	0.7%	3.25	0.7%
Fugitive Emissions from Other Energy Production	2.31	0.5%	2.03	0.4%
<b>INDUSTRIAL PROCESSES &amp; PRODUCT USE</b>	<b>18.34</b>	<b>4.2%</b>	<b>30.22</b>	<b>6.2%</b>
Mineral Industry	4.85	1.1%	5.92	1.2%
Chemical Industry	2.34	0.5%	0.37	0.1%
Non-Energy Products from Fuels & Solvent Use	2.29	0.5%	1.85	0.4%
Electronics Industry	0.59	0.1%	0.77	0.2%
Substitutes for Ozone Depleting Substances	0.04	0.0%	13.38	2.8%
Other Product Manufacture and Use	3.18	0.7%	1.67	0.3%
Other	5.05	1.2%	6.25	1.3%
<b>AGRICULTURE, FORESTRY, &amp; OTHER LAND USE</b>	<b>19.11</b>	<b>4.4%</b>	<b>25.10</b>	<b>5.2%</b>
Livestock	11.67	2.7%	15.68	3.2%
Land	0.19	0.0%	0.19	0.0%
Aggregate Sources & Non-CO <sub>2</sub> Sources on Land	7.26	1.7%	9.24	1.9%
<b>WASTE</b>	<b>9.42</b>	<b>2.2%</b>	<b>9.23</b>	<b>1.9%</b>
Solid Waste Disposal	6.26	1.4%	6.31	1.3%
Wastewater Treatment & Discharge	3.17	0.7%	2.92	0.6%

Source Category	1990 (MMTCO <sub>2</sub> e)	Percent of Total	2006 (MMTCO <sub>2</sub> e)	Percent of Total
<b>EMISSIONS SUMMARY</b>				
Gross California Emissions	433.29		483.87	
Sinks from Forests and Rangelands	-6.69		-4.07	
Net California Emissions	426.60		479.80	

*Sources:*

<sup>1</sup> California Air Resources Board, "California Greenhouse Gas 1990-2004 Inventory by IPCC Category - Summary," <http://www.arb.ca.gov/cc/inventory/archive/archive.htm>. 2007.

<sup>2</sup> California Air Resources Board, "California Greenhouse Gas 2000-2006 Inventory by IPCC Category - Summary," <http://www.arb.ca.gov/cc/inventory/data/data.htm>. 2009.

Between 1990 and 2006, the population of California grew by approximately 7.3 million (from 29.8 to 37.1 million), or 24.5 percent (California Department of Finance 2008, U.S. Census Bureau 2009). In addition, the California economy, measured as gross state product, grew from \$788 billion in 1990 to \$1.7 trillion in 2006 representing an increase of approximately 116 percent (California Department of Finance 2009). Despite the population and economic growth, California's net GHG emissions only grew by approximately 12 percent. The 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).

### *Effects of Global Climate Change*

The primary effect of global climate change has been a rise in the average global tropospheric temperature of 0.2° Celsius per decade, determined from meteorological measurements worldwide between 1990 and 2005 (IPCC 2007). Climate change modeling using 2000 emission rates suggests 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 to the proposed project site, 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);
- 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 (CalEPA 2006);
- Increasing the demand for electricity by 1 to 3 percent by 2020 due to rising temperatures resulting in hundreds of millions of dollars in extra expenditures (CalEPA 2006); and

- Summer warming projections in the first 30 years of the 21st century ranging from about 0.5 to 2 degrees Celsius (°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) (CalEPA 2006).

### 4.4.3 Regulatory Considerations

#### *Intergovernmental Panel on Climate Change*

The World Meteorological Organization (WMO) and United Nations Environmental Program (UNEP) established the IPCC in 1988. The goal of the IPCC is to evaluate the risk of climate change caused by human activities. Rather than performing research or monitoring climate, the IPCC relies on peer-reviewed and published scientific literature to make its assessment. The IPCC assesses information (i.e., scientific literature) regarding human-induced climate change, impacts of human-induced climate change, and options for adaptation and mitigation of climate change. The IPCC reports its evaluations in special reports called “assessment reports,” the latest of which was published in 2007.<sup>3</sup> In its 2007 report, the IPCC stated that global temperature increases since the mid-20<sup>th</sup> century were “very likely” attributable to man-made activities (greater than 90 percent certainty).

#### *Federal*

In *Massachusetts vs. EPA*, the Supreme Court held that United States Environmental Protection Agency (U.S. EPA) has the statutory authority under Section 202 of the Clean Air Act (CAA) to regulate GHGs from new motor vehicles. The court did not hold that the U.S. 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 U.S. 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 (RFS) requiring fuel producers to use at least 36 billion gallons of biofuel in 2022 and sets a national fuel economy standard of 35 miles per gallon by 2020. The act also contains provisions for energy efficiency in lighting and appliances and for the implementation of green building technologies in federal buildings. On July 11, 2008, the U.S. EPA issued an Advanced Notice of Proposed Rulemaking (ANPRM) on regulating GHGs under the CAA. The ANPRM 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 U.S. EPA published the

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<sup>3</sup> The IPCC’s Fourth Assessment Report is available online at <http://www.ipcc.ch/>.

Proposed Mandatory Greenhouse Gas Reporting Rule in the *Federal Register* (U.S. EPA 2009). The rule was adopted on September 22, 2009 and covers approximately 10,000 facilities nationwide, accounting for 85 percent of U.S. GHG emissions.

On September 15, 2009, the U.S. EPA and the Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) issued a joint proposal to establish a national program consisting of new standards for model year 2012 through 2016 light-duty vehicles that will reduce GHG emissions and improve fuel economy. 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 would have to meet an average standard of 295 grams of CO<sub>2</sub> per mile and 30.1 miles per gallon. By 2016, the vehicles would have to meet an average standard of 250 grams of CO<sub>2</sub> per mile and 35.5 miles per gallon.<sup>4</sup> These standards were formally adopted by the U.S. EPA and DOT on April 1, 2010.

On December 7, 2009, the U.S. EPA Administrator signed two distinct findings regarding GHGs under section 202(a) of the Clean Air Act:

- **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 U.S. EPA's proposed GHG emissions standards for light-duty vehicles, which were jointly proposed by the U.S. EPA and DOT.

### **Labs for the 21<sup>st</sup> Century (Labs 21)**

Labs21 is a voluntary (non-regulatory) partnership program sponsored by the U.S. EPA and the DOE, which is dedicated to improving the environmental performance of U.S. laboratories. (<http://www.labs21century.gov/index.htm>).

Labs21 seeks to create environmental showcase laboratories by encouraging laboratory owners, operators, and designers to adopt the "Labs21 Approach." The approach involves conducting an initial

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<sup>4</sup> The CO<sub>2</sub> emission standards and fuel economy standards stated are based on U.S. EPA formulas.



comprehensive evaluation of a laboratory's energy use, focusing on all of a laboratory's energy systems and wastes including its HVAC and electrical power supply, rather than focusing on specific energy-using components, when considering efficiency improvements. Such an approach allows laboratory owners and operators to pursue integrated energy and water conservation measures with significantly higher efficiencies and cost savings than the traditional approach of addressing components sequentially or individually.

### ***State***

Key state laws and regulations related to GHG emissions are described 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 the following goals: 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 Cal EPA is required to coordinate efforts of various agencies in order 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 CARB, 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. In addition, 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. The Climate Action Team has fulfilled both of these report requirements through its March 2006 Climate Action Team Report to Governor Schwarzenegger and the Legislature (2006 CAT Report) (Cal EPA 2006). Some strategies currently being implemented by state agencies include CARB introducing vehicle climate change standards and diesel anti-idling measures, the Energy Commission implementing building and appliance efficiency standards, and the Cal/EPA implementing their 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 have the potential to achieve the goals set forth in Executive Order S-3-05.

### ***Assembly Bill 32***

In furtherance of the goals established in Executive Order S-3-05, the legislature enacted Assembly Bill 32 (AB 32, Nuñez and Pavley), the California Global Warming Solutions Act of 2006, which 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:

#### **CARB Early Action Measures**

CARB 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 CARB's adoption of a report listing three specific early-action greenhouse gas emission reduction measures on June 21, 2007. On October 25, 2007, CARB approved an additional six early-action GHG reduction measures under AB 32. CARB 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 additional six early action regulations adopted on October 25, 2007, also meeting the narrow legal definition of “discrete early action GHG reduction measures,” include:

- 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 in order to maintain fuel efficiency; and
- Restriction on the use of sulfur hexafluoride (SF<sub>6</sub>) 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, CARB approved the 1990 greenhouse gas emissions inventory, thereby establishing the emissions limit for 2020. The 2020 emissions limit was set at 427 MMTCO<sub>2e</sub>. CARB also projected the state's 2020 GHG emissions under "business as usual" (BAU) conditions—that is, emissions that would occur without any plans, policies, or regulations to reduce GHG emissions. CARB 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 MMTCO<sub>2e</sub>. Therefore, the state must reduce its 2020 BAU emissions by approximately 29 percent in order 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 use, 7 percent; agriculture, 5 percent; and commercial uses, 3 percent (these figures represent the 1990 values, compared to **Table 4.2-2**, which presents 2006 values). AB 32 does not require individual sectors to meet their individual 1990 GHG emissions inventory; the total statewide emissions are required to meet the 1990 threshold by 2020.

### **CARB Mandatory Reporting Requirements**

In addition to the 1990 emissions inventory, CARB also adopted regulations requiring the mandatory reporting of GHG emissions for large facilities on December 6, 2007. The mandatory reporting regulations require annual reporting from the largest facilities in the state, which account for approximately 94 percent of point source greenhouse gas emissions from industrial and commercial stationary sources in California. About 800 separate sources fall under the new reporting rules and include electricity-generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and industrial sources that emit over 25,000 tons of carbon dioxide each year from on-site stationary combustion sources. Transportation sources, which account for

38 percent of California's total greenhouse gas emissions, are not covered by these regulations but will continue to be tracked through existing means. Affected facilities will begin tracking their emissions in 2008, to be reported beginning in 2009, with a phase-in process to allow facilities to develop reporting systems and train personnel in data collection. Emissions for 2008 may be based on best available emission data. Beginning in 2010, however, emissions reporting requirements will be more rigorous and will be subject to third-party verification. Verification will take place annually or every three years, depending on the type of facility.

#### **AB 32 Climate Change Scoping Plan**

As indicated above, AB 32 requires CARB 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 discussion draft of the *Climate Change Proposed Scoping Plan* released in June 2008, CARB released the *Climate Change Proposed Scoping Plan* in October 2008 that contains an outline of the proposed state strategies to achieve the 2020 greenhouse gas emission limits. The CARB Governing Board approved the *Climate Change Scoping Plan* on December 11, 2008. Key elements of the Scoping Plan include the following recommendations:

- Expanding and strengthening existing energy efficiency programs as well as 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 greenhouse gas 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 in the event that 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.

**Table 4.4-3, AB 32 Scoping Plan Measures (SPMs)**, lists CARB’s preliminary recommendations for achieving greenhouse gas reductions under AB 32 along with a brief description of the requirements and applicability.

**Table 4.4-3  
AB 32 Scoping Plan Measures (SPMs)**

Scoping Plan Measure	Description
<b>SPM-1:</b> California Cap-and-Trade Program linked to Western Climate Initiative	Implement a broad-based cap-and-trade program that links with other Western Climate Initiative Partner programs to create a regional market system. Ensure California’s program meets all applicable AB 32 requirements for market-based mechanisms. Capped sectors include transportation, electricity, natural gas, and industry. Projected 2020 business-as-usual emissions are estimated at 512 MTCO <sub>2e</sub> ; preliminary 2020 emissions limit under cap-and-trade program are estimated at 365 MTCO <sub>2e</sub> (29 percent reduction).
<b>SPM-2:</b> California Light-Duty Vehicle GHG Standards	Implement adopted Pavley standards and planned second phase of the program. AB 32 states that if the Pavley standards (AB 1493) do not remain in effect, CARB shall implement equivalent or greater alternative regulations to control mobile sources.
<b>SPM-3:</b> Energy Efficiency	Maximize energy efficiency building and appliance standards, and pursue additional efficiency efforts. The Scoping Plan considers green building standards as a framework to achieve reductions in other sectors, such as electricity.
<b>SPM-4:</b> Renewables Portfolio Standard	Achieve 33 percent Renewables Portfolio Standard by both investor-owned and publicly owned utilities.
<b>SPM-5:</b> Low Carbon Fuel Standard	CARB identified the Low Carbon Fuel Standard as a Discrete Early Action item and the final regulation was adopted on April 23, 2009. In January 2007, Governor Schwarzenegger issued Executive Order S-1-07, which called for the reduction of the carbon intensity of California’s transportation fuels by at least 10 percent by 2020.
<b>SPM-6:</b> Regional Transportation-Related Greenhouse Gas Targets	Develop regional greenhouse gas emissions reduction targets for passenger vehicles. SB 375 requires CARB to develop, in consultation with metropolitan planning organizations (MPOs), passenger vehicle greenhouse gas emissions reduction targets for 2020 and 2035 by September 30, 2010. SB 375 requires MPOs to prepare a sustainable communities strategy to reach the regional target provided by CARB.
<b>SPM-7:</b> Vehicle Efficiency Measures	Implement light-duty vehicle efficiency measures. CARB is pursuing fuel-efficient tire standards and measures to ensure properly inflated tires during vehicle servicing.
<b>SPM-8:</b> Goods Movement	Implement adopted regulations for port drayage trucks and the use of shore power for ships at berth. Improve efficiency in goods movement operations.

Scoping Plan Measure	Description
SPM-9: Million Solar Roofs Program	Install 3,000 MW of solar-electric capacity under California’s existing solar programs.
SPM-10: Heavy/Medium-Duty Vehicles	Adopt heavy- and medium-duty vehicle and engine measures targeting aerodynamic efficiency, vehicle hybridization, and engine efficiency.
SPM-11: Industrial Emissions	Require assessment of large industrial sources to determine whether individual sources within a facility can cost-effectively reduce greenhouse gas emissions and provide other pollution reduction co-benefits. Reduce greenhouse gas emissions from fugitive emissions from oil and gas extraction and gas transmission. Adopt and implement regulations to control fugitive methane emissions and reduce flaring at refineries.
SPM-12: High Speed Rail	Support implementation of a high-speed rail (HSR) system. This measure supports implementation of plans to construct and operate a HSR system between Northern and Southern California serving major metropolitan centers.
SPM-13: Green Building Strategy	Expand the use of green building practices to reduce the carbon footprint of California’s new and existing inventory of buildings.
SPM-14: High GWP Gases	Adopt measures to reduce high global warming potential gases. The Scoping Plan contains 6 measures to reduce high-GWP gases from mobile sources, consumer products, stationary sources, and semiconductor manufacturing.
SPM-15: Recycling and Waste	Reduce methane emissions at landfills. Increase waste diversion, composting, and commercial recycling. Move toward zero-waste.
SPM-16: Sustainable Forests	Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation. The federal government and California’s Board of Forestry and Fire Protection have the regulatory authority to implement the Forest Practice Act to provide for sustainable management practices. This measure is expected to play a greater role in the 2050 goals.
SPM-17: Water	Continue efficiency programs and use cleaner energy sources to move water. California will also establish a public goods charge for funding investments in water efficiency that will lead to as yet undetermined reductions in greenhouse gases.
SPM-18: Agriculture	In the near-term, encourage investment in manure digesters and at the five-year Scoping Plan update determine if the program should be made mandatory by 2020. Increase efficiency and encourage use of agricultural biomass for sustainable energy production. CARB has begun research on nitrogen fertilizers and will explore opportunities for emission reductions.

Source: California Air Resources Board, *Climate Change Scoping Plan*, (2008).

### ***Senate Bill 97 (CEQA Guidelines)***

In August 2007, the legislature enacted SB 97 (Dutton), which 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, which 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. The advisory further 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 threshold of significance. Instead, OPR requested that CARB 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.

### ***Senate Bill 375***

The California legislature passed SB 375 (Steinberg) on September 1, 2008. SB 375 requires CARB to set regional greenhouse gas reduction targets after consultation with local governments. The target must then be incorporated within that region's regional transportation plan (RTP), which is used for long-term transportation planning, in a Sustainable Communities Strategy. SB 375 also requires each region's regional housing needs assessment (RHNA) to be adjusted based on the Sustainable Communities Strategy in its RTP. Additionally, SB 375 reforms the environmental review process to create incentives to implement the strategy, especially transit priority projects. The governor signed SB 375 into law on September 30, 2008.

On January 23, 2009, CARB appointed a Regional Targets Advisory Committee (RTAC) to provide recommendations and methodologies to be used in the target setting process. The RTAC provided its recommendations in a report to CARB on September 29, 2009. On August 9, 2010, CARB staff issued the *Proposed Regional Greenhouse Gas Emission Reduction Targets For Automobiles And Light Trucks Pursuant To*

*Senate Bill 375* (CARB 2010a). CARB staff proposed draft reduction targets for the four largest MPOs (Bay Area, Sacramento, Southern California, and San Diego) of 7 to 8 percent for 2020 and reduction targets between 13 to 16 percent for 2035. For the Bay Area, CARB established a draft target of 7 percent for 2020 and 15 percent for 2035. These targets were recommended to CARB by the Metropolitan Transportation Commission, which adopted the thresholds for its planning purposes on July 28, 2010. Of note, the proposed reduction targets explicitly exclude emission reductions expected from the AB 1493 and low carbon fuel standard regulations. As indicated above, CARB is required to adopt the final targets by September 30, 2010.

### **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 energy consumption in the state. Although not originally intended to reduce GHG emissions, increased energy efficiency, and reduced consumption of electricity, natural gas, and other fuels would result in fewer GHG emissions from residential and nonresidential buildings subject to the standard. 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.

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 the following 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). Unless otherwise noted in the regulation, all newly constructed buildings in California are subject of the requirements of the CALGreen Code.

## ***Regional***

### **Bay Area Air Quality Management District**

On June 2, 2010, the BAAQMD adopted updated *CEQA Air Quality Guidelines*. These guidelines contain greenhouse gas operational emissions significance thresholds and recommended methodologies and models to be used for assessing the impacts of project-specific GHG emissions on global climate change (BAAQMD 2010). The updated *CEQA Air Quality Guidelines* recommend that thresholds of significance 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 measures for reducing GHG emissions from land use development projects and stationary sources.

### *Local Plans and Policies*

#### **2006 LRDP Principles and Strategies**

The 2006 Long Range Development Plan (LRDP) is the applicable land use plan that guides development of LBNL. The 2006 LRDP does not contain policies that specifically address GHG emissions. However, the 2006 LRDP does contain elements with respect to fuel- and energy-efficiency provisions and elements that would encourage walking and bicycling on campus and in surrounding neighborhoods, all of which would reduce GHG emissions (LBNL 2007). Development strategies set forth in the 2006 LRDP that are applicable to GHG emissions include the following:

- Site and design new facilities in accordance with *UC Presidential Policy for Green Building Design* to reduce energy, water, and material consumption and provide improved occupant health, comfort, and productivity.
- Exhibit the best practices of modern sustainable development in new projects as a way to foster a greater appreciation of sustainable practices at the Laboratory.
- Increase use of alternate modes of transit through improvements to the Laboratory's shuttle bus service.
- Promote transportation demand management strategies such as vanpools and employee ride share programs.
- Improve efficiency and security of Laboratory access through improvements to existing gates and the creation of new gates.
- Create a better linkage between parking, shuttle stops, and pedestrian circulation on site.
- Provide separated routes of travel wherever possible for pedestrians and vehicles.
- Promote use of bicycles by providing additional bicycle storage racks, and shower facilities.
- Eliminate parking from the sides of major roadways, thereby improving safety and allowing one-way roads to be converted to two-way traffic.
- Maintain or reduce the percentage of parking spaces relative to the adjusted daily population.
- Consolidate parking into larger lots and/or parking structures; locate these facilities near Laboratory entrances to reduce traffic within the main site.
- Preserve and enhance the native rustic landscape and protect sensitive habitats.

- Continue to use sustainable practices in selection of plan materials and maintenance procedures.
- Utilize native, drought-tolerant plan materials to reduce water consumption; focus shade trees and ornamental plantings at special outdoor use area.
- Minimize impervious surfaces to reduce storm water run-off and provide landscape elements and planting to stabilize slopes and reduce erosion and sedimentation.
- Design infrastructure improvements to embody sustainable practices.

#### **University of California Policy on Sustainable Practices**

The University of California Policy on Sustainable Practices is a system-wide commitment to minimize the University of California's impact on the environment and reduce the University's dependence on non-renewable energy sources. The University of California Policy on Sustainable Practices promotes the principles of energy efficiency and sustainability in the areas of Green Building Design; Clean Energy Standard; Climate Protection Practices; Sustainable Transportation Practices; Sustainable Operations; Recycling and Waste Management; Environmentally Preferable Purchasing Practices; and Food.

The Policy notes "these guidelines currently recommend that University operations:

- Incorporate the principles of energy efficiency and sustainability in all capital projects, renovation projects, operations and maintenance within budgetary constraints and programmatic requirements.
- Minimize the use of non-renewable energy sources on behalf of the University's built environment by creating a portfolio approach to energy use, including the use of local renewable energy and purchase of green power from the grid as well as conservation measures that reduce energy consumption.
- Incorporate alternative means of transportation to/from and within the campus to improve the quality of life on campus and in the surrounding community. The campuses will continue their strong commitment to provide affordable on-campus housing, in order to reduce the volume of commutes to and from campus. These housing goals are detailed in the campuses' Long Range Development Plans.
- Track, report and minimize greenhouse gas emissions on behalf of University operations.
- Minimize the amount of University-generated waste sent to landfill.
- Utilize the University's purchasing power to meet its sustainability objectives."

#### **LBNL Sustainability Executable Plan**

The LBNL Sustainability Executable Plan, which is updated annually, provides a vision and reports progress towards achieving a zero-net energy complex with minimal carbon footprint. LBNL actions

planned to achieve this goal include reducing facilities and transportation energy and other resource utilization, augmented by acquisition of electric power from renewable sources.

#### **UC Berkeley Climate Action Plan**

UC Berkeley's 2009 Climate Action Plan documents how the campus plans to reduce its GHG emissions to year 1990 levels by year 2014. The plan, which will be updated annually by the Office of Sustainability, examines campus progress to date on climate action and discusses future strategies. The plan presents and evaluates data on the campus 2009-2011 Strategic Energy Plan, identifies new potential projects and expands on financial strategies to accomplish the 2014 target, and calls for the campus to set its next interim target for the year 2020 or 2025 in 2011, building upon several years of experience implementing the Strategic Energy Plan and a better understanding of potential advancements in international GHG emissions commitments (UC Berkeley 2009).

#### **City of Berkeley Climate Action Plan**

On June 2, 2009, the City Council adopted the City of Berkeley Climate Action Plan. In November 2007, voters approved ballot Measure G that set a target of reducing the City's GHG emissions by 80 percent below year 2000 levels by year 2050. To achieve this goal, the plan provides a vision that includes new and existing Berkeley buildings achieving zero net energy consumption through increased energy efficiency and a shift to renewable energy sources such as solar and wind; public transit, walking, cycling, and other sustainable mobility modes being the primary means of transportation for Berkeley residents and visitors; personal vehicles run on electricity produced from renewable sources or other low-carbon fuels; zero waste sent to landfills; and the majority of food consumed in Berkeley produced locally (City of Berkeley 2009).

### **4.4.4 Impacts and Mitigation Measures**

#### ***Significance Criteria***

In accordance with Senate Bill (SB) 97, the Natural Resources Agency adopted amendments to the *State CEQA Guidelines* on December 30, 2009, which include criteria for evaluating GHG emissions.<sup>5</sup> According to the amended Appendix G of the *State CEQA Guidelines*, a project would have a significant effect on the environment if it would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or

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<sup>5</sup> The adopted amendments may be viewed at the following website: <http://ceres.ca.gov/ceqa/guidelines/>. 2009.

- Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

The amended *State CEQA Guidelines* include a new Section 15064.4, which states that, when making a determination of the significance of GHG emissions, 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; and/or (2) Rely on a qualitative analysis or performance based standards.

Section 15064.4 also states that a lead agency should consider the following 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 threshold of significance 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 greenhouse gas emissions.

The first Appendix G criteria may be evaluated by performing a direct calculation of the GHG emissions resulting from the proposed project and comparing the emissions with the available significance thresholds. The BAAQMD has established project-level screening criteria and significance thresholds for operational GHG emissions in its *CEQA Air Quality Guidelines*. The BAAQMD's thresholds of significance for operational-related GHG emissions are:

- For land use development projects, the threshold is compliance with a qualified GHG Reduction Strategy; or annual emissions less than 1,100 metric tons CO<sub>2</sub>e per year (MTCO<sub>2</sub>e/yr); or 4.6 MT CO<sub>2</sub>e/person/yr (residents plus employees). Land use development projects include residential, commercial, industrial, and public land uses and facilities.
- For stationary-source projects, the threshold is 10,000 MTCO<sub>2</sub>e/yr. Stationary-source projects include land uses that would accommodate processes and equipment that emit GHG emissions and would require an Air District permit to operate.

The second Appendix G criteria may be evaluated by demonstrating compliance with plans, policies, or regulations adopted by local governments to curb 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 with the general authority to adopt criteria for determining whether a given impact is “significant” (California Public Resources Code Section 21082). When no guidance exists under CEQA, the agency may look to and assess general compliance with comparable regulatory schemes. The BAAQMD’s *CEQA Air Quality Guidelines* represent a comparable regulatory scheme.

Based on the above, the proposed project’s significance with respect to the GHG emissions and global climate change will be assessed based on the BAAQMD’s GHG thresholds of significance and on the project features and GHG reduction measures that are consistent with the BAAQMD’s recommended measures to reduce GHG emissions. It is noteworthy that a review of the types of projects considered by the BAAQMD in developing the threshold for land use development projects reveals that projects similar to the proposed SERC project were not included in the development of the threshold. No land use type considered by the BAAQMD corresponds to the types of research laboratories that is proposed at LBNL. The threshold is therefore not applicable to the proposed project but in the absence of a threshold adopted by the University, will be used in this evaluation.

### ***Methodology***

The amendments to the *State CEQA Guidelines* that were adopted by the Natural Resources Agency recommend that lead agencies provide for a “good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of greenhouse gas emissions resulting from a project.” In addition, OPR has stated that, under CEQA, the following steps should be considered when assessing the significance of impacts from GHG emissions on the environment:

1. Identify and quantify the GHG emissions;
2. Assess the significance of the impact on climate change; and
3. If significant, identify alternatives and/or mitigation measures that will reduce impacts below significance (OPR 2008b).

OPR in its Technical Advisory has recommended that GHG emissions from project-related traffic, energy consumption, water usage, and construction activities, should be identified and estimated, to the extent that data is available to calculate such emissions. In addition, CARB staff has considered extensively the value of indirect emissions in a mandatory reporting program. CARB believes that indirect energy usage provides a more complete picture of the emissions footprint of a facility: “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 and provides information” to CARB to be considered for future strategies by the industrial sector. For these reasons, CARB has proposed requiring the calculation of direct and indirect GHG emissions as part of the AB 32 reporting requirements, and this analysis does so (CARB 2007).

The California Air Pollution Control Officers Association (CAPCOA) has 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 does not exist for estimating lifecycle emissions for the proposed project, the analysis does not assess such lifecycle GHG emissions.

The data sources and tools used to evaluate the GHG impacts associated with construction and operation of the proposed project include the URBEMIS2007 Environmental Management Software, and information provided in the *Software User’s Guide [for] URBEMIS2007 for Windows* (Rimpo and Associates 2008) and calculation algorithms supported by the sources listed above. The URBEMIS2007 model utilizes 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 URBEMIS2007 model where available. Where information was not available for the project, model default values suggested by the BAAQMD were selected. The average daily trip (ADT) generation rate for the proposed project was based on the project’s traffic study (Fehr & Peers 2010).

Additional sources consulted for this analysis include data and guidance from the U.S. EPA, the U.S. Energy Information Administration, CARB, the California Energy Commission, the California Climate Action Registry’s *General Reporting Protocol*, and other GHG and global climate change data as referenced. Emission calculations conducted for the proposed project are contained in **Appendix 4.4**.

### ***Project Impacts and Mitigation Measures***

The proposed project consists of the development of approximately 40,000 gross square feet of laboratory, office and interaction space centrally located in the LBNL hill site. The proposed project would be operational in 2013 and would have a total daily population of about 60 researchers. About 40 of these researchers would be relocated to the project site from existing campus buildings in the northeastern portion of the UC Berkeley campus at short distance from LBNL, 10 of the researchers would be relocated to the project site from other locations on the LBNL hill site, and 10 researchers would be new to the site. As noted in **Section 3.0**, some of the relocating UC Berkeley researchers already travel to the LBNL hill site in the course of the day in order to use LBNL user facilities and collaborate with researchers at LBNL.

Therefore, vehicle trips associated with some of the relocating researchers are already occurring and do not represent new vehicle trips (and therefore new GHG emissions). However, conservatively all trips associated with the relocating researchers are considered new trips in this analysis.

**SERC Impact GHG-1: Project development would generate greenhouse gas emissions, either directly or indirectly, that would not have a significant impact on the environment. (*Less than significant*)**

### *Construction Impacts*

Construction of the proposed project would result in one-time emissions of greenhouse gases. The primary greenhouse gases during construction are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. These emissions are the result of fuel combustion by construction equipment and motor vehicles. The other GHGs defined by state law (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) are typically associated with specific industrial sources and processes and would not be emitted during construction of the proposed project. The URBEMIS2007 Environmental Management Software was used to estimate the construction-related CO<sub>2</sub> emissions. Construction of the proposed project is anticipated to commence in mid 2011 and be completed by mid 2013. Construction activities would include grading/excavation, trenching, building construction, asphalt paving, and architectural coating. UC LBNL provided a preliminary schedule for construction and grading amounts. Grading would include the export of 13,000 cubic yards of soil. The default construction equipment and vehicle mixes generated by URBEMIS2007 were assumed for grading, building construction, and asphalt paving. The number of vendor trips (e.g., transport of building materials) and worker tips were based on default values in the URBEMIS2007 model. URBEMIS2007 only calculates CO<sub>2</sub> emissions and does not provide estimates of other GHGs associated with combustion (i.e., CH<sub>4</sub> and N<sub>2</sub>O). Therefore, in order to account for emissions of these compounds, the following adjustments were made to the URBEMIS2007 emission calculations to convert CO<sub>2</sub> emissions to a CO<sub>2</sub>e basis:

- **Construction Off-Road and On-Road Equipment.** The CO<sub>2</sub> emissions associated with off-road and on-road equipment were multiplied by a factor based on the assumption that CO<sub>2</sub> represents approximately 99.1 and 99.9 percent, respectively, of the CO<sub>2</sub>e emissions. These assumptions were derived from the California Climate Action Registry (CCAR 2009) and the California Energy Commission (CEC 2002).
- **Motor Vehicles (Workers).** The CO<sub>2</sub> emissions associated with construction-related worker trips were multiplied by a factor based on the assumption that CO<sub>2</sub> represents 95 percent of the CO<sub>2</sub>e emissions associated with passenger vehicles, which account for most of the project-related trips (U.S. EPA 2005). The 95 percent factor accounts for CH<sub>4</sub>, N<sub>2</sub>O and fugitive GHG emissions associated with mobile source air conditioning equipment.

The BAAQMD does not have a quantitative threshold of significance for construction-related GHG emissions. However, the *CEQA Air Quality Guidelines* requires the Lead Agency to quantify and disclose GHG emissions that would occur during construction. **Table 4.4-4, Estimated Construction Greenhouse Gas Emissions** shows a summary of total estimated GHG emissions from the construction of the proposed project. Given the low numbers and one-time emissions, the effect from the proposed project's construction would not be substantial.

**Table 4.4-4**  
**Estimated Construction GHG Emissions**

<b>Construction Year</b>	<b>Emissions (Metric Tons CO<sub>2</sub>e/year)</b>
2011	155.66
2012	214.28
2013	113.12
<b>Total GHG Emissions</b>	<b>483.06</b>
<b>BAAQMD Threshold</b>	<b>None</b>

*Source: Impact Sciences, Inc. Emissions calculations are provided in Appendix 4.4.*

### ***Operational Impacts***

At full buildout, the proposed project would generate direct operational emissions of GHGs. These emissions—primarily CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O—would be the result of 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); however, these emissions are not quantified since they would only occur through accidental leaks. It is not possible to estimate the frequency of accidental leaks without some level of speculation. It should be noted that CARB has drafted a proposed “Regulation for Management of High Global Warming Potential Refrigerants” that would reduce emissions of these refrigerants from stationary refrigeration and air-conditioning systems 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 (CARB 2009b).

### **Non-Stationary Source Emissions**

Non-stationary sources of operational emissions associated with the proposed project include area sources (natural gas use in laboratories, landscape maintenance equipment, and periodic architectural



coating maintenance), motor vehicles, use of electricity in the proposed building, and emissions associated with water consumption, wastewater conveyance and treatment, and solid waste disposal.

Mobile source emissions were calculated using URBEMIS2007, based on trip generation rates provided by the traffic study for the proposed project (Fehr & Peers 2010). The CO<sub>2</sub> emissions associated with project-generated trips were multiplied by a factor based on the assumption that CO<sub>2</sub> represents 95 percent of the CO<sub>2e</sub> emissions associated with passenger vehicles, which account for most of the project-related trips (U.S. EPA 2005). Emission factors for GHGs due to electrical demand were obtained from CARB's *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories*, which contains GHG emission factors from utility providers in California (CARB 2008). The cited factors in the CARB report are based on data collected by the California Climate Action Registry. The emission factors take into account the current mix of energy sources used to generate electricity and the relative carbon intensities of these sources, and includes natural gas, coal, nuclear, large hydroelectric, and other renewable sources of energy. GHG emissions from water consumption are due to the electricity needed to convey, treat, and distribute water. The annual electrical demand factors for water demand were obtained from the California Energy Commission (CEC 2006b). GHG emissions from wastewater are due to the electricity needed to treat wastewater and the treatment process itself, which primarily releases CH<sub>4</sub> into the atmosphere. GHG emission factors for wastewater treatment were obtained from the U.S. EPA (U.S. EPA 1998a). GHG emissions from solid waste generation are due to the decomposition of organic material, which releases CH<sub>4</sub> into the atmosphere. GHG emission factors for solid waste generation were obtained from the U.S. EPA (U.S. EPA 1998b). The estimated annual electrical demand, water demand, wastewater generation, and solid waste generation for the proposed project were provided by UC LBNL.

### **Stationary Source Emissions**

The stationary sources of the proposed project include a 350 kilowatt emergency generator, two boilers, and a two-cell cooling tower. The operational stationary source emissions are associated mainly with the natural gas consumption in the boilers. Natural gas CO<sub>2</sub> emissions were estimated using URBEMIS2007. These emissions were estimated based on emission factors from the U.S. EPA. Emission factors for other GHGs due to natural gas combustion were obtained from the California Climate Action Registry General Reporting Protocol (CCAR 2009). As was done for the construction emissions, the direct operational emissions calculated using URBEMIS2007 were adjusted to account for emissions of CH<sub>4</sub> and N<sub>2</sub>O. The CO<sub>2</sub> emissions from natural gas consumption for the project were adjusted based on emission factors for CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O for natural gas combustion from URBEMIS2007 and the CCAR (CCAR 2009).

**Table 4.4-5, Estimated Operational Greenhouse Gas Emissions**, shows a summary of total estimated GHG emissions from operation of the proposed project and compares these to the BAAQMD significance thresholds.

**Table 4.4-5  
Estimated Operational GHG Emissions**

GHG Emissions Source	Emissions (Metric Tons CO <sub>2</sub> e/year)
<b>Non-Stationary Sources</b>	
Area Sources	160.65
Mobile Sources	87.55
Electricity	107.09
Water	4.47
Wastewater Treatment	1.45
Solid Waste	0.53
<b>Total Operational GHG Emissions</b>	<b>361.74</b>
<b>BAAQMD Threshold</b>	<b>1,100</b>
<b>Exceeds Threshold?</b>	NO
<b>Stationary Sources</b>	
Boilers	1,397.99
Emergency Generator	12.36
Cooling Tower	0.00
<b>Total Stationary Source Emissions</b>	<b>1,410.35</b>
<b>BAAQMD Threshold</b>	<b>10,000</b>
<b>Exceeds Threshold?</b>	NO

*Source: Impact Sciences, Inc. Emissions calculations are provided in Appendix 4.4.*

As shown in **Table 4.4-5**, the proposed project's operational emissions would not exceed the threshold of 1,100 MTCO<sub>2</sub>e for land use development projects and 10,000 MTCO<sub>2</sub>e for stationary sources. The project's impact would be less than significant.

The project would also have an indirect impact on GHG emissions through the removal of 19 existing trees on the site during construction. Trees and other vegetation act as carbon sinks, removing CO<sub>2</sub> from the atmosphere and sequestering it within their mass as they grow. Removal of the trees would result both in the loss of the sequestering potential as well as the likely release of the currently sequestered

carbon back into the atmosphere. However, the total impact on emissions would be very small due to the small size (8 inch or less trunk diameters) and limited number of trees. In addition, because the trees are not located on forested lands, the removal of these trees would not interfere with the State's efforts to reduce GHG emissions in accordance with CARB's Scoping Plan (see **Table 4.4-3**, Scoping Plan Measure SPM-16: Sustainable Forests). Furthermore, any impact due to the removal of the trees would be partially offset by the planting of new trees or other vegetation as part of the landscaping of the proposed project and the planting of replacement trees at a minimum ratio of 1:1 in compliance with LBNL's standard procedures. Consequently, the potential impact due to the removal of the existing trees would be less than significant for this project individually and cumulatively with other projects that would remove or reduce vegetation.

**Mitigation Measure:** No mitigation measure is required.

**SERC Impact GHG-2:** **The proposed project would not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. (*Less than Significant*)**

#### **Consistency with LBNL and University of California Plans**

The BAAQMD encourages local governments to adopt a qualified GHG Reduction Strategy that is consistent with AB 32 goals. If a project does not conflict with an adopted qualified GHG Reduction Strategy that meets the standards laid out in the BAAQMD *CEQA Air Quality Guidelines*, it can be presumed that the project will not have significant GHG emission impacts.

The UC LBNL is in the process of preparing a climate action plan (CAP) that would estimate and report the LBNL hill site GHG emissions and identify strategies that would be implemented by UC LBNL to reduce emissions of GHGs. However the CAP is not complete at this time and has not been adopted. Therefore, the proposed SERC project's consistency with the LBNL CAP cannot be evaluated. There are no other CAPs or other GHG-related regional plans that are applicable to the proposed project and can be used to evaluate the project's consistency.

The UC Policy on Sustainable Practices is relevant to the proposed SERC project. The project would be consistent with this policy. The proposed project is being designed to exceed Title 24 standards by at least 20 percent. The project would be designed with green building strategies with a goal of achieving a Leadership in Energy and Environmental Design (LEED) Gold rating from the U.S. Green Building Council, with a LEED Silver rating as a minimum achievement. LEED is a certification system for using strategies aimed at improving energy savings, water efficiency, and CO<sub>2</sub> emissions reduction. LEED is based on a point system and can award as much as 100 points for energy savings, water efficiency, CO<sub>2</sub>

emissions reduction, and innovation in design strategies. A LEED Silver rating is awarded 50 to 59 points. Labs 21 approach has been taken in designing the SERC facility. In addition to many LEED related items that are being incorporated into SERC, the SERC HVAC system is being designed to include minimum to no reheating, a recovery variable air volume system, electronic filters for the airstream, and low pressure drop components, etc. Lighting system is being designed to utilize daylight harvesting, LED fixtures where appropriate, etc.

The proposed SERC project would also be built consistent with the 2006 LRDP planning principles and design guidelines that would reduce GHG emissions by the implementation of *Green Building Designs* (reducing energy and water demand, and material consumption), vehicle access, circulation, and parking strategies (reducing single-occupant vehicle use, increasing public transit use, and encouraging bicycle use and walking as modes of transportation), and open space and landscape strategies that would reduce water demand. Consistent with the 2006 LRDP planning principles, the SERC building would be in close proximity to a shuttle stop and employees would be encouraged to participate in the LBNL employee ride share program. The project would also supply bicycle racks and shower facilities, reduce the amount of parking spaces at the site from 35 to 26 spaces, include native drought-tolerant plants, would not increase the amount of impervious surfaces at the site, and would include a planted roof over a portion of the SERC building. Because the proposed project is consistent with the UC Policy on Sustainable Practices and the 2006 LRDP, and as reported in SERC Impact GHG-1 above, the project's operational emissions would be substantially below the BAAQMD thresholds for land use projects and stationary source projects, the proposed project would have a less than significant impact on global climate.

#### **Consistency with Statewide Plans**

The goal of AB 32 is to reduce statewide GHG emissions to 1990 levels by 2020. Various state offices have provided recommended measures that would assist lead agencies in determining consistency with the State's GHG reduction goals. The California Attorney General's Office (AGO) has stated that lead agencies can play an important role in "moving the State away from 'business as usual' and toward a low-carbon future" (AGO 2008). The AGO has released a guidance document that provides information to lead agencies that may be helpful in carrying out their duties under CEQA with respect to GHGs and climate change impacts. Provided in the document are measures that can be included as project design features, required changes to the project, or mitigation measures at the project level and at the general-plan level. The measures are not intended to be exhaustive and may not be appropriate for every project or general plan. The AGO affirms that "the decision of whether to approve a project—as proposed or with required changes or mitigation—is for the local agency, exercising its informed judgment in compliance with the law and balancing a variety of public objectives."

The proposed project is generally consistent with the goals of AB 32 and would not conflict with the State's ability to meet the goals of AB 32, including the draft reduction targets under SB 375. Consistency with other specific AB 32 programs and regulations cannot be determined at this point because CARB has not yet fully developed regulations to achieve all of the reductions called for in the Scoping Plan measures. Furthermore, AB 32 measures are generally applied at the state level and are largely not under the jurisdiction of local agencies, with the exception of measures applicable to local governments (e.g., measures related to SB 375), which CARB and the MPOs have begun to develop as previously discussed.

The project's consistency with the applicable AGO's recommended project level strategies is evaluated below in **Table 4.4-6, Consistency with Attorney General's Office Project-Level Strategies**. The sustainable policies and project design features included in the project are evaluated relative to the key recommended strategies.

**Table 4.4-6  
Consistency with Attorney General's Office Project-Level Strategies**

Strategy	Project Consistency/Comment
<b>Energy Efficiency</b>	
<b>AGO-1:</b> Incorporate green building practices and design elements.	<b>Consistent.</b> The project would be designed with green building strategies with a goal of achieving a LEED Gold rating from the U.S. Green Building Council, with a LEED Silver rating as a minimum achievement. LEED is a certification system for using strategies aimed at improving energy savings, water efficiency, and CO <sub>2</sub> emissions reduction. LEED is based on a point system and can award as much as 100 points for energy savings, water efficiency, CO <sub>2</sub> emissions reduction, and innovation in design strategies. In addition to many LEED related items that are being incorporated into SERC, the SERC HVAC system is being designed to include minimum to no reheating, a heat recovery variable air volume system, electronic filters for the airstream, and low pressure drop components, etc. The lighting system is being designed to utilize daylight harvesting, LED fixtures where appropriate, etc.
<b>AGO-2:</b> Meet recognized green building and energy efficiency benchmarks.	<b>Consistent.</b> See consistency with AGO-1 above.
<b>AGO-3:</b> Install energy efficient lighting (e.g., light emitting diodes (LEDs)), heating and cooling systems, appliances, equipment, and control systems.	<b>Consistent.</b> See consistency with AGO-1 above.

Strategy	Project Consistency/Comment
<p><b>AGO-4:</b> Use passive solar design, e.g., orient buildings and incorporate landscaping to maximize passive solar heating during cool seasons, minimize solar heat gain during hot seasons, and enhance natural ventilation. Design buildings to take advantage of sunlight.</p>	<p><b>Consistent.</b> See consistency with AGO-1 above.</p>
<p><b>AGO-5:</b> Install light colored “cool” roofs and cool pavements.</p>	<p><b>Consistent.</b> The proposed project would not increase the amount of impervious surfaces at the site, and would include a planted roof over a portion of the SERC building. In addition, see consistency with AGO-1 above.</p>
<p><b>AGO-6:</b> Install efficient lighting, (including LEDs) for traffic, street and other outdoor lighting.</p>	<p><b>Consistent.</b> See consistency with AGO-1 above.</p>
<p><b>AGO-7:</b> Reduce unnecessary outdoor lighting.</p>	<p><b>Consistent.</b> See consistency with AGO-1 above.</p>
<p><b>AGO-8:</b> Use automatic covers, efficient pumps and motors, and solar heating for pools and spas.</p>	<p><b>Not Applicable.</b> The proposed project does not include pools or spas.</p>
<p><b>AGO-9:</b> Provide education on energy efficiency to residents, customers and/or tenants.</p>	<p><b>Consistent.</b> Implementation of the project itself would result in the development of a facility with the goal of researching the science and technologies that would allow the use of sunlight to create energy sources. The research that would be conducted at the research center would focus on developing a materials-based analog to the photosynthetic process found in nature, using nanoscale solar cells and electrical systems to collect sunlight and supply electrical currents that would be used to drive fuel-forming chemical reactions. This research is expected to address major scientific barriers in solar fuel generation. The research would also be directed towards new solar fuel generators that incorporate the photovoltaics and electrochemical processes described above and transform water and carbon dioxide to produce fuels with high energy density and virtually no constraint on abundance.</p>
<p><b>Renewable Energy and Energy Storage</b></p>	
<p><b>AGO-10:</b> Meet “reach” goals for building energy efficiency and renewable energy use.</p>	<p><b>Consistent.</b> The proposed project would be consistent with the applicable portions of the UC Policy on Sustainable Practices, which would likely result in cross-regional efficiencies in GHG reductions investments across the UC system.</p>
<p><b>AGO-11:</b> Install solar, wind, and geothermal power systems and solar hot water heaters.</p>	<p><b>Consistent.</b> The proposed project would include a solar power system for heating water.</p>
<p><b>AGO-12:</b> Install solar panels on unused roof and ground space and over carports and parking areas.</p>	<p><b>Not Applicable.</b> A solar water heating system would be installed on the roof of the facility, but adequate space for solar panels is not available on the ground or over parking areas.</p>

Strategy	Project Consistency/Comment
AGO-13: Where solar systems cannot feasibly be incorporated into the project at the outset, build "solar ready" structures.	<b>Consistent.</b> The proposed project would include a solar power system for heating water.
AGO-14: Incorporate wind and solar energy systems into agricultural projects where appropriate.	<b>Not Applicable.</b> The proposed project does not include agricultural land uses.
AGO-15: Include energy storage where appropriate to optimize renewable energy generation systems and avoid peak energy use.	<b>Not Applicable.</b> The proposed project would not include energy storage.
AGO-16: Use on-site generated biogas, including methane, in appropriate applications.	<b>Not Applicable.</b> The proposed project would not generate biogas.
AGO-17: Use combined heat and power (CHP) in appropriate applications.	<b>Not Applicable.</b> The proposed project would not include a cogeneration facility.
<b>Water Conservation and Efficiency</b>	
AGO-18: Incorporate water-reducing features into building and landscape design.	<b>Consistent.</b> See consistency with AGO-1 above.
AGO-19: Create water-efficient landscapes.	<b>Consistent.</b> See consistency with AGO-1 above.
AGO-20: Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls and use water-efficient irrigation methods.	<b>Consistent.</b> See consistency with AGO-1 above.
AGO-21: Make effective use of graywater. (Graywater is untreated household waste water from bathtubs, showers, bathroom wash basins, and water from clothes washing machines. Graywater to be used for landscape irrigation.)	<b>Not Applicable.</b> The laboratory nature of the proposed project would not make it a viable candidate for effective use of graywater and it is not planned for the proposed project.
AGO-22: Implement low-impact development practices that maintain the existing hydrology of the site to manage storm water and protect the environment.	<b>Consistent.</b> The proposed project would result in a less than significant impact on hydrology and storm water (see <b>Section 4.6, Hydrology and Water Quality</b> ).
AGO-23: Devise a comprehensive water conservation strategy appropriate for the project and location.	<b>Consistent.</b> See consistency with AGO-1 above.

Strategy	Project Consistency/Comment
AGO-24: Design buildings to be water-efficient. Install water-efficient fixtures and appliances.	<b>Consistent.</b> See consistency with AGO-1 above.
AGO-25: Offset water demand from new projects so that there is no net increase in water use.	<b>Generally Consistent.</b> The proposed project would incorporate LEED measures that would reduce water demand (see consistency with AGO-1 above). The project-related demand for water supply, including water delivery for the purposes of firefighting, would not result in the need for new or upgraded water facilities. In addition, the proposed project would not result in the need for distribution system improvements because the increased need for chilled water and steam would be accommodated by cooling towers and boilers installed on site.
AGO-26: Provide education about water conservation and available programs and incentives.	<b>Consistent.</b> See consistency with AGO-9 above.
<b>Solid Waste Measures</b>	
AGO-27: Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).	<b>Consistent.</b> Construction waste will be reused and recycled consistent with UC Policy on Sustainable Practices.
AGO-28: Integrate reuse and recycling into residential industrial, institutional and commercial projects.	<b>Consistent.</b> The proposed project would provide recycling in accordance with LBNL policy.
AGO-29: Provide easy and convenient recycling opportunities for residents, the public, and tenant businesses.	<b>Consistent.</b> The proposed project, as part of the larger LBNL hill site, would educate, encourage recycling and waste reduction, and provide recycling opportunities in accordance with the UC Policy on Sustainable Practices.
AGO-30: Provide education and publicity about reducing waste and available recycling services.	<b>Consistent.</b> The proposed project, as part of the larger LBNL hill site, would educate, encourage recycling and waste reduction, and provide recycling opportunities in accordance with the UC Policy on Sustainable Practices.
<b>Land Use Measures</b>	
AGO-31: Ensure consistency with “smart growth” principles – mixed-use, infill, and higher density projects that provide alternatives to individual vehicle travel and promote the efficient delivery of services and goods.	<b>Consistent.</b> The proposed SERC facility is an infill project on the LBNL hill site. It would be constructed centrally within LBNL at the site of Buildings 25 and 25A.
AGO-32: Meet recognized “smart growth” benchmarks.	<b>Consistent.</b> See consistency with AGO-1 and AGO-31 above.
AGO-33: Educate the public about the many benefits of well-designed, higher density development.	<b>Consistent.</b> The proposed project, as part of the larger LBNL hill site, would provide education on the benefits of well-designed higher density developments in accordance with the UC Policy on Sustainable Practices.



Strategy	Project Consistency/Comment
AGO-34: Incorporate public transit into the project's design.	<b>Consistent.</b> The proposed project would integrate the facility into the existing LBNL hill site and create enhanced links for connectivity to the adjacent facilities. Public transportation would be available through the LBNL shuttle system. The shuttle route that runs off-site to UC Berkeley and the City of Berkeley would provide access to the site through the stop on McMillan Road at the intersection with Medical Road near the northwest corner of the project site. SERC researchers would be encouraged to participate in the LBNL employee ride share program. The project would also supply bicycle racks and shower facilities.
AGO-35: Preserve and create open space and parks. Preserve existing trees, and plant replacement trees at a set ratio.	<b>Consistent.</b> The proposed project would require the planting of new trees or other vegetation as part of site landscaping. The planting of replacement trees will occur at a minimum ratio of 1:1 in compliance with LBNL's standard procedures.
AGO-36: Develop "brownfields" and other underused or defunct properties near existing public transportation and jobs.	<b>Consistent.</b> The proposed SERC facility is an infill project on the LBNL hill site. It would be constructed centrally within LBNL at the site of Buildings 25A, 44, 44A, and 45.
AGO-37: Include pedestrian and bicycle facilities within projects and ensure that existing non-motorized routes are maintained and enhanced.	<b>Consistent.</b> See consistency with AGO-34 above.
<b>Transportation and Motor Vehicles</b>	
AGO-38: Meet an identified transportation-related benchmark.	<b>Consistent.</b> As shown in <b>Table 4.4-5</b> above, the proposed project would result in transportation-related GHG emissions that would be considered less than significant under the BAAQMD thresholds of significance.
AGO-39: Adopt a comprehensive parking policy that discourages private vehicle use and encourages the use of alternative transportation.	<b>Consistent.</b> The proposed project would integrate the facility into the existing LBNL hill site and create enhanced links for connectivity to the adjacent facilities. Public transportation would be available through the LBNL shuttle system. The shuttle route that runs off-site to UC Berkeley and the City of Berkeley would provide access to the site through the stop on McMillan Road at the intersection with Medical Road near the northwest corner of the project site. SERC researchers would be encouraged to participate in the LBNL employee ride share program. The project would also supply bicycle racks and shower facilities.
AGO-40: Build or fund a major transit stop within or near the development.	<b>Not Applicable.</b> The proposed project would utilize the existing transit network and existing shuttle services to provide alternative transportation modes.
AGO-41: Provide public transit incentives such as free or low-cost monthly transit passes to employees, or free ride areas to residents and customers.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-42: Promote "least polluting" ways to connect people and goods to their destinations.	<b>Consistent.</b> See consistency with AGO-39 above.

Strategy	Project Consistency/Comment
AGO-42: Incorporate bicycle lanes, routes and facilities into street systems, new subdivisions, and large developments.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-43: Require amenities for non-motorized transportation, such as secure and convenient bicycle parking.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-44: Ensure that the project enhances, and does not disrupt or create barriers to, non-motorized transportation.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-45: Connect parks and open space through shared pedestrian/bike paths and trails to encourage walking and bicycling. Create bicycle lanes and walking paths directed to the location of schools, parks and other destination points.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-46: Work with the school districts to improve pedestrian and bike access to schools and to restore or expand school bus service using lower-emitting vehicles.	<b>Not Applicable.</b> The proposed project is not located along pedestrian or bus routes to primary or secondary schools.
AGO-47: Institute teleconferencing, telecommute and/or flexible work hour programs to reduce unnecessary employee transportation.	<b>Consistent.</b> The proposed project would allow employees to access certain appropriate information remotely (e.g., via the internet).
AGO-48: Provide information on alternative transportation options for consumers, residents, tenants and employees to reduce transportation-related emissions.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-49: Educate consumers, residents, tenants and the public about options for reducing motor vehicle-related greenhouse gas emissions. Include information on trip reduction; trip linking; vehicle performance and efficiency (e.g., keeping tires inflated); and low or zero-emission vehicles.	<b>Consistent.</b> See consistency with AGO-39 above.
AGO-50: Purchase, or create incentives for purchasing, low or zero-emission vehicles.	<b>Consistent.</b> The proposed project would purchase vehicles if necessary, in accordance with UC policies.

Strategy	Project Consistency/Comment
<p><b>AGO-51:</b> Create a ride sharing program. Promote existing ride sharing programs e.g., by designating a certain percentage of parking spaces for ride sharing vehicles, designating adequate passenger loading and unloading for ride sharing vehicles, and providing a web site or message board for coordinating rides.</p>	<p><b>Not Applicable.</b> The proposed project would utilize the existing transit network, existing shuttle services, and existing ride sharing programs to provide alternative transportation modes.</p>
<p><b>AGO-52:</b> Create or accommodate car sharing programs, e.g., provide parking spaces for car share vehicles at convenient locations accessible by public transportation.</p>	<p><b>Not Applicable.</b> The proposed project would utilize the existing transit network, existing shuttle services, and existing ride sharing programs to provide alternative transportation modes.</p>
<p><b>AGO-53:</b> Provide a vanpool for employees.</p>	<p><b>Not Applicable.</b> The proposed project would utilize the existing transit network and existing shuttle services to provide alternative transportation modes.</p>
<p><b>AGO-54:</b> Create local “light vehicle” networks, such as neighborhood electric vehicle systems.</p>	<p><b>Not Applicable.</b> The proposed project would utilize the existing transit network, existing shuttle services, and existing ride sharing programs to provide alternative transportation modes.</p>
<p><b>AGO-55:</b> Enforce and follow limits idling time for commercial vehicles, including delivery and construction vehicles.</p>	<p><b>Consistent.</b> Vehicle and equipment idling would be subject to the limits under California Air Resources Board and/or BAAQMD regulations.</p>
<p><b>AGO-56:</b> Provide the necessary facilities and infrastructure to encourage the use of low or zero-emission vehicles.</p>	<p><b>Not Applicable.</b> The proposed project would utilize the existing transit network, existing shuttle services, and existing ride sharing programs to provide alternative transportation modes to, from, and within the campus. The project also includes design features that would reduce vehicle trips (see consistency with AGO-39 above).</p>
<p><b>Agriculture and Forestry</b></p>	
<p><b>AGO-57:</b> Require best management practices in agriculture and animal operations to reduce emissions, conserve energy and water, and utilize alternative energy sources, including biogas, wind and solar.</p>	<p><b>Not Applicable.</b> The proposed project does not include agricultural land uses.</p>
<p><b>AGO-58:</b> Preserve forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas and other open space that provide carbon sequestration benefits.</p>	<p><b>Not Applicable.</b> The proposed project does not include agricultural land uses or forested lands.</p>

Strategy	Project Consistency/Comment
<b>AGO-59:</b> Protect existing trees and encourage the planting of new trees. Adopt a tree protection and replacement ordinance.	<b>Consistent.</b> The proposed project would require the planting of new trees or other vegetation as part of site landscaping. The planting of replacement trees will occur at a minimum ratio of 1:1 in compliance with LBNL's standard procedures.

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As shown in **Table 4.4-6**, above, the project complies with the AGO's strategies. The project would not conflict with state and local plans adopted for reducing GHG emissions. The project would facilitate research that would help the State achieve its GHG reduction goals. Research conducted in the SERC facility would focus on development of efficient alternative fuel sources to harness solar power, which would help reduce reliance on fossil fuels and their associated contribution to global climate change.

**Mitigation Measure:** No mitigation measure is required.

#### 4.4.5 References

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