4.0 ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

4.0.1 INTRODUCTION

This section of the EIR presents potential environmental impacts of the proposed Computational Research and Theory (CRT) project. The scope of the analysis and key attributes of the analytical approach are presented below to assist readers in understanding the manner in which the impact analysis has been conducted in this EIR.

4.0.2 APPROACH TO IMPACT ANALYSIS

- The preparation of this EIR was preceded by an Initial Study (included in Appendix 1.0), which determined that the CRT project would not result in significant or potentially impacts on certain resource areas. Therefore, this EIR evaluates impacts in 14 of the 16 resource areas on the California Environmental Quality Act (CEQA) checklist.

- For each of the 14 resource areas evaluated in the sections that follow, the EIR describes the existing environmental setting, the potential for the proposed project to significantly affect the existing resources, and recommended mitigation measures that could reduce or avoid potentially significant impacts. Each of the resource sections clearly identifies those impacts that were adequately addressed in the Initial Study to be less than significant and thus not require detailed evaluation in this EIR.

- The analyses of impacts in this EIR are based primarily on three factors, depending on the primary cause of the impact. For example, impacts related to geologic, hydrological, and biological resources are analyzed primarily on the basis of the location and acreage of ground disturbance that is projected to occur as a result of the implementation of the CRT project. Impacts related to traffic, traffic-related air quality and noise, and utilities, on the other hand, are analyzed primarily on the basis of the total population associated with full development of the CRT project. Impacts related to air quality and hazardous materials are analyzed based on the research programs that would be accommodated by the proposed project.

- With respect to those impacts that are population-based, it should be noted that the total adjusted daily population for the project accounts for both employees and visitors. As noted in Section 3.0, Project Description, the proposed project would accommodate a total of 300 people, including 135 existing Lawrence Berkeley National Laboratory (LBNL) staff and 165 persons, including 75 UC Berkeley staff and students, who would be new to the site. The EIR assesses operational environmental impacts in terms of the maximum building occupancy, including guests and employees.

- The extent of the area evaluated for impacts (the study area) differs among resources depending on the locations where impacts would be expected. For example, traffic impacts due to the proposed CRT project are assessed for the regional roadway network, whereas geology and soils

impacts from the proposed project are assessed for the project site only. The settings sections describe both local resources and regional resources that occur throughout the broader geographic area.

- The environmental setting sections describe the baseline environmental conditions. For purposes of the analyses in this EIR, the year 2007 is used to establish the baseline or existing conditions. Impacts are evaluated in terms of environmental changes as a result of implementation of the CRT project as compared to existing conditions in 2007. In the case of near-term traffic impacts (and traffic-related air quality and noise impacts), year 2012 is used as the baseline year because the proposed project is expected to be operational by that year. Evaluation of 2012 conditions with the addition of project traffic presents a more conservative analysis of traffic impacts than year 2007 conditions as it takes into account traffic from other near-term projects that would be constructed by then.

- Because the proposed project is an element of the growth projected under the LBNL 2006 LRDP, relevant mitigation measures in the LBNL 2006 LRDP EIR adopted by The Regents in conjunction with the approval of the LBNL 2006 LRDP have been incorporated into and made part of the CRT project. The analysis presented in the subsequent sections evaluates environmental impacts that would result from project implementation following the application of the LBNL 2006 LRDP mitigation measures.

4.0.3 LEVELS OF SIGNIFICANCE

The EIR uses a variety of terms to describe the levels of significance of adverse impacts identified during the course of the environmental analysis. The following are definitions of terms used in this EIR:

- Significant and Unavoidable Impact. Impacts that exceed the defined standards of significance and cannot be eliminated or reduced to a less than significant level through the implementation of feasible mitigation measures.

- Significant Impact. Impacts that exceed the defined standards of significance and that can be eliminated or reduced to a less than significant level through the implementation of feasible mitigation measures.

- Potentially Significant Impact. Significant impacts that may ultimately be determined to be less than significant; the level of significance may be reduced in the future through implementation of policies or guidelines (that are not required by statute or ordinance), or through further definition of the project detail in the future. Potentially Significant Impacts may also be impacts about which there is not enough information to draw a firm conclusion; however, for the purpose of this EIR, they are considered significant. Such impacts are equivalent to Significant Impacts and require the identification of feasible mitigation measures.

- Less Than Significant Impact. Impacts that are adverse but that do not exceed the specified standards of significance.

- No Impact. The project would not create an impact.

4.0.4 KEY TO IMPACT ANALYSIS

Table 4.0-1, Key to Impact Analysis, below presents the various project components and identifies the sections of the Draft EIR that address the environmental impacts of the components, to the extent that the project component would result in a particular impact that would not result from the rest of the project.

Table 4.0-1
Key to Impact Analysis

Project Component	Section of Draft EIR
Office Building	All sections
High Performance Computing Center	All sections, specifically Section 4.2, Air Quality; Section 4.13, Utilities
Cooling Towers and Emergency Generator/Cogeneration	Section 4.2, Air Quality; Section 4.13, Utilities
Stormwater Drainage	Section 4.7, Hydrology and Water Quality; Section 4.13, Utilities
Access Drive and Turnaround	All sections, specifically Section 4.2, Biological Resources; Section 4.6, Hazards and Hazardous Materials; Section 4.7, Hydrology and Water Quality

4.1 Aesthetics

4.1.1 Introduction

This section identifies existing visual conditions at the project site and analyzes the potential for implementation of the proposed Computational Research and Theory (CRT) Facility project to affect those resources. Information presented in the discussion and subsequent analysis was drawn from site visits, the Lawrence Berkeley National Laboratory (LBNL) 2006 Long Range Development Plan (LRDP) Environmental Impact Report (EIR), and environmental documents associated with specific LBNL projects. The physical characteristics of the site and surrounding areas are discussed briefly.

For purposes of this analysis visual or aesthetic resources are generally defined as the natural and built landscape features that can be seen. The overall visual character of a given area results from the unique combination of natural landscape features including landform, water, and vegetation patterns as well as built features such as buildings, roads and other structures.

Two computer-generated visual simulations illustrating "before" (current) and "after" (proposed) visual conditions from representative public vantage points near the project site are presented as part of this analysis. The locations of the visual simulation vantage points were selected in consultation with visual resources professionals and LBNL staff and were chosen to represent public viewpoints that provide the most direct views of potential site changes.

In response to the Notice of Preparation for this EIR, several commenters expressed concern regarding quality of life, but no specific comments related to scenic resources, scenic vistas, visual character, or light and glare were received.

4.1.2 Environmental Setting

Regional Location

The CRT project is located on the LBNL campus in the eastern hills of the cities of Berkeley and Oakland in Alameda County. The LBNL campus is located on approximately 200 acres that are owned by the University of California (See **Figure 3.0-1, Regional Location Maps**). Situated on the steeply sloping hillsides above the UC Berkeley campus, the LBNL site rises from an elevation 500 feet near its main entrance along Cyclotron Road at the Blackberry Canyon Gate to about 1,000 feet at the northern border of the site. The hills are covered in a mix of grass and native stands of native oaks and California bay as

well as introduced eucalyptus or conifers provide a natural-appearing landscape backdrop to the Berkeley Lab site.

The entire LBNL site cannot be viewed from any one single off-site vantage point. However, portions of the Berkeley Lab site are visible from residential neighborhoods, public roadways, and public vantage points in adjoining areas. Views of individual buildings or groups of buildings are available from public vantage points such as the Memorial Stadium, the Lawrence Hall of Science, and Grizzly Peak Boulevard. Portions of the Berkeley Lab site are visible in medium range views (less than 1 mile) from nearby elevated off-site locations such as the residential neighborhoods in the north and northwestern portions of the City of Berkeley. Long-range views (greater than 1 mile) available from downtown Berkeley and the Berkeley Marina encompass portions of the LBNL site.

Surrounding Land Uses

The LBNL site is surrounded by open space, institutional uses, and residential and neighborhood commercial areas (see **Figure 3.0-6, Conceptual Utility Relocation Plan**, in **Section 3.0, Project Description**). The University of California, Berkeley, including the Strawberry Canyon open space area, lies south and southeast of the LBNL site. Residential neighborhoods and a small neighborhood commercial area in the City of Berkeley lie to the north and northwest, and regional open space, including the 2,000-acre Tilden Regional Park, lies to the northeast.

The Berkeley Lab site is largely buffered by undeveloped land owned by the University of California, although the northwest corner of the Berkeley Lab abuts residential neighborhoods in the City of Berkeley. Access to the Berkeley Lab's hillside site is not available to the general public; three controlled-access vehicular gates include the main Blackberry Canyon Gate on Cyclotron Road and the Strawberry Canyon and Grizzly Peak gates on Centennial Drive. Visitors primarily use the Blackberry Canyon Gate. The Grizzly Peak Gate is an exit-only gate for use after the morning commute hours. The western part of the LBNL site, including the project site, lies within the Berkeley city limits, whereas the eastern part is within the City of Oakland.

The visual character of LBNL's built environment can be described as eclectic. Established in the 1930s, the Berkeley Lab now includes buildings of various ages and architectural styles. Many buildings display an industrial look and utilitarian quality. A number of buildings are painted in neutral colors to blend with the natural setting. Some of the buildings are recognizable landmarks including Building 50 (Bevatron) and the distinctive domed Advanced Light Source building, which was constructed as the Cyclotron in the 1940s. Portions of these buildings are visible from some public locations; however, mature trees interspersed through the site screen views of buildings from many other locations. Views of

the Berkeley Lab from nearby areas generally include natural landform and tree clusters as well as buildings or other structures, roadways, fencing and pavement situated upon the hillside.

Project Site

The CRT project site occupies approximately 2.25 acres located on the western portion of the LBNL campus. The site is flanked by Buildings 70 and 70A to the east, the Building 50 complex to the north, and Cyclotron Road and the Blackberry Canyon entrance gate to the west (see **Figures 3.0-1** and **3.0-2**). The sloped terrain of the project site drops approximately 100 feet from east to west. The site includes approximately 60 eucalyptus trees and a number of smaller immature redwood, bay, and oak trees.

Site Viewshed

For purposes of this study, the project viewshed is defined as the general area from which the CRT project would be visible to the public. Due to screening provided by intervening vegetation, topography, and existing development, the CRT site is not visible from most areas located beyond the LBNL site itself. Public views are available however from limited locations on the UC Berkeley campus and in the City of Berkeley to the south and southeast. Distant views of the project site are available from a limited area of west Berkeley. Existing development and mature vegetation largely screen views of the project area from other locations. The following section describes potentially affected existing views which are available from these areas.

Site Visibility and Public View Corridors

A set of eight photographs document representative public views of the CRT project site as seen from relatively close range and distances of up to approximately 2 miles away. Locations of photo viewpoints are shown on **Figure 4.1-1, Photo Viewpoint Locations**, and the photos are presented as **Figures 4.1-2a** through **4.1-2b, Public Views of the Site and Surroundings**. The facility would be situated adjacent to Building 50, a visually prominent feature seen from some public viewing locations. In the following description of existing visual conditions, this building therefore provides a useful reference point for orientation purposes.

Distant views of the project site are available from limited locations in west Berkeley. Photo 1 shows the view from University Avenue and Curtis Street approximately 2 miles from the project site. LBNL buildings visible from this distant location appear on the hillside nestled between clumps of mature vegetation. Building 50 is located near the center of the image and the CRT project site is just to the right of this above the street trees. University Avenue is a major gateway into the City of Berkeley and to the

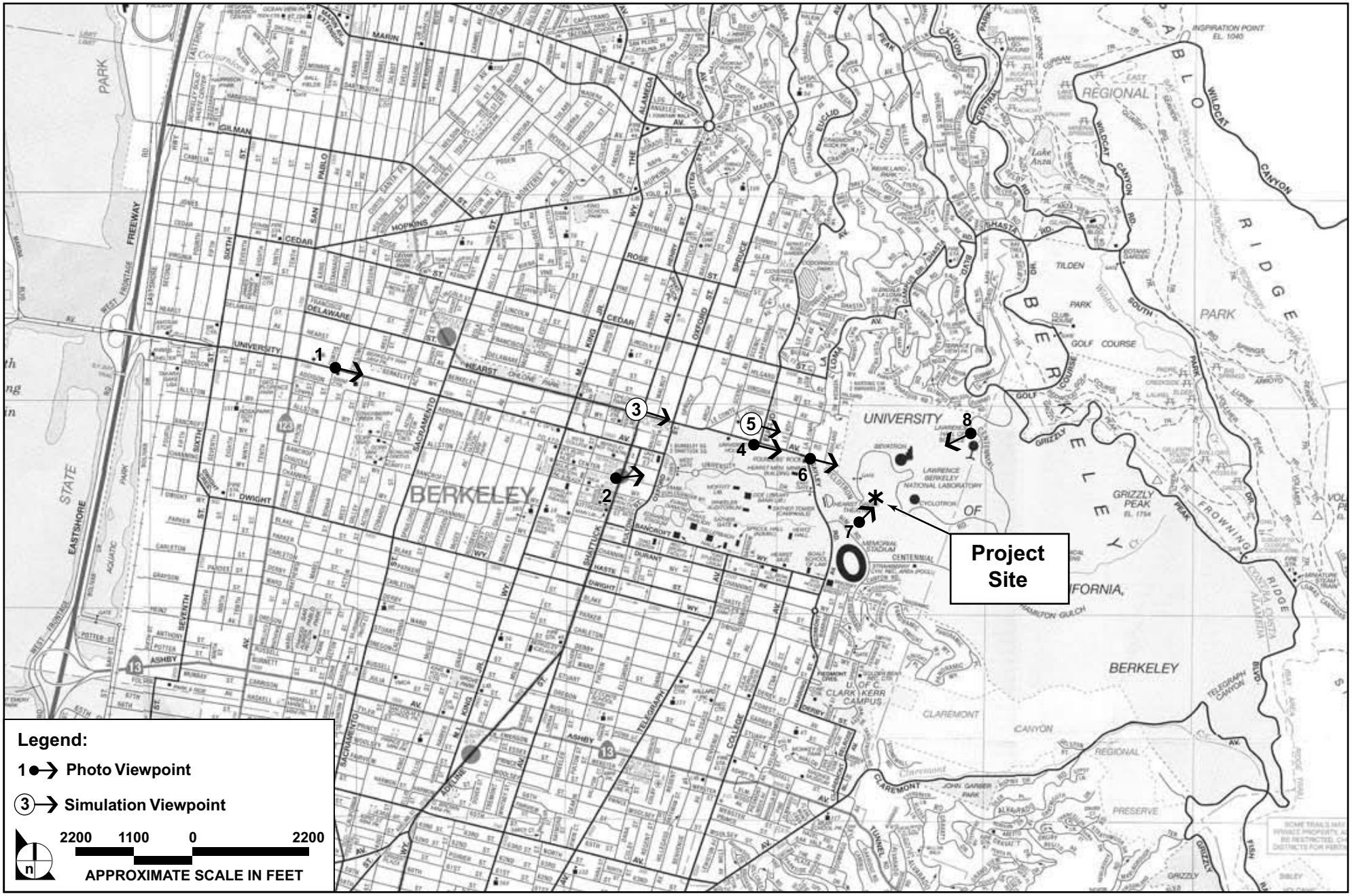
University Campus. In other locations on this street, buildings and mature vegetation partially screen views of the project area.

Limited views are available from downtown areas, although buildings and vegetation screen many downtown views of the project. Photo 2 is a view from the downtown Berkeley Bay Area Rapid Transit (BART) Station, located at Center Street and Shattuck Avenue. The project, situated almost 1 mile away, is not visible from this location. Photo 3 shows the view from Hearst Avenue and Shattuck Avenue, four blocks north of the BART Station. Building 50, which lies adjacent to the project site, can be seen from this location.

Located on the hillside to the north of the UC campus, the "Northside" neighborhood includes a small commercial area, several university facilities, and a mixture of apartment buildings, single-family homes and student housing. Views of the CRT project site are available from limited areas within this neighborhood. Photo 4 shows the view from the commercial area at Hearst Avenue near Euclid Avenue. In this view, existing vegetation partially obscures the project site. Photo 5, taken from a block north at Ridge Road near Euclid Avenue, includes a view of the two taller portions of Building 50 which appear above the trees seen near the center of the image.

When seen from closer range locations, mature trees, existing buildings, and topography generally screen views toward the site. Photo 6, taken from Hearst Avenue at La Loma Avenue and Gayley Road demonstrates that tall trees situated on the hillside below the project area largely obstruct views of Building 50 and the CRT project site. At the Foothill Parking Lot on the University campus, existing eucalyptus screen views of the site (refer to Photo 7). Views toward the site from the recreation trail which runs between this parking lot and the edge of Lawrence Road, an internal LBNL road, are also screened by existing vegetation.

Public views of the project site are available from some higher elevation locations such as the Lawrence Hall of Science (LHS) parking lot, situated about 0.5 mile away. Photo 8, taken from this area, shows various LBNL buildings including the domed Advanced Light Source (ALS) building which appears in the middle ground between groupings of mature tress. The project site is slightly to the right of the center of the image and is partially screened by existing buildings and mature vegetation.



SOURCE: Environmental Vision - September 2007

FIGURE **4.1-1**

Photo Viewpoint Locations

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1. University Avenue at Curtis Street looking east

2. BART Station at Center Street at Shattuck Avenue looking northeast

3. Hearst Avenue at Shattuck Avenue looking east* *simulation viewpoint

4. Hearst Avenue near Euclid Avenue looking east

SOURCE: Environmental Vision - September 2007

FIGURE **4.1 - 2a**

Public Views of the Site and Surroundings

924-002•11/07

5. Ridge Road near Euclid Avenue looking east*

* simulation viewpoint

6. Hearst Avenue at Laloma Avenue and Gayley Road looking east

7. Foothill Parking Lot looking northeast

8. Parking lot at Lawrence Hall of Science looking southwest

SOURCE: Environmental Vision - September 2007

FIGURE **4.1 - 2b**

Public Views of the Site and Surroundings

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4.1.3 Regulatory Considerations

Local Plans and Policies

The proposed project would be located at LBNL, which is operated by the University of California and conducts work within the University's mission on land that is owned or controlled by The Regents of the University of California. As a state entity, the University is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. LBNL is located in both the City of Berkeley and the City of Oakland. The following sections summarize objectives and policies from the LBNL 2006 LRDP and LBNL Design Guidelines, the City of Berkeley and City of Oakland General Plans and local ordinances that relate to visual quality.

2006 LRDP and LBNL Principles and Strategies[1]

The "Vision" section of the 2006 LRDP proposes four fundamental principles that form the basis for the LRDP's development strategies. The two principles most applicable to aesthetic aspects of new development are to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship" and to "Build a more campus-like research environment." (LRDP, Section 2 – "Vision")

Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts that could result from implementation of the 2006 LRDP. Development strategies set forth in the 2006 LRDP that are applicable to aesthetics include the following:

- Protect and enhance the site's natural and visual resources, including native habitats, streams and mature tree stands by focusing future development primarily within the already developed areas of the site;
- Increase development densities within areas corresponding to existing cluster of development to preserve open space, enhance operational efficiencies and access;
- To the extent possible site new projects to replace existing outdated facilities and ensure the best use of limited land resources;

1 While this Environmental Impact Report is a "stand alone" analysis that does not rely upon tiering from any programmatic CEQA document, Berkeley Lab does actively follow the 2006 Long Range Development Plan (LRDP) as a planning guide for Lab development. Accordingly, relevant 2006 LRDP principles, strategies, and design guidelines are identified in this section.

- To the extent possible site new projects adjacent to existing development where existing utility and access infrastructure may be utilized;
- Create a more "collegial" environment that encourages and facilitates interaction among the variety of Berkeley Laboratory employees and guests;
- Site and design new facilities in accordance with University of California energy efficiency and sustainability policy 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;
- 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;
- Remove parking from areas targeted for outdoor social spaces and service areas;
- Preserve and enhance the native rustic landscape and protect sensitive habitats;
- Consolidate service functions wherever possible in the Corporation Yard;
- Improve the pedestrian spaces at the heart of the research clusters and adjacent to research facilities so as to support interaction among Laboratory users;
- Retain and improve walkways as appropriate throughout the open space portions of the site, carefully integrating these pathways to minimize intrusion in the natural environment;
- Improve wayfinding for visitors in particular through a comprehensive and coordinated signage system and through the naming of buildings and research clusters;
- Develop new campus-like outdoor spaces such as plazas within clusters of facilities and improve those that already exist;
- Maintain and enhance tree stands to reduce the visibility of Laboratory buildings from significant public areas in neighboring communities;
- Improve the overall appearance and experience of the Laboratory through improvements to the main entry gates, and the landscape areas associated with roadways, parking lots, and pedestrian pathways;
- Continue to use sustainable practices in selection of plant materials and maintenance procedures;

- Develop all new landscape improvements in accordance with the Laboratory's vegetation management program to minimize the threat of wildland fire damage to facilities and personnel;
- Utilize native, drought-tolerant plant materials to reduce water consumption; focus shade trees and ornamental plantings at special outdoor use areas; and
- Minimize impervious surfaces to reduce storm water run-off and provide landscape elements and planting to stabilize slopes, reduce erosion and sedimentation.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the 2006 LRDP and provide specific guidelines for site planning, landscape, and building design as a means to implement the 2006 LRDP's development principles as each new project is developed. Specific design guidelines are organized by a set of design objectives that essentially correspond to the strategies provided in the 2006 LRDP. The LBNL Design Guidelines provide the following specific planning and design guidance for the aesthetic aspects of new development to achieve these design objectives.

The design guidelines would be applied to the proposed project. As part of the design review and approval process, the proposed project would be evaluated for adherence to the LRDP Land Use Map, the design guidelines, the Building Heights Map, and any other relevant plans and policies. Approvals would be subject to satisfactory compliance with these provisions. Design objectives that are contained within the design guidelines and applicable to the aesthetics analysis include the following:

- Provide screening landscape elements to visually screen large buildings;
- Minimize impacts of disturbed slopes;
- Create landform elements consistent with design on the Hill;
- Mass and site buildings to minimize their visibility;
- Screen roofscapes;
- Respect view corridors;
- Integrate buildings into the overall landscape using appropriate materials;
- Create a cohesive identity across the Laboratory as a whole by following established precedents for new landscape elements;
- Provide appropriate site lighting for safety and security;
- Create new commons spaces in clusters that currently lack them;

- Allow sunlight to reach the commons spaces;
- Create as high a density and critical mass around commons spaces as possible;
- Create new keystone structures in clusters that currently lack them;
- Utilize artifacts to create identity and add interest to each cluster;
- Create consistency between buildings in individual clusters;
- Develop research clusters in a way that is mindful of future expansion;
- Design pathway layouts that support pedestrian flow and encourage casual interaction;
- Construct new walkway structures such as stairs, bridges, slope retention for walkways and guardrails of materials compatible with the surrounding landscape;
- Minimize visual and environmental impacts of new parking lots;
- Site and design parking structures to integrate with the natural surroundings; and
- Organize service functions to minimize conflicts and visual impacts.

Local Plans and Policies

City of Berkeley General Plan

The Urban Design and Preservation Element of the City of Berkeley Draft General Plan contains few policies related specifically to visual quality that would apply to the proposed 2006 LRDP. Policies relevant to the LBNL include:

> Policy UD-10 The University of California: The City of Berkeley strongly supports actions by the University to maintain and retrofit its historic buildings, and strongly opposes any University projects that would diminish the historic character of the campus or off-campus historic buildings. (Also see Land Use Policies LU-36 and LU-37)
>
> Policy UD-31 Views: Construction should avoid blocking significant views, especially ones toward the Bay, the hills, and significant landmarks such as the Campanile, Golden Gate Bridge, and Alcatraz Island. Whenever possible, new buildings should enhance a vista or punctuate or clarify the urban pattern.
>
> Policy UD-32 Shadow: New buildings should be designed to minimize impacts on solar access and minimize detrimental shadows.

City of Oakland General Plan

The Open Space, Conservation, and Recreation (OSCAR) Element of the City of Oakland's General Plan was adopted in 1996. OSCAR policies pertaining to aesthetics and visual resources with relevance to implementation of the LBNL LRDP include the following:

> Policy OS-10.1: Protect the character of existing scenic views in Oakland, paying particular attention to: (a) views of the Oakland Hills from the flatlands; (b) views of downtown and Lake Merritt; (c) views of the shoreline; and (d) panoramic views from Skyline Boulevard, Grizzly Peak Road, and other hillside locations.
>
> Policy OS-10.2: Encourage site planning for new development which minimizes adverse visual impacts and takes advantage of opportunities for new vistas and scenic enhancement.

4.1.4 Impacts and Mitigation Measures

Significance Criteria

The impact of the proposed project on aesthetics would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the *CEQA Guidelines* and the UC CEQA Handbook:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway;
- Substantially degrade the existing visual character or quality of the site and its surroundings; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

The significance determination is based on several evaluation criteria including the extent of project visibility from sensitive viewing areas such as designated scenic routes, public open space, or residential areas; the degree to which the various project elements would contrast with or be integrated into the existing landscape; the extent of change in the landscape's composition and character; the number and sensitivity of viewers; and the duration of affected views.

Issues Not Discussed Further

The CRT Facility Initial Study found that implementation of the project would have no impact on scenic resources within a State scenic highway, as there are no scenic routes located within the vicinity of the project site, and no scenic routes on the project site that would be affected by the proposed project.

Methodology and Visual Simulations

Field observations of the project site and surroundings, conducted in July, August, and September 2007, were completed in order to observe existing visual conditions in the project vicinity, to photograph representative public views of the site, and to identify key viewing locations for purposes of preparing visual simulations. In addition to the field observations, the visual impact assessment is based on review of project materials including topographic maps, project drawings and technical data supplied by the LBNL project design team, aerial and ground-level photographs of the project area, and computer-generated visual simulations which portray the project's appearance from representative public viewing locations. The evaluation of potential visual impacts associated with the CRT project is based, in part, on comparing the "before" and "after" visual conditions as portrayed in the simulation images and assessing the degree of visual change that the project would bring about.

A set of visual simulations is presented as part of the CRT project visual resources analysis to illustrate "before" and "after" visual conditions in the project area. The simulations illustrate the location, scale and conceptual appearance of the proposed project as seen from two representative viewpoints: (1) Hearst Avenue at Shattuck Avenue approximately 0.9 mile from the project site (**Figure 4.1-3, Visual Simulation: Hearst Avenue at Shattuck Avenue**) and (2) Ridge Road near Euclid Avenue approximately 0.5 mile from the site (**Figure 4.1-4, Visual Simulation: Ridge Road near Euclid Avenue)**. These simulation locations are delineated on **Figure 4.1-1**. These viewpoints were selected to represent public viewpoints that provide the most direct view of the potential site changes and would therefore be the most appropriate locations from which to prepare visual simulations. Computer modeling and rendering techniques were employed to produce the visual simulation images. The computer-generated visual simulations are the results of an objective analytical and computer modeling process described briefly below.

The visual study employs photographs taken in July, August, and September 2007, using a single lens reflex (SLR) digital camera with a 50mm equivalent lens which represents a view angle of approximately 40 degrees. Existing topographic and site data supplied by LBNL project architects provided the basis for developing an initial digital model (Perkins + Will 2007a). The three-dimensional computer model of the

Existing view from Hearst Avenue at Shattuck Avenue

Visual simulation of proposed project

SOURCE: Environmental Vision - September 2007

FIGURE **4.1 - 3**

Visual Simulation: Hearst Avenue at Shattuck Avenue

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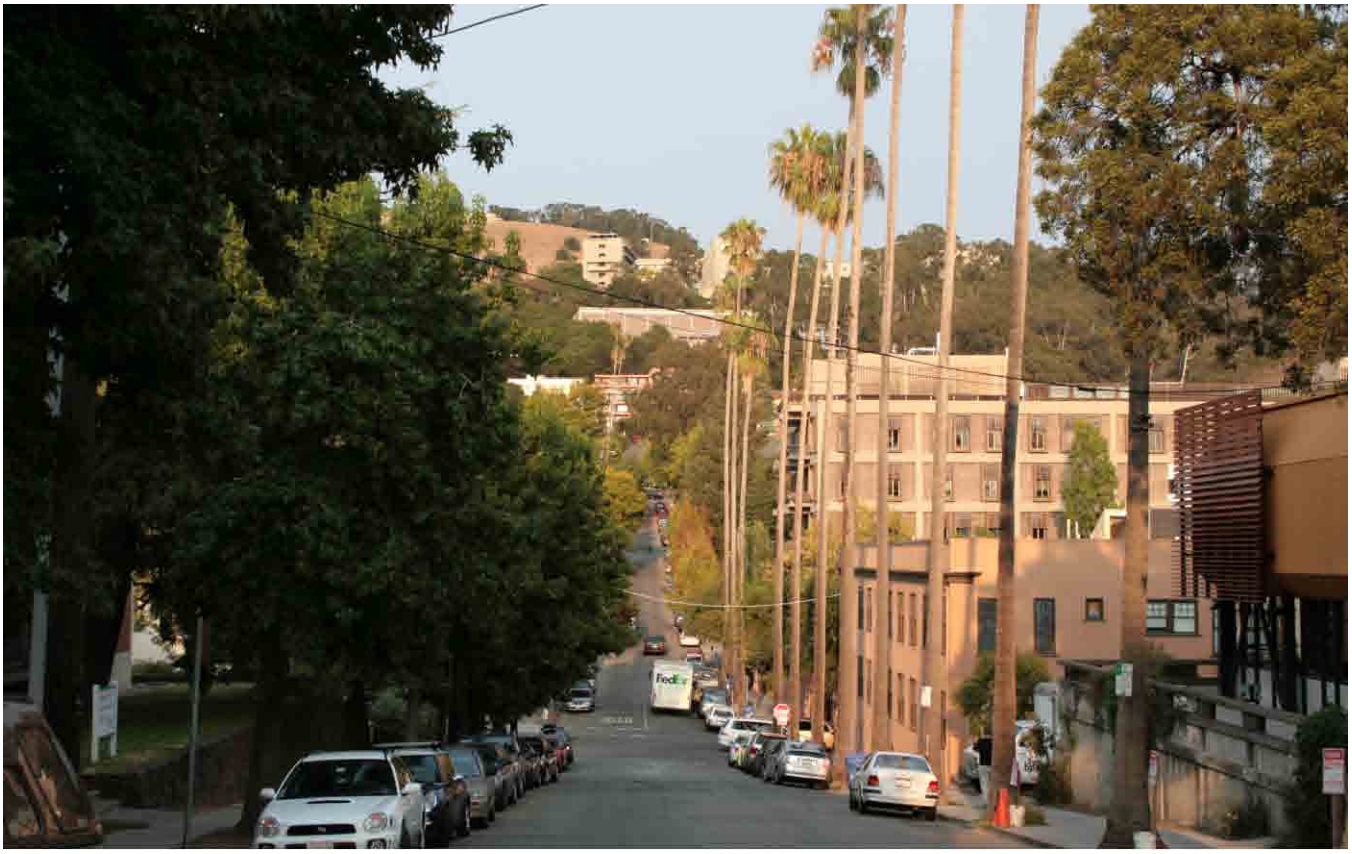
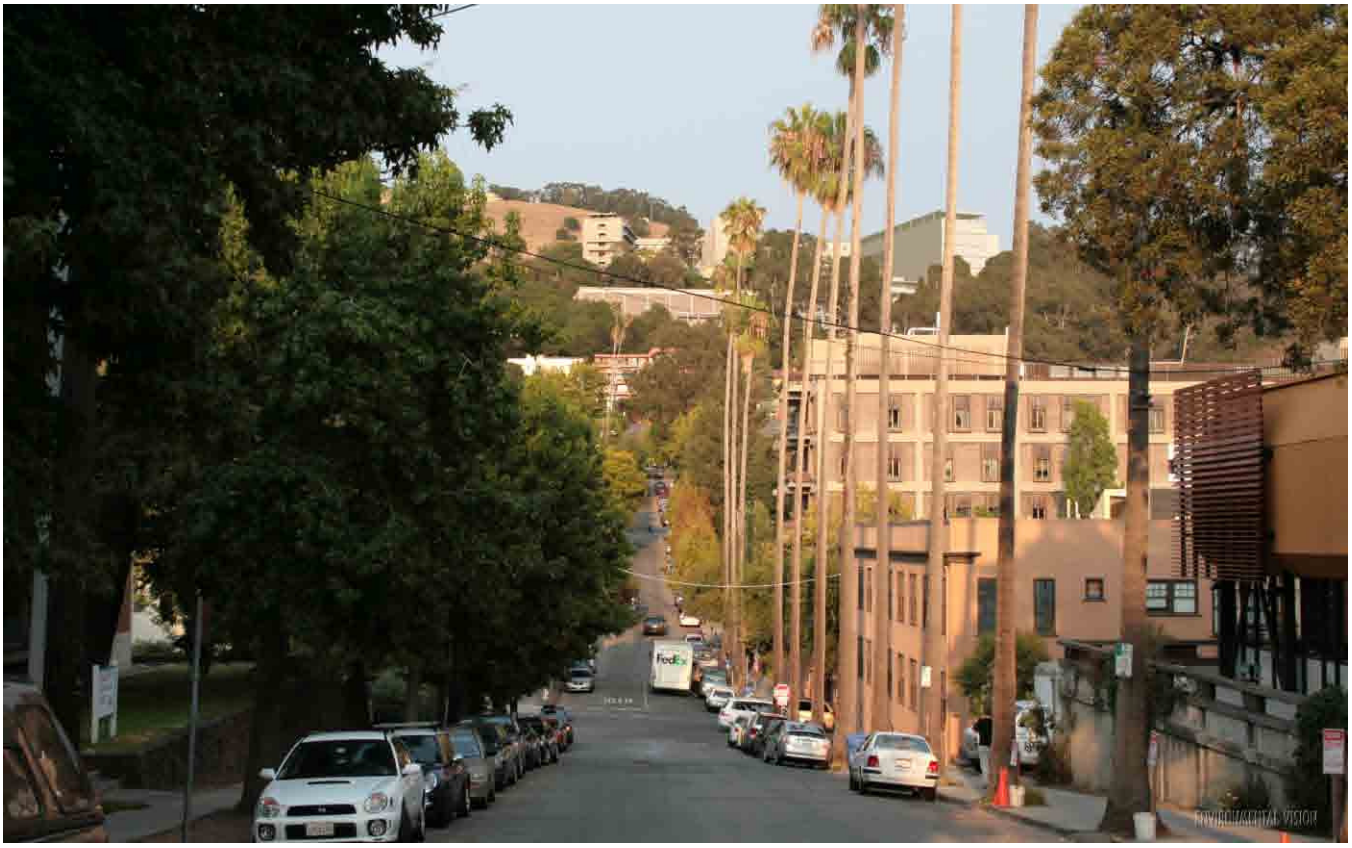


Existing view from Ridge Road near Euclid Avenue



Visual simulation of proposed project

SOURCE: Environmental Vision - September 2007

FIGURE **4.1 - 4**

Visual Simulation: Ridge Road near Euclid Avenue

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proposed project massing was combined with the digital site model to produce a complete computer model of the proposed project. For each of the simulation viewpoints, viewer location was digitized from topographic maps using 5 feet as the assumed eye level. Computer "wireframe" perspective plots were overlaid on photographs to verify scale and viewpoint location. Digital visual simulation images were then produced based on computer renderings of the 3-D model combined with digital versions of the selected site photographs.

Project Characteristics

The CRT project involves construction of a new building, adjacent cooling towers, pedestrian access, and a vehicular service access road connection to Cyclotron Road. Sited on the side of a steep slope, the building would be approximately 110 feet in height from basement level to roof level at its tallest. Building support structures and a partially enclosed staircase would extend a further 50 feet down the hillside to provide pedestrian access from Cyclotron Road. The new building would include a total of approximately 140,000 square feet comprised of a lower multi-story base, a computing floor with a footprint of approximately 32,000 square feet and a central six-story section approximately 100 feet in height. The building would also include a linear circulation loggia on the north and west faces of the uppermost floor of the central section. The upper floor would be accessible via a pedestrian bridge from the existing parking lot that connects the Building 50 complex and Buildings 70 and 70A. The majority of the building would be at a lower elevation than the adjacent Buildings 70 and 70A, with the top floor roughly level with the ground floor of Building 70A (Perkins + Will 2007b).

Specific building materials have not been chosen; however, based on information provided in the EIR Project Description, the visual simulations portray exterior materials similar to those of adjacent LBNL buildings. The final exterior architectural treatment would be responsive to the solar exposure of each façade and treatments would vary depending on exposure. The project would also include an approximately 350-foot-long service road connection from Cyclotron Road. Approximately 32 trees (all Eucalyptus) with trunk diameters greater than 20 inches and 40 smaller trees would be removed as part of the proposed project.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. These mitigation measures that are included in the project

would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM VIS-4a: All new buildings on the LBNL hill site constructed pursuant to the 2006 LRDP shall incorporate design standards that ensure lighting would be designed to confine illumination to its specific site, in order to minimize light spillage to adjacent LBNL buildings and open space areas. Consistent with safety considerations, LBNL project buildings shall shield and orient light sources so that they are not directly visible from outside their immediate surroundings.

LRDP MM VIS-4b: New exterior lighting fixtures shall be compatible with existing lighting fixtures and installations in the vicinity of the new building, and will have an individual photocell. In general, and consistent with safety considerations, exterior lighting at building entrances, along walkways and streets, and at parking lots shall maintain an illumination level of not more than 20 Lux (approximately 2 foot-candles).

LRDP MM VIS-4c: All new buildings on the LBNL hill site constructed pursuant to the 2006 LRDP shall incorporate design standards that preclude or limit the use of reflective exterior wall materials or reflective glass, or the use of white surfaces for roofs, roads, and parking lots, except in specific instances when required for energy conservation.

Project Impacts

CRT Impact VIS-1: Construction activities associated with the project would create temporary aesthetic nuisances for adjacent land uses. (*Potentially Significant; Less than Significant with Mitigation)*

Construction activities associated with the project would include earth moving, paving, and landscape installation. Project construction would be visible from locations along public roadways in the City of Berkeley including University Avenue and Hearst Avenue. This work would entail the use of considerable heavy equipment and would be most noticeable to local residents in the Northside neighborhood of Berkeley. This effect would be temporary, and it is anticipated that CRT project construction would be completed within a 27-month period. This impact is considered potentially significant. With the implementation of the proposed mitigation measure, the impact would be less than significant.

CRT Mitigation Measure VIS-1: LBNL and its contractors shall minimize the use of on-site storage and when necessary store building materials and equipment away from public view and shall keep activity within the project site and laydown areas.

Significance after Mitigation: Less than significant.

CRT Impact VIS-2: The proposed project could alter views of the LBNL site and but would not result in a substantial adverse effect to a scenic vista or substantially damage scenic resources. ***(Less than Significant)***

Scenic Vistas

For purposes of this study, a scenic vista is considered an open and expansive public view encompassing valued landscape features such as ridgeline, open bay waters, distinctive urban skyline or major landmarks. The proposed project would be partially visible from a limited area including Lawrence Hall of Science where expansive urban landscape views encompass the cityscape and San Francisco Bay in the backdrop (see Photo 8 on **Figure 4.1-2b**). However, as seen from these locations, the project would largely be screened by existing LBNL buildings and intervening vegetation. In addition, the proposed project would not obscure views of distant scenic landscape features such as the Bay or San Francisco skyline which are currently seen by the public from these locations.

Other Public Views

Figure 4.1-3 presents a "before" and "after" view from Hearst Avenue at Shattuck Avenue. The CRT building is almost a mile away from this vantage point. In the **Figure 4.1-3** visual simulation, the CRT building appears behind the streetlight seen in the foreground near the center of the image. The new building would be seen on the hillside to the right of Building 50. A cluster of mature eucalyptus trees situated below the project above Hearst Avenue would partially screen the CRT building. As shown in the simulation, the removal of existing trees associated with the CRT project would make Building 70A somewhat more visible from this location.

Figure 4.1-4 depicts a "before" and "after" view from Ridge Road near Euclid Avenue. The CRT building is approximately 0.5 mile away from this viewpoint. In the existing view UC Berkeley's Etchevery Hall and palm trees on the right and mature street trees on the left frame the view down Ridge Road. Portions of existing Berkeley Lab buildings are visible above the street trees including the two taller portions of Building 50 which appears at the top of the hill, near the center of the image. In the **Figure 4.1-4** visual simulation, the CRT building appears on the hill behind the palm trees on the right side of the view. Existing trees screen lower portions of the building.

The **Figure 4.1-3** and **4.1-4** simulations demonstrate that, as seen from a limited area situated to the west, the CRT project would alter the appearance of the LBNL site by increasing the amount of visible development. In addition to the new CRT building, the tree removal associated with the project would result in Building 70A being somewhat more visible from limited locations to the west. However, from many locations in the Berkeley area, intervening topography, vegetation, and structures would partially or fully screen views of the project. As visible from limited locations, the CRT project would introduce an additional structure into an already developed hillside. From locations in Berkeley further from the project, the project would appear as an incremental addition to an already developed hillside. These impacts would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact VIS-3: The proposed project would alter the existing visual character of the Laboratory site but would not substantially degrade the existing visual character and quality of the site and its surroundings. (*Less than Significant*)

The project would introduce a new research building and an access driveway on the hillside down slope and adjacent to/south of the Building 50 complex and Buildings 70/70A within the LBNL site. The project design calls for placing the High Performance Computer (HPC) component, which has the largest footprint, parallel to the contours of the hillside and creating a relatively narrow multi-story portion with one floor extending to form a pedestrian link to the existing buildings. This approach would reduce the need for excavation and visually integrate the new building massing into the hillside, thus reducing its potential visibility. Placement of the office portion of the building in a separate wing above and perpendicular to the HPC and the terrain would reduce the amount of square footage overlying the HPC for structural reasons, optimize building access, and reduce solar gain by minimizing the area of the facade facing west. The HPC has relatively few windows and solar gain would therefore not be a major issue for that portion of the building. Distinct lower and upper hillside entry points would also be created, allowing access from the Blackberry Gate as well as from the parking lots of buildings 50 and 70.

The CRT building would generally be lower than nearby Lab buildings and would not be visually prominent from most off-site locations. As shown in **Figures 4.1-3** and **4.1-4**, from typical public vantage points, the project would be visible as an addition to the existing hillside development. It would be relatively unobtrusive from most locations and would not be visible from large areas of the City of Berkeley because of intervening terrain, trees, and buildings.

In terms of its exterior appearance, the new CRT building would display characteristics that are similar to the nearby buildings. Materials would include the use of metal, concrete, and glass. The project would

not include new parking lots. Project design and implementation would be in keeping with the guidelines of the 2006 LRDP and in this respect, the project would contribute a more coherent appearance to the existing hillside structures through the use of similar materials and by adding to an existing cluster of buildings.

The new building would be constructed on a disturbed portion of the LBNL site. Vegetation to be removed for the project consists primarily of non-native eucalyptus trees; tree removal would be mitigated by planting new trees on the project site and elsewhere on the Berkeley Lab site.

Taken together, these changes would result in a noticeable visual effect on the site's existing visual character. However, as described above, the project would not substantially alter the overall visual character of the LBNL site. Therefore, this impact is considered less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact VIS-4: The proposed project would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. ***(Less than Significant)***

The project would create new sources of light and glare within an already developed area. Sources of new light and glare could include expansive windows, and metal and steel materials. During the day, sunlight could reflect off the windows and the metal and steel materials of the buildings, and vehicles using the access road, and could thereby create additional glare. During the nighttime, the project site would be lit for nighttime operations and security reasons. These new sources could potentially affect day and nighttime views and could conflict with local lighting regulations and policies. However, implementation of LRDP Mitigation Measure VIS-4a and LRDP Mitigation Measure VIS-4b are included in the proposed project which would ensure the project's potential lighting impacts are less than significant.

Mitigation Measure: No project-level mitigation measure required.

4.1.5 References

Lawrence Berkeley National Laboratory. 2007. 2006 Long Range Development Plan Final Environmental Impact Report, SCH No. 2000102046. July.

Perkins + Will. 2007. CRT Conceptual Project Design Drawings. August.

4.2.1 Introduction

This section presents existing air quality conditions in the project area and analyzes the potential air quality impacts associated with implementation of the proposed Computational Research and Theory (CRT) project. This section also provides a description of the regulatory framework for air quality management on a federal, state, regional, and local level. In addition, this section will evaluate the types and quantities of air emissions that would be generated on a temporary basis due to project construction and over the long term due to the project's operation.

The analysis of air quality impacts is based on air quality regulations administered by the U.S. Environmental Projection Agency (U.S. EPA), the California Air Resources Board (CARB), and the Bay Area Air Quality Management District (BAAQMD) with each agency responsible for different aspects of the proposed project's activities. The roles of these agencies are discussed in detail in the Regulatory Considerations section. Other sources used in this assessment include the BAAQMD CEQA [California Environmental Quality Act] Guidelines [for] Assessing the Air Quality Impacts of Projects and Plans established by the BAAQMD in December 1999; and the Bay Area 2005 Ozone Strategy, adopted by the BAAQMD in January 2006. Other sources of information used in this section include Lawrence Berkeley National Laboratory (LBNL) documents, the general plans for the cities of Berkeley and Oakland, the Environmental Impact Report (EIR) for the Berkeley General Plan, other environmental documents associated with LBNL projects, and the University of California [UC] CEQA Handbook prepared by the UC Office of the President.

In response to the Notice of Preparation for this EIR, a commenter expressed concern regarding carbon emissions associated with tree removal (loss of carbon sequestration) from the project site and Strawberry Canyon. However, the proposed project would replace any removed trees at a 1:1 ratio (see Section 4.3 Biological Resources), which would help offset any reduction in carbon sequestration resulting from project-related tree removal. Other commenters requested that the EIR address cumulative impacts of LBNL development on human and ecological health and safety. The cumulative health impacts of future operations associated with LBNL are discussed in Section 5.0, Cumulative Impacts, of this EIR.

4.2.2 Environmental Setting

Climate and Meteorology

The project area is located in the cities of Berkeley and Oakland within the boundaries of the San Francisco Bay Area Air Basin (SFBAAB or the Basin). The climate of the Bay Area is Mediterranean in

character, with mild, rainy winter weather from November through March and warm, dry weather from June through October. In summer, the Pacific high-pressure system typically remains near the coast of California; subsidence of warm air over the cooler marine air associated with the Pacific high creates frequent summer atmospheric temperature inversions. Subsidence inversions may be several hundred to several thousand feet deep, effectively trapping pollutants in a stagnant volume of air near the ground with little dispersion ability. Typically, May through October is considered the ozone smog season when transport studies have shown precursor emissions generated in Oakland and Berkeley are often transported to other regions of the Bay Area and beyond (e.g., Central Valley) that are more conducive to the formation of ozone. In winter, the Pacific high-pressure system moves southward, allowing ocean-formed storms to move through the region. The frequent storms and infrequent periods of sustained sunny weather are not conducive to ozone formation. Radiational cooling during the evening, however, sometimes creates thin inversions and concentrates air pollutant emissions near the ground.

Mean minimum temperatures in the project area range from high 50s in the summer to the low 40s in the winter. The average temperature in the area is the mid 50s with mean maximum summer temperatures in the low 80s and winter temperatures in the low 60s. Annual and daily temperatures in the region have fairly small oscillations due to the moderating effects of the nearby ocean. In contrast to the steady temperature regime, rainfall is highly variable and confined almost exclusively to the "rainy" period from November through April. The area receives approximately 30 inches of rainfall annually, of which about 95 percent occurs during November to April. Precipitation may vary widely from year to year as a shift in the annual storm track of a few hundred miles can mean the difference between a very wet year and drought conditions. Winds in the project area typically vary diurnally. The usual pattern consists of daytime, winds originating off-shore from the west and northwest as air is funneled through the Golden Gate, and nighttime, winds originating from the east and southeast due to the cooling of land areas. Summer afternoon sea breezes can often exceed 20 miles per hour. Peak annual winds occur during winter storms. South and southeast winds typically also precede weather systems passing through the region.

Regional Air Quality

The determination of whether a region's air quality is healthful or unhealthful is made by comparing contaminant levels in ambient air samples to national and state standards. Health-based air quality standards have been established by California and the federal government for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter less than 10 microns in diameter (PM_{10}), fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). These standards were established to protect sensitive receptors with a margin of safety from adverse health impacts due to exposure to air pollution. California has also

established standards for sulfates, visibility reducing particles, hydrogen sulfide, and vinyl chloride. The state and national ambient air quality standards for each of the monitored pollutants and the current attainment status designation for the SFBAAB are summarized in Table 4.2-1, Ambient Air Quality Standards.

The National Ambient Air Quality Standards (NAAQS) (other than ozone, PM_{10}, $PM_{2.5}$ and those based on annual averages or arithmetic mean) are not to be exceeded more than once per year. The NAAQS for ozone, PM_{10}, and $PM_{2.5}$ are based on statistical calculations over 1- to 3-year periods, depending on the pollutant. The SFBAAB is currently designated as a marginal nonattainment area with respect to the national standard for ozone and is designated as attainment or unclassifiable for all other pollutants. Additional details regarding the federal attainment status of the SFBAAB are provided in Table 4.2-5 below. Air quality of a region is considered to be in attainment of the state standards if the measured ambient air pollutant levels for OZONE, CO, SO_2 (1- and 24-hour), NO_2, PM_{10}, $PM_{2.5}$, and visibility reducing particles are not exceeded, and all other standards are not equaled or exceeded at any time in any consecutive three-year period. The SFBAAB is currently designated as a nonattainment area with respect to the state standards for OZONE, PM_{10}, and $PM_{2.5}$ and is designated as attainment or unclassified for all other pollutants. Additional details regarding the state attainment status of the SFBAAB are provided in Table 4.2-6 below.

Table 4.2-1
Ambient Air Quality Standards

Air Pollutant	State Standard	Federal Primary Standard	Most Relevant Health Effects
Ozone	0.070 ppm, 8-hr. avg. 0.09 ppm, 1-hr. avg.	0.08 ppm, 8-hr avg. (3-year average of annual 4th-highest daily maximum)	(a) Short-term exposures: Pulmonary function decrements and localized lung edema in humans and animals and risk to public health implied by alterations in pulmonary morphology and host defense in animals; (b) Long-term exposures: Risk to public health implied by altered connective tissue metabolism and altered pulmonary morphology in animals after long-term exposures, and pulmonary function decrements in chronically exposed humans; (c) Vegetation damage; and (d) Property damage
Carbon Monoxide	9.0 ppm, 8-hr avg. 20 ppm, 1-hr avg.	9 ppm, 8-hr avg. 35 ppm, 1-hr avg.	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Impairment of central nervous system functions; and (d) Possible increased risk to fetuses

Air Pollutant	State Standard	Federal Primary Standard	Most Relevant Health Effects
Nitrogen Dioxide	0.25 ppm, 1-hr avg.	0.053 ppm, annual arithmetic mean	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in sensitive groups; (b) Risk to public health implied by pulmonary and extra-pulmonary biochemical and cellular changes and pulmonary structural changes; and (c) Contribution to atmospheric discoloration
Sulfur Dioxide	0.04 ppm, 24-hr avg. 0.25 ppm, 1-hr. avg.	0.030 ppm, annual arithmetic mean 0.14 ppm, 24-hr avg.	(a) Bronchoconstriction accompanied by symptoms which may include wheezing, shortness of breath and chest tightness, during exercise or physical activity in person with asthma
Respirable Particulate Matter	20 µg/m^3, annual arithmetic mean 50 µg/m^3, 24-hr avg.	150 µg/m^3, 24-hr avg.	(a) Excess deaths from short-term exposures and exacerbation of symptoms in sensitive patients with respiratory disease; and (b) Excess seasonal declines in pulmonary function, especially in children
Fine Particulate Matter	12 µg/m^3, annual arithmetic mean	15 µg/m3, annual arithmetic mean (3-year average) 35 µg/m3, 24-hr avg. (3-year average of 98th percentile)	(a) Increased hospital admissions and emergency room visits for heart and lung disease; (b) Increased respiratory symptoms and disease; and (c) Decreased lung function and premature death
Sulfates	25 µg/m^3, 24-hr avg.	None	(a) Decrease in ventilatory function; (b) Aggravation of asthmatic symptoms; (c) Aggravation of cardio-pulmonary disease; (d) Vegetation damage; (e) Degradation of visibility; and (f) Property damage
Lead[1]	1.5 µg/m^3, 30-day avg.	1.5 µg/m^3, calendar quarterly average	(a) Increased body burden; and (b) Impairment of blood formation and nerve conduction
Visibility-Reducing Particles	In sufficient amount to produce extinction of 0.23 per kilometer due to particles when relative humidity less than 70%, 8-hr average (10 AM to 6 PM)	None	Visibility impairment on days when relative humidity is less than 70 percent
Hydrogen Sulfide	0.03 ppm, 1-hr avg.	None	Odor annoyance
Vinyl Chloride[1]	0.01 ppm, 24-hr avg.	None	Known carcinogen

Sources: BAAQMD. Air Pollutants Regulated by the District. [September 19, 2007]; http://www.baaqmd.gov/dst/pollutants.htm. SCAQMD 2003

µg/m^3 = microgram per cubic meter.

ppm = parts per million by volume.

[1] CARB has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

The project site is located within the SFBAAB, which includes all of Alameda, Contra Costa, Marin, Napa, San Mateo, and Santa Clara counties as well as the southern half of Sonoma County and the southwestern portion of Solano County. The region is named as such because its geographical formation surrounding the San Francisco Bay. The Basin is affected by the pollutants generated within dense population centers, heavy vehicular traffic, and industry. However, as mentioned above, coastal sea breezes tend to transport pollutants generated within the SFBAAB to inland locations such as the Central Valley.

The air pollutants within the Basin are generated by two categories of sources: stationary and mobile. Stationary sources are known as "point sources" which have one or more emission sources at a single facility, or "area sources" which are widely distributed and produce many small emissions. Point sources are usually associated with manufacturing and industrial uses and include sources such as refinery boilers or combustion equipment that produce electricity or process heat. Examples of area sources include residential water heaters, painting operations, lawn mowers, agricultural fields, landfills, and consumer products, such as barbecue lighter fluid or hair spray. "Mobile sources" refer to operational and evaporative emissions from on- and off-road motor vehicles.

Local Air Quality

To identify ambient concentrations of the criteria pollutants, the BAAQMD operates more than 30 air quality monitoring stations throughout the Basin. The nearest monitoring station to the project site is located at 822 Alice Street in Oakland, approximately 5 miles southwest of the project site. This monitoring station measures CO and ozone.

Table 4.2-2, Ambient Pollutant Concentrations Measured at Oakland-Alice Street Station by Year, lists the concentrations registered and the exceedances of California Ambient Air Quality Standards (CAAQS) and the NAAQS that have occurred at this monitoring station from 2001 through 2005. Although limited 2006 data are available from other air monitoring stations, 2001 through 2005 data were used in order to provide complete coverage of air pollutants monitored at the Alice Street station. In addition, 2006 air quality data from the Alice Street monitoring station have not yet been fully reviewed and compiled for public access. During this period (i.e., 2001 to 2005), the station did not register any days above the state 1-hour or federal 8-hour ozone standard. At the closest monitoring station that monitors PM_{10} (Arkansas Street station in San Francisco), the state 24-hour PM_{10} standard was exceeded each year except for 2005. At the same Arkansas Street station, the federal 24-hour $PM_{2.5}$ standard was exceeded in 2001 and 2002, but no exceedances were registered between 2003 and 2005. No other exceedances of the state or federal standards for NO_2, CO, SO_2, or Pb were registered at this station between 2001 and 2005.

Table 4.2-2
Ambient Pollutant Concentrations Measured at Oakland-Alice Street Station by Year

Pollutant	Standards[1]	Year 2001	2002	2003	2004	2005
OZONE (O_3)						
Maximum 1-hour concentration (ppm)		0.069	0.053	0.081	0.080	0.068
Maximum 8-hour concentration (ppm)		0.043	0.043	0.054	0.057	0.045
Number of days exceeding state 1-hour standard	0.09 ppm	0	0	0	0	0
Number of days exceeding federal 8-hour standard	0.08 ppm	0	0	0	0	0
CARBON MONOXIDE (CO)						
Maximum 1-hour concentration (ppm)		5.0	4.4	3.9	3.5	3.4
Maximum 8-hour concentration (ppm)		3.98	3.34	2.78	2.64	2.44
Number of days exceeding state 8-hour standard	9.0 ppm	0	0	0	0	0
Number of days exceeding federal 8-hour standard	9 ppm	0	0	0	0	0
NITROGEN DIOXIDE (NO_2)[2]						
Maximum 1-hour concentration (ppm)		0.062	0.080	0.056	0.063	0.066
Annual Average (ppm)		na	0.019	na	0.017	0.016
Number of days exceeding state 1-hour standard	0.25 ppm	0	0	0	0	0
SULFUR DIOXIDE (SO_2)[2]						
Maximum 1-hour concentration in ppm		0.010	0.020	0.021	0.044	0.019
Maximum 24-hour concentration in ppm		0.004	0.006	0.009	0.008	0.007
Annual arithmetic mean concentration (ppm)		0.002	0.002	0.003	0.002	0.002
Number of days exceeding state 1-hour standard	0.25 ppm	0	0	0	0	0
Number of days exceeding state 24-hour standard	0.04 ppm	0	0	0	0	0
Number of days exceeding federal 24-hour standard	0.14 ppm	0	0	0	0	0
PARTICULATE MATTER (PM_{10})[3]						
Maximum 24-hour concentration ($\mu g/m^3$)[4]		69.8	78.6	51.7	51.8	46.4
Maximum 24-hour concentration ($\mu g/m^3$)[5]		67.4	74.1	50.8	48.6	44.6
Annual arithmetic mean concentration ($\mu g/m^3$)[5]		26	25	22	22	19
Number of samples exceeding state 24-hour standard	50 $\mu g/m^3$	8	4	1	1	0
Number of samples exceeding federal 24-hour standard	150 $\mu g/m^3$	0	0	0	0	0
PARTICULATE MATTER ($PM_{2.5}$)[3]						
Maximum 24-hour concentration ($\mu g/m^3$)		77	70	41.6	45.8	43.6
Annual arithmetic mean concentration using federal methods ($\mu g/m^3$)		11.5	13.1	10.2	9.9	9.5
Number of samples exceeding federal 24-hour standard[6]	65 $\mu g/m^3$	2	4	0	0	0

Pollutant	Standards [1]	Year 2001	2002	2003	2004	2005
LEAD (Pb)[7]						
Maximum 30-day average concentration (µg/m³)		0.02	0.02	0.01	—	—
Maximum quarterly average concentration (µg/m³)		0.01	0.01	0.01	—	—
Number of months exceeding state standard	1.5 µg/m³	0	0	0	—	—

Sources: (i) California Air Resources Board Air Quality Database http://www.arb.ca.gov/adam/welcome.html
(ii) U.S. Environmental Protection Agency Air Quality Database http://www.epa.gov/air/data/

1 Parts by volume per million of air (ppm), micrograms per cubic meter of air (µg/m^3) or annual arithmetic mean (aam).

2 SO_2 and NO_2 are not monitored at the Alice Street monitoring station. Data for 2001–2003 were obtained from the 6701 International Boulevard monitoring station in Oakland, which is located approximately 8.5 miles southeast of the project site. The 6701 International Boulevard station is the closest monitoring station that monitors for these pollutants. Monitoring for NO_2 and SO_2 was discontinued at the 6701 International station in 2003. Data for 2004 and 2005 were obtained from the Arkansas Street station in San Francisco, the next closest monitoring station located 11 miles west of the project site.

3 Data is from monitoring station in San Francisco at Arkansas Street, the closest monitoring that that monitors that particulate pollutant.

4 Using state methods for sampling.

5 Using federal methods for sampling.

6 The federal $PM_{2.5}$ standard was revised from 65 to 35 µg/m³ in September 2006. Statistics shown are based on the 65 µg/m³ standard.

7 Pollutant concentrations were obtained from the Arkansas Street station, the closest monitoring station that monitors for lead.

NOTES:
Sulfates are monitored at Arkansas Street Station, San Francisco. Sulfates have not exceeded the state standard of 25 µg/m³ for more than 20 years.

Sensitive Receptors

Land uses such as schools, hospitals and convalescent homes are considered relatively sensitive to poor air quality because infants and children, the elderly, and people with health afflictions, especially respiratory ailments, are more susceptible to respiratory infections and other air-quality-related health problems than the general public. Residential areas are also considered sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to any pollutants present. Recreational areas are also considered sensitive locations due to vigorous exercise associated with these types of land uses (exercise causes an increased breathing rate that will lead to greater exposure to ambient air pollutants).

Meteorological conditions in the area result in winds that tend to blow toward the east, southeast, and northeast. Sensitive land uses in the vicinity of the proposed project include residential neighborhoods, open space recreational areas, university student dormitories, and day care centers. Residential neighborhoods are located along the western and northern boundary of the proposed project. The nearest residences are approximately 600 feet away.

The UC Berkeley campus lies west of the project site. Sensitive land uses on the campus, which are in proximity of the project site, include a dormitory, Foothill Student Housing facility, and a day care facility, which is located in Girton Hall. The open space areas of Strawberry Canyon (owned by

University of California) are located southeast of the project site. Other open-space areas include the University of California's Ecological Study Area and the Botanical Garden, the 2,000-acre Tilden Regional Park to the northeast, and the 208-acre Claremont Canyon Regional Preserve, which is located to the southeast of the project site.

Localized Carbon Monoxide Concentrations

Traffic congestion along roadways and at intersections has the potential to generate localized high levels of CO. The BAAQMD monitoring stations have not recorded any exceedances of the state or federal CO standards since 1991. However, because elevated CO concentrations are generally localized, heavy traffic volumes and congestion at specific intersections or roadway segments can lead to high levels of CO, or hotspots, while concentrations at the nearest air quality monitoring station may be below state and federal standards.

Surrounding Land Uses

The proposed project site is surrounded by residential neighborhoods, UC Berkeley campus, recreational areas, university dormitories, and daycare centers. Major sources of air pollutants associated with these uses include motor vehicle emissions, natural gas combustion for water and space heating, and periodic landscape maintenance. It is not anticipated that surrounding land uses would result in emissions that would have a significant impact on the employees of the proposed project.

Global Climate Change

Description of Greenhouse Effect

Heat retention within the atmosphere is an essential process to sustain life on Earth. An important natural process through which heat is retained in the troposphere[1] is called the "greenhouse effect". The greenhouse effect traps heat in the troposphere through a three-fold process as follows: Short-wave radiation emitted by the Sun is absorbed by the Earth; the Earth emits a portion of this energy in the form of long-wave radiation; and greenhouse gases (GHGs) in the upper atmosphere absorb this long-wave radiation and emit this long-wave radiation into space and toward the Earth. This "trapping" of the long-wave (thermal) radiation emitted back toward the Earth is the underlying process of the greenhouse effect. Without the greenhouse effect, it is estimated that the Earth's average temperature would be approximately -18 degrees Celsius (°C) (0° Fahrenheit [°F]) instead of its present 14°C (57°F) (National Climatic Data Center 2006). The most abundant GHGs are water vapor and carbon dioxide. Many other

[1] The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth's surface to 10 to 12 kilometers).

trace gases have greater ability to absorb and re-radiate long-wave radiation; however, these gases are not as plentiful. For this reason, and 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-radiate long-wave radiation. The GWP of a gas is determined using carbon dioxide as the reference gas with a GWP of 1.

Greenhouse Gases

Primary Greenhouse Gases

Greenhouse gases include, but are not limited to, the following (IPCC 1996)[2]:

- Carbon dioxide (CO_2). Carbon dioxide associated with human activity is generated primarily by fossil fuel combustion in stationary and mobile sources. Due to the emergence of industrial facilities and mobile sources in the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent (U.S. EPA 2006). Carbon dioxide is the most widely-emitted anthropogenic GHG and is the reference gas (GWP of 1) for determining GWPs for other GHGs. In 2004, 83.8 percent of California's GHG emissions were carbon dioxide (CEC 2006).

- Methane (CH_4). Methane is emitted from biogenic sources, incomplete combustion in forest fires, landfills, manure management, and leaks in natural gas pipelines. In the United States, the top three sources of methane come from landfills, natural gas systems, and enteric fermentation (U.S. EPA 2006). 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_2O). Nitrous oxide is produced by both 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.

- Hydrofluorocarbons (HFCs). HFCs are typically used as refrigerants for both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam blowing is growing as the continued phase-out of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) gains momentum. The GWP of HFCs range from 140 for HFC-152a to 6,300 for HFC-236fa.

- Perfluorocarbons (PFCs). PFCs are compounds consisting of carbon and fluorine. They are primarily created as a byproduct of aluminum production and semiconductor manufacturing. PFCs are potent GHGs with a GWP several thousand times that of carbon dioxide, depending on the specific PFC. Another area of concern regarding PFCs is their long atmospheric lifetime (up to 50,000 years) (Energy Information Administration 2001). The GWPs of PFCs range from 5,700 to 11,900.

- Sulfur hexafluoride. 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

2 All GWPs are given as 100-year GWP. Unless noted otherwise, all GWPs were obtained from the Intergovernmental Panel on Climate Change (Intergovernmental Panel on Climate Change 1996).

Intergovernmental Panel on Climate Change (IPCC) with a GWP of 23,900. However, its global warming contribution is not as high as the GWP would indicate due to its low mixing ratio compared to carbon dioxide (4 parts per trillion [ppt] in 1990 versus 365 ppm) (U.S. EPA 2006).

- Water vapor (H_2O). Although water vapor has not received the scrutiny of other GHGs, it is the primary contributor to the greenhouse effect. Water vapor and clouds contribute 66 to 85 percent of the greenhouse effect (water vapor alone contributes 36 to 66 percent) (Real Climate 2005). Natural processes such as evaporation from oceans and rivers and transpiration from plants contribute 90 percent and 10 percent of the water vapor in our atmosphere, respectively (United States Geological Survey 2006). The primary human-related source of water vapor comes from fuel combustion in motor vehicles; however, this is not believed to contribute a significant amount (less than 1 percent) to atmospheric concentrations of water vapor (Energy Information Administration 2002). Therefore, the control and reduction of water vapor emissions is not within reach of human actions. The IPCC has not determined a GWP for water vapor.

Other Greenhouse Gases

In addition to the six major GHGs discussed above (excluding water vapor), many other compounds have the potential to contribute to the greenhouse effect. Some of these substances were previously identified as stratospheric ozone depletors; therefore, their gradual phase-out is currently in effect. A few of these compounds are discussed below:

- Hydrochlorofluorocarbons (HCFCs). HCFCs are solvents, similar in use and chemical composition to CFCs. The main uses of HCFCs are for refrigerant products and air conditioning systems. As part of the Montreal Protocol, all developed countries that adhere to the Protocol are subject to a consumption cap and gradual phase-out of HCFCs. The United States is scheduled to achieve a 100 percent reduction to the cap by 2030. The GWPs of HCFCs range from 93 for HCFC-123 to 2,000 for HCFC-142b (U.S. EPA 1996).

- 1,1,1-trichloroethane. 1,1,1-trichloroethane or methyl chloroform is a solvent and degreasing agent commonly used by manufacturers. In 1992, the U.S. EPA issued Final Rule 57 FR 33754 scheduling the phaseout of methyl chloroform by 2002 (U.S. EPA 2006). Therefore, the threat posed by methyl chloroform as a GHG continues to diminish. Nevertheless, the GWP of methyl chloroform is 110 times that of carbon dioxide (U.S. EPA 1996).

- Chlorofluorocarbons (CFCs). CFCs are used as refrigerants, cleaning solvents, and aerosol spray propellants. CFCs were also part of the U.S. EPA's Final Rule 57 FR 3374 for the phaseout of ozone depleting substances. Currently, CFCs have been replaced by HFCs in cooling systems and a variety of alternatives for cleaning solvents. Nevertheless, CFCs remain suspended in the atmosphere, contributing to the greenhouse effect. CFCs are potent GHGs with GWPs ranging from 4,600 for CFC-11 to 14,000 for CFC-13 (U.S. EPA 2006).

- Ozone (O_3). Ozone occurs naturally in the stratosphere where it is largely responsible for filtering harmful ultraviolet (UV) radiation. In the troposphere, ozone acts as a GHG by absorbing and re-radiating the infrared energy emitted by the Earth. As a result of the industrial revolution and rising emissions of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) (ozone precursors), the concentrations of ozone in the troposphere have increased (IPCC 2006). Due to the short life span of ozone in the troposphere, its concentration and contribution as a GHG is not well established. However, the greenhouse effect of tropospheric ozone is considered small, as the radiative forcing of ozone is 25 percent of that of carbon dioxide (IPCC 2007).[3]

Contributions to Greenhouse Gas Emissions

Global

Anthropogenic GHG emissions worldwide as of 2004 (the last year for which data are available for Annex 1 countries) total approximately 29,900 CO_2 equivalent million metric tons ($MMTCO_2E$)[4] with five countries and the European Community (including Germany) accounting for approximately 72 percent of the total (see Table 4.2-3, Six Top GHG Producer Countries and the European Community). It should be noted that inventory data are not all from the same year and may vary depending on the source of the emissions inventory. Furthermore, the GHG emissions in more recent years may be substantially different than those shown in Table 4.2-3.

United States

As noted in Table 4.2-3, the United States was the top producer of greenhouse gas emissions, as of 2004. At that time, six of the states—Texas, California, Pennsylvania, Ohio, Illinois, and Florida, in ranked order—would each rank among the top 30 GHG emitters internationally (World Resources Institute 2006). The primary greenhouse gas emitted by human activities in the United States was CO_2, representing approximately 84 percent of total greenhouse gas emissions (U.S. EPA 2006). Carbon dioxide from fossil fuel combustion, the largest source of U.S. greenhouse gas emissions, accounts for approximately 80 percent of U.S. GHG emissions (U.S. EPA 2006).

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3 Radiative forcing, measured in Watts/m^2, is an externally imposed perturbation (e.g., stimulated by greenhouse gases) in the radiative energy budget of the Earth's climate system (i.e., energy and heat retained in the troposphere minus energy passed to the stratosphere).

4 The CO_2 equivalent emissions are commonly expressed as "million metric tons of carbon dioxide equivalent ($MMTCO_2E$)" The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP, such that $MMTCO_2E$ = (million metric tons of a GHG) x (GWP of the GHG). For example, the GWP for methane is 21. This means that emissions of one million metric tons of methane are equivalent to emissions of 21 million metric tons of CO_2.

Table 4.2-3
Six Top GHG Producer Countries and the European Community

Emitting Countries	2004 GHG Emissions ($MMTCO_2E$)*
United States	7,067.6[1]
China	4,963.1[2]
European Community	4,228.0[1]
Russian Federation	2,086.4[1]
India	1,889.1[2]
Japan	1,355.2[1]
Germany[3]	1015.3[1]
Total:	21,589.4

Sources:
1 United Nations Framework Convention on Climate Change 2006.
2 GHG emissions for China and India (Calendar Year 2000) were obtained from the World Resources Institute's Climate Analysis Indicators Tool (CAIT) <http://www.cait.wri.org/cait.php>
3 Germany's GHG emissions are included in the European Community.
* Excludes emissions/removals from land use, land-use change and forestry (LULUCF)

State of California

Based upon the 2004 GHG inventory data (the latest year available) compiled by the California Energy Commission (CEC) for California and GHG inventories for countries contributing to the worldwide GHG emissions inventory compiled by the United Nations Framework Convention on Climate Change (UNFCCC) for 2004, California's GHG emissions rank second in the United States with emissions of 431 $MMTCO_2E$ (excluding emissions related to imported power) and internationally between Spain (427.9 $MMTCO_2E$) and Australia (529.2 $MMTCO_2E$). However, in terms of the United States, the CEC report ranks California as the fourth lowest per capita emitter of CO_2 from fossil fuel combustion, based on 2001 data.

The CEC report placed CO_2 produced by fossil fuel combustion in California as the largest source of GHG emissions, accounting for 81 percent of the total GHG emissions. CO_2 emissions from other sources contributed 2.8 percent of the total GHG emissions, methane emissions 5.7 percent, nitrous oxide emissions 6.8 percent, and high-GWP gases 2.9 percent (CEC 2006). These high GWP gases are largely composed of refrigerants and a small contribution of sulfur hexafluoride (SF_6) used as insulating materials in electricity transmission and distribution.

The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and other sources that

include commercial and residential activities. These primary contributors to California's GHG emissions and their relative contributions are presented in Table 4.2-4, GHG Sources in California.

It should be noted that emissions from each of these economic sectors are not confined to emissions from a single process, since there is crossover with other sectors. For example, the GHG emissions from cement production places clinker (nodules formed by the heat processing of cement elements in a kiln) manufacturing in its own category and the fuel used to heat the cement production process within the industrial fuel category. In the case of landfills, methane emissions and CO_2 emissions and sinks are reported in their respective portions of the inventory. Taken together, the CO_2 sinks approximately offset the landfill methane emissions. Additionally, fuel-related GHG emissions from transporting wastes to landfills are included in transportation fuels.

Table 4.2-4
GHG Sources in California[1]

Source Category	Annual GHG Emissions ($MMTCO_2E$)[a]	Percent of Total	Annual GHG Emissions ($MMTCO_2E$)[b]	Percent of Total
Transportation	200.1	40.7%	200.1	46.4%
Electric Power Production	109.2	22.2%	48.4	11.2%
Industry	100.9	20.5%	100.9	23.4%
Agriculture & Forestry	40.9	8.3%	40.9	9.5%
Other	40.9	8.3%	40.9	9.5%
Total	492.0	100.0%	431.2	100.0%

Sources:
[1] CEC 2006.
[a] Includes emissions associated with imported electricity, which account for 60.8 $MMTCO_2E$ annually.
[b] Excludes emissions associated with imported electricity.

Global Climate Change

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer) (U.S. EPA 2006). 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, and desertification).

Effects of Global Climate Change

The primary effect of global climate change has been a rise in 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 shows that further warming would occur, which would induce further changes in the global climate system during the current century (IPCC 2007). According to the Intergovernmental Panel on Climate Change, changes to the global climate system and ecosystems and to California could include, but would not be limited to:

- the loss of sea ice and mountain snowpack resulting in higher sea levels and higher 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);
- a rise in global average sea level primarily due to thermal expansion and melting of glaciers and ice caps, and the Greenland and Antarctic ice sheets (IPCC 2007);
- changes in weather that include widespread changes in 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);
- the decline of Sierra snowpack, which accounts 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);
- an increase in the number of days conducive to ozone formation by 25 to 85 percent (depending on the future temperature scenario) in high ozone areas of Los Angeles and the San Joaquin Valley by the end of the 21st century (CalEPA 2006); and
- high potential for erosion of California's coastlines and sea water intrusion into the Delta and associated levee systems due to the rise in sea level (CalEPA 2006).

4.2.3 Regulatory Considerations

Air quality within the SFBAB is addressed through the efforts of various federal, state, regional and local government agencies. These agencies work jointly as well as individually to improve air quality through legislation, regulations, planning, policymaking, education, and a variety of programs. With respect to the proposed project, the BAAQMD would administer most of the air quality requirements affecting the CRT Facility. The agencies primarily responsible for improving the air quality within the Basin are discussed in the following pages, along with their individual responsibilities.

United States Environmental Protection Agency

Criteria Pollutants

The United States Environmental Protection Agency is responsible for enforcing the federal Clean Air Act (CAA) and the NAAQS. The NAAQS identify levels of air quality for seven criteria pollutants that are considered the maximum levels of ambient (background) air pollutants considered safe, with an adequate margin of safety, to protect the public health and welfare. The seven criteria pollutants are ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and Pb. Particulate matter is the general term used for a mixture of solid particles and liquid droplets found in the air. For air quality purposes, these particles are classified by size: fine particulates ($PM_{2.5}$) have a diameter less than or equal to 2.5 micrometers, and respirable or coarse particulates (PM_{10}) have a diameter less than or equal to 10 micrometers. The federal ambient air quality standards and the relevant health effects of the criteria pollutants are summarized in Table 4.2-1.

The SFBAAB is currently classified by the U.S. EPA as a nonattainment/marginal area for the 8-hour standard for ozone. Additionally, it has been designated as an attainment/unclassifiable area for the 1-hour and 8-hour standards for CO; the 24-hour and annual $PM_{2.5}$ standards; the annual standard for NO_2; and as an attainment area for the quarterly Pb standard and 24-hour and annual SO_2 standards. The SFBAAB is currently designated as unclassifiable for the 24-hour PM_{10} standard. In response to its enforcement responsibilities, the U.S. EPA requires each state to prepare and submit a State Implementation Plan describing how the state will achieve the federal standards by specified dates, depending on the severity of the air quality within the state or air basin. The BAAQMD has been delegated the responsibility for implementing many of the CAA requirements for the region, which includes the Berkeley Lab.

The status of the SFBAAB with respect to attainment with the NAAQS is summarized in Table 4.2-5, National Ambient Air Quality Standards and Status – San Francisco Bay Area Air Basin.

Table 4.2-5
National Ambient Air Quality Standards and Status
San Francisco Bay Area Air Basin

Pollutant	Averaging Time	Designation/Classification
Ozone (O_3)	8 Hour	Nonattainment/Marginal
Carbon Monoxide (CO)	1 Hour, 8 Hour	Attainment/Unclassifiable
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	Attainment/Unclassifiable
Sulfur Dioxide (SO_2)	24 Hour, Annual Arithmetic Mean	Attainment
Respirable Particulate Matter (PM_{10})	24 Hour	Unclassifiable
Fine Particulate Matter ($PM_{2.5}$)	24 Hour, Annual Arithmetic Mean	Attainment/Unclassifiable
Lead (Pb)	Calendar Quarter	Attainment

Source: Environmental Protection Agency. "Region 9: Air Programs, Air Quality Maps." [Online] [July 19, 2007].

Hazardous Air Pollutants

Regulation of hazardous air pollutants (HAPs) under federal regulations is achieved through federal and state controls on individual sources. Federal law defines HAPs as noncriteria air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. The 1990 federal CAA Amendments offer a comprehensive plan for achieving significant reductions in both mobile and stationary source emissions of HAPs. Under the 1990 CAA Amendments, a total of 189 chemicals or chemical families were designated HAPs because of their adverse human health effects. Title III of the 1990 federal CAA Amendments amended Section 112 of the CAA to replace the former program with an entirely new technology-based program. Under Title III, the U.S. EPA must establish maximum achievable control technology emission standards for all new and existing "major" stationary sources through promulgation of National Emission Standards for Hazardous Air Pollutants (NESHAP). Major stationary sources of HAPs are required to obtain an operating permit from the BAAQMD pursuant to Title V of the 1990 CAA Amendments. A major source is defined as one that emits at least 10 tons per year of any HAP or at least 25 tons per year of all HAPs. Neither LBNL nor UC Berkeley is considered a major source.

California Air Resources Board

CARB, a branch of the California Environmental Protection Agency (CalEPA), oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1988 California Clean Air Act (CCAA), for responding to the federal CAA requirements and for regulating emissions from motor vehicles and consumer products within the state. CARB has established emission standards for vehicles sold in California and for various types of equipment available commercially. It also sets fuel specifications to further reduce vehicular emissions. The CCAA and other California air quality statutes designate local air districts, such as the BAAQMD, with the responsibility for regulating most stationary sources, and to a certain extent, area sources. CARB is responsible for the regulation of motor vehicles and fuels and some area sources such as consumer products.

Like the U.S. EPA, CARB has established ambient air quality standards for the state (i.e., CAAQS). These standards apply to the same seven criteria pollutants as the federal CAA and also address sulfates (SO_4), visibility-reducing particles, hydrogen sulfide (H_2S) and vinyl chloride (C_2H_3Cl). The CCAA standards are more stringent than the federal standards and, in the case of PM_{10} and SO_2, far more stringent. The CCAA requires air pollution control districts to achieve the state standards by the earliest practicable date.

Based on monitored pollutant levels, the CCAA divides ozone nonattainment areas into four categories—moderate, serious, severe, and extreme—to which progressively more stringent planning and emission control requirements apply.

The Basin is a nonattainment area for the California 1-hour and 8-hour ozone standard. The Basin is designated as nonattainment for the California 24-hour and annual PM_{10} standards, as well as the California annual $PM_{2.5}$ standard. The Basin is designated as attainment or unclassifiable for all other CAAQS. The ozone precursors, reactive organic gases (ROG) and oxides of nitrogen (NO_X), in addition to PM_{10}, are the pollutants of concern for projects located in the Basin. The status of the SFAAB with respect to attainment with the CAAQS is summarized in Table 4.2-6, California Ambient Air Quality Standards and Status – San Francisco Bay Area Air Basin.

Table 4.2-6
California Ambient Air Quality Standards and Status
San Francisco Bay Area Air Basin

Pollutant	Averaging Time	Designation/Classification
Ozone (O_3)	1 Hour, 8 Hour	Nonattainment[1]
Carbon Monoxide (CO)	1 Hour, 8 Hour	Attainment
Nitrogen Dioxide (NO_2)	1 Hour	Attainment
Sulfur Dioxide (SO_2)	1 Hour, 24 Hour	Attainment
Respirable Particulate Matter (PM_{10})	24 Hour, Annual Arithmetic Mean	Nonattainment
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	Nonattainment
Lead (Pb)[2]	30 Day Average	Attainment
Sulfates (SO_4)	24 Hour	Attainment
Hydrogen Sulfide (H_2S)	1 Hour	Unclassified
Vinyl Chloride (C_2H_3Cl)[2]	24 Hour	Unclassified
Visibility Reducing Particles	8 Hour (10 AM–6 PM)	Unclassified

Source: California Air Resources Board. "Area Designations Maps/State and National." [Online] [July 26, 2007]. http://www.arb.ca.gov/desig/adm/adm.htm

[1] CARB has not issued area classifications based on the new state 8-hour standard. The previous classification for the 1-hour ozone standard was Serious.

[2] CARB has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined.

Toxic Air Contaminants

California law defines toxic air contaminants (TACs) as air pollutants having carcinogenic or other health effects. Assembly Bill (AB) 1807 (the Tanner Bill, passed in 1983) established the State Air Toxics Program and the methods for designating certain chemicals as TACs. A total of 245 substances have been designated TACs under California law; they include the federal HAPs adopted as TACs in accordance with AB 2728. The Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources; AB 2588 does not regulate air toxics emissions directly.

Under AB 2588, sources emitting more than 10 tons per year of any criteria air pollutant must estimate and report their toxic air emissions to the local air districts. Local air districts then prioritize facilities on the basis of emissions, and high priority facilities are required to submit a health risk assessment and communicate the results to the affected public. Depending on risk levels, emitting facilities are required to implement varying levels of risk reduction measures. The BAAQMD is responsible for implementing AB 2588 in the SFBAAB.

The BAAQMD is currently working to control TAC impacts from local hot spots and from ambient background concentrations. The control strategy involves reviewing new sources to ensure compliance with required emission controls and limits, maintaining an inventory of existing sources to identify major TAC emissions and developing measures to reduce TAC emissions. The BAAQMD publishes the results of the various control programs in an annual report, which provides information on the current TAC inventory, AB 2588 risk assessments, TAC monitoring programs, and TAC control measures and plans.

One of the TACs being controlled by the BAAQMD is particulate matter (PM) from diesel-fueled engines, also known as diesel exhaust particulate. In 1998, CARB identified diesel exhaust particulate as a TAC. Compared to other TACs, diesel exhaust particulate emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk in the Basin. On a statewide basis, the average potential cancer risk associated with these emissions is over 500 potential cancer cases per million exposed people. In addition to these general risks, diesel exhaust particulate can also present elevated localized or near-source exposures. Depending on the activity and nearness to receptors, these potential risks can range from small to 1,500 cancer cases per million exposed people (CARB 2000).

Greenhouse Gas Regulatory Programs

Kyoto Protocol

The original Kyoto Protocol was negotiated in December 1997 and came into force on February 16, 2005. As of June 2007, 174 countries and the European Economic Community have ratified the agreement; however, notably, the U.S. and Australia have not ratified the Protocol. Participating nations are separated into Annex 1 (i.e., industrialized countries) and Non-Annex 1 (i.e., developing countries) countries that have differing requirements for GHG reductions. The goal of the Protocol is to achieve overall emissions reduction targets for six GHGs by the period 2008-2012. The six GHGs regulated under the Protocol are carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs. Each nation has an emissions reduction target under which they must reduce GHG emissions a certain percentage below 1990 levels (e.g., 8 percent reduction for the European Union, 6 percent reduction for Japan). The average reduction target for nations participating in the Kyoto Protocol is approximately five

percent below 1990 levels (Pew Center on Global Climate Change No date). Although the United States has not ratified the Protocol, it has established a target of 18 percent reduction in GHG emissions intensity by 2012 (The White House. Addressing Global Climate Change 2007). Greenhouse gas intensity is the ratio of GHG emissions to economic output (i.e., gross domestic product).

Federal Activities

In Massachusetts vs. EPA, the Supreme Court held that U.S. EPA has the statutory authority under Section 202 of the CAA to regulate GHGs from new motor vehicles. The court did not hold that the 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, President Bush 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. The order requires the U.S. EPA to coordinate closely with other federal agencies and to consider the president's Twenty-in-Ten plan in this process. The Twenty-in-Ten plan would establish a new alternative fuel standard that would require the use of 35 billion gallons of alternative and renewable fuels by 2017. The U.S. EPA will be working closely with the Department of Transportation in developing new automotive efficiency standards.

California Activities

AB 1493

In a response to the transportation sector accounting for more than half of California's CO_2 emissions, Assembly Bill 1493 (AB 1493, Pavley) was enacted on July 22, 2002. AB 1493 required CARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles determined by the state board to be vehicles whose primary use is noncommercial personal transportation in the state. The bill required that CARB set the GHG emission standards for motor vehicles manufactured in 2009 and all subsequent model years. In setting these standards, CARB must consider cost-effectiveness, technological feasibility, economic impacts, and provide maximum flexibility to manufacturers. CARB adopted the standards in September 2004. These standards are intended to reduce emissions of carbon dioxide and other greenhouse gases (e.g., nitrous oxide, methane). The new standards would phase in during the 2009 through 2016 model years. When fully phased in, the near-term (2009-2012) standards will result in about a 22 percent reduction in greenhouse gas emissions compared to the emissions from the 2002 fleet, while the mid-term (2013 to 2016) standards will result in a reduction of about 30 percent.

Some currently used technologies that achieve GHG reductions include small engines with superchargers, continuously variable transmissions, and hybrid electric drive.

In December 2004, these regulations were challenged in federal court by the Alliance of Automobile Manufacturers, who claimed that the law regulated vehicle fuel economy, a duty assigned to the federal government. The case had been put on hold by a federal judge in Fresno pending the U.S. Supreme Court's decision in Massachusetts vs. EPA. The U.S. Supreme Court's ruling in favor of the state of Massachusetts has been discussed as a likely vindication of state efforts to control GHG emissions, although there has not yet been a decision regarding AB 1493. Before these regulations may go into effect, the U.S. EPA must grant California a waiver under the federal Clean Air Act, which ordinarily preempts state regulation of motor vehicle emission standards. Following the issuance of the Massachusetts vs. EPA decision, the U.S. EPA announced that it will decide whether to grant California a waiver by December 2007.

Executive Order S-3-05

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; GHG emissions should be reduced to 1990 levels by 2020; and GHG emissions should be reduced to 80 percent below 1990 levels by 2050. The Secretary of CalEPA (the Secretary) 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 Energy Commission, and the President of the Public Utilities Commission. The Secretary is required to submit a biannual progress report 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, the coastline, and forestry, and reporting possible mitigation and adaptation plans to combat these impacts.

AB 32

In furtherance of the goals established in Executive Order S-3-05, the Legislature enacted 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. CARB has been assigned to carry out and develop the programs and requirements necessary to achieve the goals of AB 32. The foremost

objective of CARB is to adopt regulations that require the reporting and verification of statewide GHG emissions. This program will be used to monitor and enforce compliance with the established standards. The first GHG emissions limit is equivalent to the 1990 levels, which are to be achieved by 2020. CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 allows CARB to adopt market-based compliance mechanisms to meet the specified requirements. Finally, CARB is ultimately responsible for monitoring compliance and enforcing any rule, regulation, order, emission limitation, emission reduction measure, or market-based compliance mechanism adopted. In order to advise CARB, it must convene an Environmental Justice Advisory Committee and an Economic and Technology Advancement Advisory Committee. By January 2008, the first deadline for AB 32, a state-wide cap for 2020 emissions based on 1990 levels must be adopted. The following year (January 2009), CARB must adopt mandatory reporting rules for significant sources of GHGs and also a plan indicating how reductions in significant GHG sources will be achieved through regulations, market mechanisms, and other actions.

The first action under AB 32 resulted in the adoption of a report listing early action greenhouse gas emission reduction measures on June 21, 2007. The early actions include three specific GHG control rules. On October 25, 2007, CARB approved to an additional six early action GHG reduction measures under AB 32. These early action GHG reduction measures are to be adopted and enforced before January 1, 2010, along with 32 other climate-protecting measures CARB is developing between now and 2011. The report divides early actions 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);
- require 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 SF_6 from non-electricity sectors if viable alternatives are available.

SB 1368

Governor Schwarzenegger, just two days after signing AB 32, reiterated California's commitment to reducing GHGs by signing Senate Bill (SB) 1368. SB 1368 requires the California Energy Commission to develop and adopt regulations for GHG emissions performance standards for the long-term procurement of electricity by local publicly-owned utilities. The California Energy Commission must adopt the standards on or before June 30, 2007. These standards must be consistent with the standards adopted by the California Public Utilities Commission. This effort will help to protect energy customers from financial risks associated with investments in carbon-intensive generation by allowing new capital investments in power plants whose GHG emissions are as low or lower than new combined-cycle natural gas plants, by requiring imported electricity to meet GHG performance standards in California and requiring that the standards be developed and adopted in a public process.

Executive Order S-1-07

On January 18, 2007, California further solidified its dedication to reducing GHGs by setting a new Low Carbon Fuel Standard (LCFS) for transportation fuels sold within the state. Executive Order S-1-07 sets a declining standard for GHG emissions measured in CO_2-equivalent gram per unit of fuel energy sold in California. The target of the LCFS is to reduce the carbon intensity of California passenger vehicle fuels by at least 10 percent by 2020. The LCFS will apply to refiners, blenders, producers, and importers of transportation fuels and will use market-based mechanisms to allow these providers to choose how they reduce emissions during the "fuel cycle" using the most economically feasible methods. The Executive Order requires the Secretary of CalEPA to coordinate with actions of the California Energy Commission,

CARB, the University of California, and other agencies to develop a protocol to measure the "life-cycle carbon intensity" of transportation fuels. CARB is anticipated to complete its review of the LCFS protocols no later than June 2007 and implement the regulatory process for the new standard by December 2008.

SB 97

In August 2007, as part of the legislation accompanying the state budget negotiations, the Legislature enacted SB 97 (Dutton), which directs the Governor's Office of Planning and Research (OPR) to develop guidelines under CEQA for the mitigation of greenhouse gas emissions. OPR is to develop proposed guidelines by July 1, 2009, and the Resources Agency is directed to adopt guidelines by January 1, 2010. Until such guidelines are promulgated, there is no guidance from OPR or other agencies regarding the analysis of greenhouse gas emissions in EIRs.

Bay Area Air Quality Management District

Management of air quality in the Basin is the responsibility of the BAAQMD. The BAAQMD is responsible for bringing and/or maintaining air quality in the Basin within federal and air quality standards. Specifically, the BAAQMD has responsibility for monitoring ambient air pollutant levels throughout the Basin and developing and implementing attainment strategies to ensure that future emissions will be within federal and state standards. The following plans have been developed by the BAAQMD to achieve attainment of the federal and state ozone standards. The Clean Air Plan (CAP) and Ozone Strategy fulfill the planning requirements of the CCAA, while the Ozone Attainment Plan fulfills the federal CAA requirements.

Clean Air Plans

As discussed previously, the federal and CCAA require preparation of plans to reduce air pollution to healthful levels. The CCAA requires the air districts within nonattainment areas to prepare a triennial assessments and revisions to their CAPs. The BAAQMD has responded to this requirement by preparing a series of CAPs, the most recent and rigorous of which was approved in December 2000 (BAAQMD 2000) (see also the discussion of the 2005 Ozone Strategy, which continues the series of CCAA attainment plans). The 2000 CAP continues the air pollution reduction strategy established by the 1991 CAP and represents the third triennial update to the 1991 CAP, following previous updates in 1994 and 1997. The 2000 CAP is designed to address attainment of the state standard for ozone. CAPs are intended to focus on the near-term actions through amendments of existing regulations and promulgation of new District regulations.

The 1997 CAP contained stationary and mobile source control measures, which included developing rules to reduce vehicle trips to and from major residential developments, shopping centers and other indirect sources; encouraging cities and counties to plan for high-density development; and clustering development with mixed uses in the vicinity of mass transit stations (BAAQMD 1997). The 2000 CAP includes changes in the organization and scheduling of some existing control measures, some new stationary source control measures, revisions to previous stationary source measures and deletion of some control measures deemed no longer feasible by BAAQMD staff (BAAQMD 2000). The transportation control measures (TCMs) in the 2000 CAP are unchanged from the 1997 CAP. The 2000 CAP continues to discourage urban sprawl while strongly endorsing high-density mixed-use developments near transit centers that reduce the need for commuting by personal vehicles.

2001 Ozone Attainment Plan

The BAAQMD developed the 2001 Ozone Attainment Plan as a guideline to achieve the then federal 1-hour ozone standard (BAAQMD 2001). The 2001 Attainment Plan was approved by CARB in 2001 and by the U.S. EPA in 2003. In April 2004, the U.S. EPA determined the SFBAAB had attained the federal 1-hour ozone standard. Due to the attainment status of the SFBAAB, the 1-hour ozone requirements set forth in the 2001 Ozone Attainment Plan were not required anymore. A year later, in 2005, the federal 1-hour ozone standard was revoked by the U.S. EPA for a new and more health-protective 8-hour standard. The SFBAAB was designated as marginal nonattainment for the federal 8-hour ozone standard. Although designated as nonattainment, areas designated as marginal nonattainment or less were not required to submit new attainment plans. Nonetheless, the control measures and strategies described in the 2001 Ozone Attainment Plan for the 1-hour standard will also help achieve attainment with the 8-hour standard.

2005 Ozone Strategy

The 2005 Ozone Strategy is a comprehensive document mapping how the SFBAAB will achieve attainment of the state 1-hour ozone standard as expeditiously as possible and how the SFBAAB will reduce transport of ozone and ozone precursors to neighboring air basins (BAAQMD 2006). The 2005 Ozone Strategy was prepared by the BAAQMD in cooperation with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG). The document outlines how the SFBAAB will meet the CCAA planning requirements and transport mitigation requirements through implementation of control measures and strategies. The 2005 Ozone Strategy describes its plans to implement stationary source control measures through District regulations, mobile source control measures through incentive programs; and transportation control measures through transportation programs in cooperation with MTC, transit agencies, and local governments.

Currently, the BAAQMD is developing a 2007 Ozone Strategy that will address achieving attainment for both the state 1-hour and 8-hour ozone standard. The 2007 Ozone Strategy will continue to focus on reducing transport of ozone and ozone precursors to neighboring air basins. In addition, a review of the progress achieved from 2004 to 2006 will be evaluated and used to establish meaningful and effective control measures for 2007 to 2009.

BAAQMD Rules and Regulations

The BAAQMD is responsible for limiting the amount of emissions that can be generated throughout the Basin by stationary sources. Specific rules and regulations have been adopted that limit emissions that can be generated by various uses and/or activities and identify specific pollution reduction measures that must be implemented in association with various uses and activities. These rules regulate not only the emissions of the state and federal criteria pollutants, but also the emissions of toxic air contaminants. The rules are also subject to ongoing refinement by the BAAQMD.

In general, all stationary sources with air emissions are subject to BAAQMD's rules governing their operational emissions. Some emissions sources are further subject to regulation through the BAAQMD's permitting process. Through this permitting process, the BAAQMD also monitors the amount of stationary emissions being generated and uses this information in developing the CAP. Some of the stationary emission sources that would be constructed as part of the project (e.g., cogeneration engines or emergency generator) will be subject to the BAAQMD permitting requirements. A few of the primary BAAQMD rules applicable to the proposed CRT Facility project include the following:

Regulation 2, Rule 1 (General Requirements): This rule requires new and modified sources of air pollution to acquire permits (e.g., Authority to Construct, Permit to Operate) in order to monitor stationary source emissions within the BAAQMD's jurisdiction. The rule also includes a list of equipment and processes that would be exempt from permitting requirements. Among others, these include cooling towers; boilers with a heat input rating less than 10 million British thermal units (BTU) per hour fired exclusively with natural gas, liquefied petroleum gas, or a combination; internal combustion engines with a maximum output rating less than or equal to 50 horsepower.

Regulation 2, Rule 2 (New Source Review): For new and modified stationary sources subject to permitting requirements (see Regulation 2, Rule 1), this series of rules prescribes the use of Best Available Control Technology (BACT) and the provision of emission offsets (i.e., mitigation) for equipment whose emissions exceed specified thresholds. The applicability of these requirements would be determined upon submittal of an application for an Authority to Construct under Regulation 2, Rule 1.

Regulation 2, Rule 5 (New Source Review for Toxic Air Contaminants): For new and modified stationary sources subject to permitting requirements (see Regulation 2, Rule 1) and that would emit TACs, this series of rules prescribes health risk assessment and monitoring requirements. In addition, the use of Best Available Control Technology for Toxics (TBACT) is required for sources with a cancer risk greater than 1 in one million (10^{-6}) and/or a chronic hazard index greater than 0.20. Exemptions to this rule are granted to sources that would emit TAC below the trigger levels (Table 2-5-1 of the Rule) and for emergency standby engines or testing of emergency standby engines.

Regulation 8, Rule 3 (Architectural Coatings): This rule sets limits on the VOC content in architectural coatings sold, supplied, offered for sale, or manufactured within the BAAQMD's jurisdiction. The rule also includes time schedules that specify when more stringent VOC standards are to be enforced. The rule applies during the construction phase of a project. In addition, any periodic architectural coating maintenance operations are required to comply with this rule.

Regulation 8, Rule 15 (Emulsified and Liquid Asphalts): This rule sets limits on the VOC content in emulsified and liquid asphalt used for maintenance and paving operations. The rule includes specific VOC content requirements for various types of asphalt (e.g., emulsified asphalt, rapid-cure liquid asphalt, slow-cure liquid asphalt). This rule applies during the construction phase of a project. In addition, any future asphalt maintenance of a project's roads would be required to comply with the VOC standards set in Rule 15.

Regulation 9, Rule 6 (Nitrogen Oxide Emission from Natural Gas-Fired Water Heaters): This rule sets a limit on the NO_x emissions from natural gas-fired water heaters. The rule applies to natural gas-fired water heaters manufactured after July 1, 1992 with a heat input rating of less than 75,000 BTU/hour. Water heaters subject to the rule must not emit more than 40 nanograms of NO_x per joule of heat output.

Regulation 9, Rule 8 (Nitrogen Oxides and Carbon Monoxide from Stationary Internal Combustion Engines): This rule limits the NO_x and CO emissions from stationary internal combustion engines. The rule applies to engines rated at greater than 50 brake horsepower, but it exempts emergency generators that would not run for more than 100 hours per year. The cogeneration engines would be subject to BACT, which is more stringent than the limitations in this rule.

BAAQMD CEQA Guidelines

In April 1996, the BAAQMD prepared its BAAQMD CEQA Guidelines as a guidance document to provide lead government agencies, consultants and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality sections of environmental documents for projects subject to CEQA. The BAAQMD CEQA Guidelines were last revised by the BAAQMD in December 1999. This

document describes the criteria that the BAAQMD uses when reviewing and commenting on the adequacy of environmental documents, such as this EIR. The BAAQMD CEQA Guidelines recommend thresholds for use in determining whether projects would have significant adverse environmental impacts, identify methodologies for predicting project emissions and impacts, and identify measures that can be used to avoid or reduce air quality impacts. This EIR section was prepared following these recommendations.

Association of Bay Area Governments

ABAG is a council of governments for the Counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Sonoma, and Solano. ABAG is a regional planning agency and serves as a forum for regional issues relating to transportation, the economy, community development and the environment. ABAG also serves as the regional clearinghouse for projects requiring environmental documentation under federal and state law. In this role, ABAG reviews proposed projects to analyze their impacts on ABAG's regional planning efforts.

Although ABAG is not an air quality management agency, it is responsible for several air quality planning issues. Specifically, as the designated Metropolitan Planning Organization for the nine counties, it is responsible, pursuant to Section 176(c) of the 1990 Amendments to the federal CAA, for providing current population, employment, travel and congestion projections for regional air quality planning efforts. ABAG is required to quantify and document the demographic and employment factors influencing expected transportation demand, including land-use forecasts. ABAG is also responsible for preparing and approving the portions of the Basin's CAP relating to demographic projections and integrated regional land use, housing and employment, as well as transportation programs, measures, and strategies.

Local Plans and Policies

The proposed project would be located at LBNL, which is operated by the University of California and conducts work within the University's mission on land that is owned or controlled by The Regents of the University of California. As a state project, the proposed project is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the proposed project seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. LBNL is located in the cities of Berkeley and Oakland. The following section summarizes objectives and policies from the 2006 Long Range Development Plan (LRDP), and the City of Berkeley and City of Oakland General Plans that relate to air quality.

2006 LRDP Principles and Strategies[5]

The 2006 LRDP proposed four fundamental principles that form the basis for the development strategies provided for each element of the LRDP. The one principle that is most applicable to air quality is to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship."

Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts that could result from implementation of the 2006 LRDP. Development strategies set forth in the 2006 LRDP that are applicable to air quality include the following:

- Protect and enhance the site's natural and visual resources, including native habitats, streams and mature tree stands by focusing future development primarily within the already developed areas of the site;
- Increase development densities within areas corresponding to existing cluster of development to preserve open space, enhance operational efficiencies and access;
- Site and design new facilities in accordance with University of California Policy on Sustainable Practices to reduce energy, water, and material consumption and provide improved occupant health, comfort and productivity;
- Increase use of alternative 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;
- Maintain or reduce the percentage of parking spaces relative to the adjusted daily population; and
- Consolidate parking into larger lots and/or parking structures, locate these facilities near Laboratory entrances to reduce traffic within the main site.

City of Berkeley General Plan

The City of Berkeley General Plan was adopted on April 23, 2002. The following policies and objectives are contained in the Environmental Management Element of the City of Berkeley General Plan.

Objective 3. Reduce emissions and improve air quality.

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5 While this Environmental Impact Report presents a "stand alone" impact analysis that does not rely upon tiering from any programmatic CEQA document, Berkeley Lab does actively follow the 2006 Long Range Development Plan (LRDP) as a planning guide for Lab development. Accordingly, relevant 2006 LRDP principles, strategies, and design guidelines are identified in this section.

Policy EM-18 Regional Air Quality Action: Continue working with the Bay Area Air Quality Management District and other regional agencies to:

1. Improve air quality through pollution prevention methods.
2. Ensure enforcement of air emission standards.
3. Reduce local and regional traffic (the single largest source of air pollution in the City) and promote public transit.
4. Promote regional air pollution prevention plans for business and industry.
5. Promote strategies to reduce particulate pollution from residential fireplaces and wood-burning stoves.
6. Locate parking appropriately and provide adequate signage to reduce unnecessary "circling" and searching for parking.

Policy EM-19 15% Emission Reduction: Global Warming Plan: Make efforts to reduce local [air pollutants] emissions by 15% by the year 2010.

Policy EM-20 City of Berkeley Fleet: The City should exceed Federal and State [air quality] standards for all City fleet vehicles and use all means practical to reduce emissions of criteria pollutants and greenhouse gases.

Policy EM-21 Alternative Fuels: Work with the University of California, the Berkeley Unified School District, and other agencies to establish natural gas fueling and electric vehicle recharging stations accessible to the public.

Policy EM-22 Public Awareness: Increase public awareness of air quality problems, rules, and solutions through use of City publications and networks.

In addition, the following policies from the Transportation Element of the City of Berkeley General Plan are applicable to air quality:

Policy T-10 Trip Reduction: To reduce automobile traffic and congestion and increase transit use and alternative modes in Berkeley, support, and when appropriate require, programs to encourage Berkeley citizens and commuters to reduce automobile trips. The programs that would apply to the proposed project are:

2. Participation in Commuter Check Program.

3. Carpooling and provision of carpool parking and other necessary facilities.

4. Telecommuting programs.

8. Programs to encourage neighborhood-level initiatives to reduce traffic by encouraging residents to combine trips, carpool, telecommute, reduce the number of cars owned, shop locally, and use alternative modes.

9. Programs to reward Berkeley citizens and neighborhoods that can document reduced car use.

10. Limitations on the supply of long-term commuter parking and elimination of subsidies for commuter parking.

Policy T-12 Education and Enforcement: Support, and when possible require, education and enforcement programs to encourage carpooling and alternatives to single-occupant automobile use, reduce speeding, and increase pedestrian, bicyclist, and automobile safety.

Policy T-13 Major Public Institutions: Work with other agencies and institutions, such as the University of California, the Berkeley Unified School District, Vista Community College, and the Alameda County Court, and neighboring cities to promote Eco-Pass and to pursue other efforts to reduce automobile trips.

Policy T-19 Air Quality Impacts: Continue to encourage innovative technologies and programs such as clean-fuel, electric, and low-emission cars that reduce the air quality impacts of the automobile.

Policy T-20 Neighborhood Protection and Traffic Calming: Take actions to prevent traffic and parking generated by residential, commercial, industrial or institutional activities from being detrimental to residential areas.

City of Oakland General Plan

The following transportation-related policies from the City of Oakland General Plan Land Use and Transportation Element would relate to air quality. The Land Use and Transportation Element was approved in March 1998.

Policy T2.1 Encouraging Transit-Oriented Development: Transit-oriented development should be encouraged at existing and proposed transit nodes, defined by the convergence of two or more

nodes of public transit such as BART, bus, shuttle services, light rail or electric trolley, ferry, and inter-city or commuter rail.

Policy T2.5 Linking Transportation and Activities: Link transportation facilities and infrastructure improvements to recreational uses, job centers, commercial nodes, and social services (i.e., hospitals, parks, or community centers).

Policy T3.2 Promoting Strategies to Address Congestion: The City should promote and participate in both local and regional strategies to manage traffic supply and demand where unacceptable levels of service exist or are forecast to exist.

Policy T3.5 Including Bikeways and Pedestrian Walks: The City should include bikeways and pedestrian walks in the planning of new, reconstructed, or realigned streets, wherever possible.

Policy T3.6 Encouraging Transit: The City should encourage and promote use of public transit in Oakland be expediting the movement of and access to transit vehicles on designated "transit streets" as shown on the Transportation Plan.

Policy T4.2 Creating Transportation Incentives: Through cooperation with other agencies, the City should create incentives to encourage travelers to use alternative transportation options.

Policy D3.2 Incorporating Parking Facilities: New parking facilities for cars and bicycles should be incorporated into the design of any project in a manner that encourages and promotes safe pedestrian activity.

Policy N1.2 Placing Public Transit Stops: The majority of commercial development should be accessible by public transit. Public transit stops should be placed at strategic locations in the Neighborhood Activity Centers and Transit-Oriented Districts to promote browsing and shopping by transit users.

Policy N5.1: Residential areas should be buffered and reinforced from conflicting uses through the establishment of performance-based regulations, the removal of non-conforming uses, and other tools.

In addition, the Open Space, Conservation, and Recreation (OSCAR) Element of the City of Oakland General Plan includes the following policies that are relevant to air quality. The OSCAR Element of the General Plan was adopted in 1996.

Policy CO-12.1: Promote land use patterns and densities which help improve regional air quality conditions by: (a) minimizing dependence on single passenger autos; (b) promoting projects which minimize quick starts and stops, such as live-work development, and office development with ground-floor retail space; (c) separating land uses which are sensitive to pollution from the sources of air pollution; and (d) supporting telecommuting, flexible work hours, and behavioral changes which reduce the percentage of people in Oakland who must drive to work on a daily basis.

Policy CO-12.3: Expand existing transportation systems management and transportation demand management strategies which reduce congestion, vehicle idling, and travel in single-passenger autos.

Policy CO-12.4: Require that development project be designed in a manner which reduces potential adverse air quality impacts. This may include: (a) the use of vegetation and landscaping to absorb carbon monoxide and to buffer sensitive receptors; (b) the use of low-polluting energy sources and energy conservation measures; (c) designs which encourage transit use and facilitate bicycle pedestrian travel.

Policy CO-12.5: Require new industry to use best available control technology to remove pollutants, including filtering, washing, or electrostatic treatment of emissions.

Policy CO-12.6: Require construction, demolition and grading practices which minimize dust emissions. These practices are currently required by the City and include the following:

- Avoid earth moving and other major dust-generating activities on windy days.
- Sprinkling unpaved construction areas with water during excavation, using reclaimed water where feasible. (Watering can reduce construction-related dust by 50 percent.)
- Covering stockpiled sand, soil, and other particulates with a tarp to avoid blowing dust.
- Covering trucks hauling dirt and debris to reduce spills. If spills do occur, they should be swept up promptly before materials become airborne.
- Preparing a comprehensive dust control program for major construction in populated areas or adjacent to sensitive uses like hospitals and schools.
- Operating construction and earth-moving equipment, including trucks, to minimize exhaust emissions.

Policy CO-12.7: Coordinate local air quality planning efforts with other agencies, including adjoining cities and counties, and the public agencies responsible

4.2.4 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, air quality impacts would considered significant if they would exceed the following Standards of Significance, which are based on Appendix G of the State CEQA Guidelines, the BAAQMD CEQA Guidelines, and the UC CEQA Handbook. According to these guidelines, a project would normally have a significant impact on air quality if it would:

- conflict or obstruct with implementation of the applicable air quality plan;
- violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- expose sensitive receptors to substantial pollution concentrations;
- create objectionable odors affecting a substantial number of people;
- exceed the probability of 10 in one million of a maximally exposed individual contracting cancer due to emissions of toxic air contaminants; or
- have ground level concentrations of non-carcinogenic toxic air contaminants that would result in a Hazard Index greater than 1.0 for the maximally exposed individual.

The UC CEQA Handbook states that, where applicable, the significance criteria established by the applicable air district may be used to make these determinations. The BAAQMD CEQA Guidelines recommend analytical methodologies and provide evaluation criteria for determining the level of significance of project impacts under the above-listed general criteria. The BAAQMD's evaluation criteria for determining air quality impacts provide defined screening thresholds for pollutant emissions. Screening thresholds for air quality impacts from the BAAQMD CEQA Guidelines are presented below.

Construction Emissions

PM_{10} is the pollutant of greatest concern with respect to construction activities. Construction emissions of PM_{10} can vary greatly depending upon the level of activity, construction equipment, local soils and weather conditions, among other factors. As a result, the BAAQMD CEQA Guidelines specify that "[t]he District's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions." Therefore, the determination of significance with respect to construction emissions should be based on a consideration

of the control measures to be implemented. If all the applicable control measures for PM_{10} indicated in the BAAQMD CEQA Guidelines would be implemented, then air pollutant emissions from construction activities would be considered less than significant. If a project would not implement all applicable control measures, construction emissions may be considered to result in a significant impact.

Operational Emissions

The BAAQMD CEQA Guidelines recommend that individual project impacts involving direct and/or indirect operational emissions that exceed the following thresholds be considered significant.

- 80 pounds per day of ROG
- 80 pounds per day of NOx
- 80 pounds per day of PM_{10}

Direct emissions are those that are emitted on a site and include stationary sources and on-site mobile equipment, if applicable. Examples of land uses and activities that generate direct emissions are industrial operations and sources subject to an operating permit by the BAAQMD. Indirect emissions come from mobile sources that access the project site, but generally are emitted off site. For many types of land development projects, the principal source of air pollutant emissions is the motor vehicle trips generated by the project.

Local Carbon Monoxide Concentrations

Indirect CO emissions are considered significant if they will contribute to a violation of the state standards for CO (9.0 ppm averaged over 8 hours and 20 ppm over 1 hour). The BAAQMD recommends CO modeling for projects in which: (1) project vehicle emissions of CO would exceed 550 pounds per day; (2) project traffic would affect intersections or roadway segments operating at level of service (LOS) E or F, or would cause a decline to LOS E or F;[6] or (3) project traffic would increase traffic volumes on nearby roadways by 10 percent or more (unless the increase in traffic volume is less than 100 vehicles per hour). Intersections are determined to operate at a LOS between A and E (LOS A being the best and LOS E being the worst) according to congestion or delay time, demand/capacity ratio, and relative flow of traffic at the intersection. Intersections that are determined to operate at a LOS F or E have the potential to cause a CO hotspot (i.e., exceedance of the CAAQS). If necessary, a simplified CO modeling analysis, described in the BAAQMD CEQA Guidelines, may be used to determine localized CO concentrations. If modeling demonstrates that the source would not cause a violation of the state standard at existing or reasonably

6 Levels of Service (LOS) range from A (least congested) with a condition of free flow with low volumes and high speeds to F (most congested) with stop and go, low speed conditions with little or poor maneuverability.

foreseeable receptors, the motor vehicle trips generated by the project would not have a significant impact on local air quality.

Greenhouse Gas Emissions

To date, no local or state air quality agency has adopted significance criteria for GHGs emissions or guidance on how GHGs or global climate change should be addressed in CEQA documents. While the Global Warming Solutions Act (AB 32) created a framework for the reduction of GHGs in California, the Act did not address the role of CEQA in achieving the goals of the act. As noted earlier, in August 2007, the Governor signed SB 97 (Dutton) into law which requires the OPR to prepare CEQA Guidelines for the mitigation of GHG emissions or the effects of greenhouse gas emissions. The Resources Agency must certify and adopt the guidelines by January 1, 2010. Despite the foregoing, this EIR provides a discussion of the cumulative impacts of the project with respect to global climate change in the absence of an established significance threshold.

Impact Assessment Methodology

Air quality impacts resulting from the implementation of the proposed project fall into two categories: short-term impacts due to construction activities and long-term impacts from the day-to-day operations of the proposed project. Construction activities would impact air quality on a local level due to fugitive dust PM_{10} and other criteria pollutant emissions associated with heavy-duty construction equipment exhaust. As mentioned above, compliance with standard control measures specified in the BAAQMD CEQA Guidelines is considered sufficient to reduce construction impacts to a less than significant level.

Following construction of the proposed project, operational criteria pollutant emissions would be generated due to project-related motor vehicle trips. Emissions from on-site stationary and areas sources such as cooling towers, cogeneration engines (or an emergency generator), natural gas combustion for water and space heating, and landscape maintenance equipment will also be generated. Emissions resulting from area sources such as natural gas combustion, landscape maintenance equipment, and periodic architectural coating activities were estimated using URBEMIS2007, a land use and emissions estimation program. URBEMIS2007 was also used to quantify mobile source emissions resulting from the operation of the proposed project. Emissions from on-site stationary sources (i.e., cooling towers, cogeneration engines, an emergency generator) were calculated using emission factors contained in U.S. EPA's Compilation of Air Pollutant Emission Factors (also referred to as AP 42) and the emissions standards for compression-ignition diesel engines established by CARB and the U.S. EPA. The emission calculations and daily emissions are described in further detail below.

Two options are being considered to provide electrical power to the proposed project: (1) install a nominal 3-megawatt cogeneration system with supplemental electrical power from the serving utility, or (2) obtain electrical power from the serving utility and install a 250-kilowatt emergency generator. Thus, stationary source emissions were quantified under two different operating scenarios. The first scenario would involve the installation of two 1.5-megawatt cogeneration engine-generator units. In this situation, the proposed project would generate a portion of its own electrical energy, generate hot water to run absorption chillers (for cooling), and provide backup emergency power for the CRT Facility using the proposed cogeneration engines. Thus, an emergency generator would not be necessary for the first scenario. The second scenario would involve the installation of an emergency generator. In this situation, the proposed project would be provided electrical power from the local serving utility and utilize the emergency generator as a back-up power source. Regardless of the power source, cooling towers, mobile, and area source emissions (e.g., landscape maintenance, natural gas combustion) would be included in the operational emissions.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. These mitigation measures that are included in the project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM AQ-1a: During construction of the proposed LRDP buildings, the developer must implement all “basic” control measures to minimize the generation of fugitive dust. In addition, for construction sites greater than 4 acres or projects that would generate large amounts of fugitive dust, “enhanced” and “optional” control measures should be implemented. The recommended control measures are located in Table 2 of the BAAQMD CEQA Guidelines.

LRDP MM AQ-1b: During construction of the proposed LRDP buildings, the developer must implement the following mitigation measures to minimize heavy-duty construction equipment exhaust.

- Construction equipment shall be properly tuned and maintained in accordance with manufacturer’s specifications.

- Best management construction practices shall be used to avoid unnecessary emissions (e.g., truck and vehicles in loading and unloading queues would turn their engines off when not in use).

- Any stationary motor sources such as generators and compressors located within 100 feet of a sensitive receptor shall be equipped with a supplementary exhaust pollution control system as required by the BAAQMD and CARB.

- Incorporate use of low-NO_x-emitting, low-particulate-emitting, or alternatively fueled construction equipment into the construction equipment fleet where feasible, especially when operating near sensitive receptors.

- Reduce construction-worker trips with ride sharing or alternative modes of transportation.

LRDP MM AQ-4a: To avoid the single location where implementation of the 2006 LRDP would result in an increase in health risk in excess of the 10-in-1-million threshold, LBNL shall adjust, prior to the construction of parking structure PS-1 (or similarly configured building), the exhaust system of the existing generator near Building 90 to reduce or eliminate the restriction on upward exhaust flow caused by the existing rain cap. For example, modeling indicates that removal of the rain cap would reduce the risk caused by construction of parking structure PS-1 in proximity to the existing generator to a level below 10 in 1 million. The Berkeley Lab could install a hinged rain cap, which would prevent moisture infiltration into the generator but still allow unobstructed exhaust flow and would avoid the significant impact identified in the health risk assessment.[5]

Project Impacts and Mitigation Measures

The following sections describe project-specific impacts. A discussion of the cumulative air quality impacts is provided in Section 5.5.2 of the Cumulative Impacts chapter.

CRT Impact AIR-1: Construction of the proposed project would generate short-term emissions of fugitive dust and criteria air pollutants that would not adversely affect local air quality in the vicinity of the construction site. (Less than Significant)

[5] While this measure is not specifically applicable to the proposed project, consistency with its provisions regarding the configuration of the emergency generator stack would help to reduce the potential health impacts associated with the emissions from the proposed emergency generator.

Construction of the proposed project is anticipated to commence mid-2008 and continue for approximately 27 months. The project site is currently vacant and would not require demolition operations. Prior to building construction, the entire site would be graded to prepare for asphalt paving and building activities. Fugitive dust PM_{10} would be generated on the project site as a result of earthmoving and grading activities. In addition, criteria air pollutants including ROG and NO_X, among others, would be generated due to heavy-duty construction equipment. Construction activities would also involve asphalt paving for four handicapped parking spaces. The proposed project would not involve the construction of a new parking structure or surface lot. During building construction, emissions would primarily be generated from heavy-duty construction equipment, construction worker trips, and material delivery trips. Although temporary in nature, construction emissions have the potential to cause adverse effects on local air quality in the vicinity of the project site.

The BAAQMD does not require full quantification of construction emissions, but rather emphasizes the implementation of effective and comprehensive control measures to minimize the generation of PM_{10} fugitive dust, ROG, and NO_X. If a proposed project implements all appropriate dust-control measures, the BAAQMD considers construction-related emissions to be less than significant. Implementation of the control measures specified in the BAAQMD CEQA Guidelines (Table 2, Feasible Control Measures for Construction Emissions of PM_{10}), would be sufficient to reduce construction impacts to a less than significant level. Without implementation of the control measures, construction impacts would be considered significant.

The 2006 LRDP EIR included LRDP Mitigation Measure AQ-1a, which is the suite of basic, enhanced and optional control measures recommended in the BAAQMD CEQA Guidelines to minimize the generation of fugitive dust. These measures (basic, enhanced and optional control measures) are incorporated into the proposed project and will be required during the construction of the proposed project. As a result, the project's construction-phase impact related to fugitive dust emissions would be less than significant.

In addition, construction activities would generate air emissions of ROG and NO_X, which are ozone precursors. The magnitude of emissions would vary on a day-to-day basis depending on the heavy-duty construction equipment activity level, number of construction workers, and material delivery trucks. The ozone precursors could potentially contribute to the ongoing nonattainment status of the SFBAAB for ozone. The BAAQMD CEQA Guidelines recognize that construction activities will generate ROG and NO_X; however, these emissions are included in the inventory that is used as the basis for the regional air quality plan. Hence, the emissions have been accounted for and would not be expected to impede attainment or maintenance of ozone in the SFBAAB. Furthermore, the 2006 LRDP EIR included the LRDP Mitigation Measure AQ-1b to minimize the generation of exhaust emissions during construction. This

measure is incorporated into the proposed project and will be implemented during the construction of the proposed project. This would ensure that emissions of ozone precursors are minimized during project construction. Project construction activities would also comply with Regulation 8, Rules 3 and 15, related to architectural coatings and emulsified and liquid asphalt. Therefore, the construction emissions would not conflict or obstruct with implementation of the applicable air quality plan and construction-phase project impacts on air quality would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact AIR-2: The proposed project would generate long-term operational emissions of criteria pollutants from increases in traffic and stationary and area sources that would not adversely affect air quality. (Less than Significant)

Operational emissions associated with the day-to-day activities of the proposed project would result from increased vehicular trips to and from the CRT Facility (i.e., mobile sources). Area source emissions associated with the proposed project include the use of natural gas for water and space heating and landscape maintenance equipment. Stationary source emissions include five to nine cooling towers and either an on-site cogeneration facility consisting of two 1.5-megawatt cogeneration engine-generators or one 250-kilowatt emergency generator. The cogeneration facility option would require nine cooling towers (five units for building cooling during hot weather and four units for the cogeneration facility) and the emergency generator option would require five cooling towers for building cooling. As mentioned above, BAAQMD recommends operational thresholds of significance for projects within its jurisdiction. Any project that would generate emissions of ROG, NO_X, or PM_{10} that exceed the thresholds would be considered to have significant operational impacts.

The mobile source emissions associated with the proposed project were estimated using URBEMIS2007. URBEMIS2007 can estimate vehicle emissions based on the amount of development and trip generation rate of the development. In addition, URBEMIS2007 incorporates trip distances and emission factors specific to counties, air basins, and air district jurisdictions. Trip generation rates were obtained from the traffic impact analysis for the proposed project (see Appendix 4.12). For the proposed project, Alameda County specific parameters in URBEMIS2007 were used to estimate mobile and area source emissions. Area source emissions estimated using URBEMIS2007 include natural gas combustion for water and space heating, landscape maintenance equipment, and periodic architectural coating maintenance. The proposed project would be designed to be consistent with the UC Policy for Sustainable Practices, which require new buildings to outperform California Code of Regulations Title 24 standards by at least 20 percent. Although the proposed project's design could exceed Title 24 standards by more than

20 percent, the exact percent is not known at this stage of development. Therefore, area source emissions in URBEMIS2007 were calculated assuming a minimum of 20 percent more efficient than Title 24 would require. Detailed URBEMIS2007 outputs, including parameters and assumptions, are provided in Appendix 4.2.

The proposed project would also include stationary sources such as cooling towers and either an emergency generator or a cogeneration facility. The first electrical supply option would involve a cogeneration facility that would provide a portion of electrical power required for the CRT Facility with most of the power provided by the local serving utility. The cogeneration facility would consist of two 1.5-megawatt cogeneration engines that would generate a total of 3 megawatts for the proposed project's energy demand. Criteria pollutant emissions associated with the cogeneration engines were calculated using the estimated ROG, NO_X, and CO emissions provided by the emission control equipment manufacturer, and a PM_{10} emission factor from the CARB Guidance for Permitting of Electrical Generation Technologies (CARB 2002). Cogeneration engine emission factors for SO_X were obtained from U.S. EPA AP 42 (U.S. EPA 2000). The emissions associated with operation of the cogeneration facility are included in the stationary source category in Table 4.2-7, Estimated Operational Emissions – CRT Facility with On-Site Cogeneration.

In the second electrical supply option (i.e., emergency generator scenario), the proposed project would be connected to the on-site electrical distribution system to provide its electrical power from the regional grid. In this situation, a 250-kilowatt emergency generator would be installed on site to provide power for basic building functions in the case of an electricity outage in the area. Criteria pollutant emissions associated with the emergency generator were calculated using emission standards for off-road diesel (compression-ignition) engines established by CARB and the U.S. EPA (California Code of Regulations 2000). Because the engine has an output rating greater than 50 horsepower, this unit must comply with CARB's Airborne Toxics Control Measure (ATCM) for stationary compression-ignition engines (California Code of Regulations 2005). The ATCM requires that new emergency standby engines must comply with hydrocarbon, NO_X, and CO limits that are applicable to an off-road engine of the same model year and horsepower rating. The ATCM further limits the PM emissions from an emergency standby engine to either (1) 0.15 grams per horsepower-hour (g/hp-hr) (with a maximum operating limit of 50 hours per year for testing and maintenance) or 0.01 g/hp-hr (with a maximum operating limit of 100 hours per year for testing and maintenance), or (2) the emission limit for an off-road engine with the same maximum rated power, whichever is more stringent. For the ratings of the proposed engine, assuming a 2010 model year or later, the 0.15 g/hp-hr limit is the applicable PM limit under California and federal standards for off-road engines; however, LBNL has proposed to meet the more stringent emission standard of 0.01 g/hp-hr and would restrict the operating hours to 50 hours per year for testing and

maintenance. Since June 2006, the sulfur content of available CARB diesel fuel has been 15 ppm (0.0015 percent) by weight, and this concentration was used to estimate the SO_x emissions from the proposed engine. The criteria pollutant emissions associated with the operation of the 250-kilowatt emergency generator are included in the stationary source category in Table 4.2-8, Estimated Operational Emissions – CRT Facility with Emergency Generator.

The proposed project would operate five to nine cooling towers with a maximum circulating water flow rate of 1,465 gallons per minute and a standard flow rate of 735 gallons per minute. The emissions associated with daily operation of the cooling towers were calculated using the maximum flow rate to represent a worst-case day scenario. The emissions associated with cooling towers were calculated using emission factors contained U.S. EPA's AP 42 (U.S. EPA 1995). The cooling tower emissions associated with the proposed project are included in the stationary source category in Table 4.2-7 and Table 4.2-8 for the cogeneration facility scenario and emergency generator scenario, respectively. Detailed calculations of each stationary source are included in Appendix 4.2.

Under BAAQMD Regulation 2, Rule 2 (New Source Review), an applicant for an Authority to Construct must comply with the applicable offset requirements. Before the BAAQMD can issue an Authority to Construct for a new source at a facility that emits or will be permitted to emit more than 10 tons per year, but less than 35 tons per year of precursor organic compounds (POC, equivalent to ROG) or NO_x, offsets must be provided at a 1.0 to 1.0 ratio for the new source's emissions plus any pre-existing cumulative increase[7] and all existing sources of POC and/or NOx are equipped with Best Available Retrofit Control Technology (BARCT). Generally, the offsets are provided by the BAAQMD from its Small Facility Banking account. If the account has been exhausted, the applicant must provide the offsets, usually by purchasing emission reduction credits from another party. The account currently has sufficient credits to fully fund the offset requirements for the proposed project. Based on the values shown in Table 4.2-7, together with existing emissions from permitted sources at LBNL, the ROG and NO_x emissions would not exceed 10 tons per year.[8] Thus, if the cogeneration facility were to be constructed, the ROG and NO_x emissions would not have to be offset. Offsets for PM_{10} and SO_x emissions are required only for those major facilities whose emissions of these pollutants exceed 100 tons per year. This threshold would not

7 The cumulative increase is the aggregate sum of all increases in emissions of any given pollutant from a facility pursuant to Authorities to Construct or Permits to Operate issued after April 5, 1991, excluding emissions from a source that has lost its permit exemption.

8 The cumulative increase in emissions for LBNL to date has not been quantified; however, the reported ROG and NO_x emissions for LBNL in 2005 were each approximately 0.6 tons per year (CARB Facility Search for Lawrence Berkeley National Lab [Online] [September 24, 2007] <http://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php>). When added to the proposed stationary source emissions shown in Table 4.2-7 on an annual basis (5.7 tons of ROG per year and 2.7 tons of NO_x per year), the total cumulative increase in emissions would be well below the offset trigger level of 10 tons per year.

be exceeded for PM_{10} or SO_X, so this requirement would not be applicable. No offsets are required for CO emissions.

Table 4.2-7
Estimated Operational Emissions – CRT Facility with On-Site Cogeneration

Emissions Source	Emissions in Pounds per Day				
	ROG	NO_X	CO	SO_X	PM_{10}
Summertime Emissions[1]					
Stationary Sources					
Cogeneration	31.12	14.52	20.75	0.39	4.15
Cooling Towers	—	—	—	—	4.24
Stationary Source Subtotal	31.12	14.52	20.75	0.39	8.39
Operational (Mobile) Sources	2.89	2.48	23.50	0.02	3.44
Area Sources	0.82	0.62	2.06	0.00	0.01
Summertime Emission Totals	34.83	17.62	46.31	0.41	11.84
BAAQMD Thresholds	80	80	—	—	80
Exceeds Threshold?	NO	NO	—	—	NO
Wintertime Emissions[2]					
Stationary Sources					
Cogeneration	31.12	14.52	20.75	0.39	4.15
Cooling Towers	—	—	—	—	4.24
Stationary Source Subtotal	31.12	14.52	20.75	0.39	8.39
Operational (Mobile) Sources	2.03	3.64	24.46	0.02	3.44
Area Sources	0.70	0.60	0.51	0.00	0.00
Wintertime Emission Totals	33.85	18.76	45.72	0.41	11.83
BAAQMD Thresholds	80	80	—	—	80
Exceeds Threshold?	NO	NO	—	—	NO

Source: Impact Sciences, Inc. Emissions calculations are provided in Appendix 4.2.
Totals in table may not appear to add exactly due to rounding in the computer model calculations.
[1] "Summertime Emissions" are representative of the conditions that may occur during the ozone season (May 1 to October 31).
[2] "Wintertime Emissions" are representative of the conditions that may occur during the balance of the year (November 1 to April 30).

As shown above, operational emissions associated with the day-to-day activities of the proposed project, after offsets for the emissions from the cogeneration facility are provided in accordance with BAAQMD rules, would not exceed the ROG, NO_X, or PM_{10} operational thresholds of significance. Projects that generate emissions less than the regional thresholds of significance would not be considered to contribute a substantial amount of air pollutants. Therefore, operational emissions would be considered a less-than-significant impact, and the project would not contribute substantially to the existing ozone and PM_{10} nonattainment status for the SFBAAB.

As shown below, operational emissions associated with the day-to-day activities of the proposed project with the emergency generator would not exceed the operational thresholds of significance for ROG, NO_X, or PM_{10}. Projects that generate emissions below the thresholds of significance would not be considered to contribute a substantial amount of air pollutants. Therefore, the CRT Facility's operational emissions would not result in a significant impact, and the project would not contribute substantially to the existing ozone and PM_{10} nonattainment status for the SFBAAB.

Mitigation Measure: No project-level mitigation measure required.

Table 4.2-8
Estimated Operational Emissions – CRT Facility with Emergency Generator

Emissions Source	Emissions in Pounds per Day				
	ROG	NO_X	CO	SO_X	PM_{10}
Summertime Emissions[1]					
Stationary Sources					
Emergency Generator	0.78	2.33	2.02	0.00	0.01
Cooling Towers	—	—	—	—	2.36
Stationary Source Subtotal	0.78	2.33	2.02	0.00	2.37
Operational (Mobile) Sources	2.89	2.48	23.50	0.02	3.44
Area Sources	0.82	0.62	2.06	0.00	0.01
Summertime Emission Totals	4.49	5.43	27.58	0.02	5.82
BAAQMD Thresholds	80	80	—	—	80
Exceeds Threshold?	NO	NO	—	—	NO
Wintertime Emissions[2]					
Stationary Sources					
Emergency Generator	0.78	2.33	2.02	0.00	0.01
Cooling Towers	—	—	—	—	2.36
Stationary Source Subtotal	0.78	2.33	2.02	0.00	2.37
Operational (Mobile) Sources	2.03	3.64	24.46	0.02	3.44
Area Sources	0.70	0.60	0.51	0.00	0.00
Wintertime Emission Totals	3.51	6.57	26.99	0.02	5.81
BAAQMD Thresholds	80	80	—	—	80
Exceeds Threshold?	NO	NO	—	—	NO

Source: Impact Sciences, Inc. Emissions calculations are provided in Appendix 4.2.
Totals in table may not appear to add exactly due to rounding in the computer model calculations.
[1] "Summertime Emissions" are representative of the conditions that may occur during the ozone season (May 1 to October 31).
[2] "Wintertime Emissions" are representative of the conditions that may occur during the balance of the year (November 1 to April 30).

CRT Impact AIR-3: The proposed project would increase carbon monoxide concentrations at busy intersections and along congested roadways in the project vicinity but would not expose sensitive receptors to substantial pollutant concentrations. (Less than Significant)

CO is produced in greatest quantities from vehicle combustion and is usually concentrated at or near ground level under cool, stable (i.e., low or no wind) atmospheric conditions because it does not readily disperse into the atmosphere. As a result, potential air quality impacts to sensitive receptors are assessed through an analysis of localized CO concentrations. Traffic congested roadways and intersections have the potential to generate high localized levels of CO. Congested intersections, roadways, and parking structures where high ambient concentrations of CO accumulate are termed CO "hotspots." These hotspots have the potential to exceed the state ambient air quality 1-hour CO standard of 20 ppm or the 8-hour CO standard of 9.0 ppm. Note that the federal levels are based on 1- and 8-hour standards of 35 and 9 ppm, respectively. Thus, an exceedance condition would occur based on the state standards prior to exceedance of the federal standard. As such, exceedance of the state ambient air quality 1-hour standard of 20 ppm or the 8-hour standard of 9.0 ppm would constitute a significant air quality impact from the creation of substantial concentrations of CO.

The project was evaluated to determine if it would cause a CO hotspot utilizing a simplified CALINE4 screening model developed by the BAAQMD. The simplified model is intended as a screening analysis that identifies a potential CO hotspot. If a hotspot is identified, the complete CALINE4 model is then utilized to determine precisely the CO concentrations predicted at the intersections in question. This methodology assumes worst-case conditions (i.e., wind direction is parallel to the primary roadway and 90 degrees to the secondary road, wind speed of less than one meter per second and extreme atmospheric stability) and provides a screening of maximum, worst-case, CO concentrations. This model was utilized to predict future CO concentrations 0 and 25 feet from the intersections in the study area based on projected traffic volumes for these intersections contained in the project traffic study. These intersections were determined in the project traffic study to operate at LOS D or worse. Intersections operating at a LOS of E or F are considered to have the potential to create a CO hotspot. However, for the purposes of this analysis, any intersections operating at a LOS D or worse (i.e., Centennial Drive and Grizzly Peak Boulevard) were analyzed. Maximum CO concentrations occurring during cumulative plus project conditions were calculated for peak hour traffic volumes. The results of these CO concentration calculations are presented in Table 4.2-9 Cumulative (2025) Plus CRT Project CO Concentrations, for representative receptors located 0 and 25 feet from the intersection.

As shown below, the contribution of traffic from cumulative projects plus the proposed project traffic would not generate CO concentrations near the study intersections that would exceed any of the state CO

ambient air quality standards. Therefore, the project's impact would be considered less than significant and the project would not expose sensitive receptors to substantial pollutant concentrations. The day-to-day operations of the proposed project would not violate or contribute substantially to an air quality violation.

Mitigation Measure: No project-level mitigation measure required.

Table 4.2-9
Cumulative (2025) Plus CRT Project CO Concentrations

Intersection	0 Feet		25 Feet	
	1-Hour [1]	8-Hour [2]	1-Hour [1]	8-Hour [2]
Centennial Drive and Grizzly Peak Boulevard	7.1	4.4	6.9	4.3
Gayley Avenue/La Loma Avenue and Hearst Avenue	7.3	4.6	7.1	4.4
Gayley Avenue and Stadium Rim Way	7.3	4.6	7.1	4.4
Piedmont Avenue and Bancroft Way	7.2	4.5	7.0	4.4
Piedmont Avenue and Durant Avenue	7.2	4.5	7.0	4.4

Source: Impact Sciences, Inc.
Emissions calculations are provided in Appendix 4.2.
[1] State 1-hour and 8-hour standards are 20 parts per million and 9.0 parts per million, respectively.
[2] Federal 1-hour and 8-hour standards are 35 parts per million and 9 parts per millions, respectively.

CRT Impact AIR-4: The proposed project would not create objectionable odors affecting a substantial number of people. (Less than Significant)

The proposed project would consist of computational equipment and office space to support UC Berkeley's academic programs in computational science and engineering. The CRT Facility would not include laboratories that would generate odors or gases that require fume hoods. Therefore, the proposed project is not anticipated to generate any substantial odors associated with its operation and would be considered a less than significant impact.

In addition, LBNL provides an extensive buffer zone around most of the Laboratory's perimeter. This established buffer zone for potential sources of odors is consistent with the 2005 Ozone Strategy. It should also be noted that LBNL has no previous history of odor complaints and the proposed project would not generate any odors in the project area. Furthermore, the proposed project would maintain a 50-foot no-build zone from Blackberry Canyon as well as a 40-foot setback from adjacent structures to minimize any potential impact on adjoining neighborhoods. Therefore, the project's impact with respect to odors is less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact AIR-5: The proposed project would not expose maximally exposed individuals to cancer risks exceeding 10 in one million. (Less than Significant)

A human health risk assessment (HHRA) was prepared to evaluate the emissions of TACs from potential air emission sources for two potential project configurations (Golder 2007):

Configuration 1: Nine cooling towers and two 1.5-megawatt natural-gas-fired cogeneration units

Configuration 2: Five cooling towers and one 250-kilowatt diesel emergency generator

For each configuration, estimated TAC emissions from the sources associated with the CRT Facility were screened with respect to their relative emission rates and toxicity (i.e., cancer potency) so that the TACs resulting in greater than 90 percent of the total toxicity-weighted cancer-causing emissions were included in the HHRA for the project. These TACs were thus identified as chemicals of potential concern (COPCs) for the HHRA. The sources, specific COPCs evaluated in the HHRA for cancer effects, and annual quantities are shown in Table 4.2-10, Summary of Configuration 1 Annual COPC Emissions (Carcinogens) and Table 4.2-11, Summary of Configuration 2 Annual COPC Emissions (Carcinogens). The methods used to calculate the emissions of all TACs emitted and the screening of COPCs are described in the HHRA, which is on file with the Berkeley Lab.

Table 4.2-10
Summary of Configuration 1 Annual COPC Emissions (Carcinogens)

Source(s)	Chemical	Annual COPC Emissions (Pounds/Year)
Cogeneration Units	1,3-Butadiene	51.8
Cogeneration Units	Formaldehyde	665.0

Source: Golder Associates 2007

Table 4.2-11
Summary of Configuration 2 Annual COPC Emissions (Carcinogens)

Source(s)	Chemical	Annual COPC Emissions (Pounds/Year)
Diesel Generator	Diesel Particulate Matter	0.39

Source: Golder Associates 2007

The U.S. Environmental Protection Agency-approved AMS/EPA Regulatory Model (AERMOD) model was used to model the air quality impacts of COPC emissions from the proposed CRT project configurations. The AERMOD model can estimate the air quality impacts of single or multiple sources using actual meteorological conditions. The specific exhaust parameters for the cooling towers, cogeneration units, and the emergency generator are described in the HHRA, which is on file with the Berkeley Lab.

The model was configured with the following control parameters:

- Modeling switches: regulatory defaults,
- Averaging periods: annual, and
- Choice of dispersion coefficients based upon land-use type: rural.

Meteorological data from an on-site monitoring station at LBNL for 1998 and 1999 were used in AERMOD. Rural dispersion coefficients were selected because they result in higher ambient concentrations than urban coefficients, and both rural and urban land use types exist within and outside of the LBNL facility site.

Two separate receptor grids were created for this project: one grid containing only receptor locations on, or inside of, the LBNL facility property boundaries (On-site Grid), and the second grid containing only receptor locations beyond, or outside of, the LBNL facility property boundaries (Off-site Grid). The receptor grids were created by first overlaying a rectilinear grid of receptor locations extending approximately 200 meters out from the facility property boundary with even 30-meter spacing between receptor locations. An additional grid of receptors with 180-meter spacing was extended from the edge of the 30-meter grid to a distance of at least one kilometer out from the facility property boundary to ensure that all maximum off-site concentrations would be captured in the modeling simulation.

A set of property boundary receptors was also generated by creating receptor locations every 50 meters along the LBNL facility property boundary.

A detailed description of the modeling methodology and results is provided in the HHRA, which is on file with the Berkeley Lab.

The cancer risk calculations were performed using the exposure and risk equations in the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) guidance manual for health risk assessments prepared under the Air Toxics "Hot Spots" program (OEHHA 2003). The potential exposure pathways assessed included inhalation only. Dermal (skin), soil ingestion, ingestion of homegrown produce, and mother's milk exposure pathways were not assessed as these pathways were not considered to be significant sources of potential human health risk given the emission sources and the location of the proposed project (see the HHRA for further discussion of this issue). The cancer risk calculations for off-site residential exposures were based on COPC concentrations predicted at locations in the Off-site Grid and assumed that a person is exposed continuously for 70 years (9 years as a child and 61 years as an adult). This approach is intended to result in conservative (i.e., health protective) estimates of health impacts. The cancer risk calculations for on-site worker receptors were based on COPC concentrations predicted at locations in the On-site Grid and used the assumed breathing rates and exposure periods in the OEHHA guidance manual (e.g., 8 hours per day, 245 days per year, 40 years). Cancer risks were evaluated using the inhalation Cancer Potency Factors published by CARB and OEHHA (CARB/OEHHA 2006).

Table 4.2-12, Summary of Configuration 1 Maximum Modeled Cancer Risks and Table 4.2-13, Summary of Configuration 2 Maximum Modeled Cancer Risks, shows the maximum cancer risk due to COPC emissions from the CRT Facility for both configurations at any of the on-site and off-site receptors evaluated in the AERMOD modeling.

Table 4.2-12
Summary of Configuration 1 Maximum Modeled Cancer Risks

Receptor	Cancer Risk
On-Site	
Worker	3×10^{-6}
Off-Site	
Child/Adult Resident	1×10^{-6}

Source: Golder Associates 2007

Table 4.2-13
Summary of Configuration 2 Maximum Modeled Cancer Risks

Receptor	Cancer Risk
On-Site	
Worker	0.03×10^{-6}
Off-Site	
Child/Adult Resident	0.03×10^{-6}

Source: Golder Associates 2007

As shown in these tables, the maximum on-site and off-site cancer risks resulting from the proposed project's TAC emissions from either configuration would be less than the BAAQMD significance threshold of 10 in one million (10×10^{-6}). Accordingly, the project impacts on human health with respect to the cancer risk threshold would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact AIR-6: The proposed project would not generate ground level concentrations of non-carcinogenic toxic air contaminants that would result in a Hazard Index greater than 1.0 for the maximally exposed individual. (Less than Significant)

The human health risk assessment described above also evaluated the emissions of TACs from the emission sources proposed at the CRT Facility under either configuration with respect to their noncancer health effects (Golder Associates 2007). In addition to the potential cancer risk, TACs have acute (i.e., short-term) and chronic (i.e., long-term) noncancer health impacts.

For the chronic noncancer assessment for each configuration, estimated TAC emissions from the sources associated with the CRT Facility were screened with respect to their relative emission rates and chronic toxicity (i.e., chronic noncancer reference exposure levels [RELs]) so that the TACs resulting in greater than 90 percent of the total chronic noncancer toxicity-weighted emissions were included in the HHRA for the project. These TACs were thus identified as COPCs for the HHRA. The sources, specific COPCs evaluated in the HHRA for chronic noncancer effects, and annual quantities are shown in Table 4.2-14, Summary of Configuration 1 Annual COPC Emissions (Chronic Noncarcinogens) and Table 4.2-15, Summary of Configuration 2 Annual COPC Emissions (Chronic Noncarcinogens). The methods used to calculate the emissions of all TACs emitted and the screening of COPCs are described in the HHRA, which is on file with the Berkeley Lab.

Table 4.2-14
Summary of Configuration 1 Annual COPC Emissions
(Chronic Noncarcinogens)

Source(s)	Chemical	Annual COPC Emissions (Pounds/Year)
Cogeneration Units	Formaldehyde	665.0
Cogeneration Units	Acrolein	8.3

Source: Golder Associates 2007

Table 4.2-15
Summary of Configuration 2 Annual COPC Emissions
(Chronic Noncarcinogens)

Source(s)	Chemical	Annual COPC Emissions (Pounds/Year)
Cooling Towers	Bromine Compounds[1]	0.20
Diesel Generator	Diesel Particulate Matter	0.39

Source: Golder Associates 2007

[1] Sodium bromide is an ingredient of the cooling tower treatment products currently being used at LBNL. To provide a conservative estimate of the project's health impacts, it is assumed that the same products may be used in the CRT cooling towers. However, LBNL expects to use a non-chemical treatment system for the cooling towers at the CRT Building.

Acute impacts from the emission sources associated with this project were not assessed. Acute RELs are not published by CARB/OEHHA for bromine compounds (the only TAC estimated to be emitted from the cooling towers), so no acute assessment of TAC emissions from the cooling towers was possible. For combustion sources (i.e., natural-gas-fired cogeneration units and diesel generator), it is expected that chronic health effects from their emissions (especially cancer risk) will dominate the health concerns. Since the cancer risk for both configurations of this project were insignificant (as were chronic noncancer hazards, as shown below), there was no reason to pursue an acute hazard assessment. The methods used to calculate the emissions of all TACs assessed are described in the HHRA, which is on file with the Berkeley Lab.

The chronic hazard indices were evaluated using the CARB/OEHHA inhalation RELs (CARB/OEHHA 2006). The REL is the concentration (inhalation) at or below which no adverse health effects are

anticipated. The hazard quotient is the ratio of the modeled concentration of a TAC to its REL. The hazard quotients for TACs affecting the same target organ or organ system (e.g., skin, eyes, nervous system, gastrointestinal system) are typically added together to compute a hazard index, although for this assessment all hazard quotients were conservatively added without regard to target organ.

The chronic noncancer hazard quotients for the proposed project were calculated by dividing the maximum annual average concentrations of the COPCs (predicted by the AERMOD model) by their RELs. Table 4.2-16, Summary of Configuration 1 Maximum Modeled Chronic Noncancer Health Impacts and Table 4.2-17, Summary of Configuration 2 Maximum Modeled Chronic Noncancer Health Impacts, shows the maximum chronic hazard indices due to COPC emissions from the CRT Facility at on-site and off-site receptors.

Table 4.2-16
Summary of Configuration 1 Maximum Modeled Chronic Noncancer Health Impacts

Receptor	Chronic Hazard Index
On-Site	
Worker	0.4
Off-Site	
Resident	0.02

Source: Golder Associates 2007

Table 4.2-17
Summary of Configuration 2 Maximum Modeled Chronic Noncancer Health Impacts

Receptor	Chronic Hazard Index
On-Site	
Worker	0.0003
Off-Site	
Resident	0.00003

Source: Golder Associates 2007

As shown in these tables, the maximum on-site and off-site chronic impacts resulting from the proposed project's TAC emissions from either configuration would be less than the BAAQMD significance threshold of 1.0. Accordingly, the project impacts on human health with respect to acute health impacts would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

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4.3.1 Introduction

This section identifies existing biological resources at and in the vicinity of the project site and analyzes the potential for implementation of the proposed Computational Research and Theory (CRT) project to affect those resources. Information presented in the discussion and analysis that follows was drawn from site visits conducted by Pacific Biology in June 2007 and by other biological consultants (ESA 2002a-c; ESA 2003a-c); previous environmental documents prepared by the Lab for Lawrence Berkeley National Laboratory (LBNL) projects; biological data contained in the California Natural Diversity Database (CNDDB)[1] and the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants of California; and standard biological references. This biological resources chapter identifies potential effects of the proposed project on sensitive species and habitats and proposes mitigation measures to reduce those impacts to less than significant levels.

In response to the Notice of Preparation for this EIR, several commenters raised concerns regarding impacts to biological resources as a result of project development in Strawberry Canyon. Another commenter raised concerns about impacts to mature redwood trees. These scoping comments are addressed in the impact analysis presented below.

4.3.2 Environmental Setting

Regional Location

The project site is located in the San Francisco Bay Area, which is characterized by a Mediterranean climate with moderately warm, dry summers and mild, wet winters. More specifically, LBNL is situated on approximately 200 acres on the western slopes of the Oakland-Berkeley Hills. Roughly one-half of LBNL is within Strawberry Canyon and has a south-facing orientation; the balance is within Blackberry Canyon and has a west-facing orientation. The Main Campus of the University of California, Berkeley, is located west of LBNL and the Hill Campus[2] is located to the north, east, and south of LBNL. Regional open space, including the 2,000-acre Tilden Regional Park, lies to the northeast.

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1 The CNDDB is a computer database maintained by the California Department of Fish and Game of information on the location and distribution of animals and plants that are rare, threatened, endangered, or candidate species, or habitats considered to be of high biological value or of limited distribution.

2 The Hill Campus is an 800-acre portion of the University of California, Berkeley. The Hill Campus extends from Stadium Rim Way to Grizzly Peak Boulevard, is primarily designated as open space, and includes a 300-acre Ecological Study Area and the Botanical Garden.

Surrounding Land Uses and Plant Communities

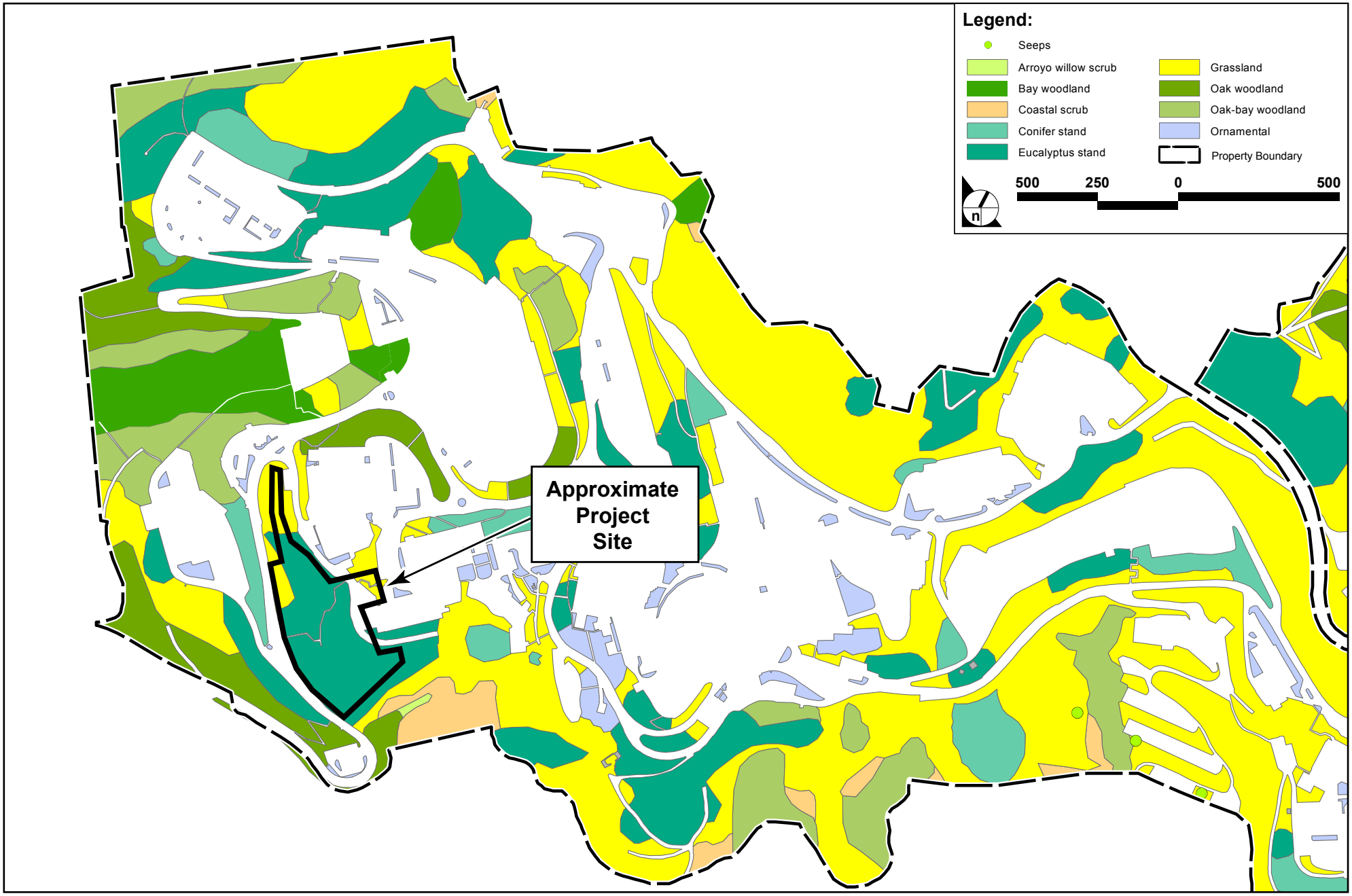
The hills surrounding LBNL contain low- to moderate-density residential neighborhoods mixed with open space containing a mosaic of plant communities and wildlife habitats, including oak and mixed hardwood forests, native and non-native grasslands, chaparral, coastal scrub, marsh and wetland communities, and riparian scrubs and forests. Developed areas of LBNL have been landscaped with a mix of non-native horticultural species and, more recently, California native plants and other drought-tolerant species suitable for landscaping purposes. Open space at LBNL is dominated by annual grassland, with eucalyptus and conifer stands planted throughout the site. Undeveloped areas along the eastern and southern perimeters of the Lab site support a mosaic of coastal scrub and grassland. Woodlands dominated by oak and bay occur along most drainages at LBNL. Open space vegetation on the Lab site is managed on an annual basis, either by goats or by mechanical means, according to the guidelines set forth in LBNL's Maintenance Vision for a Fire-Safe Sustainable Landscape (LBNL 2001).

Project Site

The approximately 2.25-acre project site is located in the western portion of the LBNL site and is flanked on three sides by Buildings 70 and 70A to the east, the Building 50 complex to the north, and Cyclotron Road and the Blackberry Canyon entrance gate to the west. The site generally slopes steeply down from east to west and a wooden stairway connecting Cyclotron Road with East Road bisects the site from east to west. The project site contains mixed grassland vegetation and a eucalyptus stand. Similar to other undeveloped portions of LBNL, the herbaceous vegetation on the site is managed on an annual basis by goats or mechanical means.

Plant Communities and Wildlife Habitat

Plant communities are assemblages of plant species that occur together in the same area and are defined by species composition and relative abundance. Please see Figure 4.3-1, Vegetation at Project Site, for the locations of the various plant communities that occur throughout LBNL, including the proposed CRT project site. Two plant communities occur on the project site, including mixed grassland and a eucalyptus stand. There are 72 trees on the project site, including 64 blue gum eucalyptus (Eucalyptus globulus), 5 coast live oak (Quercus agrifolia), 2 California bay (Umbellularia californica), and 1 plum (Prunus sp.). The on-site mixed grassland and eucalyptus stand are discussed in more detail below.



SOURCE: Perkins+Will - September 2007, LBNL; ESA (2003)

FIGURE **4.3-1**

Vegetation at Project Site

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Mixed Grassland

The northern portion of the project site is characterized by mixed grassland vegetation. Additionally, a small isolated area of grassland vegetation occurs in the eastern portion of the project site. These grassland areas are dominated by the non-native annual grass species wild oat (Avena sativa), but also contains other non-native grasses such as ripgut brome (Bromus diandrus) and harding grass (Phalaris aquatica). Other herbaceous vegetation includes Italian thistle (Carduus pycnocephalus), bristly ox-tongue (Picris echoides), French broom (Genista monspessulana), and poison oak (Toxicodendron diversilobum). Coast live oak, eucalyptus, and California bay trees occur at scattered locations throughout this portion of the site.

Moving north to south across the site (onto the steeper slopes within the eucalyptus stand, see below), the occurrence and density of native grass species increases, including purple needlegrass (Nasella pulchra) and blue wild rye (Elymus glaucas). The density of native grasses is highest in the southern portion of the site (near the fence line) where purple needlegrass provides 10 to 15 percent ground cover within an approximately 30 feet by 50 feet area.

Grasslands in the project area provide habitat for reptiles and amphibians, such as western fence lizard (Sceloporus occidentalis), northern alligator lizard (Elgaria coerulea), and California slender salamander (Batrachoseps attenuatus). Bird species commonly utilizing grassland habitats include mourning dove (Zenaida macroura), golden-crowned sparrow (Zonotrichia atricapilla), and numerous other species. Mammals such as Botta's pocket gopher (Thomomys bottae) and striped skunk (Mephitis mephitis) often forage within grassland and thrive when varied natural habitats are available nearby. Small mammals commonly occurring within grasslands attract raptors such as red-tailed hawk (Buteo jamaicensis) and red-shouldered hawk (Buteo lineatus).

Eucalyptus Stand

The southern portion of the project site contains a eucalyptus stand. This area contains mature, non-native blue gum eucalyptus trees. The understory is characterized by mixed grassland vegetation (as described above). Mature eucalyptus stands provide nesting habitat for a number of raptors, including red-tailed hawk, red-shouldered hawk, and great horned owl (Bubo virginianus). Eucalyptus trees may also provide roosting and nursery sites for several bat species, including fringed myotis (Myotis thysanodes) and long-eared myotis (Myotis evotis).

Nearby Plant Communities

Several plant communities occur near the project site but are not present within the project's disturbance boundaries. Specifically, the North Fork of Strawberry Creek and associated bay woodland, arroyo willow scrub (associated with an unnamed tributary [locally and herein after called "Cafeteria Creek"] to Strawberry Creek), and coastal scrub occur near the project boundaries. Given their proximity to the project site, they are further discussed below.

The North Fork of Strawberry Creek is located on the north side of Cyclotron Road, north and down-slope of the project site. The creek supports well-developed California bay woodland that at its closest point is approximately 120 feet north of the project boundary. The woodland is dominated by California bay, with coast live oak and big-leaf maple (Acer macrophyllum) occurring occasionally. Understory species are often absent where the tree canopy is most dense, but in more open stands understory species occur such as fairy bells (Disporum hookeri), coastal wood fern (Dryopteris arguta), California honeysuckle (Lonicera hispidula), and Stebbin's grass (Erharta erecta). California bay woodlands in a natural condition may provide habitat for numerous wildlife species, including California slender salamander, varied thrush (Ixoreus naevius), American robin (Turdus migratorius), western scrub jay (Aphelocoma californica), and Steller's jay (Cyanocitta stelleri). Mammal species that may use this woodland type include California black-tailed deer (Odocoileus hemionus), raccoon (Procyon lotor), and opossum (Didelphis virginiana).

A small area (approximately 0.06 acre) of arroyo willow scrub occurs approximately 110 feet south of project site. This small stand of willow scrub is dominated almost exclusively by arroyo willow (Salix lasiolepis), with California blackberry also occurring. The occurrence of this plant community is associated with Cafeteria Creek (a tributary to Strawberry Creek) located just south of Blackberry Canyon Gate. Willow scrub habitat may support numerous wildlife species including reptiles and amphibians such as western toad (Bufo boreas), Pacific treefrog (Hyla regilla), and California slender salamander. Resident and migratory birds often found in willow scrub include song sparrow (Melospiza melodia), spotted towhee (Pipilo maculates), yellow-rumped warbler (Dendroica coronata), Wilson's warbler (Wilsonia pusilla), western scrub jay, and black phoebe (Sayornis nigricans). Mammals such as western harvest mouse (Reithrodontomys megalotis), opossum, and raccoon also utilize riparian habitats for nesting and foraging.

Coastal scrub habitat occurs approximately 25 feet to the south of the project site. This plant community is dominated by coyote brush (Baccharis pilularis) with California honeysuckle (Lonicera hispidula var. vacillans), bedstraw (Galium sp.), and hedge nettle also likely occurring. Coastal scrub, especially coyote brush scrub, is often the successional phase between grassland and oak woodland. Coastal scrub provides nesting and foraging habitat for various birds, including spotted towhee, California towhee

(Pipilo crissalis), common bushtit (Psaltriparus minimus), western scrub jay, and California quail (Callipepla californica). Raptors may forage over such areas and prey on small birds, small mammals, and reptiles.

Special-Status Species

For the purposes of this EIR, the term "special-status species" includes species that are listed and receive specific protection defined in federal or state endangered species legislation, as well as species not formally listed as threatened or endangered but designated as species "of concern," or as "rare" or "sensitive" on the basis of adopted policies and expertise of federal or state resource agencies or organizations with acknowledged expertise, including the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), National Marine Fisheries Service (now known as "NOAA Fisheries"), and the California Native Plant Society. Specifically, the following categories are included: federally listed endangered and threatened species; species proposed for listing as endangered or threatened; candidates for such listing; federally identified Birds of Conservation Concern; species of local concern; state-listed endangered and threatened species, and rare (plants only) species; California Species of Special Concern; species designated "special animals" by the state; and "fully protected" species. Additionally, for the purposes of this report, raptors (birds of prey) are also considered to be of special status, as they are specifically protected by Fish & Game Code Section 3503.5, which prohibits the take, possession, or killing of raptors and owls, their nests, and their eggs.[3]

A list of special-status plant and animal species reported to occur in the vicinity of the project site was compiled on the basis of data in the California Natural Diversity Database (CDFG 2005, 2007), the California Native Plant Society Electronic Inventory (CNPS 2005, 2007), special-status species information from the U.S. Fish and Wildlife Service (USFWS 2005a), and biological literature of the region. Table 4.3-1 is intended to be comprehensive and includes species for which potential habitat (i.e., general habitat types) occurs within or in the vicinity of the project site. The table reflects the most recent designation of special-status plant and wildlife species based on the current Special Vascular Plants, Bryophytes, and Lichens List (CDFG 2007) and Special Animals List (CDFG 2006).

No special-status plant or wildlife species have been identified on the project site during the field survey conducted by Pacific Biology or by other biological consultants (ESA 2002a-c; ESA 2003a-c). However, for

[3] The inclusion of birds protected by Fish & Game Code Section 3503.5 is in recognition of the fact that these birds are substantially less common in California than most other birds, having lost much of their habitat to development, and the recognition that the populations of these species are therefore substantially more vulnerable to further loss of habitat and to interference with nesting and breeding than are most other birds. It is noted that a number of raptors and owls are already specifically listed as threatened or endangered by state and federal wildlife authorities.

the reasons discussed in Table 4.3-1, several special-status wildlife species are judged to have at least a moderate potential to occur on or adjacent to the project site.

Special-Status Wildlife Species

Of the special-status wildlife species presented in Table 4.3-1, only the following species, which were determined to have at least a moderate potential to occur within the project vicinity, are considered in the impact analysis: Alameda whipsnake, Cooper's hawk, great horned owl, red-tailed hawk, red-shouldered hawk, American kestrel, Allen's hummingbird, pallid bat, long-eared myotis, and fringed myotis. These species are further discussed below.

Alameda Whipsnake

Alameda whipsnake (Masticophis lateralis euryxanthus) is listed as threatened under both federal and state law and is generally found in open-canopied shrub communities, including coastal scrub and chaparral, and adjacent habitats including oak woodland/savanna and grassland areas (Swaim 1994). Recent surveys and studies have shown that Alameda whipsnake can be found in a wider variety of habitats than previously thought. For example, whipsnakes have been found in grasslands with very little scrub present, in coastal scrub with dense canopy cover, and in patches of scrub less than 0.5 acre in size (Swaim 2003). Therefore, habitat associations for this subspecies should include those that co-occur in the general chaparral/scrub habitat mosaic (Alvarez 2005). These recent findings suggest the possibility that whipsnakes could inhabit, or disperse through, areas of the LBNL site where coastal scrub habitat occurs in a mosaic with other habitat types such as grassland or woodland. Though habitat types and features used by Alameda whipsnakes may vary, home ranges typically are centered on areas of scrub habitats with open to partially open canopy, on south-, southeast-, east-, and southwest-facing slopes. Rock outcrops are important for protection from predators and as habitat for western fence lizards and other prey species (Swaim 1994).

A recent whipsnake habitat assessment of LBNL (Swaim 2006) found that potential whipsnake occurrence would be most likely in the easternmost portion LBNL that is contiguous with open space to the north and east and along the south-facing slopes of Strawberry Canyon. These areas are primarily open space with a mosaic of grassland, coastal scrub, riparian woodland, and stands of non-native trees and provide a potential dispersal corridor from designated critical habitat for the species (USFWS 2006) to areas of potential suitability for the whipsnake. The 2006 LBNL habitat assessment identified and mapped potential for Alameda whipsnake occurrence based on habitat types present and other factors, including habitat fragmentation and existing land uses. Areas designated as having "highly suitable potential habitat" for whipsnake (which include the CRT project site) were those that included relatively

large patches of coastal scrub in a mosaic of other habitat types and that were contiguous with larger open space areas and known occupied habitat and/or proposed critical habitat (Swaim 2006; McGinnis 1996). Areas designated as having "potential habitat" were those that contained smaller patches of scrub in a mosaic with other habitat types but where there was also a fairly significant degree of fragmentation and habitat degradation and a lesser degree of contiguity with larger areas of less disturbed potential habitat.

After conducting site visits during the summer of 2000, the USFWS determined that most of the LBNL site, including areas with existing facilities, should be excluded from its final critical habitat listing (USFWS 2000).[4] The 2000 designation of critical habitat was rescinded in 2003 but a new critical habitat designation was proposed in 2005 and adopted in October 2006 that, similar to the 2000 designation, includes the easternmost portion of the LBNL site.[5] This area is designated as a fixed constraint under the 2006 LRDP. Since it is a protected area, no development is proposed or allowed.

The project site is within an area of LBNL identified as having "highly suitable potential habitat" for Alameda whipsnake (see Figure 4.3-2, Sensitive Habitat at LBNL). A qualified biologist evaluated the site-specific suitability of the project site for Alameda whipsnake on June 28, 2007. The project site is located within a eucalyptus grove, has a grassland understory, and does not contain scrub communities often associated with the Alameda whipsnake. However, the project site is near areas containing high-quality habitat for Alameda whipsnake. Specifically, coastal scrub habitats and open space along south-facing slopes occur to the south of the project site that could be traversed. As such, when considered with nearby habitats, the project site may be part of a mosaic of habitats utilized by the species. While core habitat does not occur within the project boundary and Alameda whipsnake is not expected to permanently reside on the project site, the subspecies may temporarily utilize on-site habitats.

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4 Critical habitat for the Alameda whipsnake was rescinded by court order on May 9, 2003. For the purposes of this analysis, the concept is still relevant in that the designation of critical habitat implies a high likelihood of species' presence where critical habitat elements are found. Even though critical habitat has been rescinded, the species is still fully protected under the FESA. In addition, the USFWS (2002) published a draft recovery plan that includes the species, and areas that were formerly designated as critical habitat units are now designated as recovery units under the plan. Finally, critical habitat for the species was re-proposed in October 2005 (USFWS 2005d) and, as adopted in October 2006 (USFWS 2006), includes the easternmost portion of the Lab site.

5 The adopted critical habitat, while smaller than that proposed in 2005 (155,000 acres adopted, compared to 203,000 acres proposed), includes the same part of the Lab main site as included in the proposed critical habitat. Most of the 48,000 acres excluded from the adopted critical habitat are in eastern Contra Costa County, although smaller areas were excluded in the Easy Bay hills in western Contra Costa and southern Alameda counties.

Cooper's Hawk

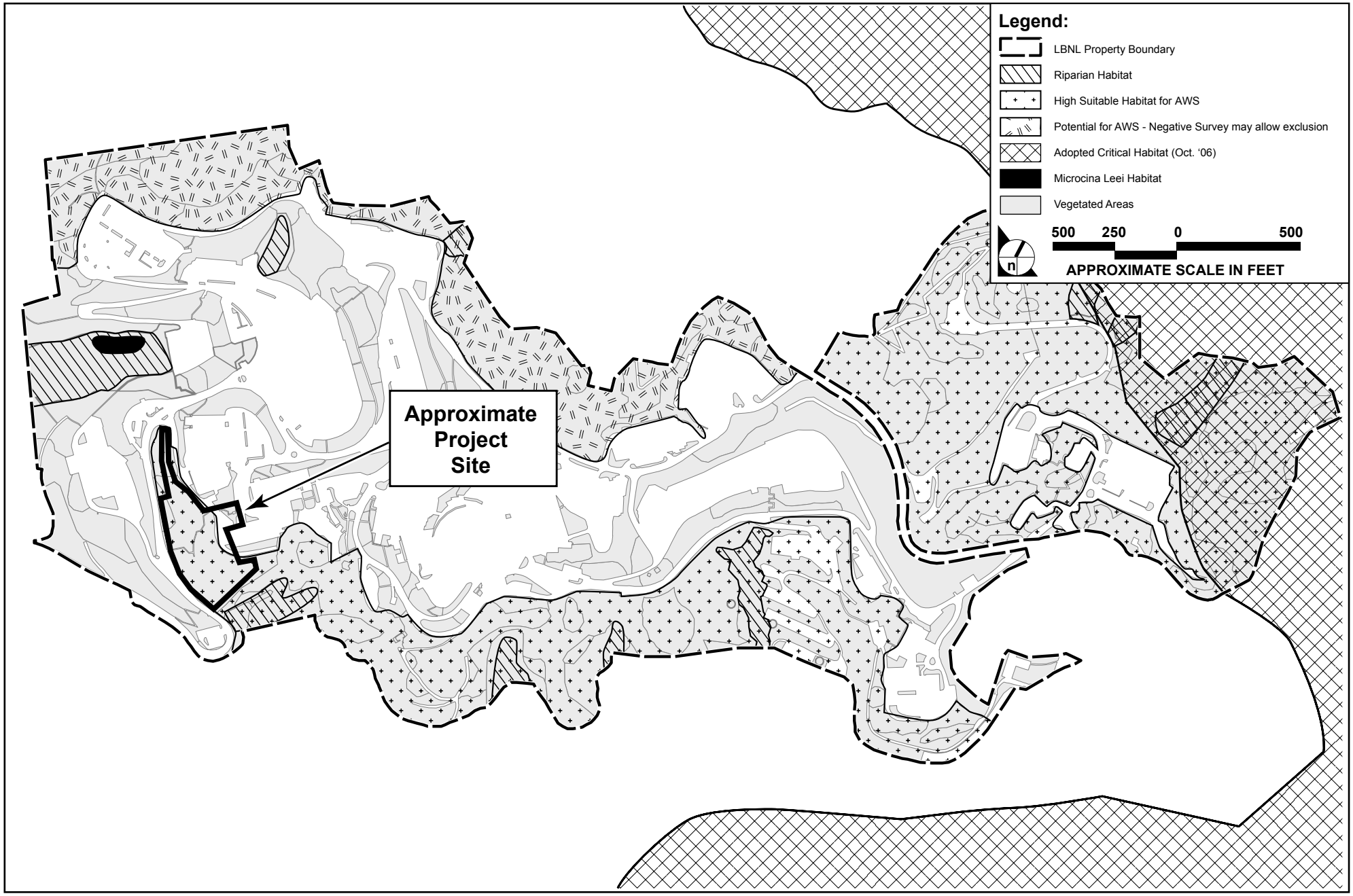
Cooper's hawk (Accipiter cooperi) is a California Species of Special Concern. The species ranges over most of North America and may be seen throughout California, most commonly as a winter migrant. Nesting pairs have declined throughout the lower-elevation, more populated parts of the state. Cooper's hawk forages in open woodlands and wooded margins and nests in tall trees, often in riparian areas (Ehrlich et al. 1988; Baicich 1997). This species has been observed foraging at LBNL (ESA 2003b). Coast live oak and eucalyptus trees on and adjacent to the project site may provide nesting habitat for the species.

Great Horned Owl

Great horned (Bubo virginianus) owl does not have any state or federal designation for rarity. However, for the purposes of this report, raptors are considered to be of special-status as they are specifically protected by Fish & Game Code Section 3503.5. Great horned owls occur throughout North America and are found in a variety of wooded habitats. These relatively common raptors prey on small to medium-sized mammals such as voles, rabbits, skunks, and squirrels. They roost and nest in large trees such as pines or eucalyptus and often use the abandoned nests of crows, ravens, or squirrels (Ehrlich et al. 1988; Sibley 2000). Great horned owls may use large eucalyptus and coast live oak trees located on and adjacent to the project site for roosting or nesting.

Red-Tailed Hawk

Red-tailed hawk (Buteo jamaicensis) does not have any state or federal designation for rarity. However, for the purposes of this report, raptors are considered to be of special-status as they are specifically protected by Fish & Game Code Section 3503.5. Red-tailed hawks are commonly found in woodlands and open country with scattered trees. These large hawks feed primarily on small mammals, but will also prey on other small vertebrates such as snakes and lizards, as well as on small birds and invertebrates. Red-tailed hawks nest in a variety of trees in woodland and agricultural habitats. This species is commonly observed foraging in the project area and large trees on and adjacent to the project site, including coast live oak and eucalyptus, may be used by red-tailed hawks for nesting.



SOURCE: Perkins+Will - September 2007, LBNL; ESA (2003); Swain Report - July 2006

FIGURE **4.3-2**

Sensitive Habitat at LBNL

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Red-shouldered Hawk

Red-shouldered hawk (Buteo lineatus) does not have any state or federal designation for rarity. However, for the purposes of this report, raptors are considered to be of special-status as they are specifically protected by Fish & Game Code Section 3503.5. Red-shouldered hawks are commonly found in a variety of woodland habitats. These small hawks feed primarily on small mammals and some reptiles and amphibians. Large trees on and adjacent to the project site, including coast live oak and eucalyptus, may be used by red-shouldered hawks for nesting. This species is commonly observed foraging in the project area.

American Kestrel

American kestrel (Falco sparverius) does not have any state or federal designation for rarity. However, for the purposes of this report, raptors are considered to be of special-status as they are specifically protected by Fish & Game Code Section 3503.5. This small member of the falcon family preys on small birds, small mammals, lizards, and insects. The kestrel is most common in open habitats, such as grasslands or pastures. This relatively common species has been observed foraging in grassland habitat at LBNL (ESA 2003b). American kestrels usually nest in tree cavities (Sibley 2001; Ehrlich et al. 1988) and the coast live oak and eucalyptus trees on and adjacent to the project site may provide nesting habitat for this species.

Allen's Hummingbird

Allen's hummingbird (Salasphorus sasin) is included on the most recent Special Animals List (CDFG 2006). This species inhabits chaparral, scrub, riparian, and woodland habitats that support nectar-producing plants. Insects and spiders are consumed as well. Potentially suitable nesting habitat for this species is present on and adjacent to the project site.

Pallid Bat

Pallid bat (Antrozous pallidus) is a California Species of Special Concern. This species is found from Mexico north through Oregon and Washington into Canada, in a variety of habitats. Roosting occurs in deep crevices on rock faces, buildings, bridges, and tree hollows (especially oaks). Pallid bat prey both aerially and terrestrially, on species such as Jerusalem crickets, moths, grasshoppers, June beetles, and scorpions. Mature trees occurring on and adjacent to the project site provide potentially suitable roosting habitat for this species.

Long-eared myotis

Long-eared myotis (Myotis evotis) is included on the most recent Special Animals List (CDFG 2006). This species inhabits nearly all types of brushlands, woodlands, and forests, but may show a preference for coniferous forests and woodlands. Roosts include caves, buildings, snags, and crevices in tree bark. Caves provide night roosts. This species is highly maneuverable in its forays for arthropods over water, open terrain, and in habitat edges. Eucalyptus and coast live oak trees on and adjacent to the project site provide potential roosting habitat for long-eared myotis.

Fringed Myotis

Fringed myotis (Myotis thysanodes) is included on the most recent Special Animals List (CDFG 2006). This species occurs throughout California and is most frequent in coastal and montane forests and near mountain meadows (Jameson and Peeters 1988). This species uses echolocation to find moths, beetles, and other prey and forms nursery colonies in caves and old buildings (Jameson and Peeters 1988). Fringed myotis often use separate day and night roosts. Trees on and adjacent to the project site provide potential roosting habitat for fringed myotis.

Special-Status Plant Species

A thorough review and analysis of special-status plant species, listed by the USFWS (2005), CDFG (2005, 2007), and CNPS (2005, 2007) databases as occurring in the project vicinity, indicate that the likelihood of adverse project impacts for most of the species listed is extremely low for the following reasons:

- Suitable habitat for the species either never existed on the project site or no longer exists due to historical and ongoing disturbance of soils and vegetation;
- The species is not documented within the general vicinity of the project site (i.e., the western side of the Oakland-Berkeley hills);
- Only historical occurrences for the species are documented from the area; or
- The species has been extirpated from the quadrangle or county.

Generally, the potential for special-status plant species to occur at LBNL is low; none have been observed in past environmental studies for LBNL, and none were observed during recent general biological resource surveys (ESA 2002a-c, 2003a-c). LBNL has been subject to ongoing disturbance, first in the form of grazing and then in the form of development, for the past 200 years. These types of disturbance, combined with the introduction of highly competitive non-native plant species, have resulted in the extirpation of a number of plant species that were documented in the Berkeley area in the late 1800s and

early 1900s. LBNL aggressively manages vegetation on virtually the entire site for fire protection. Therefore, both coastal scrub habitat and stands of eucalyptus and French broom have converted to grassland in recent years. Although small areas of patchily distributed native grasses remain scattered throughout LBNL, the native herbaceous species observed in these areas are those that are commonly found throughout the Oakland-Berkeley hills (ESA 2002a-c, 2003a-c). Generally, rarer species in the hills tend to be found on serpentine or other ultramafic soils or on thin soils, such as occur in road cuts, where non-native species do not compete as readily. These types of soils were not observed at LBNL during ESA's field surveys.

However, the following grassland, coastal scrub, and woodland species were determined to have some potential to occur to occur on LBNL given the presence of some suitable habitat: (1) big-scale balsamroot, (2) Diablo helianthella, (3) large-flowered leptosiphon, (4) Oregon meconella, and (5) robust monardella. The listing status, habitat requirements, and blooming period of these species are summarized in Table 4.3-1.

Focused surveys during the peak blooming period (i.e., spring, early summer) for special-status plant species have not been conducted on the CRT project site. However, a floristic inventory was conducted by Pacific Biology on June 28, 2007, which included a site-specific evaluation of the suitability of on-site habitats for special-status plant species. No special-status plant species were observed and a list of all common plant species identified is included in Appendix 4.3. It was concluded that it is highly unlikely that any special-status plant species occur on the project site based on the generally disturbed condition and types of habitats present (see Plant Communities). Also, many of the target special-status plant species (i.e., big-scale balsamroot, Diablo helianthella, and robust monardella) would have been visible and identifiable at the time of the survey if present due to their large size and persistence after flowering. The two remaining species—large-flowered leptosiphon and Oregon meconella—are smaller annual species. Large flowered leptosiphon is associated with sandy soils. In general, the soils on the site are loamy and it is highly unlikely the species would occur. Oregon meconella is typically associated with openings in shaded or wooded canyons. There were no such habitats on the site so it is also highly unlikely the species would occur.

Sensitive Plant Communities

The CNDDB lists several sensitive plant communities as occurring in the project area, including northern maritime chaparral, serpentine bunchgrass, and purple needlegrass grassland. The CDFG also considers riparian plant communities and freshwater marsh and seep communities in a generally arid climate to be sensitive plant communities. No sensitive plant communities occur on the project site.

As previously discussed (see Plant Communities), purple needlegrass occurs in varying densities on the project site, with the highest density occurring in the southern portion of the project site (within the eucalyptus stand) where purple needlegrass provides 10 to 15 percent ground cover within an approximately 30 feet by 50 feet area. Given the relatively sparse occurrence of purple needlegrass throughout most of the understory, the relatively small size and isolated occurrence of the stand of purple needlegrass, and that the small stand of native grasses is within a eucalyptus stand, the understory is more accurately described as a mixed grassland and not a purple needlegrass grassland.

Sensitive plant communities occurring in proximity to the project site include the North Fork of Strawberry Creek and associated bay woodland and the small area of arroyo willow scrub associated with the Cafeteria Creek drainage just south of Blackberry Canyon Gate. While bay woodland is not always considered to be a riparian plant community, in this case it is associated with the North Fork of Strawberry Creek and associated hydrologic conditions. These plant communities were discussed in detail earlier in this section (see Nearby Plant Communities) and their locations relative to the project site are shown in Figure 4.3-1 and Figure 4.3-2.

Sensitive Habitat

The following habitats on the LBNL site are considered to be sensitive: (1) known habitat of Lee's micro-blind harvestman (Microcina leei); (2) potential Alameda whipsnake habitat; (3) Critical Alameda whipsnake habitat, as adopted by USFWS in October 2006; and (4) riparian and wetland habitat that is potentially jurisdictional under federal or state law.

The location of the project site relative to these sensitive habitats is shown in Figure 4.3-2. As shown, the project site is located entirely within a sensitive habitat area identified as having "high potential for Alameda whipsnake." Please see Special-Status Wildlife, above, for further discussion of the potential use of the project site by Alameda whipsnake. Additionally, the project site is located near riparian habitats associated with the North Fork of Strawberry Creek and Cafeteria Creek to Strawberry Creek. Please see Nearby Plant Communities, above, for further discussion of these drainages and associated riparian habitat.

Known habitat for Lee's micro-blind harvestman occurs within the woodland associated with the North Fork of Strawberry Creek. This arachnid was first identified at LBNL in the 1960s and again in the 1980s. The species is only known from one other occurrence in Claremont Canyon (Briggs and Ubick 1989). Lee's micro-blind harvestman is currently listed as a special animal by the state (CDFG 2006). Although the species has no formal listing status, its known habitat at LBNL is designated as a fixed constraint under the 2006 LRDP and will continue to be protected from development.

Waters of the United States and Waters of the State

Wetlands, creeks, streams, and permanent and intermittent drainages are generally subject to the jurisdiction of the Army Corps of Engineers (ACOE) under Section 404 of the federal Clean Water Act. The CDFG generally has jurisdiction over these resources, as well as other aquatic features that provide an existing fish and wildlife resource pursuant to Sections 1602-1603 of the California Fish and Game Code. The CDFG asserts jurisdiction to the edge of any riparian-associated vegetation.

There are no "waters of the United States" (including wetlands) regulated by the ACOE or "waters of the State" regulated by the CDFG on the project site. However, the North Fork of Strawberry Creek and Cafeteria Creek (which are located near the project site, but outside of the project boundaries) are expected to be under ACOE and CDFG jurisdiction pursuant to Section 404 of the federal Clean Water Act and Sections 1602–1603 of the California Fish and Game Code. These drainages are discussed in more detail above (see Nearby Plant Communities).

4.3.3 Regulatory Considerations

Federal and State Laws and Regulations

Federal Endangered Species Act

Under the federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Pursuant to the requirements of the FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed or proposed species may be present in the project region, and whether the proposed project would result in a "take"[6] of such species. The "take" provision of the FESA applies to actions that would result in injury, death, or harassment of a single member of a species protected under the Act. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under the FESA, or result in the destruction or adverse modification of critical habitat for such species (16 USC 1536[3][4]). If it is determined that a project may result in the "take" of a federally listed species, a permit from the USFWS would be required under Section 7 or Section 10 of the federal Endangered Species Act.

6 "Take," as applied in Section 9 of the FESA, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect or to attempt to engage in any such conduct." "Harass" is further defined by the USFWS (50 C.F.R. § 17.3) as an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering. "Harm" is defined as "an act which actually kills or injures wildlife." This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Section 7 applies if there is a federal nexus (e.g., the project is on federal land, the lead agency is a federal entity, a permit is required from a federal agency, or federal funds are being used). Section 10 applies if there is no federal nexus.

Substantial, adverse project-related impacts to FESA-listed species or their habitats would be considered significant in this EIR. Proposed species are granted limited protection under the Act and must be addressed in Biological Assessments (under Section 7 of the Act); proposed species otherwise have no protection from "take" under federal law, unless they are emergency-listed species. Candidate species are afforded no protection under the Act. However, the USFWS recommends that candidate species and species proposed for listing also be considered in informal consultation during a project's environmental review.

Clean Water Act

The federal Water Pollution Control Act of 1972, often referred to as the Clean Water Act, is the nation's primary law for regulating discharges of pollutants into waters of the United States. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The regulations adopted pursuant to the Act deal extensively with the permitting of actions in waters of the United States, including wetlands. The Act's statutory sections and implementing regulations provide more specific protection for riparian and wetland habitats than any other federal law. The U.S. Environmental Protection Agency (U.S. EPA) has primary authority under the Clean Water Act to set standards for water quality and for effluents, but the ACOE has primary responsibility for permitting the discharge of dredge or fill materials into streams, rivers, and wetlands.

Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (16 USC, Section 703, Supplement I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. The Act encompasses whole birds, parts of birds, and bird nests and eggs.[7]

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFG has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code Section 2070). The CDFG also

[7] The act covers hundreds of birds, including varieties of loon, grebe, albatross, booby, pelican, cormorant, heron, stork, swan, goose, duck, vulture, eagle, hawk, falcon, fail, plover, avocet, sandpiper, phalarope, gull, tern, murre, puffin, dove, cuckoo, roadrunner, owl, swift, hummingbird, kingfisher, woodpecker, swallow, jay, magpie, crow, wren, thrush, mockingbird, vireo, warbler, cardinal, sparrow, blackbird, finch, and many others.

maintains a list of "candidate species," which are species formally under review for addition to either the list of endangered species or the list of threatened species. In addition, the CDFG maintains lists of "species of special concern," which serve as watch lists. Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species could be present on the project site and determine whether the proposed project could have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that may affect a candidate species. Project-related impacts to species on the CESA endangered or threatened lists would be considered significant in this EIR. Impacts to "species of concern" would be considered significant if the species met the criteria set forth under CEQA Guidelines Section 15380, or if the species were also protected under any of the other statutes or policies discussed in this section.

California Native Plant Protection Act

State listing of plant species began in 1977 with the passage of the California Native Plant Protection Act (NPPA), which directed the CDFG to carry out the legislature's intent to "preserve, protect, and enhance endangered plants in this state." The NPPA gave the California Fish and Game Commission the power to designate native plants as endangered or rare and to require permits for collecting, transporting, or selling such plants. The CESA expanded upon the original NPPA and enhanced legal protection for plants. The CESA established threatened and endangered species categories and grandfathered all rare animals—but not rare plants—into the act as threatened species. Thus, there are three listing categories for plants in California: rare, threatened, and endangered.

California Fish and Game Code

The California Fish and Game Code provides a variety of protections for species that are not federally or state-listed as threatened, endangered, or of special concern.

- Section 3503 protects all breeding native bird species in California by prohibiting the take,[8] possession, or needless destruction of nests and eggs of any bird, with the exception of non-native English sparrows and European starlings (Section 3801).
- Section 3503.5 protects all birds of prey (in the orders Falconiformes and Strigiformes) by prohibiting the take, possession, or killing of raptors and owls, their nests, and their eggs.

8 "Take" in this context is defined in Section 86 of the California Fish and Game Code as to "hunt, pursue, catch, capture, or kill, or to attempt to hunt, pursue, catch, capture, or kill."

- Section 3513 of the code prohibits the take or possession of migratory nongame birds as designated in the Migratory Bird Treaty Act or any parts of such birds except in accordance with regulations prescribed by the Secretary of the Interior.
- Section 3800 of the code prohibits the taking of nongame birds, which are defined as birds occurring naturally in California that are not game birds or fully protected species.
- Section 3511 (birds), Section 5050 (reptiles and amphibians), and Section 4700 (mammals) designate certain wildlife species as fully protected in California.

Local Plans and Policies

The proposed project would be located at LBNL, which is operated by the University of California and conducts work within the University's mission on land that is owned or controlled by The Regents of the University of California. As a state entity, the University is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. LBNL is located in both the City of Berkeley and the City of Oakland. The following sections summarize objectives and policies from the LBNL 2006 LRDP and LBNL Design Guidelines, and other local plans that relate to biological resources. Policies in the City of Berkeley and City of Oakland General Plans related to biological resources are listed in Appendix 4.3.

2006 LRDP Principles and Strategies[9]

The 2006 LRDP proposes four fundamental principles that form the basis for the Plan's development strategies provided for each element of the Plan. The one principle most applicable to the biological aspect of new development is to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship."

Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts that could result from implementation of the 2006 LRDP. Development strategies set forth in the 2006 LRDP applicable to biological resources include the following:

- Protect and enhance the site's natural and visual resources, including native habitats, riparian areas, and mature tree stands by focusing future development primarily within the already developed areas of the site.
- Continue to use sustainable practices in selection of plant materials and maintenance procedures.

9 While this Environmental Impact Report is a "stand alone" analysis that does not rely upon tiering from any programmatic CEQA document, Berkeley Lab does actively follow the 2006 Long Range Development Plan (LRDP) as a planning guide for Lab development. Accordingly, relevant 2006 LRDP principles, strategies, and design guidelines are identified in this section.

- Develop all new landscape improvements in accordance with the Laboratory's vegetation management program to minimize the threat of wildland fire damage to facilities and personnel.
- Utilize native, drought-tolerant plant materials to reduce water consumption; focus shade trees and ornamental plantings at special outdoor use areas.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the 2006 LRDP and were adopted by the Lab following The Regents' approval of the 2006 LRDP. The LBNL Design Guidelines provide specific guidelines for site planning, landscape and building design as a means to implement the 2006 LRDP's development principles as each new project is developed. The LBNL Design Guidelines provide the following specific planning and design guidance relevant to the biological resources related aspects of new development to achieve these design objectives:

- Projects or portions of projects which fall within the Rustic Landscape zones identified on the LRDP Landscape Framework Map shall provide new plantings consistent with this zone.
- Projects or portions of projects which fall within the Rustic Riparian Landscape zones identified on the LRDP Landscape Framework Map shall provide new plantings consistent with this zone.
- Projects or portions of projects which fall within the Ornamental Landscape zones identified on the LRDP Landscape Framework Map shall provide new plantings consistent with this zone.
- Minimize impacts of disturbed slopes.
- Create a cohesive identity across the Lab as a whole by following established precedents for new landscape elements.
- Minimize further increases in impermeable surfaces at the Lab.

UC Berkeley Strawberry Creek Management Plan

The Strawberry Creek Management Plan was originally prepared in 1987. The streams that dissect LBNL's slopes represent a significant portion of the upper Strawberry Creek watershed. The plan contains recommendations on best management practices for the Strawberry Creek watershed to control nonpoint-source pollution and reduce degradation of water quality. LBNL's has its own best management practices related to non-point-source pollution and reduction of degradation of water quality.

UC Berkeley Management Plan for Strawberry and Claremont Canyons

As outlined in the UC Berkeley 2020 LRDP policy, "Manage the Hill Campus Landscape to Reduce Fire and Flood Risk and Restore Native Vegetation and Hydrology Patterns," UC Berkeley maintains an ongoing program of fire fuel management in the hill area adjacent to LBNL. While the treatment used in a given area is customized to address its specific conditions, including vegetation type, access, and proximity to roads and structures, in general the treatments are designed to meet one or more of the following goals:

- Reducing fuel load by removing dead material, reducing plant density, and favoring species with lower fuel content;
- Reducing horizontal spread by reducing fine fuel material and by separating dense clusters of vegetation with areas of lower fuel load; and
- Reducing vertical fire spread by increasing separation of understory and crown fuels.

Whenever feasible, campus fuel management projects include the selective replacement of high-hazard introduced species with native species: for example, the restoration of native grassland and oak-bay woodland through the eradication of invasive exotics (broom, acacia, pampas grass) and the replacement of aged Monterey pines and second growth eucalyptus.

4.3.4 Impacts and Mitigation Measures

Significance Criteria

The impact of the proposed project on biological resources would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the CEQA Guidelines and the UC CEQA Handbook:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG or USFWS;
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFG or USFWS;
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan; or
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Issues Not Discussed Further

The Initial Study prepared for the CRT project found that there are no federally protected wetlands as defined by Section 404 of the Clean Water Act on the project site, and the project would therefore have no direct impact to such resources. The Initial Study also found that there are no native resident or migratory wildlife corridors or native wildlife nursery sites on the project site, and the proposed project would therefore have no impact to the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Additionally, the Initial Study found that there is no adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan that covers the project site, and there would therefore be no impact with respect to this issue. These issues are not discussed further in this section.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. These mitigation measures that are included in the project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM BIO-2a: Future development under the 2006 LRDP shall avoid, to the extent feasible, the fill of potentially jurisdictional waters. Therefore, during the design phase of any future development project that may affect potentially jurisdictional waters, a preliminary evaluation of the project site shall be made by a qualified biologist to determine if the site is proximate to potentially jurisdictional waters and, if deemed necessary by the biologist, a wetlands delineation shall be prepared and submitted to the ACOE for verification. Most development projected under the 2006 LRDP would have no potential for impacts on jurisdictional waters. However, development in specific locations including Buildings S-2 and S-0, as well as Parking Structures and Lots PS-1 and PL-9 and Roads R-2 and R-5, could require fill of or create the potential for accidental discharges to jurisdictional

waters. It should be noted that the preferable form of mitigation recommended by the ACOE is avoidance of jurisdictional waters. To the extent practicable, new development under the 2006 LRDP shall be located so as to avoid the fill of jurisdictional waters.

LRDP MM BIO-2b: Any unavoidable loss of jurisdictional waters shall be compensated for through the development and implementation of a project-specific Wetlands Mitigation Plan. In the event that potential impacts to streams resulting from a 2006 LRDP development project are identified, compensation for loss of jurisdictional waters would be based on the ACOE-verified wetlands delineation identified in Mitigation Measure BIO-2a. During the permit application process for specific development project(s) with identified impacts on jurisdictional drainages or wetlands, LBNL would consult with the ACOE, CDFG, and Regional Water Quality Control Board regarding the most appropriate assessment and mitigation methods to adequately address losses to wetland function that could occur as a result of the development project(s). A project-specific wetland mitigation plan would be developed prior to project implementation and submitted to permitting agencies for their approval. The plan may include one or more of the following mitigation options: restoration, rehabilitation, or enhancement of drainages and wetlands in on-site areas that remain unaffected by grading and project development or off site at one or more suitable locations within the project region; creation of on-site or off-site drainages or wetlands at a minimum of a 1:1 functional equivalency or acreage ratio (as verified by the ACOE); purchase of credits in an authorized mitigation bank acceptable to the ACOE and CDFG; contributions in support of restoration and enhancement programs located within the project region (such as those operated by local non-profit organizations including the Friends of Strawberry Creek, the Urban Creeks Council, or the Waterways Restoration Institute); or other options approved by the appropriate regulatory agency at the time of the specific project approval.

All mitigation work proposed in existing wetlands or drainages on- or off-site shall be authorized by applicable permits.

LRDP MM BIO-2c: To the extent feasible, construction projects that might affect jurisdictional drainages and/or wetlands could be scheduled for dry-weather months.

Avoiding ground-disturbing activities during the rainy season would further decrease the potential risk of construction-related discharges to jurisdictional waters.

LRDP MM BIO-3: Direct disturbance, including tree and shrub removal or nest destruction by any other means, or indirect disturbance (e.g., noise, increased human activity in area) of active nests of raptors and other special-status bird species (as listed in Table 4.3-1) within or in the vicinity of the proposed footprint of a future development project shall be avoided in accordance with the following procedures for Pre-Construction Special-Status Avian Surveys and Subsequent Actions. No more than two weeks in advance of any tree or shrub removal or demolition or construction activity involving particularly noisy or intrusive activities (such as concrete breaking) that will commence during the breeding season (February 1 through July 31), a qualified wildlife biologist shall conduct pre-construction surveys of all potential special-status bird nesting habitat in the vicinity of the planned activity and, depending on the survey findings, the following actions shall be taken to avoid potential adverse effects on special-status nesting birds:

1. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding season (August 1 through January 31).

2. If pre-construction surveys indicate that no nests of special-status birds are present or that nests are inactive or potential habitat is unoccupied, no further mitigation is required.

3. If active nests of special-status birds are found during the surveys, a no-disturbance buffer zone will be created around active nests during the breeding season or until a qualified biologist determines that all young have fledged. The size of the buffer zones and types of construction activities restricted within them will be determined through consultation with the CDFG, taking into account factors such as the following:

    a. Noise and human disturbance levels at the project site and the nesting site at the time of the survey and the noise and disturbance expected during the construction activity;

    b. Distance and amount of vegetation or other screening between the project site and the nest; and

    c. Sensitivity of individual nesting species and behaviors of the nesting birds.

4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-breeding season and continuing into the breeding season do not require surveys (as it is assumed that any breeding birds taking up nests would be acclimated to project-related activities already under way). However, if trees and shrubs are to be removed during the breeding season, the trees and shrubs will be surveyed for nests prior to their removal, according to the survey and protective action guidelines 3a through 3c, above.

5. Nests initiated during demolition or construction activities would be presumed to be unaffected by the activity, and a buffer zone around such nests would not be necessary.

6. Destruction of active nests of special-status birds and overt interference with nesting activities of special-status birds shall be prohibited.

7. The noise control procedures for maximum noise, equipment, and operations identified in Section IV.I, Noise, of this EIR[10] shall be implemented.

LRDP MM BIO-4: Project implementation under the 2006 LRDP shall avoid disturbance to the maternity roosts of special-status bats during the breeding season in accordance with the following procedures for Pre-Construction Special-Status Bat Surveys and Subsequent Actions. No more than two weeks in advance of any demolition or construction activity involving concrete breaking or similarly noisy or intrusive activities, that would commence during the breeding season (March 1 through August 31), a qualified bat biologist, acceptable to the CDFG, shall conduct pre-demolition surveys of all potential special-status bat breeding habitat in the vicinity of the planned activity. Depending on the survey findings, the following actions shall be taken to avoid potential adverse effects on breeding special-status bats:

1. If active roosts are identified during pre-construction surveys, a no-disturbance buffer will be created by the qualified bat biologist, in consultation with the CDFG, around active roosts during the breeding season. The size of the buffer will take into account factors such as the following:

    a. Noise and human disturbance levels at the project site and the roost site at the time of the survey and the noise and disturbance expected during the construction activity;

10 Refers to 2006 LRDP EIR.

b. Distance and amount of vegetation or other screening between the project site and the roost; and

c. Sensitivity of individual nesting species and the behaviors of the bats.

2. If pre-construction surveys indicate that no roosts of special-status bats are present, or that roosts are inactive or potential habitat is unoccupied, no further mitigation is required.

3. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding season (September 1 through February 28).

4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-breeding season and continuing into the breeding season do not require surveys (as it is assumed that any bats taking up roosts would be acclimated to project-related activities already under way). However, if trees are to be removed during the breeding season, the trees would be surveyed for roosts prior to their removal, according to the survey and protective action guidelines 1a through 1c, above.

5. Bat roosts initiated during demolition or construction activities are presumed to be unaffected by the activity, and a buffer is not necessary.

6. Destruction of roosts of special-status bats and overt interference with roosting activities of special-status bats shall be prohibited.

7. The noise control procedures for maximum noise, equipment, and operations identified in Section IV.I, Noise, of this EIR[11] shall be implemented.

LRDP MM BIO-5a: With the approval of the USFWS on a case-by-case basis, relocate any snake encountered during construction that is at risk of harassment; cease construction activity until the snake is moved to suitable refugium. Alternatively, submit a general protocol for relocation to the USFWS for approval prior to project implementation.

LRDP MM BIO-5b: Conduct focused pre-construction surveys for the Alameda whipsnake at all project sites within or directly adjacent to areas mapped as having high potential for whipsnake occurrence. Project sites within high potential areas shall be fenced to exclude snakes prior to project implementation. This would not include ongoing and non-site-specific activities such as fuel management.

[11] Refers to 2006 LRDP EIR.

Methods for pre-construction surveys, burrow excavation, and site fencing shall be developed prior to implementation of any project located within or adjacent to areas mapped as having high potential for whipsnake occurrence. Such methods would be developed in consultation or with approval of USFWS for any development taking place in USFWS officially designated Alameda whipsnake critical habitat. Pre-construction surveys of such project sites shall be carried out by a permitted biologist familiar with whipsnake identification and ecology (Swaim 2002). These are not intended to be protocol-level surveys but designed to clear an area so that individual whipsnakes are not present within a given area prior to initiation of construction. At sites where the project footprint would not be contained entirely within an existing developed area footprint and natural vegetated areas would be disturbed, any existing animal burrows shall be carefully hand-excavated to ensure that there are no whipsnakes within the project footprint. Any whipsnakes found during these surveys shall be relocated according to the Alameda Whipsnake Relocation Plan. Snakes of any other species found during these surveys shall also be relocated out of the project area. Once the site is cleared, it shall then be fenced in such a way as to exclude snakes for the duration of the project. Fencing shall be maintained intact throughout the duration of the project.

LRDP MM BIO-5c: (1) A full-time designated monitor shall be employed at project sites that are within or directly adjacent to areas designated as having high potential for whipsnake occurrence, or (2) Daily site surveys for Alameda whipsnake shall be carried out by a designated monitor at construction sites within or adjacent to areas designated as having moderate potential for whipsnake occurrence.

Each morning, prior to initiating excavation, construction, or vehicle operation at sites identified as having moderate or high potential for whipsnake occurrence, the project area of applicable construction sites shall be surveyed by a designated monitor trained in Alameda whipsnake identification to ensure that no Alameda whipsnakes are present. This survey is not intended to be a protocol-level survey. All laydown and deposition areas, as well as other areas that might conceal or shelter snakes or other animals, shall be inspected each morning by the designated monitor to ensure that Alameda whipsnakes are not present. At sites in high potential areas the monitor shall remain on site during construction hours. At sites in moderate potential areas the monitor shall remain on-call

during construction hours in the event that a snake is found on site. The designated monitor shall have the authority to halt construction activities in the event that a whipsnake is found within the construction footprint until such time as threatening activities can be eliminated in the vicinity of the snake and it can be removed from the site by a biologist permitted to handle Alameda whipsnakes. The USFWS shall be notified within 24 hours of any such event.

LRDP MM BIO-5d: Alameda whipsnake awareness and relevant environmental sensitivity training for each worker shall be conducted by the designated monitor prior to commencement of on-site activities. All on-site workers at applicable construction sites shall attend an Alameda whipsnake information session conducted by the designated monitor prior to beginning work. This session shall cover identification of the species and procedures to be followed if an individual is found on site, as well as basic site rules meant to protect biological resources, such as speed limits and daily trash pickup.

LRDP MM BIO-5e: Hours of operation and speed limits shall be instituted and posted. All construction activities that take place on the ground (as opposed to within buildings) at applicable construction sites shall be performed during daylight hours, or with suitable lighting so that snakes can be seen. Vehicle speed on the construction site shall not exceed 5 miles per hour.

LRDP MM BIO-5f: Site vegetation management shall take place prior to tree removal, grading, excavation, or other construction activities. Construction materials, soil, construction debris, or other material shall be deposited only on areas where vegetation has been mowed.

Areas where development is proposed under the 2006 LRDP are subject to annual vegetation management involving the close-cropping of all grasses and ground covers; this management activity would be performed prior to initiating project-specific construction. Areas would be re-mowed if grass or other vegetation on the project site becomes high enough to conceal whipsnakes during the construction period. In areas not subject to annual vegetation management, dense vegetation would be removed prior to the onset of grading or the use of any heavy machinery, using goats, manual brush cutters, or a combination thereof.

LRDP MM BIO-6a: Floristic surveys for special-status plants shall be conducted at specific project sites where suitable habitat is present. Floristic surveys shall also be conducted in designated Perimeter Open Space. All occurrences of special-status plant populations, if any, shall be mapped.

Although no special-status plants have been observed at LBNL during past biological resource surveys, the distribution and size of plant populations often vary from year to year, depending on climatic conditions. Therefore, a baseline survey of all non-developed areas, including the designated Perimeter Open Space areas, where there is potential for future development or vegetation management activities, should be conducted in accordance with USFWS and CDFG guidelines by a qualified botanist during the period of identification for all special-status plants. During this initial survey, any special-status plant populations found, as well as areas with high potential for supporting special-status plants (i.e., less disturbed areas, rock outcrops and other areas of thin soils, areas supporting a relatively high proportion of native plant species) would be identified and mapped. Thereafter, surveys of Perimeter Open Space areas where ongoing vegetation management (i.e., active vegetation removal to minimize potential wildland fire damage to facilities and personnel) activities would be undertaken, and that are mapped as supporting or having potential to support special-status plant species, would be conducted in April and June every five years.

In those proposed LRDP development sites where suitable habitat is present for special status species identified as having a moderate to high potential for occurrence, protocol-level rare plant surveys would be conducted prior to construction. Surveys should be conducted during the periods of identification for all species under consideration at each applicable development site, the timing and scope to be directed by a qualified botanist. During the initial survey, any special-status plant populations found, as well as all areas with high potential for supporting special-status plants (i.e., less disturbed areas, rock outcrops and other areas of thin soils, areas supporting a relatively high proportion of native plant species) would be identified and mapped.

LRDP MM BIO-6b: Seeds or cuttings shall be collected from sensitive plant species found within developable areas and open space and at risk of being any adversely affected, or sensitive plants found in these areas shall be transplanted.

If special-status plants are found during floristic surveys and are at risk of being adversely affected, a qualified botanist working in conjunction with an expert in native plant horticulture, CNPS, and CDFG, would collect seeds, bulbs, and cuttings for propagation and planting in specific project revegetation efforts as well as restoration of native habitat within designated Open Space. Perennial species could be transplanted, if found in undeveloped locations that have a high likelihood for future development. Due to its unreliability, translocation alone should not be relied upon as a sole means of mitigation; however, healthy individuals of any special-status plant species should be transplanted to areas of suitable habitat that are protected in perpetuity. The relocation sites may be located either on or off the LBNL hill site. If the areas for transplanting are located off site, they should be within a 20-mile radius of the project site. Plants should be relocated to areas with ecological conditions (slope, aspect, microclimate, soil moisture, etc.) as similar to those in which they were found as possible. Existing plants could also be held in containers for specific post-project revegetation efforts on site.

Project Impacts and Mitigation Measures

CRT Impact BIO-1: Construction of the proposed project would result in the permanent removal of 2.25 acres of vegetation. (Less than Significant)

Excavation, grading, and construction activities would result in the removal of approximately 2.25 acres of vegetation, including a eucalyptus stand and mixed grassland vegetation. Approximately 72 trees would be removed, including 64 eucalyptus, 5 coast live oak, 2 California bay, and 1 plum. About 40 trees are moderate to small in size (with trunk diameters less than 20 inches at breast height) while 32 trees (all eucalyptus) are relatively large with trunk diameters greater than 20 inches at breast height. More specifically, the diameter at breast height of the eucalyptus trees to be removed ranges from 12 inches to 33 inches; these trees are not native to the project area. The five coast live oak trees to be removed have diameters at breast height of 18, 12, 12, 10, and 10 inches, while the bay trees to be removed have diameters at breast height of 9 and 15 inches; these trees are native to the project area. Large groves of trees would be maintained near the project site (see Figure 4.3-1), including bay woodland associated with the North Fork of Strawberry Creek, oak woodland, eucalyptus stands, and conifer stands.

While the permanent loss of vegetation associated with the buildout of the Berkeley Lab (including the CRT project) could affect common wildlife species locally, the impact to vegetation types that are

common throughout the Oakland-Berkeley hills would be less than significant because of the existing abundance of these plant communities and associated common wildlife species. The plant communities to be removed as part of the proposed project are common on LBNL and the surrounding area and predominately include non-native plant species. The LBNL Construction Standards and Design Requirements require that all trees to be removed would be replaced at a 1:1 ratio. These replacement trees would be planted on the project site or greater LBNL campus. Additionally, incorporation of the LRDP Development Principles and Design Guidelines, as well as the following best practices currently undertaken by the Lab in connection with development projects, would further reduce the degree of the impact. Among these practices are the following: revegetation of disturbed areas (not covered by active buildings or parking lots), including slope stabilization sites, using native shrubs, trees, and grasses is included as a part of all new projects to the extent feasible and in keeping with the Lab's vegetation management program. Invasive plant species and other undesirable plants, such as French broom, yellow star-thistle, and Italian thistle, are controlled as appropriate under the Laboratory's vegetation management program.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact BIO-2: The proposed project would not result in indirect adverse effects to nearby creeks and seeps subject to ACOE and CDFG jurisdiction and also considered to be sensitive plant communities and habitats. (Less than Significant)

There are no creeks, seeps, wetlands or other features potentially subject to ACOE and/or CDFG jurisdiction on the project site. However, the North Fork of Strawberry Creek and known habitat for Lee's micro-harvestman occur 120 and 350 feet, respectively, to the north of the project site. Additionally, willow riparian scrub habitat associated with Cafeteria Creek occurs approximately 110 feet to the south of the project site. In the absence of avoidance measures, these habitats could be indirectly affected during construction of the proposed project. LBNL currently employs, and would continue to employ, a wide array of construction-period "best management practices" to minimize the potential for accidental discharges of fill or other materials into jurisdictional waters. Active management of construction-related stormwater flows from development sites is a standard part of contract specifications on all construction projects undertaken by LBNL. Construction projects incorporate control measures and are monitored to manage stormwater flows and potential discharge of pollutants. For example, LBNL's standard construction specifications include requirements for installation of erosion control netting and riprap to protect slopes and minimize adverse effects of runoff; protection of existing plant materials; application and maintenance of hydroseeding (sprayed application of seed and reinforcing fiber on graded slopes); no washout of concrete trucks to the storm drain system; and proper disposal of wastewater resulting from vehicle washing. LBNL also implements spill prevention and response programs to minimize

pollutants in runoff. Construction sites are replanted as soon as practicable following construction. In addition, the Lab's construction specifications require that contractors properly maintain construction vehicles to minimize fluid leaks and that construction equipment not be refueled in proximity to waterways. These ongoing programs would reduce the potential for accidental discharge during construction to adversely affect jurisdictional waters and sensitive plant communities/habitats. In addition to the employment of LBNL best management practices, LRDP Mitigation Measure BIO-2c (see above) is incorporated into the proposed project. The implementation of these measures would ensure that the potential impact on jurisdictional waters and sensitive plant communities/habitats from accidental discharges of fill or other deleterious substances would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact BIO-3: The proposed project would not adversely affect special-status nesting birds (including raptors) such that nests are destroyed, they abandon their nests, or that their reproductive efforts fail. (Less than Significant)

The removal of trees from the project footprint has the potential to affect active special-status bird nests (including raptors). Additionally, any unusually loud noise levels generated by project construction activities have the potential to disturb raptors or other special-status birds nesting on or near the project site and to result in the abandonment of active bird nests. Based on the presence of suitable habitat on and near the project site, a number of raptors and other special-status bird species (see Table 4.3-1) should be considered as potentially present and possibly using the area for nesting. The loss of active nests of special-status bird species would be avoided through implementation of LRDP Mitigation Measure BIO-3 which involves pre-construction surveys and implementation of additional measures incase active nests are encountered (see above). The Berkeley Lab would also comply with the Migratory Bird Treaty Act and Section 3503 of the California Fish and Game Code. With the implementation of this measure, impacts to special-status nesting birds (including raptors) would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact BIO-4: Removal of trees and other proposed construction activities during the breeding season would not result in direct mortality of special-status bats. In addition, construction noise could cause maternity roost abandonment and subsequent death of young. (Less than Significant)

Special-status bats that may occur on or near the project site include pallid bat, fringed myotis, and long-eared myotis. These bat species may use crevices in exfoliating tree bark and/or hollow cavities in trees

located on and near the project site for roosting. Therefore, the removal of trees from the project footprint could result in the destruction of special-status bat roosts and any unusually loud noise levels generated by project construction activities could result in the abandonment of an active maternity bat roost. The loss of active maternity roosts would be avoided through implementation of LRDP MM BIO-4 (see above), which is incorporated into the proposed project. The implementation of this measure would ensure that impacts to special-status bat species would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact BIO-5: Construction of the proposed project would not result in take or harassment of Alameda whipsnake. (Less than Significant)

The project site is within an area of LBNL identified as having a "highly suitable potential habitat" for Alameda whipsnake (see Figure 4.3-2) (Swaim 2006). A qualified biologist evaluated the site-specific suitability of the project site for Alameda whipsnake on June 28, 2007. The project site is located within a eucalyptus grove, has a grassland understory, and does not contain scrub communities often associated with the Alameda whipsnake. However, the project site is near areas containing high-quality habitat for Alameda whipsnake. Specifically, coastal scrub habitats and open space along the south-facing slopes occur to the south of the project site. As such, when considered with nearby habitats, the project site may be part of a mosaic of habitats utilized by the species. While core habitat does not occur within the project boundary and Alameda whipsnake is not expected to permanently reside on the project site, the subspecies may temporarily occur on the site. Given the potential of Alameda whipsnake to occur on the project site, in the absence of the implementation of avoidance measures, the proposed project could result in the loss or harassment of the species during construction. LRDP MM BIO-5(a) through LRDP MM BIO-5(f) (see above) have been incorporated into the proposed project and would be implemented to ensure that the species is protected during project construction and that no loss of individual whipsnakes occurs. Implementation of these measures would ensure that impacts to Alameda whipsnake would be less than significant. Additionally, prior to project commencement, informal consultation will be conducted with the USFWS to determine if a permit would be required under the federal Endangered Species Act.

Mitigation Measure: No project-level mitigation measures required.

Table 4.3-1
Special-Status Species Documented in the Project Area

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
SPECIES LISTED OR PROPOSED FOR LISTING				
Invertebrates				
Bay checkerspot butterfly Euphydryas editha bayensis	FT/--/--	Serpentine bunchgrass grassland, larvae feed on Plantago erecta	Unlikely. Grasslands on the project site and greater LBNL do not occur on serpentinite and are not known to support larval host plants.	March–May
Callippe silverspot butterfly Speyeria callippe callippe	FE/--/--	Coastal areas in dunes, prairie, scrub, and grasslands supporting Viola pedunculata	Unlikely. Species' host plant is not known to occur in the grasslands on the project site or greater LBNL.	Spring
Fish				
Central California coastal steelhead Oncorhynchus mykiss	FT/CSC/--	Unblocked Bay Area and coastal rivers and streams	Unlikely. Strawberry Creek contains downstream barriers to migration of this species.	Year-round
Winter-run chinook salmon Oncorhynchus tshawytscha	FE/CE/--	Unblocked Bay Area and coastal rivers and streams	Unlikely. Strawberry Creek contains downstream barriers to migration of this species.	Winter
Amphibians				
California tiger salamander Ambystoma californiense	FT/CSC/--	Breed in ponds and vernal pools; occupies small mammal burrows in surrounding grassland habitats during most of the year	Unlikely. Suitable aquatic and upland habitat for this species is not present within the project area.	November–May

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Amphibians (continued)				
California red-legged frog Rana draytonii	FT/CSC/--	Breed in stock ponds, pools, and slow-moving streams with emergent vegetation for escape cover and egg attachment	Unlikely. Suitable aquatic habitat does not occur on the project site; the North Fork of Strawberry Creek (which is located near the project site) has a dense canopy, is steeply incised, and does not provide suitable habitat for the species. No occurrences of the species are reported within several miles of the project site (CNDDB 2007).	May–November
Reptiles				
Alameda whipsnake Masticophis lateralis euryxanthus	FT/CT/--	Inhabits open to partially open scrub communities, including coyote bush scrub and chamise chaparral on primarily south-facing slopes	High potential. The preferred habitat for this species is not present within the project boundaries. However, suitable habitat occurs near the site (i.e., scrub habitats) and the project site is part of a mosaic of habitats potentially utilized by the species. While it is unlikely that permanently occupied territory is present on site, the species may disperse through the site. The site is within an area identified as having "highly suitable potential habitat" for the species (Swaim 2006).	Spring

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Birds				
American peregrine falcon Falco peregrinus	Delisted/CE/--	Forages in marshes and grasslands; nesting habitat includes high, protected cliffs and ledges near water	Unlikely. Suitable nesting habitat is not present in the project area. May forage in the project area.	Year-round
Bald Eagle Haliaeetus leucocephalus	FT/CE/--	Nests and forages on inland lakes, reservoirs, and rivers; winter foraging at lakes and along major rivers	Unlikely. Suitable foraging or nesting habitat is not present in the project area.	Winter
Plants				
Large-flowered fiddleneck Amsinckia grandiflora	FE/CE/1B.1	Valley grassland, foothill woodland, annual grassland	Low potential. Project site contains marginally suitable habitat and only three natural occurrences are known, the nearest in east Alameda County (CNPS 2005).	April–May
Pallid manzanita Arctostaphylos pallida	FT/CE/1B.1	Broadleaved upland forest, cismontane woodland, closed-cone coniferous forest, chaparral, and coastal scrub; found in siliceous shale, sandstone, or gravelly substrates	Unlikely. The project site does not contain suitable soils for this species. Species is readily recognizable and was not seen during recent or past field surveys.	December–March
Robust spineflower Chorizanthe robusta var. robusta	FE/--/1B.1	Sandy or gravelly openings in cismontane woodland; also coastal dunes and coastal scrub	Unlikely. Suitable soils not present. Not seen in Alameda or adjacent counties since the 1890s; presumed extirpated in Bay Area (CNPS 2005).	April–September
Presidio clarkia Clarkia franciscana	FE/CE/1B.1	Serpentine outcrops in coastal scrub and valley and foothill grassland	Unlikely. Suitable habitat is not present, as the site does not contain serpentine outcrops.	May–July

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Plants (continued)				
Santa Cruz tarplant *Holocarpha macradenia*	FT/CE/1B.1	Light, sandy, or sandy clay soil in coastal prairie and scrub and in valley and foothill grassland; often with non-native associates	Unlikely. Marginally suitable habitat is present on the project site. Not observed during recent field survey conducted during the species' blooming period. Naturally occurring populations have been extirpated from the Bay Area (CNPS 2005).	June–October
San Francisco popcorn flower *Plagiobothrys diffusus*	FSC/CE/1B.1	Coastal prairie and valley and foothill grassland	Low Potential. The project site provides marginally suitable habitat. Species known from fewer than 10 occurrences. Not observed during recent June survey.	April–June
FEDERAL BIRDS OF CONSERVATION CONCERN/STATE SPECIES OF SPECIAL CONCERN/ STATE SPECIAL ANIMALS				
Invertebrates				
Monarch butterfly *Danaus plexippus*	--/*/--	Winters in eucalyptus groves; winter roosting sites protected by the state	Low potential. Suitable habitat is present on site, but the species has not been documented wintering on LBNL or the surrounding project area.	Winter
Bridges' Coast Range shoulderband snail *Helminthoglypta nickliniana bridgesi*	--/*/--	Inhabits open hillsides; prefers rock piles but can be found under tall grasses and weeds	Low potential. Preferred habitat is absent including rock piles and other suitable damp areas.	Year-round
Ricksecker's water scavenger beetle *Hydrochara ricksecker*i	--/*/--	Specific habitat requirements are unknown; requires calm, shallow water of ponds and streams	Unlikely. Suitable aquatic habitat is not present in the project area.	Unknown

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Invertebrates (continued)				
Lee's micro-blind harvestman Microcina leei	--/*/--	Requires undisturbed rocks in native grasslands and woodlands	Unlikely. Suitable habitat is not present on the project site. Known to occur on LBNL in Blackberry Canyon, approximately 500 feet north of the project site.	Year-round
San Francisco lacewing Nothochrysa californica	--/*/--	Coastal scrub and woodlands	Low potential. Not generally associated with eucalyptus stands. The species is known to occur in woodland and coastal scrub habitat on LBNL in Strawberry Canyon; the project site is located within Blackberry Canyon.	January–July
Birds				
Cooper's hawk (nesting) Accipiter cooperi	--/CSC/--	Nests in riparian growths of deciduous trees and live oak woodlands	Moderate potential. Suitable nesting habitat is available on and bordering the project site.	March–July
Sharp-shinned hawk (nesting) Accipiter striatus	--/CSC/--	Nests in riparian growths of deciduous trees and live oaks	Low potential. The project site is located outside of the species' expected nesting range; could occur as a winter migrant.	March–July
Tricolored blackbird (nesting colony) Agelaius tricolor	BCC/CSC/--	Riparian thickets and emergent vegetation	Unlikely. Suitable nesting habitat is not present on or near the project site.	Spring
Grasshopper sparrow Ammodramus savannarum	--/*/--	Dry, dense grasslands, especially with a variety of grasses and tall forbs and scattered shrubs	Low potential. Available grassland habitat is relatively small and fragmented; the species generally frequents areas that are more arid.	April–July

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Birds (continued)				
Bell's sage sparrow Amphispiza belli belli	BCC/CSC/--	Inhabits arid areas with low, fairly dense stands of shrubs, including chamise chaparral and coastal sage scrub	Low potential. Suitable habitat is not present on project site; While potentially suitable scrub habitat is present near the project site, the species generally frequents areas that are more arid.	Year-round
Golden eagle (nesting and wintering) Aquila chrysaetos	BCC/CSC/CFP	Generally nests in remote areas in trees, on cliffs, rocky outcrops, and utility towers, mostly in hilly or mountainous terrain; prefers to forage in habitat with dense ground squirrel populations	Unlikely. Suitable nesting and foraging habitat is not present on or near the project site.	Year-round
Burrowing owl (burrow sites) Athene cunicularia	BCC/CSC/--	Nests in mammal burrows in open, lowland grasslands; also uses man-made structures	Unlikely. Suitable nesting habitat (i.e., small mammal burrows of adequate size) is not present on or near the project site.	February–June
Oak titmouse (nesting) Baelophus inornatus	--/*/--	Inhabits open oak woodlands and oak savannah	Low potential. Suitable habitat is not present; species is relatively rare on western slopes of East Bay hills due to generally high density of oak habitat.	Year-round
Great horned owl Bubo virginianus	--/3503.5/--	Often uses abandoned nests of corvids or squirrels; nests in large oaks, conifers, eucalyptus	Moderate potential. Suitable nesting habitat is present on the project site.	Year-round
Red-tailed hawk Buteo jamaicensis	--/3503.5/--	Usually nests in large trees, often in woodland or riparian deciduous habitats	Moderate potential. Suitable nesting habitat is present on the project site.	Year-round
Red-shouldered hawk Buteo lineatus	--/3503.5/--	Nest in a variety of woodland or riparian habitats	Moderate potential. Suitable nesting habitat is present on the project site.	Year-round

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Birds (continued)				
Lark sparrow (nesting) Chondestes grammacus	--/*/--	Inhabits sparse valley foothill hardwood, open mixed chaparral and brushy habitats, grasslands with scattered trees or shrubs	Unlikely. Suitable nesting habitat is not present on the project site as the canopy cover is too dense.	Year-round
Northern harrier (nesting) Circus cyaneus	--/CSC/--	Most commonly found foraging over marshes and open fields. Nests on slightly elevated ground or in thick vegetation.	Unlikely. Suitable nesting habitat is not present on or near the project site.	Year-round
Olive-sided flycatcher (nesting) Contopus cooperi	BCC/--/--	Inhabits open conifer or mixed woodlands; nests in large coniferous trees	Low potential. Preferred nesting habitat is not present on or adjacent to the project site; species is relatively rare in East Bay hills.	May–August
White-tailed kite (nesting) Elanus leucurus	--/CFP/--	Nests near wet meadows and open grasslands, in dense oak, willow, or other tree stands	Low potential. This species rarely seen in the Oakland-Berkeley hills likely due to the extent of woodland habitats and lack of large, open grasslands. Grasslands on and bordering the project site are relatively small and fragmented and unlikely to be used by the species.	March–July
California horned lark Eremophila alpestris acita	--/CSC/--	Nests and forages in short-grass prairie, mountain meadow, coastal plain, fallow fields, and alkali flats	Unlikely. Project site and nearby areas do not provide suitable habitat.	March–July
Merlin (wintering) Falco columbarius	BCC/CSC/--	Breeds outside California, inhabits coastlines, open grasslands, savannahs, and woodlands	Low potential. Does not nest in California; could infrequently occur as a winter migrant but available on-site habitat is marginal.	September–May

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Birds (continued)				
American kestrel Falco sparverius	--/3503.5/--	Frequents generally open grasslands, pastures, and fields; primarily a cavity nester	Moderate potential. Potential nesting habitat available on and adjacent to the project site in cavities of mature trees.	Year-round
Yellow-breasted chat (nesting) Icteria virens	--/CSC/--	Nests in riparian corridors with willows or other dense foliage	Unlikely. No riparian habitat present within the project boundaries; limited extent of riparian vegetation present near the project makes nesting unlikely in the project area.	March–September
Loggerhead shrike (nesting) Lanius ludovicianus	BCC/CSC/--	Nests in shrublands and forages in open grasslands	Unlikely. Suitable open grassland habitat is not present on or adjacent to the project site.	March–September
Lewis' woodpecker (nesting) Melanerpes lewis	BCC/--/--	Nests in cavities of dead or burned out trees in open, deciduous, and conifer habitats with brushy understory	Unlikely. Project site is located outside of the species' expected nesting range and does not contain characteristic brush understory. Rarely occurs on the west side of East Bay hills in oak woodland habitat in winter.	Winter
Rufous hummingbird (nesting) Selasphorus rufus	BCC/--/--	Inhabits riparian areas, open woodlands, chaparral, and other habitat with nectar-producing flowers; breeding does not occur in San Francisco Bay Area.	Unlikely. Breeding does not occur in the San Francisco Bay Area; nectar producing flowers scarce or absent within the project boundaries.	February–April
Allen's hummingbird (nesting) Selasphorus sasin	--/*/--	Inhabits coastal scrub, valley foothill hardwood, and riparian habitats	Moderate potential. Trees and shrubs within and adjacent to the project site provide potential nesting habitat.	January–July

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Birds (contintued)				
Red-breasted sapsucker (nesting) Sphyrapicus ruber	--/*/--	Breeds in coastal forests of Northern California and Oregon	Unlikely. Does not breed in the area; could infrequently occur in winter.	November–March
California thrasher Toxostoma redivivum	--/*/--	Moderate to dense chaparral and scrub, open valley foothill riparian thickets	Unlikely. Suitable habitat not present within or adjacent to the project site.	Year-round
Mammals				
Pallid bat Antrozous pallidus	CSC/--	Day roosts include rock outcrops, mines, caves, hollow trees, buildings, and bridges. Recent research suggests high reliance on tree roosts.	Moderate potential. Suitable roosting habitat present on the site in mature trees.	March–August
Townsend's big-eared bat Corynorhinus townsendii	--/CSC/--	Inhabits a variety of habitats, requires caves, mines, or man-made structures for roosting	Low potential. Suitable roosting habitat is not present on or adjacent to the project site, but the species may forage in the area.	March–August
Berkeley Kangaroo rat Dipodomys heermanni berkeleyensis	--/*/--	Open, grassy hilltops and open spaces in chaparral and blue oak/gray pine woodland	Unlikely. Suitable habitat is not present on the project site; species is presumed extinct.	Year-round
Western mastiff bat Eumops perotis	--/CSC/--	Breeds in rugged, rocky canyons and forages in a variety of habitats	Low potential. Suitable roosting habitat is not present in the project area, but the species may forage in the area.	March–August
Long-eared myotis Myotis evotis	--/*/--	Inhabits woodlands and forests up to approximately 8,200 feet in elevation; roosts in crevices and snags	Moderate potential. Suitable foraging and roosting habitat is present on and adjacent to the project site.	March–August
Fringed myotis Myotis thysanodes	--/*/--	Inhabits a variety of woodland habitats, roosts in crevices or caves, and forages over water and open habitats	Moderate potential. Suitable foraging and roosting habitat is present on and adjacent to the project site.	March–August

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Mammals (continued)				
San Francisco dusky-footed woodrat Neotoma fuscipes annectens	--/CSC/--	Forests with moderate canopy and moderate to dense understory	Unlikely. No woodrat nests were observed on the project site during recent field survey; marginally suitable habitat present.	Year-round
Plants				
Bent-flowered fiddleneck Amsinckia lunaris	--/--/1B.2	Coastal bluff scrub, woodland, and valley and foothill grassland	Low potential. Marginally suitable habitat is present on the project site, and records from Oakland-Berkeley hills are historic only. A focused search of the project site for the species was conducted on June 28, 2007. The search was conducted after the peak spring bloom (making identification of the species more difficult). However, the species would have been persistent or recognizable to genus or species if present. The species was not observed during the survey.	March–June

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Plants (continued)				
Big-scale balsamroot Balsamorhiza macrolepis var. macrolepis	--/--/1B.2	Woodland and valley and foothill grassland, sometimes on serpentine soils	Low potential. Low-quality suitable habitat is present on the project site and serpentine soils are absent. A focused search of the project site for the species was conducted on June 28, 2007. The search was conducted after the peak spring bloom (making identification of the species more difficult). However, the species would have been persistent or recognizable to genus or species if present. The species was not observed during the survey.	March–June
Mt. Diablo fairy-lantern Calochortus pulchellus	--/--/1B.2	Woody and shrubby slopes of chaparral, cismontane, and riparian woodland, and valley and foothill grassland	Low potential. Marginally suitable habitat is present on the project site, and the species is not known from Oakland-Berkeley hills. A focused search of the project site for the species was conducted on June 28, 2007. The search was conducted after the peak spring bloom (making identification of the species more difficult). However, the species would have been persistent or recognizable to genus or species if present. The species was not observed during the survey.	April–June

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Plants (continued)				
Western leatherwood Dirca occidentalis	--/--/1B.2	On brushy slopes and mesic areas of chaparral, riparian woodland and forest, and broadleaf or coniferous forest	Unlikely. Marginal habitat present on the project site. This shrub would have been recognizable during the field survey and was not observed.	January–April
Round-leaved filaree California macrophyllum	--/--/1B.1	On clay soils in woodland and valley and foothill grasslands	Low potential. Marginal habitat is present on the project site; most regional collections are historic (CNPS 2005).	March–May
Diablo helianthella Helianthella castanea	--/--/1B.1	Broadleaf upland forest, cismontane woodland, chaparral, coastal scrub, riparian woodland, and valley and foothill grassland	Low potential. Low-quality suitable habitat is present on the project site. A focused search of the project site for the species was conducted on June 28, 2007. The search was conducted after the peak spring bloom (making identification of the species more difficult). However, the species would have been persistent or recognizable to genus or species if present. The species was not observed during the survey.	April–June
Fragrant fritillary Fritillaria liliacea	--/--/1B.2	Cismontane woodland, coastal prairie and scrub, valley and foothill grasslands, often on serpentine soils	Low potential. Serpentine or heavy clay soils are not present on the project site. The species is unlikely to be found on other soils.	February–April
Kellogg's horkelia Horkelia cuneata spp. sericea	--/--/1B.1	In sandy or gravelly openings of closed-cone coniferous forest, chaparral and coastal scrub	Low potential. Suitable habitat is not present on the project site. Presumed extirpated in Alameda County (USFWS 2005a).	April–September

Common Name Scientific Name	Listing Status	General Habitat	Potential for Occurrence	Period of Identification
Plants (continued)				
Large-flowered leptosiphon (linanthus) Leptosiphon grandiflorus (formerly Linanthus grandiflorus)	--/--/4.2	Cismontane woodlands, valley and foothill grassland, coastal scrub; associated with sandy soils	Low potential. Sandy soils (generally associated with the species) do not occur on the project site.	April–August
Oregon meconella Meconella oregana	--/--/1B.1	Coastal scrub and prairie	Low potential. Low-quality suitable habitat is present at LBNL and is absent from the project site. Known only from five occurrences, including Oakland East, Richmond, and Briones Valley quads.	March–April
Robust monardella Monardella villosa ssp. globosa	--/--/1B.2	In clay or sandy soils of coastal prairie and scrub, and valley and foothill grassland	Low potential. Low-quality suitable habitat is present on the project site. A focused search of the project site for the species was conducted on June 28, 2007. The species would have been persistent or recognizable if present. The species was not observed during the survey.	June–July
Most beautiful jewel-flower Streptanthus albidus ssp. peramoenus	--/--/1B.2	Ridges and slopes with chaparral, valley and foothill grassland, and woodland; on serpentine outcrops	Low potential. No serpentine soils or outcrops are present on the project site.	April–June

STATUS CODES:
High potential = High to moderate quality habitat present and site within the geographic range; species expected to occur.
Moderate potential = Low to moderate quality habitat present, or habitat suitable but not within species' reported geographic range.
Low potential = Habitat highly limited or only marginally suitable or species may not be reported within the region.
Unlikely = Habitat does not meet species requirements as currently understood in the scientific community, site not within currently known species distribution or range, and/or not identified during focused searches when (plant) species would have been identifiable.

Federal: (U.S. Fish and Wildlife Service)	State: (California Department of Fish and Game)
FE = Listed as endangered (in danger of extinction) by the federal government	CE = Listed as endangered by the State of California
FT = Listed as threatened (likely to become endangered within the foreseeable future) by the federal government	CT = Listed as threatened by the State of California
PE/PT = Proposed for listing as endangered or threatened	CR = Listed as rare by the State of California (plants only)
FC = Candidate to become a proposed species	CSC = California Species of Special Concern
	CFP = California Fully Protected
	* = Species designated as "Special Animals" by the state
	3503.5 = California Fish and Game Code Section 3503.5, Protection for nesting species of Falconiformes (hawks) and Strigiformes (owls)

California Native Plant Society

List 1A = Plants presumed extinct in California
List 1B = Plants rare, threatened, or endangered in California and elsewhere
List 2 = Plants rare, threatened, or endangered in California but more common elsewhere
List 3 = Plants about which more information is needed
List 4 = Plants of limited distribution
An extension reflecting the level of threat to each species is appended to each rarity category as follows:
1 – Seriously endangered in California
2 – Fairly endangered in California
3 – Not very endangered in California
SOURCES: CalFlora 2003; CDFG 2004, 2007; CNPS 2006; USFWS 2005a; Zeiner et al. 1990.

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4.4.1 Introduction

This section evaluates the potential impacts to cultural resources (historical and archaeological) associated with implementation of the proposed Computational Research and Theory (CRT) project. Information presented in the discussion and subsequent analysis was based on information from technical studies prepared for the project area, including archival research at the California Historical Resources Information System's Northwest Information Center conducted for the entire Lawrence Berkeley National Laboratory (LBNL) site; a cultural resources evaluation and survey completed by Archaeological Research and Services in 1986; an archaeological survey report (Kielusiak 2000); and the first of a series of reports being prepared by D.W. Harvey (Harvey 2003) of the Pacific Northwest National Laboratory as a part of an inventory and evaluation of potential historically significant buildings and structures at LBNL, and the LBNL 2006 LRDP EIR.

In response to the Notice of Preparation for this EIR, one commenter stated that the Berkeley Lab should evaluate the project's impact on the Strawberry Canyon cultural landscape. The project is located in an area known as Blackberry Canyon, which is near Strawberry Canyon. A cultural landscape is defined by the National Park Service as "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designated landscapes, historic vernacular landscapes, and ethnographic landscapes." Although not necessarily required for California Environmental Quality Act (CEQA) evaluation purposes, cultural landscape information in the standard National Park Service format would typically include a history of the use and development of an important landscape, including a cultural landscape chronology, identification of its potential boundaries, and a description of the character defining features of the landscape. Strawberry Canyon has not been the subject of such a study to date and has not been designated a cultural landscape by the City of Berkeley Landmarks Preservation Commission or the State Historic Preservation Officer, and it is not clear what historic event, activity, or person would be the basis for significance of the area as a cultural landscape. Furthermore, at this time the City does not have an ordinance to designate cultural landscapes, the canyon has not been recorded or nominated to the National Register or California Register as a cultural landscape, and it is not clear that it has characteristics that would warrant such nomination or would make it eligible for listing. If the property were nominated to the California Register of Historical Resources (CRHR) or National Register of Historic Places (NRHP), the State Historical Resources Commission (and National Park Service for federal nominations) would be the agency to determine whether the property meets the criteria. If

Strawberry Canyon is designated as a cultural landscape in future, LBNL will take such designation into account in future planning, as required by CEQA. Note that the Canyon area has been the site of numerous and changing research, recreational and land management activities of the University of California, as well as residential and other development activities on private properties. The proposed project is consistent with this existing and ongoing pattern of development in the area.

4.4.2 Environmental Setting

Early Regional and Local History

Native Americans began to occupy the present-day Northern California (i.e., San Francisco Bay region) around 2,000 B.C. Linguistic evidence suggests that the Native Americans that lived in the area spoke Chochenyo, one of the Costanoan[1] languages. In 1770, the Costanoan-speaking people lived in approximately 50 separate and politically autonomous nations or tribelets. Records from early Spanish diaries document a number of small villages along the foothills of the East Bay area. A settlement named Huchiun may have been situated in the general vicinity of the present city of Berkeley as indicated by ethnographic sources (Kroeber 1925). During the mission period, 1770 through 1835, the Costanoan people experienced cataclysmic changes in almost all areas of their lives, particularly a massive decline in population due to introduced diseases and declining birth rate. Following the secularization of the missions by the Mexican government in the 1830s, most Native Americans gradually left the missions to work as manual laborers on the ranchos that were established in the surrounding areas. In the project region (i.e., Alameda County), Native American archaeological sites tend to be situated along ridgetops, midslope terraces, alluvial flats, near ecotones,[2] and near sources of water including springs (LBNL 2007).

In 1820, Sergeant Luis Peralta obtained Mission San Antonio, the present-day sites of the cities of Oakland, Berkeley, and Alameda. The land was later (in 1842) divided among his four sons. In 1860, the University of California was established as the College of California on 160 acres. Four years later in 1864, a Homestead Association was established in the adjacent areas. These actions led to increased development in the vicinity of the University and incorporation of the town of Berkeley in April 1878. During this time, the present-day LBNL site was largely undeveloped, and remained so until the late 1930s (LBNL 2007).

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1 "Costanoan" is derived from the Spanish word Costanos meaning "coast people." No native name of the Costanoan people as a whole existed in prehistoric times as the Costanoan were neither a single ethnic group nor a political entity.

2 An "ecotone" is defined as the zone of transition between adjacent ecological systems, having a set of characteristics uniquely defined by space and time scales and by the strength of interactions between them.

Development of Lawrence Berkeley National Laboratory

Lawrence Berkeley National Laboratory was founded in 1931 as the University of California Radiation Laboratory on the UC Berkeley main campus. The Radiation Laboratory (the former Civil Engineering Test lab) was established as an accelerator laboratory by UC President Robert Gordon Sproul for physics professor Ernest Orlando Lawrence. A couple of years earlier (in 1929), on the UC Berkeley campus, Lawrence had built the world's first cyclotron, a 4-inch circular particle accelerator. With the establishment of the Radiation Laboratory, Lawrence and his associates had the opportunity to expand their research. Further expansion of the physical size of the Laboratory's hill site during World War II was partly due to an increase in nuclear fission research, which prompted the need for higher-energy accelerators and more room for locating them. Growth of the hill site is also attributed to the fame and publicity Lawrence received for the Nobel Prize, which helped to attract research funding (LBNL 2007).

Previous Site-Wide Studies

As part of the environmental analysis for the 1987 LRDP EIR, as amended, all undeveloped land and then-proposed building locations were examined for potential historical and archaeological resources. All reasonably accessible parts of the LBNL area were examined with special attention given to areas of relatively flat land or rock outcrops. The steep hillsides were not examined intensively, although transects were made through accessible areas. Based on the findings of the historic and archaeological resources survey, no indications of historic or prehistoric archaeological resources were encountered in any location at the project site. Based on this survey, LBNL was not determined to be eligible for listing on the NRHP (LBNL 2007).

Current Studies of Historical Resources

To evaluate the potential for historically significant buildings or structures, LBNL retained the Pacific Northwest National Laboratory team of licensed cultural resource professionals to conduct field surveys and historic research at LBNL. In coordination with LBNL, the U.S. Department of Energy (DOE), and the State Office of Historic Preservation, the team is systematically investigating and reporting on all buildings and structures at the Lab. The team is currently in the process of completing a series of reports to identify, survey, and evaluate approximately 245 buildings and structures at the LBNL site for potential eligibility for listing in the National Register. These studies have been undertaken pursuant to Section 110 of the National Historic Preservation Act, which requires that federal agencies, such as DOE, survey the lands under their control and evaluate all historic properties (including buildings and the equipment contained therein) for eligibility for listing in the National Register. When completed, these reports will be submitted to the State Historic Preservation Officer for concurrence.

Current Studies of Archaeological Resources

Field surveys and archival research at the California Historical Resources Information System's Northwest Information Center have been undertaken to determine whether any archaeological resources have been discovered at LBNL. The Northwest Information Center has indicated there is a "low potential for Native American sites in the project area" and thus "a low possibility of identifying Native American or historic-period archaeological deposits in the project area." Additionally, field studies conducted at various times at LBNL have not encountered any archaeological resources. Native American archaeological sites in this portion of Alameda County tend to be situated on terraces along ridgetops, midslope terraces, alluvial flats, near ecotones, and near sources of water, including springs. LBNL is situated on a steep slope adjacent to Strawberry Creek. Therefore, there is a low-to-moderate potential for Native American sites to be present on the project site (LBNL 2007).

4.4.3 Regulatory Considerations

National Register of Historic Places

The National Register of Historic Places is the nation's central inventory of known historic resources. The National Register is administered by the National Park Service and includes listings of buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the national, state, or local level. There are three different officials that can nominate properties into the National Register of Historic Places; the State Historic Preservation Officer of the state in which the property is located, the Federal Preservation Officer for federally owned or controlled property, or the Tribal Preservation Officer for tribally owned property. In order to be considered eligible for listing in the National Register as a significant historic resource, a structure, site, building, district, or object must be at least 50 years old or "exceptionally important."

State Office of Historic Preservation

The State Office of Historic Preservation maintains the CRHR, an authoritative listing of the state's significant historic resources as well as architectural, archaeological, and cultural resources. The California Register includes properties listed in or formally determined eligible for the National Register, pursuant to Section 4851(a) of the Public Resources Code, and lists selected California Registered Historical Landmarks. The State Office of Historic Preservation also maintains the Directory of Properties in the Historic Property Data File; however, properties on the Property Data File are not protected or regulated.

The State Office of Historic Preservation sponsors the California Historical Resources Information System (CHRIS), a statewide system for managing information on the full range of historical resources identified in California. CHRIS is a cooperative partnership among the citizens of California, historic preservation professionals, 11 information centers, and various agencies (Office of Historic Preservation 2003). CHRIS provides an integrated database that furnishes site-specific archaeological and historical resources information on known resources and surveys to government, institutions, and individuals. CHRIS also supplies a list of qualified consultants. Information for the project area is available through CHRIS's Northwest Information Center.

Local Plans and Policies

2006 LRDP Principles and Strategies[3]

The "Vision" section of the 2006 LRDP proposes fundamental principles that form the basis for the LRDP's development strategies. The main principle most applicable to the cultural resource aspects of new development are to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship." Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts on valued cultural resources that could result from implementation of the 2006 LRDP.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the 2006 LRDP and provide specific guidelines for site planning, landscape and building design as a means to implement the 2006 LRDP's development principles as each new project is developed. Specific design guidelines are organized by a set of design objectives that essentially correspond to the strategies provided in the 2006 LRDP. The LBNL Design Guidelines provide the following specific planning and design guidance for the cultural resource aspects of new development to achieve these design objectives.

The design guidelines would be applied to the proposed project as part of the 2006 LRDP program. As part of the design review and approval process, the proposed project would be evaluated for adherence to the LRDP Land Use Map, the design guidelines, the Building Heights Map, and any other relevant plans and policies. Approvals would be subject to satisfactory compliance with these provisions. Design

3 While this Environmental Impact Report presents a "stand alone" impact analysis that does not rely upon tiering from any programmatic CEQA document, Berkeley Lab does actively follow the 2006 Long Range Development Plan (LRDP) as a planning guide for Lab development. Accordingly, relevant 2006 LRDP principles, strategies, and design guidelines are identified in this section.

objectives that are contained within the design guidelines and applicable to the cultural resource analysis include the following:

- Complement building aesthetics and enhance visual value through creation of land form elements that are consistent with design on the Hill. Mass and site buildings to minimize their visibility and to "ensure each building contributes to a cohesive and coherent architectural expression through the Laboratory site."
- Each Research Cluster, because of topography, historic buildings, plant palette, and so on will develop a unique identity.
- Preserve the Hill's rustic landscape through provision of screening landscape elements for large buildings and the integration of buildings into the overall landscape using appropriate materials.
- There are many interesting historic objects scattered around the Lab. These artifacts are important reminders of the Lab's legacy as well as items of interest which stimulate interaction. Placement of these artifacts at major pedestrian nodes and at prominent locations in each commons is encouraged.
- Designers shall examine the architectural precedents, especially of historic buildings, present in the Research Cluster where their project is to be located. A clear rationale based on precedent for the architectural expression of each project will be developed.

City of Berkeley General Plan

The Urban Design and Preservation Element of the City of Berkeley General Plan contains policies relating to the development and preservation of cultural resources in the city. The City of Berkeley does not list as facilities at LBNL as a historical resource (City of Berkeley 2002). The Urban Design and Preservation Element policies pertaining to the proposed LRDP are as follows:

> Policy UD-5 Architectural Features: Encourage, and where appropriate require, retention of ornaments and other architecturally interesting features in the course of seismic retrofit and other rehabilitation work.
>
> Policy UD-6 Adaptive Reuse: Encourage adaptive reuse of historically or architecturally interesting buildings in cases where the new use would be compatible with the structure itself and the surrounding area.
>
> Policy UD-10 The University of California: Strongly support actions by the University to maintain and retrofit its historic buildings, and strongly oppose any University projects that would diminish the historic character of the campus or off-campus historic buildings.

Policy UD-36 Information on Heritage: Promote, and encourage others to promote, understanding of Berkeley's built and cultural heritage, the benefits of conserving it, and how to sensitively do that.

City of Berkeley Landmarks Preservation Ordinance

The City of Berkeley's Landmarks Preservation Ordinance, adopted in 1974, requires the City to establish a list of potential buildings that should be considered for landmark, historic district, or structure of merit status. The ordinance provides a procedure for designating properties as landmarks and for reviewing proposed physical changes to landmark buildings. The City Council and City staff appoints a Landmarks Preservation Commission that administers the ordinance. In order for buildings to be designated as landmarks or as structures of merit, buildings must meet criteria for consideration set forth in the ordinance. The criteria consist of three levels of designation for historic buildings: properties of exceptional significance (landmarks), structures of merit, and properties that do not meet landmark criteria but are worthy of preservation as part of a neighborhood, block, or street front. In late 2006, the Bevatron site, but not its housing structure (Building 51) or any of its equipment, was designated as a City of Berkeley landmark and the City of Berkeley has requested that a marker or monument be placed to acknowledge the scientific research done at the site. No other structures at the LBNL main site are listed as City of Berkeley historical resources.

City of Oakland General Plan

The Oakland General Plan Historic Preservation Element, adopted in 1994 and revised in 1998, identifies several categories of historical resources. Designated Historic Properties include three classes of City Landmarks (1 through 3, in declining order of importance); two classes of Preservation Districts (Areas of Primary Importance and Areas of Secondary Importance); and Heritage Properties, which are historic resources (designated by the Landmarks Preservation Advisory Board or Planning Commission) that are not Landmarks or Preservation Districts.[4] The Element also defines a category of Potential Designated Historic Properties (PDHPs), which are those properties that have an existing or contingency rating of "A" (highest importance), "B" (major importance), or "C" (secondary importance) in either the Oakland Cultural Heritage Survey (OCHS), a project of the City's Planning Department, or the Reconnaissance Survey, or have been determined by the surveys to contribute (or potentially contribute, based on

[4] Eligibility requirements for designation as a Heritage Property include an existing or contingency Oakland Cultural Heritage Survey (OCHS) rating of A, B, or C; an existing or contingency Reconnaissance Survey rating of A or B; or is a contributor (or potential contributor based on contingency rating) to a potentially eligible Preservation District. The Heritage Property category was developed in the Historic Preservation Element to replace the City's Preservation Study List. However, as of 2006, the City has not initiated designation of a list of Heritage Properties.

contingency rating) to an Area of Primary Importance or Area of Secondary Importance. PDHPs are so identified by their survey rating; unlike Designated Historic Properties, PDHPs are not formally designated by any City body. None of the facilities at LBNL or in its vicinity are listed as a City of Oakland historical resource.

Historic Preservation Element goals and policies applicable to the 2006 LRDP include the following:

> Historic Preservation Goal 2: To preserve, protect, enhance, perpetuate, use, and prevent the unnecessary destruction or impairment of properties or physical features of special character or special historic, cultural, educational, architectural or aesthetic interest or value. Such properties or physical features include buildings, building components, structures, objects, districts, sites, natural features related to human presence, and activities taking place on or within such properties or physical features.
>
> Policy 3.1 Avoid or Minimize Adverse Historic Preservation Impacts Related to Discretionary City Actions: The City will make all reasonable efforts to avoid or minimize adverse effects on the Character-Defining Elements of existing or Potential Designated Historic Properties which could result from private or public projects requiring discretionary City actions.
>
> Policy 3.5 Historic Preservation and Discretionary Permit Approvals: For additions or alterations to Heritage Properties or Potential Designated Historic Properties requiring discretionary City permits, the City will make a finding that (1) the design matches or is compatible with, but not necessarily identical, to the property's existing or historical design; or (2) the proposed design comprehensively modifies and is at least equal in quality to the existing design and is compatible with the character of the neighborhood; or (3) the existing design is undistinguished and does not warrant retention and the proposed design is compatible with the character of the neighborhood.
>
> For any project involving complete demolition of Heritage Properties or Potential Designated Historic Properties requiring discretionary City permits, the City will make a finding that (1) the design quality of the proposed project is at least equal to that of the original structure and is compatible with the character of the neighborhood; or (2) the public benefits of the proposed project outweigh the benefit of retaining the original structure; or (3) the existing design is undistinguished and does not warrant retention and the proposed design is compatible with the character of the neighborhood.
>
> Policy 3.8 Definition of "Local Register of Historical Resources" and Historic Preservation "Significant Effects" for Environmental Review Purposes: For purposes of environmental review

under the California Environmental Quality Act, the following properties will constitute the City of Oakland's Local Register of Historic Resources:

1) All Designated Historic Properties, and

2) Those Potential Designated Historic Properties that have an existing rating of "A" or "B" or are located within an Area of Primary Importance.

3) Until complete implementation of Action 2.1.2 (Redesignation), the "Local Register" will also include the following designated properties: Oakland Landmarks, S-7 Preservation Combining Zone properties, and Preservation Study List properties.

4.4.4 Impacts and Mitigation Measures

Significance Criteria

The impact of the proposed project on cultural resources would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the CEQA Guidelines and the UC CEQA Handbook:

- Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5;
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5;
- Directly or indirectly destroy a unique paleontological resource or site or unique geological feature; or
- Disturb any human remains, including those interred outside of formal cemeteries.

Issues Not Discussed Further

The CRT Facility Initial Study determined that implementation of the proposed project would not directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. This issue is not discussed further in this section.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. The mitigation measures that are included in the proposed

project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM CUL-3: If an archaeological artifact is discovered on site during construction under the proposed LRDP, all activities within a 50-foot radius shall be halted and a qualified archaeologist shall be summoned within 24 hours to inspect the site. If the find is determined to be significant and to merit formal recording or data collection, adequate time and funding shall be devoted to salvage the material. Any archaeologically important data recovered during monitoring shall be cleaned, catalogued, and analyzed, with the results presented in a report of finding that meets professional standards.

LRDP MM CUL-4: In the event that human skeletal remains are uncovered during construction or ground-breaking activities resulting from implementation of the 2006 LRDP at the LBNL site, CEQA Guidelines Section 15064.5(e)(1) shall be followed:

- In the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery, the following steps should be taken:

  (1) There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

    (A) The coroner of the county in which the remains are discovered must be contacted to determine that no investigation of the cause of death is required, and

    (B) If the coroner determines the remains to be Native American: (1) The coroner shall contact the Native American Heritage Commission within 24 hours; (2) The Native American Heritage Commission shall identify the person or persons it believes to be the most likely descended from the deceased Native American. (3) The most likely descendent may make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or

  (2) Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance.

(A) The Native American Heritage Commission is unable to identify a most likely descendent or the most likely descendent failed to make a recommendation within 24 hours after being notified by the commission;

(B) The descendant identified fails to make a recommendation; or

(C) The landowner or his authorized representative rejects the recommendation of the descendant, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

Project Impacts and Mitigation Measures

CRT Impact CUL-1: The proposed project would not cause a substantial adverse change in the significance of a historical resource as defined in §15064.5. (Less than Significant)

The project site does not include any existing buildings, and the existing Building 50 stairway, which would be altered to accommodate pedestrians to the CRT facility, is not currently listed on any National or State Register. Furthermore, the stairway structure was built in the last 50 years, and is not likely to be considered "exceptionally important," so is not likely eligible for the National Register of Historic Places or the State Office of Historic Preservation. Therefore, no project-level impact resources would occur, and the project would not contribute to the loss of any historic resources.

As discussed in the introduction of this chapter, the project site is located in Blackberry Canyon, outside the Strawberry Canyon area, and Strawberry Canyon has not been designated as a cultural landscape. There would therefore be no impacts related to alteration of a cultural landscape.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact CUL-2: The proposed project would not cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5. (Less than Significant)

Most of the surrounding area of the project site has been subject to extensive excavation for surrounding buildings and infrastructure. However, based on archival research from the Northwest Information Center and the project's proximity to the North Fork of Strawberry Creek and Cafeteria Creek (a tributary to Strawberry Creek), the potential for Native American sites to exist on the project site is considered moderate and undiscovered archaeological resources could be discovered during construction. In the event of the discovery of any archaeological resources during construction, LRDP Mitigation Measure

CUL-3, which is included in the proposed project and involves work stoppage and appropriate treatment and Native American involvement, would be implemented. As a result, the proposed project would result in a less than significant impact on archaeological resources.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact CUL-3: The proposed project would not disturb any human remains, including those interred outside of formal cemeteries. (Less than Significant)

As discussed above under the CRT Impact CUL-2, based on archival research from the Northwest Information Center, there is a moderate potential that undiscovered archaeological resources could be discovered during construction activities. These undiscovered archaeological resources could include human remains, including those interred outside of a formal cemetery. However, with the implementation of LRDP Mitigation Measure CUL-4, which is included in the proposed project, in the event that human remains are discovered during construction activities, all construction activities would be halted and a qualified archaeologist would be summoned within 24 hours to inspect the site. In addition, the mitigation measure would assure that any human remains, include those interred outside of formal cemeteries, are handled and preserved without further disturbance and maintaining appropriate dignity.

Mitigation Measure: No project-level mitigation required.

4.4.5 References

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4.5 Geology and Soils

4.5.1 Introduction

This section presents existing geologic conditions at the Computational Research ad Theory Facility (CRT) project site and analyzes the potential for the project to be affected by those conditions. Information presented in the discussion and analysis presented below was drawn from site visits, the 2006 Long-Range Development Plan (LRDP) EIR, and environmental documents associated with previous Lawrence Berkeley National Laboratory (LBNL) projects.

In response to the Notice of Preparation for this EIR, several commenters expressed concern regarding past landslides near the project site. Several commenters expressed concern with respect to the project's proximity to the Hayward Fault and the probability of an earthquake occurring on that fault. All of these scoping comments are addressed in the impact assessment presented below.

4.5.2 Environmental Setting

The sections below present a detailed description of the environmental setting of the LBNL site related to geology and soils, concentrating primarily on aspects that are specific to the CRT project site.

Geology

LBNL is located within the California Coast Ranges geomorphic province that parallels the boundary between two major tectonic plates—the Pacific and North American plates. The predominant rock types within this province are marine sedimentary and volcanic rocks that were originally part of the intact, overriding (North American) plate. The units were uplifted after the plate margin changed from a subduction zone to a transform fault, approximately 25 million years ago (Alt and Hyndman 2000).

The proposed CRT project site is located on an unnamed Cretaceous sandstone/shale unit within the Great Valley sequence. Bedrock exposures along Cyclotron Road near the site indicate that the rock is mostly sandstone, with some interbedded layers of mudstone (Fugro 2002). These layers have been uplifted and deformed as a result of movement along the Hayward Fault. A very steep dip (80 degrees) to the east-southeast has been recorded for this unit at a nearby location (Graymer and others 1996).

Topographic Setting

The CRT project site is located primarily within the North Fork Strawberry Creek watershed, north of the 'Cafeteria Creek' tributary, at an elevation between about 620 feet (just east of Cyclotron Road) and 760 feet above mean sea level. The existing land surface at the site slopes to the west at an average of

about 40 percent, although the upper portion of the site is slightly less steep (average grade of about 35 percent).

Mineral Resources

LBNL is located in an area where no significant mineral or aggregate deposits are present (LBNL 2007).

Soils

The CRT project site lies almost entirely on an area of Maymen loam soils, although the easternmost portion overlies soils within the Xerorthents-Millsholm complex. Both are relatively thin soils (less than 2 feet) on bedrock, and are well drained with rapid runoff and high erosion potential due to steep slopes. In addition, both soil types have low shrink-swell potential. Soils in the eastern portion of the project area have likely been highly disturbed due to past grading and construction of Buildings 50, 50A, 50B, 70, and 70A and associated parking areas and roads.

Groundwater

Due to the high relief and the varying geologic units at the site, depth to groundwater within the LBNL site varies considerably, both spatially and seasonally, between 0 and over 100 feet below the ground surface (bgs). Depth to water at the CRT site varies from approximately 12 feet bgs to approximately 30 to 40 feet bgs. This variation is due primarily to the complex geology of the site and the low permeability of the units. A complete discussion of the groundwater setting of the CRT site is provided in **Section 4.7, Hydrology and Water Quality**.

Seismicity and Faults

The proposed CRT project is located approximately 400 feet west of the eastern trace of the Hayward Fault, one of several major fault zones present within the San Francisco Bay Area. The project site is located within the Hayward Fault zone, as defined by the Alquist-Priolo Earthquake Fault Zoning map. A fault investigation did not identify any active fault traces at the CRT project site (Kleinfelder 2006b).

The most recent major earthquake on the Hayward Fault occurred in 1868 (on the southern portion of the fault, near Mills College). The United States Geological Survey (USGS) Working Group on California Earthquake Probabilities estimates that there is a 27 percent chance that the Hayward–Rodgers Creek Fault System[1] will experience an earthquake of magnitude 6.7 or greater by 2032 (USGS 2003). A major

[1] The Hayward Fault is associated with the Rogers Creek Fault, located north of San Pablo Bay, and the two faults are often combined into one shear zone when discussing regional tectonics.

earthquake on the Hayward Fault is anticipated to produce violent to very violent ground shaking within the LBNL site and correspondingly at the site of the CRT facility.

Additionally, the San Andreas Fault parallels the Hayward Fault approximately 17 miles west of LBNL, and the Great Valley-Concord-Calaveras fault zone is located about 13 miles to the east. Taken together, along with other faults in the area, there is a 62 percent probability of at least one magnitude 6.7 or greater earthquake striking the San Francisco Bay Area before 2032 (USGS 2003). The intensity of ground shaking at LBNL would be reduced as the distance from the epicenter of the earthquake increases; however, a major earthquake on any of the active Bay Area faults could still produce violent shaking at the CRT project site.

Another potential seismic hazard is that of earthquake-induced settlement. Buildings constructed on compressible sediment may be subject to differential settlement of soils during an earthquake, depending on the distribution of the building weight, the type and condition of the underlying sediment, and the intensity or style of ground shaking experienced at the site. Primary areas of concern regarding differential settlement include the Bay Mud present near San Francisco Bay and other areas of deep sediment deposits, as well as areas of poorly engineered fill. The CRT project site is located on relatively thin soils underlain by bedrock material, and most (if not all) of the unconsolidated sediment under the building will be removed during construction, so earthquake-induced settlement is not expected to be a hazard in this location.

Landslides

LBNL is located in an area with a high occurrence of landslides and other slope instability. The California Geological Survey Seismic Hazard Zones map (California Geological Survey [CGS] 2003), shows that much of LNBL is located within areas of previous landslide movement or conditions that indicate a high probability of ground displacement (**Figure 4.5-1, Seismic Hazard Zone Map)**.

Wentworth and others (1997) provided a summary of the distribution of landslides delineated within Alameda County. They mapped the majority of the LBNL site (including the area of the proposed CRT project) as having "few, if any, large mapped landslides" but locally containing scattered and small landslides.

LBNL has completed a detailed mapping of slope instability within the campus (LBNL 1999). The map shows that the proposed CRT project area contains two areas of potential slope instability that have been designated a 'medium risk' area of landslide movement. Additionally, the western portion of the project site (near Blackberry Gate) is underlain by a small area where past work has repaired slope instability.

The portion of the project overlying this repaired area is designated as a walkway; the main building would be located approximately 100 feet to the east.

Soil trenches conducted as part of the fault-trace investigation identified evidence of a dormant landslide at the site of the CRT project (Kleinfelder 2006b). The landslide slip surface is up to 8 feet below the ground surface and a small amount of water was seen seeping from the lower contact. The landslide deposits were identified in both trenches, which were located approximately 150 feet apart.

An array of hydraugers is present beneath the CRT site between Cyclotron Road and the southern portion of the Building 50 complex. These drains were installed in the late 1980s and serve to drain groundwater from the slope to help limit the potential for landslide movement.

Other Geologic and Seismic Hazards

Several other types of geologic and seismic hazards are unlikely to affect the LBNL site, including tsunami, seiche, and liquefaction. These hazards, correspondingly, are not likely to affect the proposed CRT facility, and are therefore not discussed within this EIR.

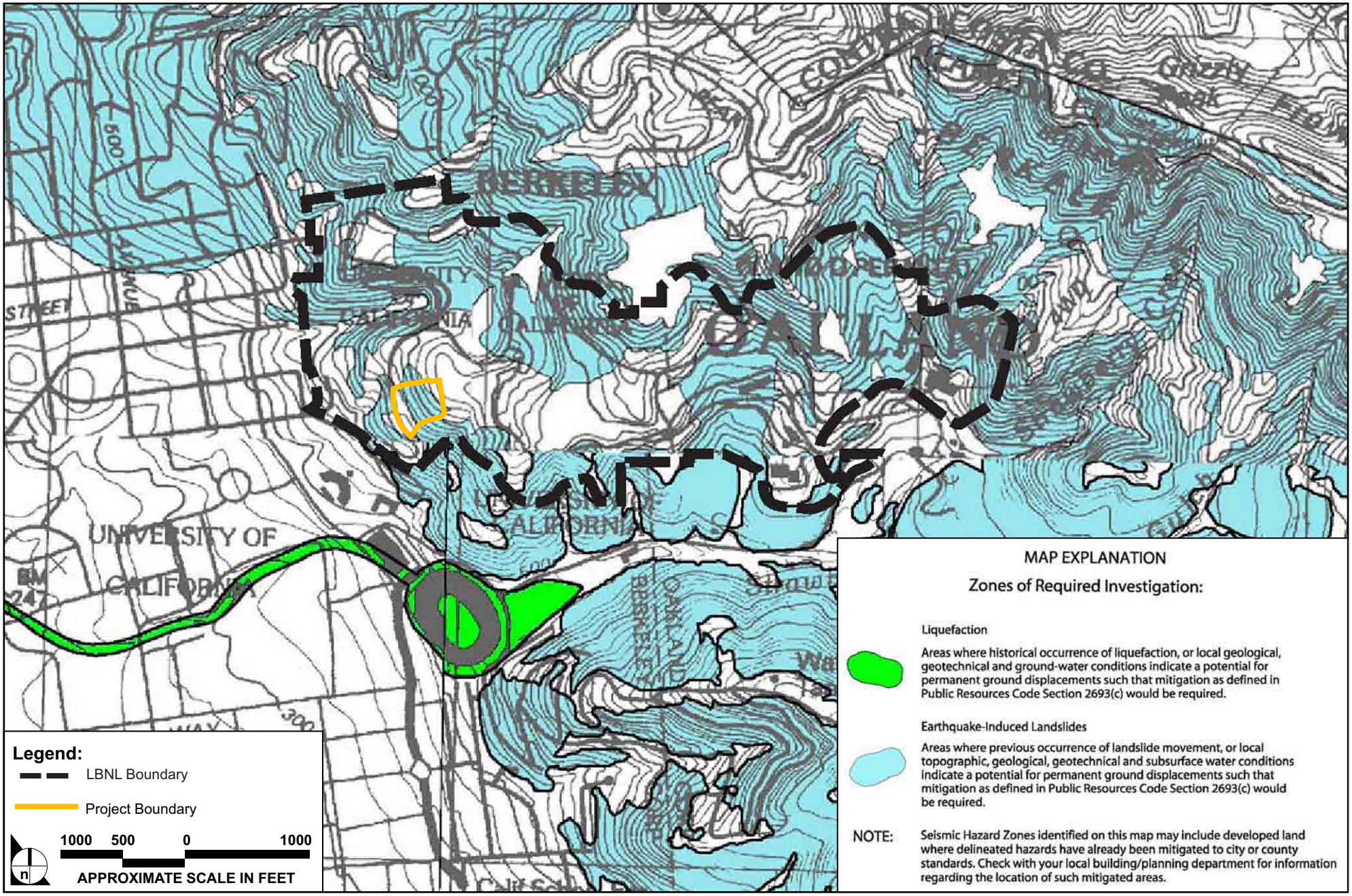
4.5.3 Regulatory Considerations

This section briefly summarizes the regulatory requirements that govern proposed projects within LBNL, expanding where necessary to describe how the regulations specifically affect the proposed CRT project.

State Regulations

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (originally enacted in 1972) is intended to regulate development on or near active fault traces to reduce the hazardous effects of fault rupture. The act prohibits the construction of most buildings intended for human occupancy across active fault traces, and therefore requires that site-specific fault-trace studies be conducted for projects within delineated fault zones to identify potential active fault traces. The site of the proposed CRT facility is located within an Alquist-Priolo Zone associated with the Hayward Fault, and therefore a fault trace study was conducted by Kleinfelder (Kleinfelder 2006b).



SOURCE: California Department of Conservation, California Geologic Survey, 2003; LBNL 2006 Long Range Development Plan

FIGURE **4.5-1**

Seismic Hazard Zone Map

924-002•11/07

Seismic Hazards Mapping Act

The State Geologist has delineated various seismic hazard zones related to ground shaking, liquefaction, landslides, and other ground failure to better regulate development in hazard-prone areas. Geotechnical investigations conducted within Seismic Hazard Zones must incorporate standards specified by CGS Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards* (CGS 1997c).

The CGS has designated much of the LBNL site as a seismic hazard zone for earthquake-induced landslides. The proposed CRT facility is located within this zone (see **Figure 4.5-1**) and a site specific geotechnical study has been conducted to address potential seismic landslide hazards (Kleinfelder 2006b).

California Building Code

The California Building Code requires extensive geotechnical analysis and engineering for grading, foundations, retaining walls, and other structures, including criteria for seismic design. The San Francisco Bay area is located within Zone 4, which is expected to experience the greatest effects from earthquakes, and requires the most stringent requirements for seismic design. The CRT facility has been designed according to the latest seismic design standards (see **Section 3.0, Project Description**, for details), and would meet all relevant California Building Code requirements for seismic safety.

Local Plans and Policies

The proposed project would be located at LBNL, which is operated by the University of California and conducts work within the University's mission on land that is owned or controlled by The Regents of the University of California. As a state entity, the University is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. LBNL is located in both the City of Berkeley and the City of Oakland; the CRT project site is located entirely within the City of Berkeley. The following sections summarize objectives and policies in the LBNL 2006 LRDP, LBNL Design Guidelines, the City of Berkeley General Plan, and local ordinances that relate to geology and soils.

University of California Seismic Safety Policy

The University of California Seismic Safety Policy requires that all "new buildings…comply with the current provisions of the California Building Code, or local seismic requirements, whichever is more stringent" and that "no new University structures… [will] be constructed on the trace of a known active fault."

2006 LRDP Principles and Strategies[2]

The 2006 LRDP outlines a series of development strategies to meet the core planning principles to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship" and to "Build a more campus-like research environment." As listed in the 2006 LRDP, the strategies most relevant to geology and soils include:

- Protect and enhance the site's natural and visual resources, including native habitats, streams, and mature tree stands by focusing future development primarily within the already developed areas of the site.
- Increase development densities within the most developed areas of the site to preserve open space, enhance operational efficiencies and access.
- To the extent possible site new projects to replace existing outdated facilities and ensure the best use of limited land resources.
- To the extent possible site new projects adjacent to existing development where existing utility and access infrastructure may be utilized.
- Site and design new facilities in accordance with University of California energy efficiency and sustainability policy to reduce energy, water, and material consumption and provide improved occupant health, comfort, and productivity.

LBNL Design Guidelines

The LBNL Design Guidelines (Appendix B to the 2006 LRDP EIR; LBNL 2007) provide guidelines to meet the planning principles and strategies listed in the 2006 LRDP. The primary guidelines that pertain to geologic resources include:

- Minimize impacts of disturbed slopes.
- To the degree practicable cut and fill slopes will be minimized. Cut and fill slopes exposed to view shall be promptly restored, using best management practices to minimize erosion. New vegetation should be planted in a manner to return the visual quality of the slope to a condition similar to its original state or better.
- Building footprints shall be designed with long-narrow aspect ratios in parallel to natural terrain to the degree consistent with program needs.
- Reduce the amount of impermeable surfaces at the Berkeley Lab.

2 While this Environmental Impact Report presents a "stand alone" impact analysis that does not rely upon tiering from any programmatic CEQA document, Berkeley Lab does actively follow the 2006 Long Range Development Plan (LRDP) as a planning guide for Lab development. Accordingly, relevant 2006 LRDP principles and strategies are identified in this section.

Berkeley General Plan

About 95 acres, or almost half of the LBNL site, is within the City of Berkeley. The Safety Element of the Berkeley General Plan contains the following policies relevant to the proposed CRT project:

Policy S-14 Land Use Regulation: Require appropriate mitigation in new development, redevelopment/reuse, or other applications.

Action S-14 A: When appropriate, utilize the environmental review process to ensure avoidance of hazards and/or mitigation of hazard-induced risk.

Action S-14 B: Require soil investigation and/or geotechnical reports in conjunction with development/redevelopment on sites within designated hazard zones such as areas with high potential for soil erosion, landslide, fault rupture, liquefaction, and other soil-related constraints.

Action S-14 C: Place structural design conditions on new development to ensure that recommendations of the geotechnical/soils investigation are implemented.

Action S-14 D: Encourage owners to evaluate their buildings' vulnerability to earthquake hazards, fire, landslides, and floods, and to take appropriate action to minimize the risk.

Policy S-15 Construction Standards: Maintain construction standards that minimize risks to human lives and property from environmental and human-caused hazards for both new and existing buildings.

Action S-15 A: Periodically update and adopt the California Building Standards Code with local amendments to incorporate the latest knowledge and design standards to protect people and property against known fire, flood, landside, and seismic risks in both structural and non-structural building and site components.

Action S-15 B: Ensure proper design and construction of hazard-resistant structures through careful plan review/approval and thorough and consistent construction inspection.

Policy S-18 Public Information: Establish public information programs to inform the public about seismic hazards and the potential hazards from vulnerable buildings.

4.5.4 Impacts and Mitigation Measures

Significance Criteria

The impact of the proposed project on the geology and soils environment would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the *California Environmental Quality Act (CEQA) Guidelines* and the UC CEQA Handbook:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area, or based on other substantial evidence of a known fault (refer to CGS Special Publication 42);
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction; or
  - Landslides.
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the California Building Code, creating substantial risks to life or property; or
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.

Issues Not Discussed Further

The CRT Initial Study found no impacts associated with wastewater infiltration facilities. The project site is currently surrounded by developed land uses and sewers are available for the disposal of wastewater. No septic systems or other infiltrating wastewater disposal systems are proposed as part of the CRT project. Therefore, implementation of the project would not require the construction of septic tanks for wastewater disposal. This issue is not discussed further in this section.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below

evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. These mitigation measures that are included in the project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM GEO-1: Seismic emergency response and evacuation plans shall be prepared for each new project at LBNL that is developed pursuant to the 2006 LRDP. These plans shall incorporate potential inaccessibility of the Blackberry Canyon entrance and identify alternative ingress and egress routes for emergency vehicles and facility employees in the event of roadway failure from surface fault rupture.

Note: a Draft Plan has been prepared, and this plan is described in **Section 4.6, Hazards and Hazardous Materials**, of this EIR.

LRDP MM GEO-2: A site-specific, design-level geotechnical investigation shall occur during the design phase of each LBNL building project, and prior to approval of new building construction within the LBNL hill site. This investigation shall be conducted by a licensed geotechnical engineer and include a seismic evaluation of potential maximum ground motion at the site. Geotechnical investigations for sites within either a Seismic Hazard Zone for landslides or an area of historic landslide activity at LBNL, as depicted on [LRDP] Figures IV.E-2 and IV.E-3, or newly recognized areas of slope instability at the inception of project planning, shall incorporate a landslide analysis in accordance with CGS Publication 117. Geotechnical recommendations shall subsequently be incorporated into building design.

LRDP MM GEO-3a: Construction under the LRDP shall be required to use construction best management practices and standards to control and reduce erosion. These measures could include, but are not limited to, restricting grading to the dry season, protecting all finished graded slopes from erosion using such techniques as erosion control matting and hydroseeding or other suitable measures.

LRDP MM GEO-3b: Revegetation of areas disturbed by construction activities, including slope stabilization sites, using native shrubs, trees, and grasses, shall be included as part of all new projects.

Project Impacts and Mitigation Measures

CRT Impact GEO-1: The proposed project would construct a research facility within the Hayward Fault zone but would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death due to rupture of the Hayward Fault. (*Less than Significant*)

Much of the proposed CRT facility falls within the Hayward Fault zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Map. The University Seismic Safety Policy precludes the construction of a new building over an active fault trace [LRDP, IV.E-11]. The LRDP requires a specific fault trace study for any project located with an identified fault zone. Kleinfelder conducted a fault-trace study for the CRT project that included review of geologic maps and reports for the area and excavation of two test trenches to assess the potential for fault traces to be present on site. The study found that no active fault traces cross the site of the proposed CRT facility (Kleinfelder 2006a), and impacts from fault rupture would not occur. The impact, therefore, is less than significant.

Mitigation Measure: No project-level mitigation required.

CRT Impact GEO-2: The proposed project would expose people and structures to substantial adverse effects related to seismic ground shaking. (*Potentially Significant; Less than Significant with Mitigation*)

The CRT project site is located in a seismically active area. Seismic ground shaking could damage the proposed buildings, roadway, retaining walls, and other ancillary facilities such as stormwater detention vaults, and the development of the proposed project would expose future facility users to seismic ground shaking. The proposed CRT facility is expected to be occupied by up to approximately 300 people on a day-to-day basis. Approximately 210 people, including UC Berkeley students and staff, would be relocated from the adjacent Building 50 complex, which was constructed in various stages during the 1970s, or from UC Berkeley buildings that were constructed between the 19th century and the 1970s. Another 70 people would be relocated from the LBNL Oakland Scientific Facility, a 1970s-era building in downtown Oakland. Seismic shaking hazards would generally be reduced for these people, as they would be moving from older buildings within seismically active areas that were built under similar or less stringent seismic safety codes. The remaining 20 people would be either new staff or existing staff relocated from an unknown location. For these 20 people, the conservative assumption must be made that they will be relocating from less seismically active areas. Even though the CRT facility would be constructed under the latest and most stringent seismic guidelines, this additional population may be at an incrementally greater risk of injury due to seismic shaking. As discussed in the 2006 LRDP EIR,

compliance with LRDP Mitigation Measure GEO-2 and the UC Seismic Safety Policy would reduce seismic risks to a less than significant level. The CRT project incorporates these measures into project design.

The University of California Seismic Safety Policy prescribes that all new buildings be constructed to "comply with the current seismic provisions of CCR, Title 24, California Building Standards Code, or local seismic requirements, whichever requirements are more stringent."[3] Following this policy the CRT project also includes "provisions…for adequate anchorage for seismic resistance of nonstructural building elements—including, but not limited to, glass, fixtures, furnishings, and other contents, equipment, material storage facilities, and utilities (gas, high-temperature water, steam, fire protection water, etc.)—with respect to potential hazards to persons in the event of seismic disturbances."

In compliance with CGS Publication 117 (Guidelines for Evaluating and Mitigating Seismic Hazards) and LBNL's "Force Design Criteria RD3.22" the CRT facility has been designed to resist seismic loading. The design ground motions shall have no more than a 2 percent chance of being exceeded within a 50-year period. Although conformance to the highest seismic provisions does not constitute any guarantee that structural damage would not occur in the event of a maximum credible earthquake, it is reasonable to expect that structures built in compliance with the seismic requirements would not collapse or cause loss of life in a major earthquake. Furthermore, in order to reduce the risk of injury during seismic events, the LBNL job hazards questionnaire recommends that new employees take a 1.5-hour earthquake/wildland fire safety course to teach employees how to take the appropriate actions to protect themselves from the harmful effects of a major earthquake (or wildland fire) in the Bay Area. UC Berkeley through its Office of Emergency Preparedness also implements programs focused on emergency planning, training, response, and recovery. This includes education of all UC building occupants. The Berkeley Lab or UC Berkeley would take the lead in implementing the training programs for CRT facility occupants. All new employees at the CRT facility would be provided training which would further reduce the potential for significant adverse impacts on those individuals from a major seismic event.

Additionally, there are seismic shaking hazards beyond that associated with building collapse, including falling debris, fire, gas leaks, and others that are difficult to quantify given the potential magnitude and unpredictable nature of seismic events. The UC Seismic Safety Policy dictates stringent standards intended to limit the impacts of such hazards; and the LBNL Master Emergency Program Plan (LBNL, 2005) outlines the procedure for assessing damages to buildings and infrastructure following large seismic events. Following major earthquakes the LBNL Damage Assessment Team, composed of

3 See http://www.ucop.edu/facil/fmc/facilman/volume1/rpsafety.html for more details.

engineers and the Department of Environmental Health and Safety (EH&S) safety specialists, will inspect buildings for structural and other infrastructure damage.

Beyond potential damage to the building itself, there are associated facilities that, if damaged in an earthquake, could cause significant environmental impacts. Of specific concern for the CRT project are the hydromodification vaults proposed to control stormwater runoff for the project. While these structures would also be built to withstand seismic shaking hazards, following the UC seismic safety code and based on site-specific geotechnical recommendations, minor damage during one event could weaken the structures such that they would be more likely to fail during a subsequent event or events. Failure of the stormwater drainage system or hydromodification vaults could serve to infiltrate stormwater on steeply sloped areas not suitable for infiltration. This is a potentially significant impact. Because of this concern, CRT Mitigation Measure GEO-2 expands the damage assessment component to include assessment of the hydromodification vaults following major earthquakes.

CRT MM GEO-2: In addition to damage assessment of the CRT building structural elements (which is covered in the LBNL Master Emergency Program Plan), assessment of stormwater conveyance systems and hydromodification vaults shall be conducted by the Damage Assessment Team following earthquakes strong enough to cause damage.

Significance after Mitigation: Less than significant.

CRT Impact GEO-3: The proposed project would not expose people and structures to substantial adverse effects associated with seismic-related liquefaction or landslides (*Less than Significant*)

The project site is not located in an area underlain by liquefiable soils. Therefore, the potential impact due to liquefaction at the site is not significant.

As described above, the proposed CRT building is located in a CGS-defined seismic landslide hazard area, and shallow landslide deposits have been identified at the project site. In compliance with LRDP Mitigation Measure GEO-2, a site-specific geotechnical investigation was conducted to address potential landslide hazards. The investigation found that bedrock underlying the site has a steep dip opposite the prevailing ground-surface slope, so deep-seated landslides in the area are unlikely. A shallow landslide deposit was detected during the fault investigation (Kleinfelder 2006a). The portion of this landslide deposit within the building footprint would be removed and replaced with compacted fill during site preparation. The geotechnical investigation recommended that the structure be supported by a combination of spread footings directly on bedrock and piers drilled at least 10 feet into the underlying

bedrock. These recommendations have been included in the facility design; and therefore, the potential seismic landslide hazard impacts are considered less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact GEO-4: The proposed project would not result in substantial soil erosion or loss of topsoil. (*Less than Significant*).

The building is proposed in an area of very steep slopes (an average slope of 2:1, horizontal to vertical), and therefore the site is highly susceptible to erosion during construction. Furthermore, project construction would involve substantial cuts and fills and earthmoving activities. As required by the 2006 LRDP and LRDP EIR, the project would include control measures to meet the conditions of the Lab's Storm Water Pollution Prevention Plan (SWPPP) (2006) that addresses construction-related erosion control practices, and would include the development and implementation of a site-specific erosion control plan following the outlined practices in the general LBNL SWPPP.

Additionally, LRDP Mitigation Measure GEO-3a and 3b require individual projects to incorporate construction site best management practices and standards to control and reduce erosion, and require that all disturbed areas be revegetated with native plants following completion of the project. These measures have been incorporated into the project, and erosion-related impacts would therefore be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact GEO-5: The proposed project is located on a geologic unit that may be unstable or could become unstable as a result of the project. (*Less than Significant*)

The discussion of CRT Impact GEO-3 above highlights potential landslide hazards at the building site due to seismic conditions. Additional instability of underlying units may be attributed to differential settlement, soil creep, or the triggering of localized slumps or landslides in response to grading at the site. The site-specific geotechnical report states that the building foundation will be on spread footings lying directly on bedrock and piers drilled at least 10 feet into the underlying bedrock, which will minimize differential settling and structural impacts due to hillslope soil creep. Storm drainage systems at the project site would be designed to avoid infiltration of stormwater into subsurface soils that could potentially be destabilized by increased infiltration. With incorporation of these design features, the potential impact would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

CRT Impact GEO-6: The CRT building would not be located on expansive soils. (*Less than Significant*)

As described above, the soils at the CRT project site have low shrink-swell potential and therefore pose little risk to life or property due to expansion and contraction of the soil. In addition, the building foundation would rest on bedrock, and would not be subject to soil shrink-swell. The impact is therefore considered less than significant.

Mitigation Measure: No project-level mitigation measure required.

4.5.5 References

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4.6 Hazards and Hazardous Materials

4.6.1 Introduction

This section discusses existing conditions with respect to hazards in the project vicinity and analyzes the potential for the Computational Research and Theory (CRT) project to increase the exposure of people or the environment to hazards or increase the risk associated with the use, generation, and disposal of hazardous materials. Information presented in the discussion and analysis presented below was drawn from the Lawrence Berkeley National Laboratory (LBNL) 2006 Long Range Development Plan (LRDP) Environmental Impact Report (EIR), previous California Environmental Quality Act (CEQA) documents prepared for projects at LBNL, and the Master Emergency Program Plan for the Ernest Orlando Lawrence Berkeley National Laboratory (2005).

In response to the Notice of Preparation for this EIR, several commenters expressed concern with respect to the project's location in an area susceptible to wildland fires and for the project's potential to affect area evacuation. All of these scoping comments are addressed in the impact assessment presented below.

4.6.2 Environmental Setting

Hazardous Materials

The term "hazardous material" is defined in Section 25501 of the California Health and Safety Code as any material that, because of quantity, concentration, or physical or chemical characteristics poses a significant present or potential hazard to human health and safety or to the environment. Hazardous materials are grouped into the following four categories, based on their properties: toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), and reactive (causes explosions or generates toxic gases).

Numerous hazardous materials, including non-radioactive hazardous chemicals (solvents, organic compounds, reagents) and radioactive materials, are used in research activities at the Berkeley Lab. Other hazardous materials are used in facility operations and maintenance. Hazardous materials use at the Berkeley Lab generates hazardous and mixed wastes (i.e., radioactive wastes with hazardous waste components) that must be handled and disposed of as hazardous waste. LBNL complies with applicable federal, state, and local laws and regulations for the handling, storage and disposal of hazardous materials and wastes to minimize worker exposure and environmental impact. In addition to the above, several sources of non-ionizing radiation (such as lasers, magnets, and microwave generators) are also used at the Berkeley Lab to conduct research.

Soil and Groundwater Contamination

There are some areas of soil and groundwater contamination that exist at LBNL as a result of historical releases of hazardous materials into the environment. The primary chemical constituents of concern are volatile organic compounds, mostly degreasing solvents used to clean equipment. Other detected constituents include Polychlorinated Biphenyls (PCBs), petroleum hydrocarbons, and very small amounts of polynuclear aromatic hydrocarbons, semivolatile organic compounds, and metals. The principal radioactive contaminant is tritium. All areas of soil contamination have been cleaned up to levels consistent with LBNL operations (designated as institutional land use) and acceptable to regulatory oversight agencies (LBNL 2007).

While there is remaining groundwater contamination, it is confined within the boundary of LBNL's main hill site. Remediation and monitoring of non-radioactive contamination in groundwater are being conducted under the Resource Conservation and Recovery Act of 1976 Corrective Action Program. Department of Toxic Substances Control (California) (DTSC) has the primary responsibility for regulatory oversight of non-radioactive contamination. In addition, the San Francisco Bay Regional Water Quality Control Board (RWQCB) and City of Berkeley have oversight roles with respect to these activities. Monitoring of a tritium plume in groundwater on the other hand is being conducted under the Atomic Energy Act, and the Department of Energy is responsible for the regulatory oversight of tritium in groundwater. These agencies have been involved in review and approval of various work plans and reports related to these investigation and cleanup activities. LBNL submits quarterly progress reports to these agencies and meets with them periodically to review the status of these activities. Currently, there are about 150 groundwater monitoring wells at LBNL, with an additional groundwater monitoring well located off site. Groundwater under the LBNL site is not used as a drinking water source by the Berkeley Lab or by local utilities, and groundwater contamination is therefore not a threat to the local drinking water supply.

Fire Hazards

The northern and eastern boundary of LBNL is located along a portion of the interface between wildlands and developed lands in the East Bay hills. The Berkeley Lab is similar in character to other developed hillside areas in the region as it combines developed lands, groves of trees, and non-irrigated grassland areas. Dry summers desiccate plant materials and make them more prone to burning. The fire risk during brief periods of the fall months is even more pronounced when strong offshore winds, often called "Diablo winds," occur in the East Bay hills, which further dry up fuel material and can drive fire fronts and fire brands at extreme speeds.

These winds contributed to the extensive damage that occurred in the devastating Oakland Berkeley Hills Fire of October 1991. On average, serious Diablo-wind-driven wildland fires that destroy structures occur in the regional vicinity of LBNL approximately every 20 years. The site where LBNL now is situated last burned in 1923 (LBNL 2007). These fire conditions are now well understood. Although these fires can spread over large areas, it has been shown that each structure is at risk of damage for approximately 10 minutes, since during this interval a Diablo-wind-driven fire will typically consume the adjacent fuel. LBNL has reviewed fire histories, worked with fire researchers, and applied computer models to determine how the fuels adjacent to its buildings can be reduced to levels that will not support fire intensities that pose serious risks to the structures. Under LBNL's vegetation management program, the site is now managed to minimize wildland fire damage to structures. This program provides for annual treatment of vegetation on the LBNL site such that ground fuels cannot produce flame heights in excess of 3 feet (and ground plantings within 10 feet of buildings and roadways produce even lower flame heights); trees are "limbed up" so that flammable branches are at least 8 to 10 feet above the ground, and bushes that would allow ground-based fires to rise into tree canopies are removed.

LBNL is provided firefighting services by the Alameda County Fire Department, which staffs a fire station on the LBNL grounds (Alameda County Station 19 is located at LBNL Building 48). At least four firefighters are on duty at all times. Equipment at the station includes one fire engine, one reserve fire engine, a hazardous materials vehicle, and a light-duty four-wheel drive "brush rig" that can be used for low-intensity wildland fires.

Through an Automatic Aid Agreement between LBNL and the City of Berkeley Fire Department, the Alameda County Fire Department, who has been contracted by LBNL, will provide emergency response to the Helios Building. As Station 19 is the closest fire station, it will provide first response, with Berkeley Fire Department augmenting response with other fire apparatus as needed. The Alameda County Fire Department has mutual aid agreements with other agencies, including Oakland and the East Bay Regional Park District, which can be activated in the event of a major emergency.

LBNL Emergency Response Plan

LBNL has developed a Master Emergency Program Plan (MEPP) that establishes policies, procedures, and an organizational structure for responding to and recovering from a major disaster at the Berkeley Lab. The MEPP utilizes the Standardized Emergency Management System for managing response to multi-agency and multi-jurisdiction emergencies in California and the National Incident Management System, which is a nationwide standardized approach to incident management prescribed by Homeland Security Presidential Directive 5. The Plan includes a hazard analysis and assessment, which finds that the primary hazards for the hill site are a major earthquake along the Hayward Fault and a major urban-

wildland fire. In view of these primary hazards, the plan includes four phases of emergency management, including mitigation, preparedness, response, and recovery. Mitigation includes activities that eliminate or reduce the occurrence or effects of a disaster. For instance, to address earthquake hazard, the Berkeley Lab uses both structural and non-structural measures to make buildings and work areas seismically safe. To address wildland fires, as discussed above, the Berkeley Lab implements vegetation management. Preparedness includes planning as to how to respond when an emergency occurs; LBNL provides regular training to employees so that they are prepared to respond to an emergency. For response, LBNL relies on local fire and police services and also maintains response equipment on site for use by employees. Recovery includes short and long-term actions necessary to return all systems to normal or near-normal conditions. LBNL's plan includes a planned transition from response to recovery.

The MEPP also includes a Wildland Fire Evacuation/Relocation Plan. This plan presents the steps that the Berkeley Lab will implement in the event that any portion of the site is threatened by a major fire. In such an emergency, the Berkeley Lab will order an evacuation of the site either by vehicle or foot, order relocation of employees from one area to another, more protected area, or provide instructions to employees to remain in place and await further instructions. The plan outlines the steps involved in a vehicular evacuation which include traffic control and use of those gates and routes that are not threatened by fire. For evacuation by foot, the plan identifies all evacuation routes including the use of the Blackberry Canyon gate near the CRT project site, and an assembly area on the UC Berkeley campus from where the evacuated employees would be transported by bus to a BART station.

Project Site

The project site is located in the southwestern portion of the Berkeley Lab site. There is no history of hazardous materials use, storage or disposal on the project site and there is no existing contamination at the project site. The tritium plume is located in the eastern portion of the Berkeley Lab site. The project footprint lies approximately 2,200 feet west of the tritium plume area. The project site is located in a stand of eucalyptus with a few immature redwood, bay, and oak trees, and a grassland understory. Areas adjacent to the site have similar vegetation communities.

4.6.3 Regulatory Considerations

LBNL is subject to environmental, health, and safety regulations applicable to the transportation, use, management, and disposal of hazardous materials and wastes. This section provides an overview of the regulatory setting and describes LBNL's current health and safety policies and procedures.

State and Federal Regulatory Requirements

The primary federal agencies with responsibility for hazardous materials management include the U.S. Environmental Protection Agency (EPA), U.S. Department of Labor Occupational Safety and Health Administration (OSHA), U.S. Department of Transportation (DOT), and DOE. The applicable federal laws, regulations, and responsible agencies are discussed in detail in this section. In many cases, California state law mirrors or is more restrictive than federal law, and enforcement of these laws has been delegated to the state or a local agency. In January 1996, the California Environmental Protection Agency adopted regulations implementing a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The program has six elements: hazardous waste generators and hazardous waste on-site treatment, underground storage tanks, aboveground storage tanks, hazardous materials release response plans and inventories, risk management and prevention programs, and Unified Fire Code hazardous materials management plans and inventories. The local agency responsible for implementation of the Unified Program is called the Certified Unified Program Agency (CUPA). Since the LBNL main site is located within the city limits of the City of Berkeley and the City of Oakland, both cities are the designated CUPAs. In order to streamline their oversight of CUPA regulations at LBNL, Berkeley and Oakland have entered into a Memorandum of Understanding that established the City of Berkeley as the lead agency for all CUPA activities (other than emergency release reporting) (LBNL 2007).

Hazardous Materials Management

Federal and state laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and in the event that such materials are accidentally released, to prevent or to mitigate injury to health or the environment. These laws require hazardous materials users to prepare written plans detailing the types and quantities of hazardous materials used on site and addressing emergency response and training procedures. The City of Berkeley, through its CUPA program, requires any business that handles hazardous materials above certain thresholds to prepare a Hazardous Materials Business Plan. LBNL voluntarily complies with these state requirements as implemented by the City of Berkeley.

Hazardous Waste Handling

Under the federal Resource Conservation and Recovery Act of 1976 (RCRA), the US (EPA) regulates the generation, treatment, and disposal of hazardous waste, and the investigation and remediation of hazardous waste sites. Individual states may apply to EPA to authorize them to implement their own hazardous waste programs in lieu of RCRA, as long as the state program is at least as stringent as federal

RCRA requirements. California has been authorized by EPA to implement its own hazardous waste program, with certain exceptions. In California, DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste, and the investigation and remediation of hazardous waste sites. The California DTSC program incorporates the provisions of both federal and state hazardous waste laws (LBNL 2007).

Hazardous Materials Transportation

The DOT regulates the transportation of hazardous materials between states and foreign countries. The State of California has adopted DOT regulations for the intrastate movement of hazardous materials. In addition, the State of California regulates the transportation of hazardous waste originating in the state and passing out of the state. The two state agencies that have primary responsibility for enforcing federal and state regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). The CHP enforces hazardous material and hazardous waste labeling and packing regulations to prevent leakage and spills of material in transit and to provide detailed information to cleanup crews in the event of an accident. The CHP conducts regular inspections of licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill identification teams at as many as 72 locations throughout the state that can respond quickly in the event of a spill (LBNL 2007).

Occupational Safety

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. OSHA is generally responsible for assuring worker safety in the workplace.

The CRT project would be a UC building that would be occupied by DOE programs, and site operations would therefore be subject to LBNL policy and to DOE jurisdiction and safety regulations.

OSHA regulations at 29 Code of Federal Regulations (CFR) 1910 and 1926 contain requirements concerning the use of hazardous materials in the workplace and during construction that mandate employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, emergency action and fire prevention plan preparation, and a hazard communication program. The hazard communication program regulations contain training and information requirements, and require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, alarm systems, and training in emergency evacuation). In addition, LBNL adheres to Cal OSHA Construction Safety Orders when a Cal OSHA standard is more stringent than federal standards.

Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, state, and local government and private agencies. The plan is administered by the State Office of Emergency Services, which coordinates the responses of other agencies, including the California Environmental Protection Agency, the CHP, the Department of Fish and Game, the San Francisco Bay RWQCB, and Alameda County Fire Department. LBNL's on-site fire department provides first response capabilities, if needed, for hazardous materials and other emergencies.

Local Plans and Policies

The proposed project would be located at LBNL, which is operated by the University of California and conducts work within the University's mission on land that is owned or controlled by The Regents of the University of California. As a state entity, the University is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The following section summarizes objectives and policies from the City of Berkeley and City of Oakland General Plans and local ordinances that relate to hazards and hazardous materials.

LBNL Hazardous Materials Storage, Handling and Disposal

LBNL stores chemicals and other hazardous materials in aboveground tanks and storage drums. Hazardous, radioactive, and mixed wastes are stored in designated areas in research and support areas throughout the Berkeley Lab. From these locations, they are taken to the permitted Hazardous Waste Handling Facility for temporary storage. From this site, the wastes are hauled off for treatment and disposal. None of these types of materials has been stored on the CRT site.

2006 LRDP Principles and Strategies[1]

The 2006 LRDP proposes four fundamental principles that form the basis for the Plan's development strategies provided for each element of the Plan. The two principles most applicable to concerns regarding hazards and hazardous materials related to new development are to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental

[1] While this Environmental Impact Report is a "stand alone" analysis that does not rely upon tiering from any programmatic CEQA document, Berkeley Lab does actively follow the 2006 Long Range Development Plan (LRDP) as a planning guide for Lab development. Accordingly, relevant 2006 LRDP principles, strategies, and design guidelines are identified in this section.

stewardship" and to "Build a safe, efficient, and cost-effective scientific infrastructure capable of long-term support of evolving scientific missions."

Development strategies set forth in the 2006 LRDP applicable to hazards and hazardous materials include the following:

- Improve efficiency and security of Laboratory access through improvements to existing gates and the creation of new gates.
- Develop all new landscape improvements in accordance with the Laboratory's vegetation management program to minimize the threat of wildland fire damage to facilities and personnel.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the 2006 LRDP. The design guidelines would be applied to the proposed project; however, there are no design guidelines that are specifically relevant to hazards and hazardous materials.

City of Berkeley General Plan

The City of Berkeley General Plan was adopted on April 23, 2002. The following policies are contained in the General Plan pertaining to hazards and hazardous materials:

> Policy EM-13 Hazardous Materials Disclosure: Continue to require the disclosure of hazardous materials usage and encourage businesses using such materials to prepare and implement a plan to reduce the use of hazardous materials and the generation of hazardous wastes.
>
> Policy EM-14 Hazardous Materials Regulation: Control and regulate the use, storage, and transportation of toxic, explosive, and other hazardous and extremely hazardous material to prevent unauthorized and accidental discharge.
>
> Policy EM-15 Environmental Investigation: When reviewing applications for new development in areas historically used for industrial uses, require environmental investigation as necessary to ensure that soils, groundwater, and buildings affected by hazardous material releases from prior land uses would not have the potential to affect the environment or the health and safety of future property owners, users, or construction workers.
>
> Policy EM-16 Risk Reduction: Work with owners of vulnerable structures with significant quantities of hazardous materials to mitigate potential risks.

Policy EM-17 Warning Systems: Establish a way to warn residents of a release of toxic material or other health hazard, such as sirens and/or radio broadcasts.

Policy EM-31 Landscaping: Encourage drought-resistant, rodent-resistant, and fire-resistant plants to reduce water use, prevent erosion of soils, improve habitat, lessen fire danger, and minimize degradation of resources.

Policy S-23 Property Maintenance: Reduce fire hazard risks in existing developed areas by ensuring that private property is maintained to minimize vulnerability to fire hazards.

City of Berkeley Manufactured Nanoparticle Disclosure Ordinance

In 2006, the City of Berkeley approved a change to the Hazardous Materials and Wastes Management portion of its Municipal Code. The amendment adds to facilities subject to reporting requirements, those facilities "that manufacture or use manufactured nanoparticles," and requires such facilities to disclose "current toxicology of the materials reported, to the extent known, and how the facility will safely handle, monitor, contain, dispose, track inventory, prevent releases, and mitigate such materials."

City of Oakland General Plan

The following policies from the City of Oakland General Plan Open Space, Conservation and Recreation Element would relate to hazards and hazardous materials.

Policy CO-1.2 Soil Contamination Hazards: Minimize hazards associated with soil contamination through the appropriate storage and disposal of toxic substances, monitoring of dredging activities, and cleanup of contaminated sites. In this regard, require soil testing for development of any site (or dedication of any parkland or community garden) where contamination is suspected due to prior activities on the site.

Policy CO-5.2 Improvements to Groundwater Quality: Support efforts to improve groundwater quality, including the use of nontoxic herbicides and fertilizers, the enforcement of anti-litter laws, the cleanup of sites contaminated by toxics, and ongoing monitoring by the Alameda County Flood Control and Water Conservation District.

4.6.4 Impacts and Mitigation Measures

Significance Criteria

The impacts of the proposed project related to hazards and hazardous materials would be considered significant if they would exceed the following Standards of Significance, in accordance with Appendix G of the CEQA Guidelines and the UC CEQA Handbook:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school;
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- Result in a safety hazard for people residing or working in the project area for a project that is located within an airport land use plan or, where such plan has not been adopted, within 2 miles of a public airport or public use airport;
- Result in a safety hazard for people residing or working in the project area for a project within the vicinity of a private airstrip;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

Issues Not Discussed Further

It is expected that the CRT project would include storage of aqueous ammonia solution that would be used to remove nitrogen compounds from exhaust from the electrical cogeneration equipment that may be included in the project. This process produces gaseous ammonia, and both aqueous and gaseous ammonia are considered potentially hazardous substances. If the proposed project includes an emergency generator (required if the cogeneration option is not implemented), an aboveground diesel fuel storage tank with a capacity of 2,200 gallons would also be installed. The tank would be required to have secondary containment and monitoring to comply with applicable federal and state regulations.

The Initial Study prepared for the CRT project found that compliance with federal, state, and local rules and regulations and LRDP Mitigation Measures HAZ-3a through HAZ-3f would reduce potential impacts to the public and the environment associated with routine transport, use, disposal, or accidental release of hazardous materials. These same rules, regulations, and mitigation measures would also reduce potential impacts to nearby schools associated with the handling of hazardous materials and wastes to a less than significant level. As discussed in the Initial Study, the project site is not located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, and would not create a significant hazard to the public or the environment as a result.

The Initial Study also found that the project site is more than 11 miles northeast of the Oakland Metropolitan Airport, and is also not located within the vicinity of a private airstrip. Implementation of the project would not expose people on the project site to hazards from aircraft overflights or result in any safety hazards related to private airstrips.

These issues are not discussed further in this section.

Mitigation Measures included in the Proposed Project

The following mitigation measures, adopted as part of the 2006 LRDP, are required by the LRDP for the proposed project and are thus included as part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. These mitigation measures that are included in the project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

LRDP MM HAZ-3a: LBNL shall continue to prepare an annual self-assessment summary report and a Site Environmental Report that summarize environment, health, and safety program performance and identify any areas where LBNL is not in compliance with environmental laws and regulations governing hazardous materials and worker safety, emergency response, and environmental protection.

LRDP MM HAZ-3b: Prior to shipping hazardous materials to a hazardous waste treatment, storage, or disposal facility, LBNL shall confirm that the facility is licensed to receive the type of waste LBNL is proposing to ship.

LRDP MM HAZ-3c: LBNL shall require hazardous waste haulers to provide evidence that they are appropriately licensed to transport the type of wastes being shipped from LBNL.

LRDP MM HAZ-3d: LBNL shall continue its waste minimization programs and strive to identify new and innovative methods to minimize hazardous waste generated by LBNL activities.

LRDP MM HAZ-3e: In addition to implementing the numerous employee communication and training requirements included in regulatory programs, LBNL shall undertake the following additional measures as ongoing reminders to workers of health and safety requirements:

- Continue to post phone numbers of LBNL EH&S subject matter experts on the EH&S website.[2]
- Continue to post Emergency Response and Evacuation Plans in all LBNL buildings.
- Continue to post sinks, in areas where hazardous materials are handled, with signs reminding users that hazardous materials and wastes cannot be poured down the drain.
- Continue to post dumpsters and central trash collection areas where hazardous materials are handled with signs reminding users that hazardous wastes cannot be disposed of as trash.

LRDP MM HAZ-3f: LBNL shall update its emergency preparedness and response program on an annual basis and shall provide copies of this program to local emergency response agencies and to members of the public upon request.

Project Impacts and Mitigation Measures

CRT Impact HAZ-1: The proposed project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. The proposed project would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. (Less than Significant)

2 This mitigation measure has been slightly altered from the previous wording of "Post, in areas where hazardous materials are handled, phone numbers of LBNL offices that can assist in proper handling and emergency response information."

Emergency Response and Evacuation

The proposed emergency evacuation plan prepared pursuant to LRDP Mitigation Measure GEO-1, for the proposed project includes the following routes:

1. The majority of the occupants of the CRT building would exit via the stairwells and bridge to the parking area outside Buildings 70 and 50 complex.

2. Occupants from the fourth floor, at the east end of the building, would assemble in the parking lot of the Building 50 complex.

3. Occupants using the stairwell on the west face of the building would exit to the Seaborg stairs and would assemble in the parking lot of Building 88.

Once occupants reach the assembly areas, the LBNL evacuation plan would be used. In the event that a fault rupture causes the failure or blockage of Cyclotron Road, evacuees would be directed (and, if necessary, assisted) to evacuate on foot by way of the Seaborg stairs to the UC Berkeley campus.

The proposed project would not alter the evacuation routes of nearby neighborhoods, which would not use Cyclotron Road or the other internal Berkeley Lab roadways in the immediate vicinity of the CRT project site. More importantly, in the event of evacuation by vehicle, traffic control would be provided on Centennial Drive and Cyclotron Road, which are potential evacuation routes, by the Berkeley Lab and UC Berkeley to ensure orderly evacuation of all persons in the area. There would be no impact related to an emergency response plan or an evacuation plan.

Wildland Fires

Although both the proposed building and the new population associated with the new building could be exposed to the risk from wildland fires, a significant impact related to risk of loss, injury or death involving wildland fire is not expected because the building would be designed and constructed in conformance with the requirements for Group B for office and building support spaces as defined by the California Building Code, Type I Fire Resistive Construction, and with fire code safety requirements. The building would be fitted with automatic sprinklers. Furthermore, in compliance with LBNL's vegetation management program, fire-resistant ground cover would be installed as needed for erosion control in the areas surrounding the building and the access driveway. Vegetation management to reduce fuel loads will continue to be conducted on all areas near the project site, as well in the Perimeter Open Space land use zone as depicted in the 2006 LRDP Land Use Plan. All new employees on the Berkeley Lab site will be provided training and information regarding measures to be taken in the event of a fire. The fire

station on the Berkeley Lab site is within 1,500 feet of the project site and is adequately staffed to serve this project along with other existing and proposed facilities on the Berkeley Lab site. The impact related to exposure to wildland fire risk would be less than significant.

Mitigation Measure: No project-level mitigation measure required.

4.6.5 References

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