3.0 PROJECT DESCRIPTION

3.1 INTRODUCTION

The section presents the details of the proposed Solar Energy Research Center (SERC) project in terms of the need for the project and its objectives, the facility’s various components and design features, the population associated with the proposed project, and construction schedule and activities.

The University of California at Lawrence Berkeley National Laboratory (UC LBNL) is proposing to construct an approximately 40,000-gross-square-foot (gsf), three-story research facility that would accommodate research focused on developing fuels from sunlight using nanoscale photovoltaic and electrochemical solar energy systems.

3.2 Research Program Goals and Program Elements

The goal of SERC is to develop the science and technology that would allow the use of sunlight alone as the energy source to create fuels from atmospheric carbon dioxide and water. There are several fuels that might be generated from this research, including hydrogen, hydrocarbons, ethanol, and methanol.

Currently, 80 to 85 percent of energy used around the world comes from fossil fuels. As a consequence, non-renewable fossil fuels are being depleted at high rates, making it imperative for humans to identify and develop new sources of energy. Furthermore, global use of fossil fuels has grown to the point where the by-products of energy consumption appear to be significantly affecting the earth’s atmosphere and climate. Transportation is a major sector of the world economy that is highly dependent on fossil fuels and is a significant contributor of emissions that may be contributing substantially to global climate change. The proposed SERC would house research that would explore ways to develop and improve the production of fuels obtained from solar energy, focusing especially on those fuels that could be used as transportation fuel. This would serve both to reduce the dependence on fossil fuels and aid in the effort to halt or reverse global climate change.

The research that would be conducted at SERC 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 process is called artificial photosynthesis (AP) because of its similarity to the microscopic processes in a leaf. In artificial photosynthesis, the energy of incident sunlight is stored as chemical energy in a fuel; the energy is released and used when the fuel is burned and carbon dioxide is released. The net process is carbon-neutral.
As envisioned, the chemical reactions would convert water and carbon dioxide into a high-energy-density fuel that could be stored, transported, and used for transportation or other applications. The entire process would take place in a single reactor (termed a photoelectrochemical, or PEC, cell) that would collect sunlight and would be the site of the reactions involving water and ambient carbon dioxide. This research is expected to address major scientific barriers in solar fuel generation. Successful establishment of artificial photosynthesis as a large scale process will require advances in science that will likely have beneficial spin-offs in other areas, including more efficient and inexpensive solar panels and green chemistry.

It is anticipated that the SERC facility would house the following research programs:

- **Nanoscale Photovoltaic and Electrochemical Systems Research.** This research would develop high-efficiency, discrete, individual nano-scale photovoltaic and electrochemical systems using abundant elements with emphasis on materials that can be incorporated into the synthesis of complete solar fuel generators. These systems would use feedstocks of water and atmospheric carbon dioxide (CO₂). New chemical processes, including complex new catalysts that may mimic those in nature, would be developed. This research would address major scientific barriers in solar fuel generation.

- **Synthesis of Complete Solar Fuel Generators.** This research would 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.

The SERC would require multi-disciplinary laboratories focused on solar-to-electrical energy and solar-to-chemical energy. Wet research laboratories (fume hoods with direct ventilation and specialized piped utilities) and vibration-sensitive imaging and laser equipment would be required to conduct the proposed research and therefore are included in the proposed facility. The laboratory space would also need to be adaptable to a variety of functions to accommodate new technology and different research programs.

### 3.3 PROJECT NEED AND OBJECTIVES

Research aimed at developing and improving the production of fuels obtained from solar energy is currently undertaken at a number of locations on the UC Berkeley campus and on the LBNL hill site. Several of the researchers conducting this research are currently dispersed in a number of laboratories in the Chemistry, Chemical Engineering, Materials Sciences and Engineering, and Physics Department buildings on the UC Berkeley campus while others are located on the LBNL hill site. The purpose of the proposed project is to consolidate these researchers in one facility in order to foster collaboration and interaction and to facilitate growth in the research programs described above.
Another major consideration for the proposed project is easy access to LBNL’s major user facilities such as the experimental capabilities of the current and future soft x-ray based facilities of the Advanced Light Source (ALS), the Molecular Foundry and its specialized nanomaterials synthesis and characterization, the unique microscopic visualization and imaging in the National Center for Electron Microscopy (NCEM), and the computer services of the National Energy Research Supercomputing Center (NERSC) once it is located at LBNL. The UC Berkeley researchers currently travel back and forth between the campus and the LBNL hill site in order to access these user facilities. The SERC researchers will not only use these facilities but will also partner with staff from NCEM, ALS, and Molecular Foundry to conduct advanced research, and the SERC staff, users of enormous state-of-the art computing, will serve as a testing site for new computer systems that are installed by NERSC. Being physically close to these facilities will be beneficial for scientific collaboration and access.

Consolidation of the researchers and close location to these services would result in better communication and partnering and fewer trips up and down from UC Berkeley campus for the researchers for meetings and facility use. Furthermore, the principal investigators in the SERC research programs are anticipated to hold joint appointments as UC LBNL researchers and UC Berkeley professors.

The SERC project is therefore proposed to be located in the Old Town portion of the LBNL hill site in order to consolidate research programs focused on solar energy in one facility to remove the constraints to intellectual exchange and collaboration resulting from the dispersed locations of the programs and the LBNL and UC Berkeley researchers; allow for an expansion of the research programs; and to reduce the loss of time involved in travel between the campus and the user facilities at LBNL.

Although the SERC facility is proposed by the University of California and not the U.S. Department of Energy (DOE), the proposed project is consistent with the overarching mission of the DOE which is to advance the national, economic, and energy security of the United States and to promote scientific and technological innovation in support of that mission at its national laboratories, including at the LBNL site.

Key objectives of the proposed project are to:

- Consolidate existing LBNL and UC Berkeley solar energy research programs in one facility in close proximity to the unique user facilities at the LBNL hill site that will be used by the SERC program researchers, in partnership with the researchers currently located in those LBNL facilities, including the National Center for Electron Microscopy, the Molecular Foundry, the Advanced Light Source and the proposed computing facilities of NERSC (for which the proposed SERC facility will serve as a testing site for new computer systems);

- Locate the SERC facility so as to optimally draw upon the intellectual, technological, and material resources of the DOE LBNL programs and facilities, the primary focus of which is energy research;
3.0 Project Description

- Minimize travel between the UC Berkeley campus and the LBNL hill site to allow SERC researchers to conduct research at LBNL while maintaining their teaching and research activities on the UC Berkeley campus;

- Avoid duplication of facilities and remove the physical constraints to intellectual exchange and collaboration that has resulted from the dispersed program locations; and

- Provide an integrated, economical and appropriately designed facility for high-level research in solar energy sources and technologies that will become a benchmark for energy-efficiency in future similar building types.

3.4 PROJECT LOCATION AND SURROUNDING USES

LBNL is situated in the eastern hills of the cities of Berkeley and Oakland in Alameda County, and is located on approximately 200 acres that are owned by the University of California (see Figure 3.0-1, Regional Location). The LBNL hill site is surrounded by open space, institutional uses, and residential and neighborhood commercial areas. UC Berkeley’s main campus and its Hill Campus, including the Strawberry Canyon open space areas, lie south of the LBNL hill site. Residential neighborhoods and a small neighborhood commercial area in the City of Berkeley lie to the west, and regional open space, including the 2,000-acre Tilden Regional Park, lies to the northeast.

The proposed SERC project would be centrally located on the LBNL site at the current location of Buildings 25A, 44, 44A, and 44B (see Figure 3.0-2, LBNL Site). These buildings currently house a total of 17 employees. Building 25A is currently used as the Energy and Environmental Technology Division Shops and Lab, Building 44 is used for storage, and trailers 44A and 44B are used as offices. The existing buildings are expected to be decontaminated and demolished as part of the approved Old Town Demolition and Environmental Restoration project prior to commencement of construction of the SERC project. The project site is located east of Building 5, south of McMillan Road, west of the Health Center (Building 26), and north of Building 25 and a 0.25-acre redwood grove. Surrounding research facilities include the Advanced Light Source, which is a national user facility that generates intense light for scientific and technological research, and will include the approved General Purpose Laboratory (GPL) which will be built at the site of Building 25/25B under the Seismic Phase 2 project. Other buildings in the general vicinity of the proposed SERC project, specifically Buildings 4, 5, 14, 16, 40, 41, and 52, are planned to be demolished under the Old Town Demolition and Environmental Restoration project.
Ernest Orlando Lawrence
Berkeley National Laboratory

Shuttle Route
Lab Buildings
Parking Lot
City Boundaries

Legend:

Project Boundary

NOT TO SCALE


FIGURE 3.0-2
The project site is approximately 1.5 acres and would be vacant following demolition of Buildings 25A, 44, 44A, and 44B under the Old Town Demolition and Environmental Restoration project (see Figure 3.0-3, Project Site). The site has been heavily disturbed by construction and uses associated with the existing buildings.

3.5 PROJECT CHARACTERISTICS

The proposed project includes the construction of a new building, modification of a service road and McMillan Road, reconfiguration of parking surrounding the building, and minor modifications to utilities to serve the project. The project components are shown on Figure 3.0-4, Site Plan, and Figure 3.0-5, Cross Section of the Building Looking West, and described in detail below.

Proposed Building

The proposed research building would contain approximately 40,000 gsf of laboratory, office, and interaction space. There would be approximately 21,000 assignable square feet (asf)\(^1\) of space. The research facility would be a three-story building with three components: a plinth\(^2\) that would partially buried to minimize the building mass, a glazed office floor acting as a “breezeway” atop the plinth, and a space housing chemistry laboratories on the top level. Due to the shallow depths at which bedrock occurs at the project site (less than 10 feet below ground surface), it is anticipated that the building would be supported by a conventional spread footing foundation that bears directly on bedrock. The roof parapet wall would extend 34 feet above the entrance level on the east side of the building and approximately 50 feet above grade level on the downhill west side.

- Level One (partial basement) would be the largest level of the building with approximately 21,000 gsf of space; however, the apparent mass of this floor would be minimized as it would be mostly below grade and covered by greenery. Level One would house light and vibration-sensitive laboratory equipment and a mechanical room. Level One would include a laser spectroscopy lab, a membrane lab, a microwave and electro imaging lab, a PV/PEC characterization lab, an electronics lab, and a number of fabrication labs. Level One would have pedestrian access to the exterior space at the south end of the building via a landscaped stairway that would connect to the redwood grove and the proposed General Purpose Lab main courtyard. The loading and receiving area would also be located at this level and would be accessed by a reconfigured service road around the site.

- Level Two (the ground level) would be smaller with approximately 9,000 gsf of space. It would be the primary access level and would house most office and all common areas including the main lobby, gathering and seminar spaces, and a small kitchen. Level Two would be the most transparent floor, offering views out and allowing the green adjacent spaces to be part of the interior. The main entry

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1 Assignable square feet (asf) comprises the portion of building area assigned to or available for an occupant or specific use. Common areas such as restrooms, hallways, or mechanical space are excluded from asf.

2 The plinth is the solid base for anchoring the building.
located at the southeast corner of the building would create a node of pedestrian activity due to its proximity to the proposed General Purpose Lab.

- Level Three would contain approximately 10,000 gsf of space primarily occupied by wet chemistry laboratories. Biophysics, catalysis, and nano-interface and prototype development labs would be located on Level Three with views of exterior spaces and the surrounding terrain.

These levels would be connected via a “grand” stairway accessible from the entry lobby and would be the primary means of circulation in the building. A small penthouse (approximately 600 sq ft) on the roof is anticipated to house the heating and cooling equipment.

**Building Design Features**

The SERC facility design would incorporate 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. The mission of the design is to construct a building that is consistent with the proposed research and to implement practices during its construction and operation that reduce reliance upon fossil fuels. Some of the proposed design features include the use of low albedo material and minimization of paved areas to reduce the heat island effect, the use of material with high levels of recycled content, the use of regional material when available, the use of certified wood, and the provision of natural daylight and views in all offices and common areas.

The building would be oriented to maximize light from the north and south. To the north, the building would face steep hillside terrain that is typical of the LBNL hill site. To the south, the building would face the courtyard space that would be developed as part of the future approved General Purpose Lab, and the existing redwood grove. To the west there would be views of Oakland, Berkeley, and the San Francisco Bay. The building site is part of the Special Viewshed Zone, as indicated in the LBNL Design Guidelines. The proposed building would meet the height limitations of the Guidelines in order to preserve the views of the ALS building dome as a piece of architectural history and identity for the LBNL hill site and the greater community.

The exterior material of the building would be compatible with the surrounding buildings, and appropriate for the intended uses of the site. The exterior cladding is anticipated to include a mix of concrete, metal, glass, and wood. Exterior lighting features would include landscape lighting and building exterior lighting limited to exit doors and near outdoor equipment. Exterior lighting and lighting on the roof would have cut-off shielding to prevent light spill and light pollution per LEED requirements.
Project Site

FIGURE 3.0-3


APPROXIMATE SCALE IN FEET

Project Site

McMillan Road

Site Plan

FIGURE 3.0-4

SOURCE: LBNL – September 2010

APPROXIMATE SCALE IN FEET

Level 1: 21,000
Level 2: 9,000
Level 3: 10,000
Total: 40,000 GSF

924-007-08/10
Cross Section of the Building Looking West

SOURCE: LBNL – May 2010

FIGURE 3.0-5

APPROXIMATE SCALE IN FEET
Roadway and Pedestrian Access, On-Site Circulation, and Parking

Roadway Access

Automobile access to the site would be via McMillan Road and an existing service road (Medical Road). Medical Road is an existing one-lane service road that traverses the eastern edge of the project site, then turns west and then north, completing a loop and connecting back to McMillan Road. That road would become open to two-way traffic and modified to meet current fire code requirements. The SERC project would modify approximately 200 linear feet of Medical Road on the western side of the building, while modifications to the southern and eastern portions of Medical Road would be completed as part of the Seismic Phase 2 GPL project (see Figure 3.0-6, Potential Area of Disturbance). In the event that the Seismic Phase 2 GPL project is not implemented before the SERC project, the SERC project would modify the southern and eastern portions of Medical Road as well.

Parking

The project footprint would remove 35 existing parking spaces and replace them with 26 spaces. If feasible, up to nine additional new parking spaces would be created along McMillan Road in order to minimize the net loss of parking.

Bicycle Facilities

The proposed project includes bicycle spaces, showers, and locker rooms in order to encourage the use of bicycles for travel to the site. The planned bicycle spaces would meet the LEED requirement that bicycle parking be at least 5 percent of the total parking provided.

Pedestrian Facilities and Circulation

Pedestrian access to the project site is available from McMillan Road. Pedestrian access to the LBNL hill site is available from the Blackberry Canyon Entrance on Cyclotron Road or from the Strawberry Canyon Gate on Centennial Drive. Given the distance to UC Berkeley facilities, limited pedestrian facilities along Centennial Drive and Cyclotron Road, and hilly terrain, it is expected that few of the persons accessing the SERC facility would walk to the site.

There would be one main entrance and lobby on the south/east side of the building on Level Two, pedestrian access on the south/west side of the building on Level One, and a loading area on the west side of the building on Level One along the service road. A lobby area would be located at the main entrance on the second level. Pedestrian circulation throughout the project would be via the stairs located in the northeast corner of the building or by elevator located adjacent to the stairs.
Public Transportation

Public transportation would be available through the LBNL shuttle system. The shuttle route that currently runs off-site to UC Berkeley and the City of Berkeley would be expected to 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.

Landscaping and Tree Removal

The proposed building site is developed with buildings and pavement and contains approximately 10 trees, including acacia trees, an apple tree, and a redwood tree (trunk diameters of approximately 8 inches) and one large shrub. These trees would be removed for project construction. In addition, the reconfiguration of parking spaces along McMillan Road could result in the removal of approximately nine additional acacia trees. In the event that the SERC project is constructed prior to the Seismic Phase 2 GPL project, the SERC project would construct a storm drain through the hillside to the southeast of the project site which would result in the removal of one Coast live oak. In compliance with LBNL Standard Construction Specifications, trees removed from the project site would be replaced at a 1:1 ratio. The replacement trees would be planted on the project site or in other parts of the LBNL hill site and would be 48-inch box specimens (approximately 6-inch trunk diameter trees) or of a size that is recommended as appropriate by an arborist. Trees would be planted at a distance from the proposed building that meets the LBNL Fire Marshal’s defensible space requirements.

The proposed project site would be landscaped consistent with LBNL Construction Standards and Design Requirements. The landscaping would conform to and complement the existing character of planting in the broader area around the site. Drought-tolerant, low water use, and low fire fuel volume plant materials (mostly grasses) would be installed in areas disturbed during project construction. No lawn areas are proposed. Irrigation would be used on site for the first year in order to allow the plantings to establish.
Approximate Limit of Disturbance:

- GPL 1.5± ACRES
- SEIC 1.5± ACRES
- SEIC (ADDITIONAL IF GPL IS NOT BUILT) 0.4± ACRES

SOURCE: LBNL – April 2010
3.6 UTILITIES

The SERC project would comply with the UC Policy on Sustainable Practices.\(^3\) A project focus is to concentrate effort on energy savings. Energy efficiency measures being considered during design include a heat recovery system, an evaporative pre-cooling hybrid system, ultra low air pressure drop air handling units, and daylight harvesting. In addition to attaining the UC Policy requirement of outperforming the requirements of Title 24 by 20 percent, the proposed project includes a building design that would ensure outperformance of ASHRAE 90.1 standards by at least 30 percent.\(^4\)

Table 3.0-1, SERC Project Utility Demand, presents the project’s annual and peak demand for utilities.

<table>
<thead>
<tr>
<th>Utility</th>
<th>Peak Demand</th>
<th>Annual Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potable Water*</td>
<td>7,030 gpd</td>
<td>1.1 million gallons/year</td>
</tr>
<tr>
<td>Wastewater**</td>
<td>2,820 gpd</td>
<td>710,000 gallons/year</td>
</tr>
<tr>
<td>Electricity ***</td>
<td>380 kw per day</td>
<td>1,670 MWh/year</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>25 therms/hr</td>
<td>55,000 therms/year</td>
</tr>
</tbody>
</table>

Source: LBNL 2010

* Includes cooling tower make-up water, deionized water, cold water for research use, cold water for domestic use.

** Includes domestic wastewater and cooling tower blow down

*** Current electricity demand at Buildings 25A, 44, 44A, and 44B is 185 kw per day.

Potable and Fire Suppression Water

Potable water service (including water for fire suppression) for the SERC project would be supplied from an existing water main on the project site, which would be relocated to remove it from the building footprint, and a second existing water main in Medical Road to the west of the project site. Approximately 250 feet of the existing water main would be relocated, one additional fire hydrant would be installed, and approximately 50 feet of a new waterline would be installed on the project site to serve the SERC project.


\(^4\) ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) 90.1 is a building standard that provides minimum energy-efficient requirements for the design and construction of new buildings and their systems.
3.0 Project Description

Water demand for the SERC project is estimated to average about 5,760 gallons per day (gpd), with peak day demand estimated at 7,030 gpd. The annual demand, assuming recycling of water in the proposed cooling towers, is estimated to be about 1.1 million gallons per year. This includes demand for domestic water, fire water, laboratory water including de-ionized water, and cooling tower water. The proposed project includes high-efficiency fixtures and low-flow urinals which would reduce water demand.

Wastewater

Wastewater flows from the western portion of the LBNL hill site exit through sewer lines within Hearst Avenue that flow to the City of Berkeley’s sanitary sewer sub-basin 17-013. Wastewater flows from the southern and eastern portions of LBNL, hill portions of UC Berkeley, and the Panoramic Hill area in the City of Berkeley contribute to sub-basin 17-503. Wastewater flows from the SERC project would drain to sub-basin 17-013.

Stormwater

The proposed project would not substantially change the area of impervious surfaces at the project site as it is currently developed with Buildings 25A, 44, 44A, and 44B, paved parking areas, and the service road. However, the existing storm drain system downstream of the project site has insufficient capacity to handle storm water flows generated from the project site under current conditions. As part of the Seismic Phase 2 GPL project, a new storm drain, 125 feet in length, would be installed to the east of the site and would connect to an existing catch basin in Grizzly Station Road. The SERC project would also utilize the new storm drain via a short connection. In the event that the Seismic Phase 2 GPL project is not implemented before the SERC project, the SERC project would install the new storm drain. It is anticipated that small drains and a collection system would be utilized in the landscaping areas.

The basement walls for the new building would be drained through a subdrain collection system and an under-drainage system would be installed below the concrete floor slab of Level One of the building to intercept and drain away seepage. Due to the depth of the basement and the location of the available storm drains in the area, it is expected that the subdrain collection system would need to be pumped utilizing a small submersible pump contained within a 20-foot-deep manhole/vault. Groundwater that is collected would be tested for contamination, if required, treated if necessary, and appropriately disposed. Disposal options include, but are not limited to, injection into the ground water treatment system at the project site and disposal to storm drain system if the water is clean.
3.0 Project Description

Chilled and Hot Water Systems

Chilled water would be used for cooling building space and for laboratory use. A two-cell cooling tower would be installed on the roof of the building. The chilled water system would have a cooling load of approximately 240 tons, produced by two 120-ton high-efficiency centrifugal, water-cooled chillers. Domestic and industrial hot water would be produced through a system of solar collecting panels and heat exchangers for pre-heating and gas-fired boiler for final heating. Two 1.5 million-Btu/hour natural gas fired boilers are included in the project. All heating and cooling equipment would be installed in the rooftop mechanical room.

Energy Systems

Electricity

Both peak demand for and annual consumption of electricity for the proposed facility are reported in Table 3.0-1. As indicated in that table, annual electricity consumption is estimated at 1,670 MWh, which would be an increase of up to 860 MWh per year over current electricity consumption at the project site. This is a conservative estimate as it is calculated as 50 percent higher than the “best in class” rate for similar uses. Electrical power at the LBNL hill site is purchased from the Western Area Power Administration and delivered by the Pacific Gas and Electric (PG&E) transmission system to the Lab’s Grizzly Substation located adjacent to Building 77. The Grizzly Substation consists of two DOE-owned transformers with a combined capacity of 100 MW. This substation is exclusively for LBNL use. In addition, power can be supplied to LBNL from UC Berkeley’s Hill Area Substation, located adjacent to the Grizzly Substation. There is currently sufficient electrical capacity at LBNL to serve the proposed project.

The SERC project would connect to the new sectionalizing switches installed by the Seismic Phase 2 GPL project. In the event that the Seismic Phase 2 GPL project is not implemented before the SERC project, the SERC project would install the new sectionalizing switches and a 200-foot-long duct bank beneath Medical Road to the southwest of the project site.

Standby electrical power would be provided through a back-up generator located in close proximity to the building. A 350-kilowatt diesel generator with an 800-gallon, sub-base fuel storage tank would provide electricity to the building for up to 24 hours. The generator would be equipped with a silencer and a sound-attenuated enclosure to control noise and passive catalyzed diesel particulate filters (air purifiers) to reduce the engine exhaust air emissions.
Natural Gas

Natural gas would be required for use throughout the laboratories and in the boilers for heating. The natural gas supply is provided by the Defense Fuel Supply Center in Oregon and delivered by the PG&E system. The point of delivery is a meter vault in the hillside area above Cyclotron Road and below Building 88. A gas line distributes high pressure natural gas from PG&E’s metering vault to the buildings throughout the LBNL hill site. The SERC project would utilize a new gas main and a lateral installed as part of the Seismic Phase 2 GPL project. In the event that the Seismic Phase 2 GPL project is not implemented before the SERC project, the SERC project would install the gas main and lateral.

The proposed project would be designed consistent with the UC Policy for Sustainable Practices, which requires new buildings to outperform California Code of Regulations Title 24 standards by at least 20 percent, and design and build new buildings to a minimum standard equivalent to a LEED Silver rating. Energy measures being considered during design include a heat recovery system, an evaporative pre-cooling hybrid system, ultra low air pressure drop air handling units, and daylight harvesting.

Exhaust

All air exhausts would be located on the roof of the building. The project would include one common building exhaust system for both fume hoods and general exhaust. The exhaust system would consist of two exhaust fans. Each exhaust stack would extend approximately 30 feet above the roof. There would be a 14-foot parapet wall around the roof enclosing the exhaust system.

Up to 28 fume hoods would be installed in the SERC facility laboratories. Typical chemical fume hoods would be variable air volume hoods. Each fume hood would be equipped with an air flow sensor. Flammables and corrosives storage would take place in cabinets made for this service either beneath or adjacent to a fume hood, and cabinet vents would be connected to the hood exhaust system. Discharge from the fume hood exhaust would meet all applicable vertical velocity and stack height requirements.

Air intakes for the proposed project would be located in different areas along the roof. Potential air re-entrainment from the proximity of air exhausts and air intakes would be avoided through specific engineering and design, including wind-tunnel modeling during the detailed design phase of the proposed project.

Hazardous Waste

Hazardous waste generated at the SERC facility would be transported to the UC LBNL Hazardous Waste Handling Facility in Building 85/85A, which operates under a permit from the California Department of
Toxic Substances Control (DTSC). Waste management activities would be conducted in full compliance with all applicable local, State, and Federal requirements to assure proper accumulation, storage, treatment, and disposal. In addition, a variety of best management practices helps ensure these activities are conducted with minimal environmental impact.

3.7 CHEMICALS AND RESEARCH MATERIALS ON-SITE

Research that would be conducted in the proposed facility would involve a wide variety of research materials, including non-hazardous organic and inorganic materials, hazardous chemicals, and nano-scale materials. Nanomaterials and chemical use would occur in the laboratories assigned to nano-structures research located on Level Three.

Although the facility would primarily be an energy research facility and no research involving biohazardous materials is anticipated, the SERC facility would be built to safety standards that exceed the minimum requirements. In all portions of the building, primary and secondary barriers would be used to reduce or eliminate exposure of the laboratory environment and the outside environment to potentially hazardous agents. Primary barriers (biosafety cabinets and fume hoods) are designed to protect personnel and the laboratory environment from exposure to hazardous agents. Facility design criteria provide secondary barriers as a protection for personnel inside and outside the laboratory. Air changes would be implemented for worker safety. All lab facilities would maintain negative pressure, which would control the release of any airborne materials to non-lab areas via doors and other openings. The laboratory staff and researchers would be trained in the use of certified biosafety cabinets, autoclaving, and other specialized disinfection techniques, and biological materials handling protocols. The storage, handling, use and disposal of all hazardous materials, hazardous wastes and other scientific materials within the SERC project would be subject to UC LBNL EH&S programs.

3.8 PROJECT POPULATION AND DAILY VEHICLE TRIPS

It is anticipated that the SERC facility would house approximately 60 researchers, including principal investigators, graduate students, and post doctoral researchers. Approximately 40 researchers would be relocated to the SERC facility from UC Berkeley, 10 researchers would relocate from other locations within the LBNL hill site, and 10 new researchers would be hired as a result of project implementation.

The SERC facility is therefore expected to increase the daily population of the LBNL hill site by about 50 persons and result in an estimated 71 daily vehicle trips associated with the commuting researchers, with 8 to 9 of these trips occurring during the peak commute hours. The UC Berkeley researchers who would relocate to this facility are currently dispersed in a number of laboratories in the Chemistry, Chemical Engineering, Materials Sciences and Engineering, and Physics Department buildings in the
northeastern portion the UC Berkeley campus near the LBNL hill site. They currently travel between the campus and LBNL for use of LBNL facilities and collaboration with LBNL researchers. With the proposed project, these researchers would travel using the same city streets to commute to the LBNL hill site on a daily basis, and would experience only a small increase in their travel distance resulting from the project’s location on the LBNL hill site.

As noted earlier, some of the principal investigators are anticipated to hold joint appointments as UC LBNL researchers and UC Berkeley professors and therefore are anticipated to travel between the SERC facility and the UC Berkeley campus during the course of the day. While some amount of travel between the UC Berkeley campus and the LBNL hill site is expected to continue even with the consolidation of the research programs in the SERC facility, by siting SERC in close proximity to major user facilities at LBNL, the project would eliminate some of the daily trips.

Consistent with the 2006 LRDP planning principles, the proposed project has been designed to reduce vehicle trips. 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 and reduce the amount of parking spaces at the site from 35 to 26 spaces.

3.9 PROJECT CONSTRUCTION

Construction Access, Staging, and Schedule

Construction access to the project site would be via McMillan Road and the Blackberry Canyon Entrance on Cyclotron Road. Staging areas would be established in the space currently used for employee parking in the general “Old Town” area surrounding the project site. Staging areas would be fenced and enclosed.

The project would apply for coverage under the California National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity. In compliance with the permit process, the construction contractor would file a Notice of Intent with the State Water Resources Control Board, and a construction-phase Storm Water Pollution Prevention Plan (SWPPP) would be developed and implemented during project construction in order to avoid the discharge of pollutants into surface waters. The SWPPP will include Best Management Practices (BMPs) appropriate for construction activity on hillside locations.
Site Grading Activities and Construction Traffic

Based on the proposed design of the building, parking facilities, and service road, the proposed project would require the export of approximately 13,000 cubic yards (cy) of material. Assuming a truck capacity of 12 cy, the hauling of material from the SERC project site during site grading would result in up to 2,170 one-way truck trips (1,085 inbound empty trucks and 1,085 outbound full trucks). Project construction activities would generate daily construction vehicle trips. There would be an average of 10 construction truck trips per day between August 2011 and July 2013 associated with the delivery of concrete, rebar, form work, structural steel, mechanical and electrical equipment, exterior siding and windows, drywall and studs, pipes and conduits, roofing materials, etc. Construction crews would park off site and be shuttled into the laboratory. In general, heavy and slow moving trucking would not be allowed between 7:00 AM and 8:30 AM. Haul trucks would travel on McMillan Road to Smoot Road and Chu Road, exit via the Blackberry Canyon gate to Cyclotron Road, and then to the City of Berkeley designated truck routes to dispose of the material off site.

In the LBNL 2006 LRDP EIR, UC LBNL committed to minimizing construction traffic impacts on City streets (LBNL 2006). Pursuant to LRDP Best Practice TRANS-6c, UC LBNL has instituted a program to manage construction schedules of projects to minimize the overlap of heavy truck activity periods. As a part of this program, UC LBNL makes necessary adjustments to truck movements to keep the total number of one-way truck trips on the Hearst-Oxford-University Avenue truck route below 98 trips per day. Truck trips associated with the proposed project would also be governed by this LBNL site program to ensure that the project’s trips—when added to truck trips from other ongoing construction projects—would not exceed the established limit. UC LBNL has a full-time Site Construction Coordinator who oversees all construction activities, including traffic to and from the LBNL hill site. The Site Construction Coordinator is responsible for administering best management practices and ensuring that construction

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5 http://www.lbl.gov/Community/LRDP/index.html
6 The 2006 LRDP EIR, under Impact TRANS-6 (focused on construction traffic), concluded that estimated construction truck traffic from the LBNL site including 65 one-way daily truck trips (33 trucks per day) in a peak year would not result in a significant impact to city intersections. An impact threshold for truck trips was not identified in the 2006 LRDP EIR. Since the certification of the 2006 LRDP EIR, in anticipation of concurrent construction of a number of large projects on the LBNL site, UC LBNL conducted a reevaluation of the traffic impacts associated with construction truck trips. This study, conducted by Fehr & Peers, examined the existing (2009) traffic conditions along the designated truck route from the LBNL site through the City of Berkeley to I-80, focusing on major intersections that are known to be operating at or near failing conditions. The study determined that so long as the total number of one-way truck trips from the LBNL site that pass through the Hearst Avenue, Oxford Street, and University Avenue intersections do not exceed 98 one-way truck trips per day (or 49 trucks per day) and LBNL’s construction truck traffic does not exceed 50 one-way truck trips (or 25 trucks a day) through the Gayley Road/Stadium Rim Way intersection, construction traffic would result in minimal effects on city intersections. The study utilized the City’s thresholds for traffic impacts that were amended after the certification of the LRDP EIR. This study is incorporated in this EIR by reference.
vehicle traffic does not contribute to a substantial increase in volumes or degradation in level of service on surrounding roadways.

Any groundwater encountered during project construction would be tested and, if found to be contaminated, would be treated and appropriately disposed. Disposal options include, but are not limited to, injection into the ground water treatment system at the project site and disposal to storm drain system if the water is clean.

**Groundwater Remediation System Modifications**

The SERC project site is located in an area where volatile organic compounds (VOCs) have been detected in groundwater. The area of contamination has been designated the Building 25A lobe of the Old Town Groundwater Solvent Plume. An *in-situ* soil flushing system to treat this contamination is currently located on the SERC project site. This cleanup is being conducted under the regulatory oversight of DTSC in accordance with Resource Conservation and Recovery Act (RCRA) Corrective Action Process (CAP) requirements.

The *in-situ* soil flushing system consists of a groundwater extraction trench west of Building 25A and south of Building 44, a groundwater extraction well located north of Building 25A, and a shallow gravel-filled infiltration bed immediately west of Building 25A (see **Figure 3.0-7, Soil Flushing and Groundwater Migration Control System**). The groundwater extraction trench which is 40-feet long, 2-feet wide and 40 feet deep is backfilled with gravel to control the migration of contaminated groundwater from the Building 25A lobe source area. An extraction well was installed in the trench backfill. The extracted groundwater is treated to non-detectable levels of VOCs in a treatment system that consists of a 1,000-pound granular activated carbon (GAC) canister with an in-line 55-gallon GAC drum as backup located next to Building 44. Treated groundwater is conveyed by a short pipeline segment to the infiltration bed located between Buildings 25A and 44A where it percolates into the ground. Several wells located in the Building 25A area monitor the progress of the corrective measures toward achieving the required groundwater cleanup level (drinking water standards), including a monitoring well inside Building 25A. Although the corrective measure has been effective in significantly reducing contaminant concentrations, with concentrations decreasing to the required cleanup level over much of the Building 25A lobe area, concentrations still remain well above drinking water standards in some wells at the project site.
Groundwater Extraction/Collection Trenches
Groundwater Injection Trenches/Areas
Soil flushing system area
Building 25A Groundwater
Building 25A
Building 25A Trench
SERC Facility

Explanation
- Injection well
- Groundwater extraction well
- Treated water supply line (showing flow direction)
- Groundwater extraction line (showing flow direction)
- Granular activated carbon (GAC) treatment system
- Soil flushing system area

Treatment Systems
- T3 Building 25A Groundwater
- E5 Building 25A
- Groundwater Injection Trenches/Areas
- I4 Building 25A Trench
- SERC Facility

Soil Flushing and Groundwater Migration Control System

Figure 3.0-7
The construction of the SERC facility would require the modification of some portions of the in-situ soil flushing system. The extraction well in the extraction trench would be relocated and a new section of extraction trench may be constructed, if required. The infiltration bed would be relocated to a new area to increase its efficiency. Proper destruction of several monitoring wells would also be required and new monitoring wells would be installed where needed to continue monitoring cleanup progress. All modifications to this soil flushing system would require DTSC approval.

**Construction Schedule**

Project construction is anticipated to occur over a two-year period beginning in mid 2011 and continuing through mid 2013. Construction would take place Monday through Friday and would involve typical construction hours that extend from early morning through mid-afternoon. Consistent with LRDP EIR Mitigation Measure NOISE-1a, which is incorporated into the project description, project construction hours would be limited to comply with the City of Berkeley Noise Ordinance.

3.10 2006 LRDP EIR MITIGATION MEASURES

Because the proposed project is an element of the growth projected under the 2006 LRDP, mitigation measures adopted by The Regents in conjunction with the approval of the 2006 LRDP that are relevant to the proposed project have been included in and made part of the SERC project. The full text of the mitigation measures is provided in each resource section in Section 4.0. The analysis presented in Section 4.0, evaluates environmental impacts that would result from project implementation following the application of the 2006 LRDP EIR mitigation measures. These mitigation measures are a part of the proposed project and would not be readopted.

3.11 PROJECT APPROVALS

SERC will be a University of California facility located on land owned by the University within the boundaries of the LBNL hill site. The Board of Regents is the University’s decision-making body and is responsible for approving projects to be built on University-owned land. The Regents will review and consider this EIR in conjunction with the review and consideration of the SERC project.

This EIR will also provide information to other agencies with permitting or approval authority over the proposed project. Other potential approvals that the project may need include the following:

- An Authority to Construct and a Permit to Operate for the emergency generator included in the proposed project.
- Coverage under the Statewide NPDES General Permit for Storm Water Discharges Associated with Construction Activity.
3.0 Project Description

- An approval from the DTSC to modify the groundwater remediation system present on the project site.