APPENDIX 1.0

Project Documentation

State of California
Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

NOTICE OF PREPARATION
ENVIRONMENTAL IMPACT REPORT

Project Title: Helios Energy Research Facility

Lead Agency: University of California, Lawrence Berkeley National Laboratory

Project Location: One Cyclotron Road, Berkeley, California 94720

County: Alameda County

Contact Person: Jeff Philliber
Environmental Planning Group
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 90J0120
Berkeley, CA 94720

Project Description

Lawrence Berkeley National Laboratory (LBNL) proposes to construct and operate the Helios Energy Research Facility Project that would be located in the southeastern portion of LBNL in Berkeley, Alameda County, California. The proposed project includes a 160,000 gross square foot building, an access road, and a parking lot. The proposed building would house research programs focused primarily on alternative and renewable energy sources.

Environmental Review Process

The University of California will be the Lead Agency and will prepare an Environmental Impact Report (EIR) for the proposed project. An Initial Study has been prepared in accordance with the California Environmental Quality Act (CEQA), the *CEQA Guidelines*, and the *University of California Procedures for*

Implementation of CEQA to identify potential environmental impacts that will be addressed in the EIR. The attached Initial Study also includes a description of the proposed project. At this time, it is anticipated that the EIR will address environmental impacts in the following resource areas: aesthetics, air quality, biological resources, geology and soils, hazards and hazardous materials, hydrology and water quality, noise, transportation and traffic, and utilities.

A copy of this Notice of Preparation (NOP), Initial Study, and public scoping meeting announcement will be placed on the following website:

http://www.lbl.gov/community/Helios/

Please note that LBNL has issued another NOP for an EIR for the Computational Research and Theory (CRT) Project which is also available at the Lab's website.

LBNL will hold a joint public scoping meeting for the EIRs for both projects on Wednesday August 8, 2007 at the North Berkeley Senior Center, 1901 Hearst Street, Berkeley, from 6:30 PM to 8:30 PM. More information regarding the scoping meeting is provided in Attachment A.

This notice is to solicit your views on the scope and contents of the forthcoming Helios EIR. We request that any comments be received no later than 5:00 PM on Friday August 24, 2007. Your name and a mailing address should be included with your comments. Please direct your comments to the attention of Jeff Philliber at the address noted above. Comments may also be submitted via email to the following address: **planning@lbl.gov**

If you have any questions regarding this NOP, please contact Jeff Philliber at the above address or via email at **planning@lbl.gov**

Signature: Jeff Philliber · FOR · Date: 7/26/07
Laura Chen, Chief Facilities Planner
Lawrence Berkeley National Laboratory

Attachments: Public Scoping Meeting Announcement
Initial Study

cc: LBNL CEQA Agency and Public Mailing List

State Agencies

State Clearinghouse
CA Air Resources Board, Executive Officer, Mary Nichols,
CA Department of Fish and Game, Director, Ryan Broddrick,
CA Department of Health Services, Chief, Radiological Health Branch, Edgar Bailey, et al.
CA Department of Parks & Recreation, Office of Historic Preservation, State Historic Preservation Officer, M. W. Donaldson, FAIA,
CA Department of Water Resources, Director, Lester Snow
CA Environmental Protection Agency, Secretary, Linda S. Adams, et al.
CA EPA, Department of Toxic Substances Control, Mohindar Sandu et al
CA Regional Water Quality Control Board, Bruce H. Wolff, Executive Officer, Keith Lichten, Section Leader Environmental Compliance, et al
CA State Resources Agency, Mike Chrisman, Secretary
CA State Water Resources Control Board, Executive Officer, Celeste Cantú, et al
CalTrans, Director, Will Kempton; Region 4 Director, Bijan Sartipi, et al

Federal Agencies

U.S. Environmental Protection Agency, Region 9 Administrator, Wayne Nastri; Radiation & Compliance Assurance, Michael Bandrowski, et al
U.S. Fish and Wildlife Service, Sacramento Field Office, Susan Moore, Chief Supervisor
U.S. Department of Energy, Berkeley Site Office, Aundra Richards, et al
U.S. Department of Energy, NEPA Compliance Officer – Oakridge Operations Office, Gary Hartman
U.S. Department of Energy, NEPA Representative - BSO, Kim Abbott
U.S. Department of Interior, National Park Service, Elaine Jackson-Retondo, Historian

Regional/County Agencies

Alameda County, Clerk-Recorder's Office, Patrick O'Connell
Alameda County, Supervisor District 5, Keith Carson
Alameda County, LAFCO, Executive Officer, Crystal Hishida Graff,
Alameda County, County Administrator, Susan Muranishi,
Alameda County, Health Care Agency, Public Health Officer, Dr.Anthony Iton, et al
Alameda County, Clerk to Board of Supervisors, Crystal Hishida Graff,
Alameda County, Planning Department, Agency Director, James Sorenson, et al
Metropolitan Transportation Commission, Executive Director, Steve Heminger,
Association of Bay Area Governments, Executive Director-Secretary Treasurer, Henry Gardner, et al
Bay Area Air Quality Management District, Executive Officer/APCO, Jack Broadbent, et al
Contra Costa County, Department of Health Services, Director of Public Health, Wendel Brunner,
East Bay Municipal Utilities District, General Manager, Dennis Diemer, et al
East Bay Regional Park District, General Manager, Pat O'Brien, et al

Cities

City of Berkeley

City of Berkeley, City Clerk, Pamyla Means, City Clerk

City of Berkeley, City Manager, Phil Kamlarz, and City Manager's Office et al
City of Berkeley, City Attorney, Manuela Albuquerque
City of Berkeley, Mayor Tom Bates
City of Berkeley, Council Members, Anderson, Capitelli, Maio, Moore, Olds, Spring, Worthington, Wozniak
City of Berkeley, Planning Department, Dan Marks, Director, et al
City of Berkeley, Toxics Management Division, Dr. Nabil Al-Hadithy
City of Berkeley, Energy Officer, Neal DeSnoo
City of Berkeley, Police Department, Doug Hambleton, Chief of Police
City of Berkeley, Fire Department, Deby Pryor, Fire Chief, et al
City of Berkeley, Assistant City Manager for Transportation

City of Berkeley Commissions

City of Berkeley, Community Environmental Advisory Commission, Nabil Al-Hadithy, Secretary
City of Berkeley, Community Health Commission, Kimi Sakashita, Secretary
City of Berkeley, Landmarks Preservation Commission, Janet Homrighausen, Secretary
City of Berkeley, Peace & Justice Commission, Manual Hector, Jr., Secretary
City of Berkeley, Parks, Recreation & Waterfront Commission, Virginia Aiello, Secretary
City of Berkeley, Planning Commission, Jordan Harrison, Secretary
City of Berkeley, Public Works Commission, Jeff Egeberg, Secretary
City of Berkeley, Solid Waste Management Commission, Tania Levy, Secretary
City of Berkeley, Transportation Commission, Secretary

City of Oakland

City of Oakland, Mayor Ron Dellums
City of Oakland, District 1, Jane Brunner, Councilmember
City of Oakland, City Attorney John Russo
City of Oakland, Planning and Zoning Division, Claudia Cappio, Planning & Zoning Director, et al
City of Oakland, City Clerk's Office, La Tonda Simmons, City Clerk
City of Oakland, City Administrator, Deborah Edgerly,
City of Oakland, Fire Department, Daniel Farrell, Fire Chief, et al

City of Albany

City of Albany, City Clerk, Jacqueline Bucholz
City of Albany, Administrator, Beth Pollard

El Cerrito and Kensington

El Cerrito Fire Department & Kensington Fire District, Mark Scott, Fire Chief

University of California Office of the President (UCOP)

UCOP, University Affairs, Bruce Darling, Senior Vice President
UCOP, Laboratory Administration, George Campbell, Acting Director, ES&H & ERWM,
UCOP, Office of General Counsel, Charles F. Robinson, University Counsel
UCOP, Office of Planning, Design, & Construction, John Zimmermann, Director, et al

UCOP, Facilities Administration, Michael Bocchichio, Assistant Vice President

UC Berkeley

UC Berkeley, Chancellor Robert Birgeneau
UC Berkeley, Executive Vice Chancellor, George Breslauer
UC Berkeley, Vice Chancellor for Research, Beth Burnside
UC Berkeley, Associate Chancellor and Chief of Staff, John Cummins
UC Berkeley, Facilities Services, Edward Denton, Vice Chancellor
UC Berkeley, Physical and Environmental Planning, Emily Marthinsen, Assistant Vice Chancellor, et al
UC Berkeley, Chancellor's Advisory Committee on Strawberry Creek, G. Mathias Kondolf
UC Berkeley, EH&S Division, Mark Freiberg, Director, et al
UC Berkeley, Office of Radiation Safety, Gregory Yuhas, Associate Director, et al
UC Berkeley, Community Relations, Irene Hegarty, Director
UC Berkeley, Lawrence Hall of Science, Elizabeth Stage, Director, et al
UC Berkeley, Botanical Garden, Paul Licht, Director, et al
UC Berkeley, Police Department, Victoria Harrison, Chief of Police
UC Berkeley, Campus Landscape Architect, Jim Horner
UC Berkeley, Emergency Services Manager, Tom Klatt
UC Berkeley, Residence Hall Assembly, Oriana Madrigal Zamora, President

Organizations

Berkeley Association of Realtors, Association Executive, Sally Dunker,
Berkeley Chamber of Commerce, Chief Executive Officer, Ted Garrett, et al
Campus Parnassus Neighborhood Association, President, Eric Arens
Committee to Minimize Toxic Waste, Co-Chair, Pam Sihvola, et al
Council of Neighborhood Associations/BANA, President, Marie Bowman
Downtown Berkeley Association, Executive Director, Deborah Badhia
Euclid-LeConte Neighbors, Jim Sharp et al
League of Women Voters BAE, President, Jinky Gardner, et al
Nyingma Institute, Program Director, Abbe Blum
Oakland Metropolitan Chamber of Commerce, President & CEO, Joseph Haraburda
Panoramic Neighborhood Association, President, Jerry Wachtel
Sierra Club, Group Chair, Kent Lewandowski
Urban Creeks Council, UCC Vice Chair, Carole Schemmerling
Friends of Strawberry Creek, Work Programs, Jennifer Pearson

Individuals and Neighbors

(Various)

ATTACHMENT A: PUBLIC SCOPING MEETING

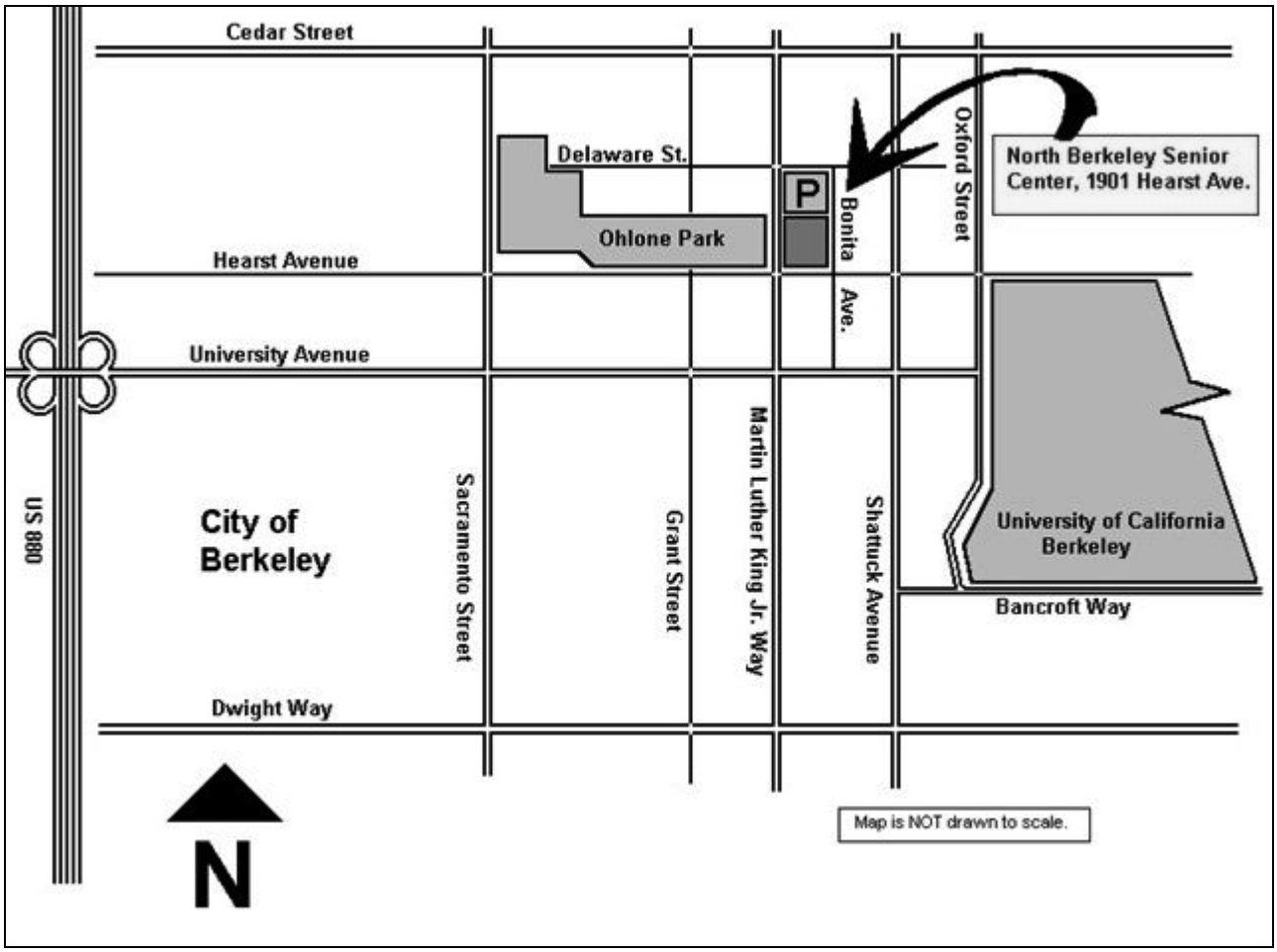
LBNL will hold a joint public scoping meeting open to all interested agencies and members of the public. The meeting is intended to present a brief overview of both the Helios and CRT projects, to identify environmental resource areas to be analyzed in the Draft EIRs, and to invite public comments on the scope of the EIR analyses.

What: Joint Scoping Meeting for the Helios Energy Research Facility Project EIR and the CRT Facility Project EIR

When: Wednesday, August 8, 2007

Where: North Berkeley Senior Center, 1901 Hearst Street, Berkeley

Parking: Parking is available at the Senior Center and on surrounding streets (see map below)



1. ENVIRONMENTAL CHECKLIST/INITIAL STUDY

Helios Energy Research Facility

Project Title:	Construction and Operation of the Helios Energy Research Facility
Lead Agency:	University of California Lawrence Berkeley National Laboratory
Location:	Lawrence Berkeley National Laboratory One Cyclotron Road Berkeley, California 94720
Applicant:	See Lead Agency above
Existing LRDP Designation:	Research and Academic
Existing On-site Land Uses	Vacant
Surrounding Land Uses	The project site is surrounded by existing research facilities including the Molecular Foundry, the National Center for Electron Microscopy, Building 66, Building 62, undeveloped open space, a UC Berkeley-managed corporation yard area, and Centennial Drive.
Description of Project:	See attached Project Description in Section 3 of this Initial Study.

Interested and Responsible Agencies:

- Bay Area Air Quality Management District;
- California Department of Fish and Game; and
- San Francisco Bay Regional Water Quality Board.

2. INTRODUCTION

2.1 Initial Study

Pursuant to Section 15063 of the California Environmental Quality Act (CEQA) Guidelines (Title 14, California Code of Regulations, Sections 15000 et seq.), an Initial Study is a preliminary environmental analysis that is used by the lead agency as a basis for determining whether an EIR, a Mitigated Negative Declaration, or a Negative Declaration is required for a project. The *CEQA Guidelines* require that an Initial Study contain a project description; a description of environmental setting; an identification of environmental effects by checklist or other similar form; an explanation of environmental effects; a discussion of mitigation for significant environmental effects; an evaluation of the project's consistency with existing, applicable land use controls; and the names of persons who prepared the study.

2.2 EIR Process

This environmental analysis is an Initial Study for the proposed Helios Energy Research Facility (referred to as the "proposed project" or the "Helios project" throughout this document). The purpose of this Initial Study is to evaluate the potential environmental impacts of the proposed project to determine what level of additional environmental review, if any, is appropriate.

This environmental analysis incorporates by reference the Lawrence Berkeley Laboratory (LBNL) 2006 Long Range Development Plan (LRDP) EIR in accordance with Sections 15150 of the *CEQA Guidelines*. The 2006 LRDP EIR anticipated a similar scale and type of development in the area where the proposed project is located, and evaluated the potential environmental impacts from that development. Therefore, the program-level analyses contained in the 2006 LRDP EIR was used in this Initial Study to support certain conclusions related to potential environmental impacts of the proposed project and to determine which potential environmental impacts need to be examined further.

The analysis contained in this Initial Study concludes that the proposed project would result in the following categories of impacts, depending on the environmental issue involved: no impact; less-than-significant impact; or a potentially significant impact. As shown in the Determination form in Section 6 of this document and based on the analysis contained in this Initial Study, it has been determined that the proposed project may result in potentially significant impacts. Therefore, an EIR will be prepared after circulation of this Initial Study in conjunction with a Notice of Preparation (NOP).

2.3 Public and Agency Review

This Initial Study and NOP will be circulated for public and agency review from July 26, 2007 to August 24, 2007. Copies of this document are available for review at the following locations and online at http://www.lbl.gov/community/Helios/:

Copies of the 2006 LRDP and the 2006 LRDP EIR are available for review online at http://www.lbl.gov/Community/env-rev-docs.html or at the following locations:

- Berkeley Public Library, 2090 Kittredge Street, 2nd Floor Reference Desk, Berkeley, CA 94704
- Berkeley Lab Main Library, One Cyclotron Road, Building 50, Room 4034, Berkeley, CA 94720

Comments on this Initial Study and NOP must be received by 5:00 PM on Friday, August 24, 2007 and should be sent to:

Jeff Philliber
Environmental Planning Group Coordinator
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 90J0120
Berkeley, CA 94720

2.4 Project Approvals

As a public agency principally responsible for approving or carrying out the proposed project, the University of California is the Lead Agency under CEQA and is responsible for certifying the adequacy of the environmental document and approving the proposed project. It is anticipated that the Board of Regents of the University of California (The Regents) will consider approval of the proposed project in early 2008.

2.5 Organization of the Initial Study

This Initial Study is organized into the following sections:

Section 1 - Project Information: provides summary background information about the proposed project, including project location, lead agency, and contact information.

Section 2 - Introduction: summarizes the scope of the document, the project's review and approval processes, and the document's organization.

Section 3 - Project Description: presents a description of the proposed project, including the need for the project, the project's objectives, and the elements included in the project.

Section 4 - Environmental Factors Potentially Affected: addresses whether this Initial Study identifies any environmental factors that involve a significant or potentially significant impact that cannot be reduced to a less-than-significant level.

Section 5 - Determination: indicates whether impacts associated with the proposed project would be significant and what, if any, additional environmental documentation is required.

Section 6 - Evaluation of Environmental Impacts: contains the Environmental Checklist form for each resource area. The checklist is used to assist in evaluating the potential environmental impacts of the proposed project. This section also presents a background summary for each resource area, and an explanation of all checklist answers.

Section 7 - References: lists references used in the preparation of this document.

Section 8 - Report Preparers: lists the names of individuals involved in the preparation of this document.

3. PROJECT DESCRIPTION

3.1 Introduction

Lawrence Berkeley National Laboratory (LBNL) is a multi-program national research facility operated by the University of California (UC) for the Department of Energy's (DOE) missions in fundamental sciences, energy resources, and environmental quality. LBNL's programs advance four distinct goals for DOE and the nation:

- To perform leading multidisciplinary research in the computing sciences, physical sciences, energy sciences, biosciences, and general sciences in a manner that ensures employee and public safety and protection of the environment;
- To develop and operate unique national experimental facilities for qualified investigators;
- To educate and train future generations of scientists and engineers to promote national science and education; and
- To transfer knowledge and technological innovations and to foster productive relationships among the LBNL research programs, universities, and industry in order to promote national economic competitiveness

Classified research is not conducted at LBNL.

3.2 Project Summary

LBNL is proposing to construct a new 160,000 gross square foot, 4-story research facility that would house research programs focused on alternative and renewable energy sources. The need for this research facility has been determined through analysis of global effects of consumption of fossil fuels and the need to discover alternative forms of energy.

The proposed research building would include laboratories, offices, an auditorium, and a cafeteria. The proposed building would house the Helios research program, a collaborative effort between LBNL and UC Berkeley that would conduct research to utilize sunlight to create efficient energy sources. The building would also house the Energy Biosciences Institute (EBI). The EBI is a grant-funded program through British Petroleum (BP) that would conduct research with BP partners, LBNL, UC Berkeley, and the University of Illinois, Urbana-Champaign (UI). The EBI would focus research primarily on renewable biofuels for transportation and conversion of heavy hydrocarbons to clean fuels. Because Helios and EBI would share common objectives related to the development of efficient alternative fuel sources, it is beneficial to house both programs in the same building as to share laboratory equipment where appropriate and to provide convenient access to unique scientific facilities such as the Advanced Light Source, the Molecular Foundry, and the National Center for Electron Microscopy located in the southeastern portion of LBNL.

3.3 Project Need

The goal of the Helios research program is to develop the science and technology that would allow the use of sunlight to create energy sources. There are several fuels that could benefit from this research including hydrocarbons, ethanol, and methanol. In addition, research into photovoltaics (solar panels), storage of electrical energy, and artificial photosynthesis would be conducted. The EBI research program

will primarily focus on renewable biofuels for transportation, conversion of heavy hydrocarbons to clean fuels, improved recovery from existing oil and gas reservoirs, and carbon sequestration.

The Helios research program would utilize nano-scale photovoltaic and electrical systems. Research would be conducted to manage these microscopic solar panels to harness solar power. This research is expected to address major scientific barriers in solar fuel generation. Additionally, the photosynthesis process would be studied as to apply it to artificial systems for the purposes of energy generation. Related to natural systems of energy generation, the metabolic pathways in microorganisms would be studied to produce a variety of fuels and fuel additives. The programs and synthetics biofuels discovered as part of Helios program would facilitate the production of any number of fuels and fuel additives that could be utilized in the current transportation infrastructure.

The EBI would perform bioscience research aimed at increasing energy production using biofuels and reducing the impact of energy consumption on the environment. There would be two components within EBI, the non-proprietary UC Berkeley and LBNL researchers and a small group of BP scientists in a separate, proprietary division. There would be six programs within EBI. The core scientific programs would be: Feedstock Development, which is sustainable development of plant biomass in close proximity to a processing plant that converts biomass to fuel; Biomass Depolymerization, which is research into reducing the cost and energy consumption associated with biofuels such as ethanol; Biofuels Production, which is efficient conversion of biomass to fuel under industrial conditions; and Fossil Fuel Bioprocessing and Carbon Sequestration, which is research into biological process to improve oil recovery, fossil fuel processing and biological carbon sequestration. The fifth program would focus on the social and economic benefits of biofuels. The final program, Discovery and Development, would support all of the scientific programs.

Both the Helios and EBI research programs would require multi-disciplinary laboratories focused on solar-to-electrical energy and solar-to-chemical energy. Wet research laboratories (fume hoods with direct ventilation and specialized piped utilities), fermentation laboratories, and greenhouse facilities would be required. Advanced imaging and analytical tools related to feedstocks would be required for EBI. The laboratory space would also need to be adaptable to a variety of functions to accommodate new technology and different research programs.

3.4 Project Location and Surrounding Uses

LBNL is situated in the eastern hills of the cities of Berkeley and Oakland in Alameda County, and is located on approximately 200 acres that are owned by the University of California and leased to the U.S. Department of Energy (DOE) (See **Figure 1, Regional Location**). The LBNL site is surrounded by open space, institutional uses, and residential and neighborhood commercial areas. The University of California, Berkeley, including the Strawberry Canyon open space areas, 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 project site is located at the southeast portion of LBNL. The project site is located east of Chicken Creek, south of Lawrence Road, west of the Molecular Foundry, and north of the UC Berkeley boundary line. The access road that would be constructed for the project would be approximately 1,200 feet and would descend along the hillside to Centennial Drive. The access road would cross the boundary line for LBNL and would extend into UC Berkeley managed land. Surrounding research facilities include the

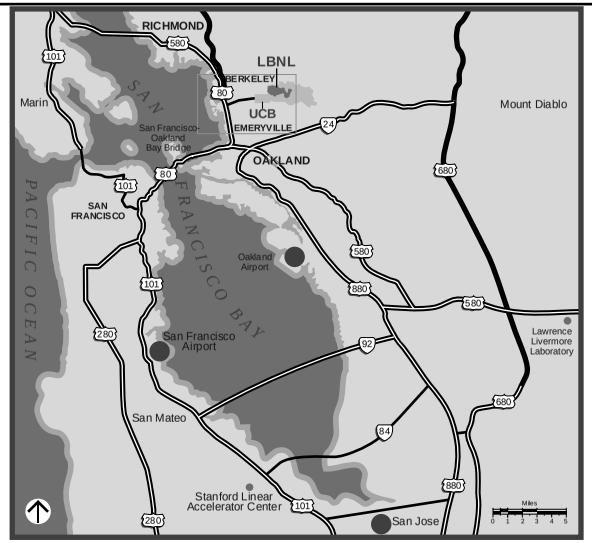
National Center for Electron Microscopy which specializes in high-powered microscopes and the Molecular Foundry which provides support and research in Nanoscience. The location of the project has been selected with a view to foster interaction between existing LBNL research programs in the Materials Sciences Research Cluster and the proposed facility. The location is also close to the Lab's southern fence line to facilitate access and interaction between the project and UC Berkeley laboratories.

The project site, including the access road, is approximately 3 acres and is currently undeveloped. The site has been heavily graded in conjunction with the recent construction of the Molecular Foundry building and in the past to establish the roadway terraces that descend south along the hill. There is minimal vegetation present where the building and parking lot would be located. The vegetation consists of seasonal grasses and some newly planted trees associated with the Molecular Foundry construction. The area where the access road would be constructed and improved is more densely vegetated with seasonal scrub, evergreen trees, and grasses.

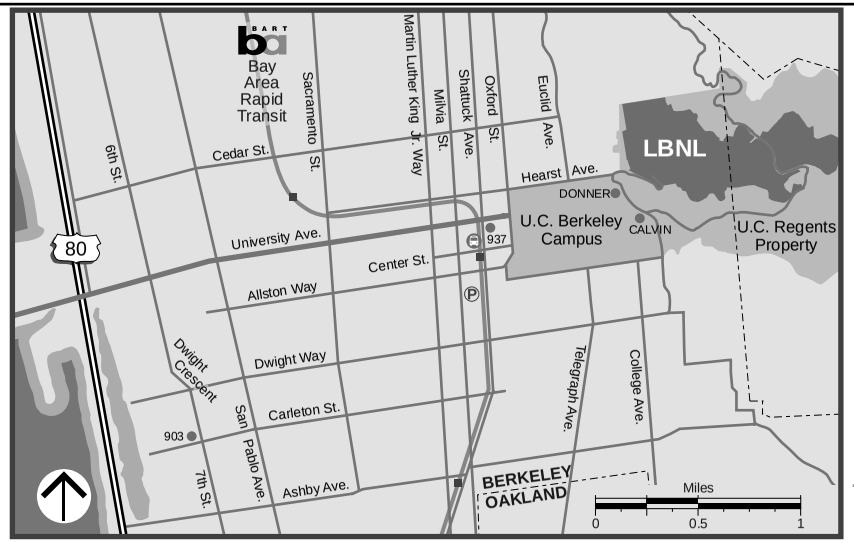
3.5 Project Characteristics

The proposed project includes the construction of one building, parking lot, and access road (See **Figure 2, Approximate Project Site**). The proposed Helios building would contain approximately 160,000 gross square feet (gsf) of laboratory, office, and mechanical space and would be integrated into the hillside. There would be approximately 88,000 square feet of assignable square feet (asf)[1]. The Helios building would be a narrow, stepped design, oriented north-south with separate levels devoted to different project components. This design would place the building parallel with the contours of the hillside, giving distinct lower and upper hillside entry points. The southern portion of the building would be dedicated to lab and office space associated with the Helios program and would consist of four levels, with three of the four levels below grade with terraced, green roofs. The second level from the top of the Helios portion of the building would have a lower level entrance for employees accessing the building from the proposed parking lot. **Figure 3, Helios Conceptual Site Plan**, presents the conceptual design of the project site. The northern portion of the building would include one below-grade level, which would house mechanical equipment and three above-ground levels. The top three above-ground floors would contain labs and office space associated with EBI. A single, shared level would span the entire course of both southern and northern portions of the facility. This common floor would comprise the top floor of the southern portion and the bottom above-grade floor of the northern portion of the facility. It would also contain the Helios main lobby and the upper level entrance for employees entering the building from other LBNL facilities and the existing service road. A 250-seat auditorium, located on the third level of the southern portion, would be shared between Helios and EBI.

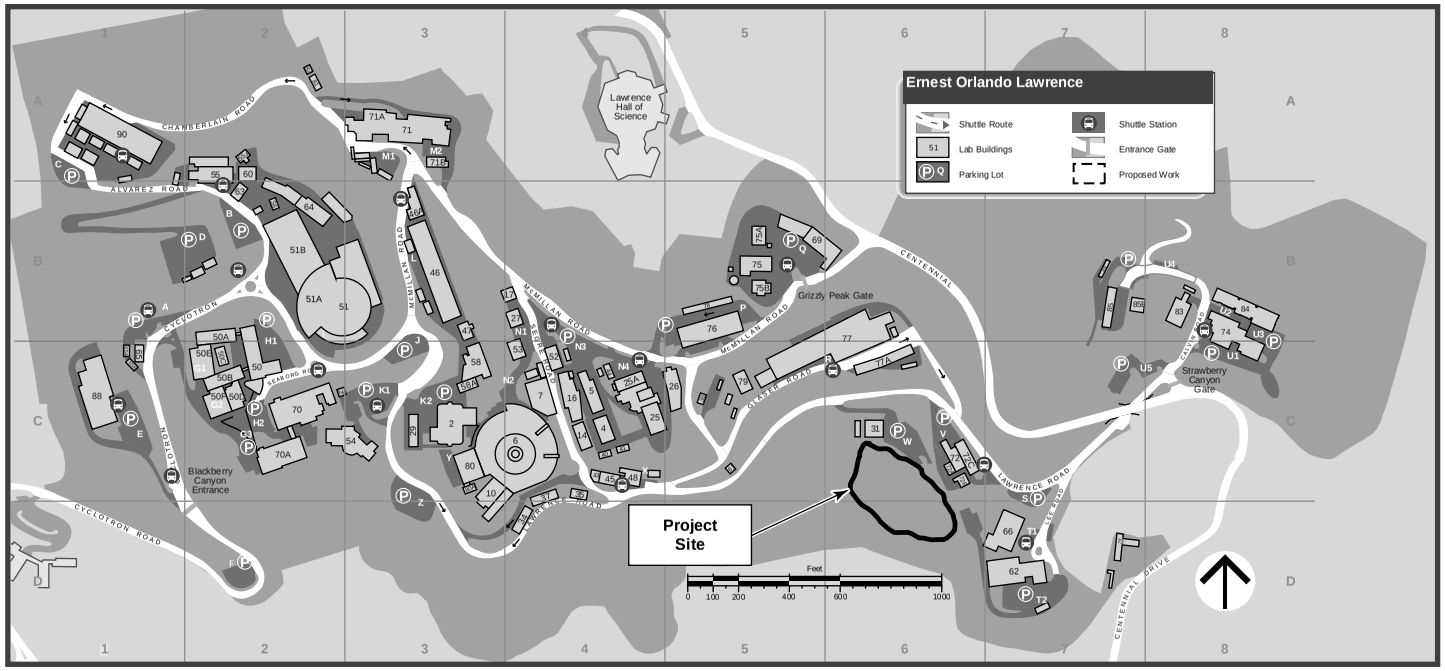
1 Assignable square feet is the total floor or surface area of a room assigned to or available for assignment to an occupant or specific use. It does no include common areas such as restrooms, hallways, or mechanical space.



LBNL Regional Location



LBNL Local Location



LBNL Site

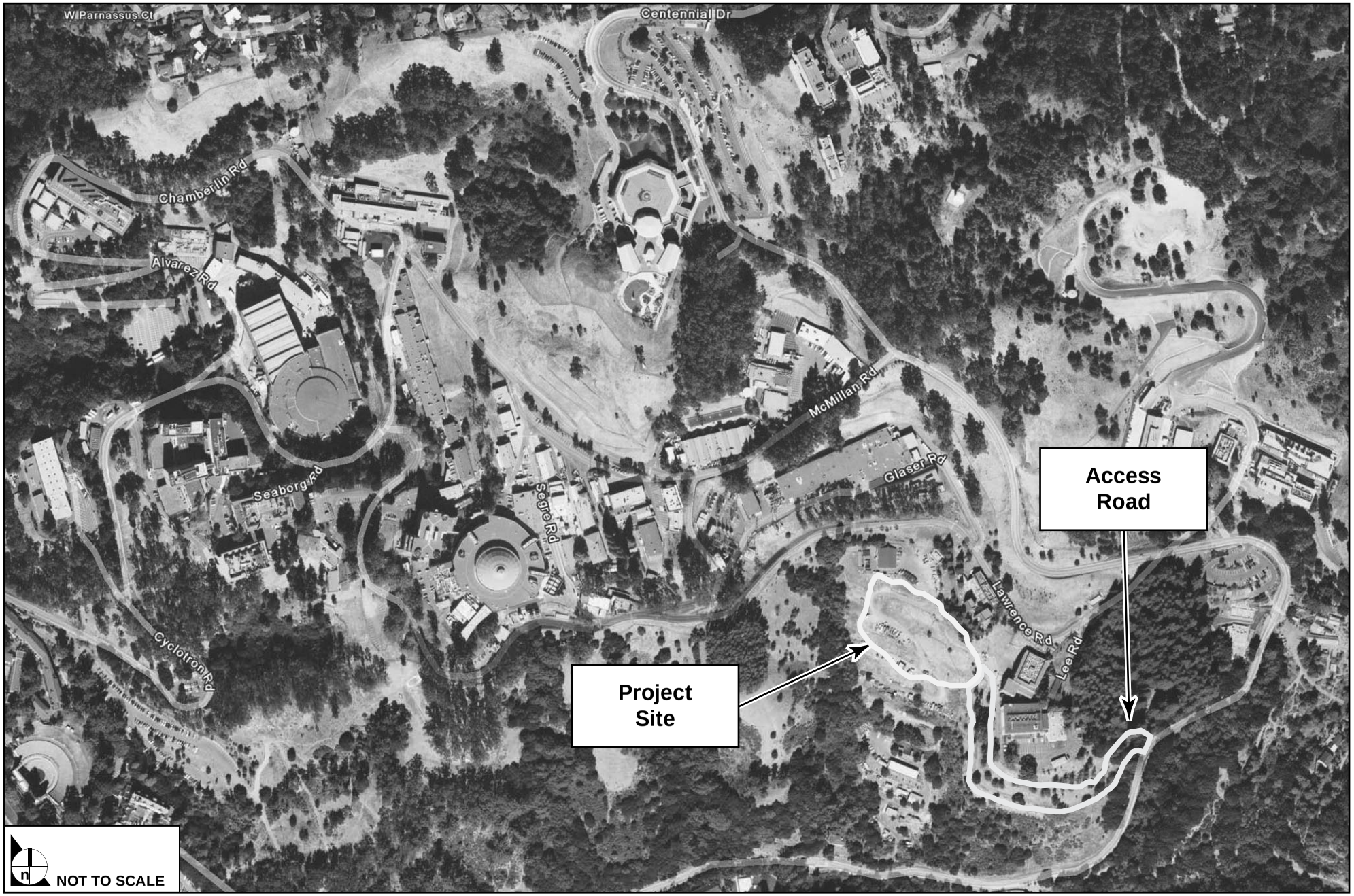
NOT TO SCALE

SOURCE: Lawrence Berkeley National Laboratory, 2004

FIGURE **1**

Regional Location Maps

924-001•07/07

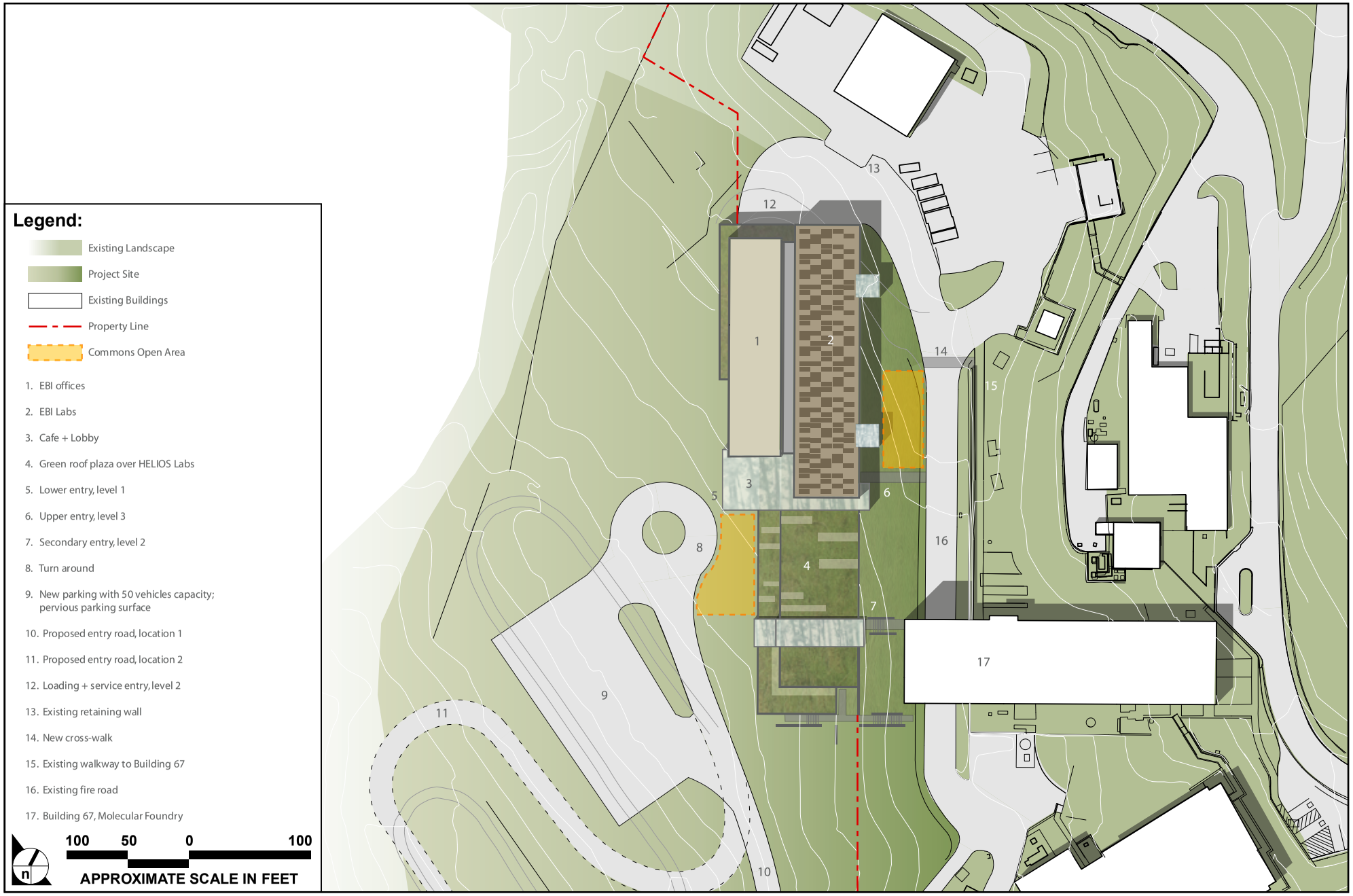


SOURCE: Google Earth - July 2007, Impact Sciences, Inc. - July 2007

FIGURE **2**

Approximate Project Site

924-001•07/07



SOURCE: SMITHGROUP 2007, Impact Sciences, Inc. - July 2007

FIGURE **3**

Helios Conceptual Site Plan

924-001•07/07

An outdoor 50-space parking lot south of the proposed building would be provided for building staff and visitors. The proposed access road would lead to this parking lot. A small roundabout with designated drop-off areas would be provided adjacent to the parking lot.

A detailed description of the project characteristics is provided below.

3.5.1 Project Design and Landscaping Features

Building Design

The mission of the design is to implement a building that is consistent with the proposed research, and to employ materials and implement practices which reduce reliance upon fossil fuels. In order to achieve green building principles and to be consistent with the 2006 LRDP, the design of the proposed facility would integrate the building into the hillside. The portion of the building above ground would be associated with the EBI. The entry floor from the lower level would span the entire length of the footprint. The remaining underground levels would be associated with the Helios program. The green roofs of the underground portion of the building would provide cooling, absorb rainwater, and minimize runoff. Air handling units and exhaust fans would be located on the roof and would be vibration isolated. A parapet wall would shield the roof-mounted equipment from view and would reduce noise. The roof-mounted equipment would be grouped together to the extent feasible. Photovoltaic panels would also be located on the roof of this portion of the project site. Alternative energy sources such as solar energy and wind are proposed to be used for ventilation, lighting, and electrical generation.

Colors and Materials

The exterior of the building would be durable, water-resistant, compatible with the surrounding buildings and appropriate for the intended uses of the site. The exterior cladding would be similar in appearance and quality to the Molecular Foundry and would include the use of metal, concrete, and glass. There are a number of retaining walls that would be needed for the building, parking lot, and access road. The concrete that would be used would mimic retaining walls associated with the Molecular Foundry. High performance glazing would be implemented to reduce the effects of afternoon heat gains.

Lighting

Internal lighting would utilize indirect sunlight where appropriate and motorized shades to reduce bright light and glare at various times of day. Uses oriented toward the east and northeast would utilize fabric shades in the morning hours to reduce glare from morning light. The shades would be automatically raised by an astronomical clock that would track sun movement. Laboratories and offices oriented toward the south and west would utilize the indirect morning light. Light and glare during the afternoon would pose more of an intrusion on users. This southwestern façade would be exposed to light from the sunset that can be more intense. A fixed shade would be mounted on the exterior of the building. A fabric motorized shade would be implemented similar to the eastern side of the building. An additional moveable shade would be available to be used at the discretion of the users inside of the building. These characteristics would aide in maximizing natural light and reducing heat and glare associated with direct sunlight. Skylights would be implemented where feasible.

Exterior lighting features would be implemented at both entrances, in the proposed parking lot, and along the walkway along the southern exterior portion of the building. Lighting would be designed to minimize glare.

3.5.2 Access, On-Site Circulation, and Parking

Automobile access to the site would be via a new road constructed from Centennial Drive. There is an existing access easement developed with a one-lane service road that ends approximately 700 feet from the project site. The proposed project would upgrade this to a two-lane roadway and extend it to connect to Centennial Drive. As LBNL is a controlled-access facility, access via this road will be controlled. The new access road would end in the proposed parking lot and no vehicular access to uses north of the project site or a connection to Lawrence Road would be provided. There is an existing service road that would remain in place between the project site and the Molecular Foundry. This would provide an additional access point for emergency vehicles.

There would be two entrances to the building: a lower entrance which would be accessed from the parking lot and an upper entrance which would be accessed on the uphill potion of the project, adjacent to the existing service road. An exterior staircase would run along the southern portion of the building and would allow access to and from the parking lot to the service road and surrounding uses. A lobby area as well as food service would be located on two levels and would be accessible from either entrance point. Pedestrian circulation throughout the project would be via the elevators located near the entrance points or by stairs adjacent to the elevators.

Public transportation would be available through the LBNL shuttle system. An additional stop would be added to the shuttle route that runs off-site to UC Berkeley and the City of Berkeley. The internal shuttle route would provide access to the site through the stop on Lawrence Road near the Molecular Foundry Building.

There are 50 parking spaces proposed for the facility. Parking at the project site would be located on the south side of the building. Additional parking would be available at existing LBNL parking areas along Lawrence Road.

3.5.3 Infrastructure

Infrastructure improvements would be necessary for water, sanitary sewer service, and storm drainage. The project would connect to an existing 8-inch high-pressure water main along the Building 67 lower access road from Lawrence Road. The water main would be extended 50 feet for potable and fire water and an additional 350 feet to provide for fire hydrant coverage in the upper and lower portions of the site. Construction of the project would require removal of an abandoned sanitary sewer line and connection to the existing sewer line at the access road to Building 67. A sanitary sewer lift station would be required to reach the existing sanitary sewer main. Storm drainage would be provided on-site to control discharge and to direct flows away from Chicken Creek. The construction of the project would require relocating existing storm drainage facilities including concrete swales and subdrains along the existing slope south of Building 66. The Helios project would meet the UC Policy on Sustainable Practices.

3.5.4 Research Materials and Chemicals On-Site

At this time, there is no definitive inventory of the chemicals and research materials that would be used or stored in the Helios building. However, such information will be gathered and reported in the EIR. Helios would be primarily an engineering building that would include some biological research facilities. The Helios building biological research areas would be built to Biosafety Level 2 standards, which is the

standard required for working with organic agents with a moderate-potential hazard Such Helios facilities would be operated by authorized, trained staff using certified biosafety cabinets, autoclaving, and other specialized disinfection techniques, and biological materials handing protocols..

3.6 Project Population

It is anticipated that the Helios building would contain approximately 500 people. It is anticipated that approximately 132 people would be relocated to the Helios building from other locations within LBNL or UC Berkeley, and there would be 368 new people that would be employed as a result of project implementation. Given the 250-seat capacity of the auditorium, a maximum of 750 people could be accommodated in the building at one time. Such hypothetical maximum occupancy could be expected to occur only during workdays when the auditorium is in use and at full capacity.

3.7 Construction Schedule

Project construction is anticipated to begin in spring 2008 and continue for approximately 30 months.

4. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

X	Aesthetics		Agricultural Resources
X	Air Quality	**X**	Biological Resources
	Cultural Resources	**X**	Geology and Soils
X	Hazards	**X**	Hydrology and Water Quality
	Land Use and Planning		Mineral Resources
X	Noise		Population and Housing
	Public Services		Recreation
X	Transportation/Circulation	**X**	Utilities and Service Systems
X	Mandatory Findings of Significance		

5. DETERMINATION

On the basis of this initial evaluation:

_____ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

_____ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the proposed proponent. EITHER A MITIGATED NEGATIVE DECLARATION OR ENVIRONMENTAL IMPACT REPORT will be prepared.

_____ I find that the proposed project MAY have a significant effect on the environment and an ENVIRONMENTAL IMPACT REPORT is required.

__X__ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measure based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT will be prepared.

Signature: _____ Date: 7/26/07

Jeff Philliber, LBNL Environmental Planning Group Coordinator

6. EVALUATION OF ENVIRONMENTAL IMPACTS

Introduction

The following Environmental Checklist form is based on Appendix G of the *CEQA Guidelines*. The checklist has been adapted based on the analyses presented in the 2006 LRDP EIR, to assist in evaluating the environmental effects of the proposed project with respect to the analysis in the 2006 LRDP EIR.

Project Impacts

The Environmental Checklist identifies potential project effects as corresponding to the following categories of impacts:

- Potentially Significant Impact: An effect that was either not previously addressed in the 2006 LRDP EIR or was addressed at a program-level and may be significant based on substantial evidence and the significance criteria for the proposed project. If the project may result in one or more Potentially Significant Impacts, an EIR is required.
- Less than Significant with Mitigation Incorporated: An effect that was not previously addressed in the 2006 LRDP EIR but, with the implementation of project-specific mitigation measures, is reduced from potentially significant to a less than significant level.
- Less-than-Significant Impact: An effect for which no significant impacts, only less than significant impacts, would result because LRDP mitigation measures are already incorporated into the proposed project.
- No Impact: The project would not create an impact.

Cumulative Impacts

For those impacts that were determined to be less than significant, a summary of cumulative impacts is presented in this Initial Study. For those impacts that will be discussed in further detail in the project-level EIR, a cumulative analysis will be presented in the project-level EIR.

2006 LRDP EIR Analysis and Mitigation Measures

The 2006 LRDP EIR evaluated environmental impacts of Lab development under the LRDP using an Illustrative Development Scenario, which was a conceptual portrayal of the likely development under the 2006 LRDP. The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design. The full text of the 2006 LRDP EIR mitigation measures is presented in **Appendix A**.

6.1 Aesthetics

6.1.1 Background

Section IV.A of the 2006 LRDP EIR addresses the aesthetic effects of Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines*, Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.A of the 2006 LRDP EIR and describes the project site and relevant aspects of the project.

LBNL

The LBNL site is located on the steeply sloping hillsides of the Berkeley-Oakland hills, rising from elevation 500 feet near the Blackberry Canyon Gate to about 1,000 feet at the northern border of the site. The hills provide a semi-natural, vegetated open space backdrop to the Lab site. The hills are wooded with native stands of oaks and California bay or with introduced eucalyptus or conifers. As discussed in the 2006 LRDP EIR, the entire LBNL site cannot be viewed from any one single off-site vantage point. However, portions of the Lab site are visible from residential neighborhoods, public roadways, and public vantage points in the areas that adjoin the Lab. 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 Road. As described in the 2006 LRDP EIR, portions of the 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) are available from downtown Berkeley and the Berkeley Marina.

The visual character of the Lab's built environment is eclectic. Many buildings display an industrial look and utilitarian quality. Many buildings are painted in neutral colors to blend with the natural setting. Some of the buildings are recognizable landmarks, including Building 50 and the Advanced Light Source, both of which are also visible from off-site locations.

Some amount of nighttime lighting is produced on the site as a result of interior and exterior lighting associated with the Lab buildings, roadways and parking lots. All buildings and parking areas are equipped with downward-directed light fixtures for nighttime lighting.

Project Site

The Helios project site is located in the eastern portion of the Lab site near the Molecular Foundry building in the Materials Sciences Research Cluster area. Due to its proximity to nearby hillsides, trees, and Strawberry Canyon, this cluster including the Helios site is not visible from most off-site areas near the Lab, although medium-range views of the site are available from nearby residential neighborhoods and from intermittent stretches of Centennial Road.

6.1.2 2006 LRDP EIR Analysis

The 2006 LRDP EIR evaluated visual impacts of Lab development under the LRDP utilizing an Illustrative Development Scenario, which was a conceptual portrayal of the likely development under the 2006 LRDP. That illustrative scenario assumed new buildings in the general area that is now being considered for the location of the Helios project. The LRDP EIR analysis determined that Lab

development could result in a significant and unavoidable impact on scenic vistas and resources (LRDP Impact VIS-1), and significantly affect site character (LRDP Impact VIS-2), but would not result in a significant impact related to light and glare or due to construction activities.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.1.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
AESTHETICS - Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☒	☐	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☒	☐	☐	☐
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?	☒	☐	☐	☐

DISCUSSION:

a. **Potentially Significant Impact.** The 2006 LRDP EIR discusses scenic vistas under Impact VIS-2. While there are no officially designated scenic vistas in the 2006 LBNL LRDP, the hillside where the project occurs could be considered a scenic vista from off-site locations. The proposed project would construct a building and parking lot in a currently undeveloped location on a hillside that is developed with other LBNL facilities. Development in the area where the proposed project is located was anticipated under the 2006 LRDP EIR. That analysis contained preliminary visual simulations that showed that future development, where the proposed project occurs, was visible from off-site locations. The LRDP EIR concluded that LRDP Impact VIS-2 would be significant and unavoidable. Although this impact is adequately addressed in the 2006 LRDP EIR, as more design detail has become available, the Helios project EIR will contain visual simulations that show project characteristics and will include a discussion of project-specific impacts.

b. **No Impact.** The Initial Study prepared as part of the LRDP EIR scoping process concluded that development on the Lab site would have no impact on scenic resources. The nearest state highways to

the project site are Interstate 80, Interstate 580, Highway 24, and Highway 13. The portions of these highways that are within the vicinity of the project site are not designated or eligible as scenic routes. There are no other scenic resources located on the project site that would be affected by the implementation of the proposed project. Therefore, there would be no impact to scenic resources on-site or within the vicinity of a designated state scenic highway and no additional analysis is required.

c. **Potentially Significant Impact.** The 2006 LDRP EIR addressed impacts associated with degradation of visual character and quality under LRDP Impacts VIS-1 and VIS-3. LRDP Impact VIS-1 specifically evaluated impacts to visual character related to construction activity. Because construction would be temporary in nature, this impact was determined to be less than significant and no mitigation measures were imposed. The proposed project would involve grading and construction of an undeveloped site. The visual impact related to construction activity for the proposed project would be less than significant because it would be a temporary change in visual character for the area.

Because the specific locations and designs of all future buildings were not available, the 2006 LRDP EIR evaluated the overall change in visual character based on an Illustrative Development Scenario. This scenario assumed that three new buildings would be constructed in the area of the proposed project. The 2006 LRDP EIR included a visual simulation of this assumed development as observed from nearby residential areas, and conservatively concluded that the impact on visual quality and character would be significant and unavoidable. As more detailed design of the Helios project is now available, a project-specific discussion will be included in the Helios project EIR.

d. **Potentially Significant Impact.** The project would create new sources of light and glare, including expansive windows, metal and steel materials, and a surface parking lot. During the day, sunlight could reflect off the windows and the metal and steel materials of the buildings, and the cars using the surface parking lots, 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. The 2006 LRDP EIR evaluated potential light and glare impacts from the proposed development of the Lab site (LRDP Impact VIS-4), and concluded that with mitigation the impact would be less than significant. Although the proposed project is within the 2006 LRDP scope of development, and more detailed design information shows that the impact of the proposed project is adequately addressed in the 2006 LRDP EIR and will be reduced to a less-than-significant level with implementation of LRDP mitigation measures the light and glare impact will be further discussed in the Helios project EIR.

6.2 Agricultural Resources

6.2.1 Background

The Initial Study for the 2006 LRDP, prepared as part of the EIR scoping process concluded that development on Lab site would not result in the loss of farmland, conflict with Williamson Act contracts, or result in the conversion of adjacent agricultural land to urban uses. The LBNL site does not contain any designated or actively farmed land. The project site is currently undeveloped and characterized by seasonal grasses and dense vegetation along the hillside. The soil types present are not suitable to support agriculture. Furthermore, the project site is considered "Other Land" by the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP). This land classification includes, "low density rural development, brush, timber, wetland, and riparian areas not suitable for livestock grazing." Vacant and non-agricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as "Other Land" as well. FMMP land classifications that surround the project site are "Urban and Built-Up" land. Therefore, development of the project site would not result in the conversion of agricultural land to urban uses.

6.2.2 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
AGRICULTURAL RESOURCES - In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

DISCUSSION:

a.-c. **No Impact.** The project site is located in a developed area. According to the 2006 LRDP EIR, there are no Williamson Act Contracts within the boundaries of LBNL. The project would not result in the conversion of farmland to a non-agricultural use on-site and off-site because there is no farmland within LBNL or in the vicinity of the Lab. Therefore, implementation of the project would not impact agricultural resources, and no further analysis is required.

6.3 Air Quality

6.3.1 Background

Section IV.B of the 2006 LRDP EIR addresses the air quality effects of Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.B of the 2006 LRDP EIR.

The project area is subject to air quality planning programs developed in response to both the Federal Clean Air Act (CAA) and the California Clean Air Act (CCAA). In the Lab vicinity, within the San Francisco Bay Area, air quality is monitored, evaluated, and regulated by the U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and Bay Area Air Quality Management District (BAAQMD).

LBNL

The Lab is located in Alameda County, which, along with eight other counties, is within the San Francisco Bay Area Air Basin (SFBAAB or Basin).

Air pollutants are emitted by a variety of sources, including mobile sources such as automobiles; stationary sources such as manufacturing facilities, power plants, and laboratories; and area sources such as homes and commercial buildings. While some of the air pollutants that are emitted need to be examined at the local level, others are predominantly an issue at the regional level. For instance, ozone (O_3) is formed in the atmosphere in the presence of sunlight by a series of chemical reactions involving oxides of nitrogen (NO_x) and reactive organic gases (ROG). Because these reactions are broad-scale in effects, ozone typically is analyzed at the regional level (i.e., in the Basin) rather than the local level. On the other hand, other air pollutants such as sulfur dioxide (SO_2), respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), carbon monoxide (CO), lead (Pb), and toxic air contaminants (TAC) are a potential concern in the immediate vicinity of the pollutant source because the pollutants are emitted directly or are formed close to the source. Therefore, the study area for emissions of SO_2, PM_{10}, $PM_{2.5}$, CO, Pb, and TAC is the local area nearest the source, such as in the vicinity of congested intersections, whereas the study area for regional pollutants such as NO_x and ROG is the entire Basin.

Air pollutants typically are categorized as criteria pollutants or TACs. The criteria pollutants are those regulated at the federal level by US EPA and at the state level by CARB. These include O_3, PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, and Pb. O_3 is a secondary pollutant formed during photochemical reactions with precursor pollutants. As such, O_3 is measured by assessing emissions of its precursors, Reactive Organic Gases (ROG) and NO_2. Sources of criteria pollutants at the Lab include automobiles and heating equipment.

TACs are airborne pollutants for which there are no air quality standards but that are known to have adverse human health affects. Examples include aromatic and chlorinated hydrocarbons, certain metals, and asbestos. Adverse health effects can be carcinogenic, short-term (acute) noncarcinogenic, and long-term (chronic) noncarcinogenic. TACs are generated by a number of sources, including stationary sources such as dry cleaners, gas stations, combustion sources, and laboratories; mobile sources such as automobiles and trucks, particularly diesel-fueled vehicles; and area sources, such as farms, landfills, construction sites, and residential areas. Sources of TACs around the Lab include diesel buses and

trucks; laboratory vent emissions; boilers in individual buildings; emergency generators; and painting operations.

Air quality in the Basin is monitored by the BAAQMD and CARB. Based on pollutant concentrations measured at monitoring stations within the Basin, the SFBAAB is classified as being in attainment or non-attainment of federal and state air quality standards. The Basin is in attainment or unclassified for all federal and state standards except for the state and federal O_3 standards and the state standards for particulate matter. The SFBAAB is designated nonattainment for the state O_3 1-hour standard, nonattainment for the federal O_3 8-hour standard, and nonattainment for the state PM_{10} and state $PM_{2.5}$ standards.

Some groups of people are considered more sensitive to adverse effects from air pollution than the general population. These groups are termed sensitive receptors. Sensitive receptors include children, the elderly, and people with existing health problems, who are more often susceptible to respiratory infections and other air quality-related health problems. Schools, childcare centers, hospitals, and nursing homes are all considered sensitive receptors. Air pollution impacts are assessed, in part, based on potential effects on sensitive receptors.

Project Site

The project site is not within 1/4 mile of any sensitive receptors. There are no hospitals or nursing homes in the project vicinity. Vehicles are the primary sources of air pollution in the vicinity of the project site. Other sources of emissions in the vicinity of the project site include emergency generators associated with various existing buildings, and fume hoods located in laboratories, which are vented to the roofs of laboratory buildings.

6.3.2 2006 LRDP EIR Analysis

Consistent with BAAQMD Guidelines, the 2006 LRDP EIR evaluated the impact of the LRDP on air quality by focusing on the plan's consistency with the most recently adopted air quality plan (in this case the Bay Area 2005 Ozone Strategy Plan). The 2006 LRDP EIR did not evaluate odor impacts because there is no history of odor complaints from LBNL and the site is fairly distant from off-site receptors.

Impacts on air quality from Lab growth under the 2006 LRDP through 2025 are evaluated in Section IV.B of the 2006 LRDP EIR. The analysis concluded that all air quality impacts would be either less than significant or less than significant with mitigation with one exception. With respect to LRDP Impact AQ-6, the 2006 LRDP EIR concluded that even though cumulative emissions of TACs would decrease, implementation of the 2006 LRDP in combination with other contributing projects would produce cumulative emissions of TACs that would result in an excess cancer risk that exceeds 10 in one million.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.3.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
AIR QUALITY - Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☒	☐	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒
f) Expose people to substantial levels of toxic air contaminants (TACs), such that the exposure could cause an incremental human cancer risk greater than 10 in one million or exceed a hazard index of one for the maximally exposed individual?	☒	☐	☐	☐

DISCUSSION:

a.-c. **Potentially Significant Impact.** The project site is located in the SFBAAB, which is currently designated a non-attainment area for PM_{10} and ozone. Project-related increases in LBNL employees, laboratory space, equipment, and construction activities would be likely to add incrementally to regional ambient air pollutant emissions including short- and long-term emissions of criteria air pollutants from mobile and stationary sources, including PM_{10} and ozone. LRDP Impact AQ-1 identified construction emission of fugitive dust as a potentially significant impact. The BAAQMD has developed mitigation measures to

reduce the fugitive dust impact for construction activities. These measures and additional construction mitigation identified in the 2006 LRDP EIR will be discussed in the Helios project EIR. LRDP Impact AQ-2 estimated the total emissions from all development under the 2006 LRDP and found that these emissions would be below the BAAQMD thresholds for criteria pollutants. The 2006 LRDP EIR therefore concluded that no individual project proposed under the 2006 LRDP would result in air emissions in excess of BAAQMD thresholds and no further evaluation would be necessary. Although the proposed project is within the scope of development of the 2006 LRDP, the project-specific impact will be further discussed in the Helios project EIR.

d. **Less than Significant Impact.** The 2006 LRDP EIR evaluated the potential for traffic associated with full development under the 2006 LRDP to expose sensitive receptors to high carbon monoxide (CO) concentrations in the area of congested intersections (LRDP Impact AQ-3) and other pollutants. The analysis concluded that the CO concentrations would not exceed air quality standards. The 2006 LRDP EIR also found that individual projects under the 2006 LRDP would not cause an exceedance of an air quality standard for CO. Because the impact was adequately analyzed in the 2006 LRDP EIR, no further project-level analysis is required.

e. **No Impact.** There is no history of odor complaints from LBNL and the Lab site is fairly distant from off-site receptors. Ongoing activities from the proposed project are not expected to create nuisance or objectionable odors affecting substantial numbers of people, particularly off-site. Therefore no impact related to objectionable odors would occur and no further project-level analysis is required.

f. **Potentially Significant Impact.** Development of the proposed Helios project would add research facilities that would be potential sources of toxic air contaminants (TACs). The 2006 LRDP EIR included a health risk assessment that evaluated the impact related to incremental carcinogenic and non-carcinogenic human health risk from exposure to TACs associated with Lab growth (LRDP Impact AQ-4) and cumulative growth in TACs (LRDP Impact AQ-6). This analysis assumed the operation of a similar sized research laboratory in the general area where the Helios project is currently proposed. The 2006 LRDP EIR found LRDP Impact AQ-4 to be less than significant with mitigation. However the EIR concluded that the cumulative impact related to TACs (LRDP Impact AQ-6) would be significant and unavoidable. Although the TAC emissions associated with the Helios project were included in the Lab-wide HRA and the risk from this proposed facility is already accounted for in the 2006 LRDP EIR analysis, a project-specific discussion will be included in the Helios project EIR to confirm that the previous analysis is still valid and the project will not result in a significant impact related to human health risk.

6.4 Biological Resources

6.4.1 Background

Section IV.C of the 2006 LRDP EIR addresses the effects on biological resources from Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.C of the 2006 LRDP EIR as it relates to the proposed project.

LBNL

Similar to other developed areas in the Berkeley-Oakland hills, the Lab site is characterized by clusters of development interspersed with open space that contains a mosaic of vegetation types and wildlife habitats, including oaks and mixed hard wood forests, native and non-native grasslands, chaparral, coast scrub, marsh and wetland communities, and riparian scrubs and forests. Grasslands are the predominant plant community and make up approximately 67 acres of the Lab site. Grasslands consist mostly of annual grasses either as open grassland or as an understory in relatively open eucalyptus and pine stands. Eucalyptus stands are the second most dominant plant community with approximately 22 acres under such stands. Oak-Bay woodland is found on about 12 acres of the site and consists of a mix of coast live oaks and California bay. Coast live oak woodland occurs over 9 acres at the Lab and California bay woodland occurs on 5.5 acres of the site, and is concentrated mainly in the drainages. Coastal scrub occurs on approximately 8.5 acres at the Lab and includes both California sagebrush scrub and coyote brush scrub. Developed areas at the Lab have been landscaped with non-native ornamentals in the past and native and drought resistant plants in recent years.

The 2006 LRDP EIR evaluated the potential for the Lab site to support special status plant and wildlife species. Based on the evaluated species, the EIR noted that five special status plant species and 21 special status wildlife species had at least a moderate potential to occur on the Lab site. The EIR also determined that four habitats at the Lab site qualified as sensitive habitats, including known habitat of Lee's micro-blind harvestman, potential Alameda whipsnake habitat, critical Alameda whipsnake habitat, and riparian and wetland habitat.

Project Site

The Helios project site is located in an area that has previously been graded and disturbed in conjunction with the construction of the buildings in the Material Science Research cluster and a service road. The site currently supports small patches of annual grassland and scrub vegetation. Chicken Creek is approximately 250 feet to the west of the project site. A small seep is located south of the project site.

6.4.2 2006 LRDP EIR Analysis

Impacts on biological resources from Lab growth under the 2006 LRDP through 2025 are evaluated in Section IV.C of the 2006 LRDP EIR and are incorporated herein by reference. The 2006 LRDP EIR analysis concluded that all impacts to biological resources would either be less than significant or would be reduced to a less than significant level with the proposed mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design, and will be

implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.4.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
BIOLOGICAL RESOURCES - Would the project:				
a) 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 the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
c) 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?	☒	☐	☐	☐
d) 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?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☒	☐	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

DISCUSSION:

a. **Potentially Significant Impact.** There may be suitable habitat for the Alameda whipsnake, Fringed and Long-Eared Myotis, and other plant and animal special-status species on or in the vicinity of the project site. In 2000, the U.S. Fish and Wildlife Service (USFWS) designated a substantial portion of the eastern LBNL site as critical habitat for the Federally threatened Alameda whipsnake species. There have never been reported sightings of the Alameda whipsnake at LBNL. A previous LBNL survey prepared by a whipsnake specialist designated most of the USFWS designated land as not "colonizable" by the Alameda whipsnake species (LRDP 2007). In 2003, the critical habitat listing for the Alameda whipsnake was vacated for the LBNL site. A relatively small area of LBNL (about 5 acres) had been designated as Critical Habitat for the species. This area is located at LBNL's eastern end, distant from the project site. However, LBNL continues to evaluate all undeveloped portions of the Lab with respect to sensitive habitat for the Alameda whipsnake.

Due to the nationwide decline of bat populations, a number of bat species have been listed by the USFWS as species of special concern. Both the Fringed and Long-Eared Myotis are bat species of concern that may occur at LBNL. These bats use crevices in exfoliating tree bark and/or hollow cavities located in trees at LBNL, as well as abandoned buildings.

Potential impact to special status wildlife species from Lab growth, including the proposed project, are addressed under LRDP Impacts BIO-1 and BIO-3 in the LRDP EIR and mitigation measures are proposed that would reduce the impacts to a less than significant level. Although special status species impacts are adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be discussed in the Helios project EIR.

b. **Potentially Significant Impact.** There are no existing drainages or other sensitive communities on the Helios project site. Although this impact is adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be discussed in the Helios project EIR.

c. **Potentially Significant Impact.** LRDP Impact BIO-2 in the 2006 LRDP EIR discusses the potential for the 2006 LRDP development to affect wetlands. There is a small seep, near the Helios project site containing wetland vegetation. There is the potential that project-related grading and paving could alter groundwater flow to this seep. Although, this impact is adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be discussed in the Helios project EIR.

d. **No Impact.** Although there could be some wildlife movement in the project vicinity, the project site is located near developed areas and is not part of an established wildlife movement corridor or a native wildlife nursery site. There would be no impact and no further analysis is required.

e. **Potentially Significant Impact.** The proposed project would remove dense vegetation including trees in the area where the proposed access road would connect to Centennial Drive. Project consistency with policies related to biological resources in the LBNL 2006 LRDP and the UC Berkeley LRDP will be discussed and evaluated in the Helios project EIR. The impact related to removal of native and nonnative vegetation was evaluated under LRDP Impact BIO-1 in the LRDP EIR and determined to be less than significant. Although, this impact is adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be further discussed in the Helios project EIR.

f. **No Impact.** No Habitat Conservation Plans or Natural Community Conservations Plans have been adopted that encompass the project area. Therefore no impact would occur and no additional analysis is required.

6.5 Cultural Resources

6.5.1 Background

Section IV.D of the 2006 LRDP EIR addresses the effects on cultural resources from development under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.D of the 2006 LRDP EIR.

LBNL site history presented in the 2006 LRDP EIR 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; a cultural resources evaluation and survey; an archaeological survey report; and the first of a series of reports being prepared as part of an inventory and evaluation of potential historically significant buildings and structures at LBNL.

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. Special attention was 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 National Register of Historic Places.

Current Studies of Historical Resources

To evaluate the potential for historically significant buildings or structures, LBNL has 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, 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 will complete 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. These reports will then 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.

6.5.2 2006 LRDP EIR Analysis

Impacts on cultural resources from Lab development under the 2006 LRDP through 2025 are evaluated in Section IV.D of the 2006 LRDP EIR and incorporated herein by reference. The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.5.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
CULTURAL RESOURCES - Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries	☐	☐	☒	☐

DISCUSSION:

a. **Less than Significant Impact.** As described under Impact CUL-1 of the 2006 LRDP EIR, implementation of the 2006 LRDP could cause a substantial adverse change in the significance of historical resources, as defined in *CEQA Guidelines* Section 15064.5, including historical resources that have not yet been identified. As assessed in the 2006 LRDP EIR, demolition or substantial alteration of the existing buildings and structures in the area of potential effects (APE) would cause a substantial adverse change in the significance of historic resources. The adopted LRDP Mitigation CUL-1, which requires the completion of the ongoing surveys and research, including the development of a Memorandum of

Agreement (MOA) among the Department of Energy, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation, would minimize impacts to historic buildings or structures.

The project does not include any demolition of existing buildings. The proposed project is within the 2006 LRDP APE. However, since no demolition would occur, no project-level impact on historic resources would occur and the project would not contribute to the significant and unavoidable impact identified in the 2006 LRDP EIR with respect to loss of historic resources. No project specific mitigation measures are required. There would be no impact related to historical resources and no further analysis is required.

Comments on the 2006 LRDP Draft EIR raised the possibility that Strawberry Canyon could be considered a cultural landscape and that activities under the 2006 LRDP could affect the integrity of such an area. Some individuals have suggested that Strawberry Canyon should not be altered because it is a potential cultural landscape. 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.

As discussed in the 2006 LRDP Final EIR, 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 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, the City does not have an ordinance to designate cultural landscapes, the landscape 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 CRHR or NRHP, the State Historical Resources Commission (and NPS 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.

Cumulative Impacts

As concluded in the 2006 LRDP EIR, implementation of the 2006 LRDP would not combine with other cumulative projects to result in an adverse change to the significance of historical resources that share historic significance with resources that could be lost at LBNL (Impact CUL-5).

The Southeast Campus Integrated Projects (SCIP) are included in the 2006 LRDP EIR for purposes of cumulative analyses. The UC Berkeley Southeast Campus Integrated Projects (SCIP) would result in significant and unavoidable impacts with regard to historical resources due to changes to Memorial Stadium, demolition of several structures, and alterations to buildings and landscape along Piedmont Avenue. For the most part, the buildings and facilities that would be adversely affected by the SCIP do

not share historical associations with other facilities at LBNL. However, there is one potential exception: Calvin Laboratory, a UC Berkeley building occupied by LBNL staff and researchers that would be demolished under the SCIP. Although constructed in 1964 and therefore less than 50 years old—the normal minimum age for consideration for designation as a historical resource—Calvin Laboratory was identified in the SCIP Draft EIR as a historical resource because of its association with Melvin Calvin, a Nobel laureate who made significant contributions to science, especially in his research on photosynthesis.

The 2006 LRDP EIR concludes that the 2006 LRDP would not adversely affect buildings with particular historical association to Melvin Calvin, whose pioneering work was undertaken in facilities on the UC Berkeley campus. Moreover, it would be the UC Berkeley SCIP that would demolish Calvin Laboratory. Therefore, the LBNL 2006 LRDP would not result in a considerable contribution to any cumulative adverse impact on historical resources related to association with Melvin Calvin.

b., d. **Less than Significant Impact.** There is a potential that undiscovered archaeological resources could be discovered during construction. The adopted 2006 LRDP Mitigation Measure CUL-3, which requires work stoppage and archaeological assessment in the event of a discovery during construction, is incorporated in the project to minimize impacts to undiscovered archaeological resources (Impact CUL-3). The adopted 2006 LRDP EIR Mitigation Measure CULT-4, also included in the proposed project, provides for work stoppage and appropriate treatment and Native American involvement in the event of the discovery of human remains. With the inclusion of these measures in the proposed project, the potential for the project to result in impacts to any historical resources, archaeological resources or human remains that might be discovered during construction would be less than significant. Further evaluation is not required.

Cumulative Impacts

Concerning potential cumulative impacts on cultural resources, the areas surrounding LBNL are either built out or would be retained as open space under the 2006 LRDP, thus limiting development opportunities in undisturbed areas. Therefore, the potential for the proposed LRDP to result in the discovery of other cultural resources is low. As there are no known or reasonably foreseeable projects in the immediate areas adjacent to LBNL that could combine with LRDP projects, cumulative impacts on cultural resources would not be considered significant.

Furthermore, as specific projects are proposed in the vicinity and LBNL and in the region, lead agencies would have to determine, on a case-by-case basis, whether the potential for historical or archaeological resources to be disturbed or adversely affected exists at a particular site. Therefore, site-specific research on the presence of historical and/or archaeological resources is frequently one of the first considerations in project planning and CEQA review. Accordingly, while it cannot be stated with certainty the nature of the cumulative impact, the fact that the 2006 LRDP impacts would be relatively minimal, combined with the site- and project-specific considerations that must be given to subsequent projects elsewhere in the vicinity and the region, implementation of the 2006 LRDP is not expected to result in a considerable contribution to any potential cumulatively significant effects on historical and archaeological resources.

c. **No Impact.** The 2006 LRDP Initial Study found that the 2006 LRDP would have no significant impact on a unique paleontological resource or site or a unique geologic feature at LBNL. During the course of development at LBNL, extensive excavation for buildings and infrastructure has not revealed the presence of unique paleontological or geologic resources, and thus implementation of the 2006 LRDP would not

affect such resources. No impact would occur with implementation of the proposed project and further analysis is not required.

6.6 Geology and Soils

6.6.1 Background

Section IV.E of the 2006 LRDP Final EIR addresses the effects related to geology and soils from Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project, pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.E of the 2006 LRDP EIR.

LBNL

The LBNL site is located on the western slopes of the Berkeley-Oakland hills within the central region of the Coast Range Geomorphic province. The Miocene Orinda Formation, composed of poorly indurated non-marine mudstone and sandstone underlies most of the site. The western and southern portions are underlain by older marine mudstone and sandstone deposits. Some of the higher elevation portions of the site and a portion of the eastern part of the site are underlain by Moraga Formation rocks, and a small portion of the eastern extent of the site is underlain by shallow marine sandstones of the Claremont Formation. The entire site is mapped by the California Department of Conservation, Geologic Survey (CGS) as MRZ-1, an area where no significant mineral or aggregate deposits are present. The majority of the site soils are Xerorthents-Millsholm complex, 30 to 40 percent slope. These soils are well-drained and susceptible to erosion. Other soil types on the site include Altamont Clay, Mayhem loam, and Mayhem-Los Gatos complex, all soil types highly susceptible to erosion.

The Hayward Fault and associated Earthquake Fault Zone traverses the western edge of the Lab site near the Blackberry Canyon Gate. The San Andreas Fault Zone is approximately 19 miles southwest of the Lab. According to the USGS Working Group on California Earthquake Probabilities estimates, there is a 27 percent chance of an earthquake of M 6.7 on the Hayward-Rodgers Creek Fault system by 2032 and a 21 percent chance of an earthquake of M 6.7 on the San Andreas Fault by 2032. The Lab site is expected to experience strong ground shaking from a seismic event on any of the Bay Area major faults. CGS has designated much of the LBNL site as a Seismic Hazard Zone for earth-quake induced landslides. The CGS has not designated any portion of the Lab site as a Seismic Hazard Zone for liquefaction.

Project Site

The Helios Project site is located in the eastern portion of the Lab site. According to previously prepared geotechnical evaluations, the proposed project is characterized by sandstone and shale bedrock in the western portion of the site. Areas in the eastern portion of the site are characterized by Orinda formation bedrock.

6.6.2 2006 LRDP EIR Analysis

Impacts related to geology and soils from Lab growth under the 2006 LRDP through 2025 are evaluated in Section IV.E of the 2006 LRDP EIR and incorporated herein by reference. The 2006 LRDP EIR analysis concluded that all impacts related to geology and soils would either be less than significant or would be reduced to a less than significant level with the proposed mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design, and will be

implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.6.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
GEOLOGY AND SOILS - Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) 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 Division of Mines and Geology Special Publication 42.	☒	☐	☐	☐
ii) Strong seismic ground shaking?	☒	☐	☐	☐
iii) Seismic-related ground failure, including liquefaction?	☒	☐	☐	☐
iv) Landslides?	☒	☐	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☒	☐	☐	☐
c) 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- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☒	☐	☐	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☒	☐	☐	☐
e) 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?	☐	☐	☐	☒

DISCUSSION:

a. i-iv. **Potentially Significant Impact.** The LBNL site is located in the San Francisco Bay Area, a seismically active region, and as such is exposed to some risk of impacts related to seismic activity. The San Andreas Fault is located about 19 miles west of the Lab site. The Hayward fault runs through the western part of the LBNL site. The United States Geologic Survey (USGS) has determined that there is a 62 percent probability that a 6.7 magnitude earthquake will occur in the San Francisco Bay Area before the year 2032 on the Hayward Fault. The 2006 LRDP EIR evaluated the potential for seismic-related impacts to life and property from the development proposed under the 2006 LRDP, including the proposed project (LRDP Impact GEO-2). That evaluation revealed that with the incorporation of Mitigation Measure GEO-2 (which calls for implementation of the recommendations of a site specific geotechnical investigation for each project site), the impact would be reduced to a less than significant level.

The project site is not within a designated Alquist-Priolo Earthquake Fault Zone and there is no potential for fault rupture on the project site. Although, this impact is adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be further discussed in the Helios project EIR. In conformance with LRDP Mitigation Measure GEO-2, the recommendations of a detailed geotechnical investigation for Helios project will be incorporated into the building design. The results of the investigation will be summarized in the Helios project EIR.

b. **Potentially Significant Impact.** Impact GEO-3 in the 2006 LRDP EIR discusses erosion associated with construction under the 2006 LRDP and includes mitigation measures to minimize the impact. The project site is located on a hillside. Given this, significant grading would occur during construction of the Helios building, parking lot, and access road. Because construction would disturb soils, these areas may be subject to erosion by rain splash and overland flow of storm water for the duration of any construction activities. This runoff could loosen soil that could discharge sediment into storm drains and to surrounding ephemeral drainages that drain to Centennial Drive. Bank erosion could cause sedimentation downstream resulting in potential flooding during times of heavy rain. LRDP mitigation measures would be implemented in conjunction with the proposed project. The potentially significant disturbance of hillside areas would be reduced to a less than significant impact with implementation of LRDP mitigation measures. Although this impact is adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be further discussed in the Helios project EIR.

c.-d. **Potentially Significant Impact.** The project site is mainly situated on Xerorthents-Millsholm complex, 30 to 50 percent slope. These are well-drained soils that generally allow for rapid runoff of precipitation and are highly susceptible to erosion. With implementation of the recommendations of a site-specific geotechnical investigation, impacts related to unstable or expansive geologic units would be reduced to a less than significant level. Although this impact is adequately addressed by the 2006 LRDP EIR analysis, the project-specific impact will be further discussed in the Helios project EIR.

e. **No Impact.** The project site is currently surrounded by developed land uses and sewers are available for the disposal of wastewater. Therefore, implementation of the project would not require the construction of septic tanks for wastewater disposal. No further analysis is required.

6.7 Hazards and Hazardous Materials

6.7.1 Background

Section IV.F of the 2006 LRDP EIR addresses impacts related to hazards and hazardous materials from the growth of the Lab under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.F of the 2006 LRDP EIR.

Definition of Hazardous Materials

The term hazardous material is defined in different ways for different regulatory programs. The 2006 LRDP EIR uses the definition given in California Health and Safety Code Section 25501(o), which defines hazardous material as:

> …any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

Hazardous materials include, but are not limited to, hazardous substances, hazardous wastes, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

In addition to hazardous chemicals, biohazardous and radioactive materials are also used in laboratories at LBNL.

LBNL Hazardous Materials Plans and Policies

LBNL has developed an Integrated Safety Management (ISM) System that establishes environment, safety and health policies and procedures to ensure all work is performed safely and in a manner that strives for the highest protection for the employees, guests, visitors, the public and the environment. In addition, the Lab has developed an Environmental Management System to implement sound environmental stewardship practices that protect the air, water, land and other resources that could potentially be affected by facility operations. The LBNL Environment, Health, and Safety (EH&S) Division has the primary responsibility of developing strategies for compliance with local, state, and federal laws and regulations. EH&S has the authority to require abatement of any condition or operation that could endanger people or facilities at the Lab or result in violations of pertinent federal or state laws or Lab policies concerning health and safety. EH&S develops specific policies and programs in the following areas: industrial hygiene, chemical safety, physical safety, radiation safety, biohazard safety, hazardous waste management, and environmental protection.

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 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.

Other Hazards

Other potential hazards at LBNL include the presence of asbestos, lead based paints, PCBs, and radioactive materials in Lab structures; soil and groundwater contaminations in some areas of the Lab due to historical releases of hazardous and radioactive materials. Prior to demolition of older structures, the Lab conducts surveys to identify locations where hazardous substances are present and to establish procedures to safely remove the substances. The Lab is also performing remediation and monitoring of contamination in groundwater using about 150 groundwater monitoring wells located throughout the Lab and one additional well located off-site.

Similar to other developed hillside areas, the Lab's developed areas are interspersed with grassland areas and groves of trees. The Lab implements a vegetation management program to minimize the risk of wildland fires. In addition, Alameda County Fire Station 19 is located on the Lab site.

Project Site

The proposed Helios Project would include laboratories that will involve the use of hazardous chemicals and other scientific materials. However, the project site is not within ¼ mile of any schools or childcare centers. The project site is located within a grassland area with a small amount of scrub vegetation and is near the Chicken Creek riparian area.

6.7.2 2006 LRDP EIR Analysis

Impacts related to hazards and hazardous materials from Lab growth under the 2006 LRDP through 2025 are evaluated in Section IV.F of the 2006 LRDP EIR and are incorporated herein by reference. The 2006 LRDP EIR analysis concluded that all hazards and hazardous materials related impacts would either be less than significant or would be rendered less than significant by the proposed mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.7.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
HAZARDS AND HAZARDOUS MATERIALS- Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☒	☐	☐	☐

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
b) 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?	☒	☐	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☒	☐	☐	☐
e) For a project located within an airport land use plan or, where such plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☒	☐	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wild land fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands?	☒	☐	☐	☐

DISCUSSION:

a.,b.,d. Potentially Significant Impact. The project would be subject to both state and federal laws pertaining to hazardous materials and wastes.

As discussed in the 2006 LRDP EIR, Impact HAZ-2, excavation, grading, and dewatering associated with future construction activities could encounter soil or groundwater that has been affected by hazardous

materials use at LBNL. For example, future construction activities could require the removal of USTs or ASTs, which would occur in compliance with state tank regulations. Soil and/or groundwater sampling performed at the time of tank removal could reveal previously unknown petroleum hydrocarbon impacts. Building demolition activities could also allow testing and/or remediation of suspected or known soil contamination in areas that were previously inaccessible.

LBNL has performed site investigations for soil and groundwater contamination in accordance with requirements of the RCRA Corrective Action Program. Human health and ecological risk assessments performed under the program have identified areas of potential hazards. Groundwater contamination has been detected at a number of locations, and corrective action measures have been implemented to address the contamination. Construction activities at some locations, including former USTs for which LBNL has received case closure, have the potential to encounter soil that contains residual petroleum hydrocarbon contamination. Improper handling or disposal of contaminated soil or groundwater associated with future laboratory and facility expansion could expose construction workers, the public, and the environment to hazardous conditions.

The most recently published (2001) California Hazardous Waste and Substances List, compiled in accordance with Government Code Section 65962.5 and more commonly known as the Cortese List, included six locations within LBNL: Buildings 7E, 50, 62, 69, 74, and 76. These sites were included due to the presence of leaking USTs. LBNL has received case closure from the City of Berkeley and San Francisco Bay RWQCB for these former USTs. Of these sites, Building 62 is the closest to the project site and the proposed access road would run adjacent to this building.

As discussed in LRDP Impact HAZ-3 in the 2006 LRDP EIR, the quantity of hazardous waste, low-level radioactive waste, mixed waste, and medical waste generated at LBNL is also expected to increase, particularly as laboratory space and functions increase. Future generation, handling, storage, and transport of these types of wastes would continue to be subject to applicable federal, state, and local requirements. Additional mitigation measures are identified in the 2006 LRDP EIR (Mitigation Measures HAZ 3a-3f) to reduce impacts associated with hazardous materials; conformance, with those measures would reduce the proposed project's impacts to a less than significant level. Impacts associated with handling, storage, use and disposal of hazardous materials will be discussed in the Helios project EIR.

c. **Less than Significant Impact.** There are no public or private elementary, middle, or high schools within one-quarter mile of the Lab, although there are several day-care/child-care centers and preschools. Portions of the UC Berkeley campus are also within one-quarter mile of LBNL. Compliance with federal, state, and local rules and regulations, and Mitigation Measures HAZ-3a through HAZ-3f from the 2006 LRDP EIR, would reduce potential impacts to nearby schools associated with the handling of hazardous materials and wastes to a less-than-significant level. No further analysis is required.

e. **No Impact.** The project site is more than 11 miles northeast of the Oakland Metropolitan Airport, and lies outside the boundaries of the Alameda County Airport Land Use Commission Plan for the Oakland Metropolitan Airport. Therefore, implementation of the project would not expose people on the project site to hazards from aircraft overflights. No further analysis is required.

f. **No Impact.** The project site is not located within the vicinity of a private airstrip. Therefore, implementation of the project would result in not result in any safety hazards related to private airstrips. No further analysis is required.

g. **Potentially Significant Impact.** As discussed in LRDP Impact HAZ -5, development under the 2006 LRDP, including the proposed project, would increase the number of people and the amount of property that could be exposed to regional, compounded, or terrorist-related catastrophic events. Regionally catastrophic events could include earthquakes or fires of sufficient magnitude to impair regional emergency support and service systems such that LBNL could not expect to receive aid from external sources. The proposed project would contribute to the increase in people and amount of property that could be exposed to catastrophic events. The 2006 LRDP EIR identifies preventative measures that would apply to the proposed project which would ensure that the impact would be less than significant. This project-specific impact will be discussed in the Helios project EIR.

h. **Potentially Significant Impact.** LRDP Impact HAZ-6 in the 2006 LRDP EIR discusses wildland fires and risk to humans and structures associated with wildland fires. Development of the proposed project would increase both laboratory and other facility space at the LBNL hill site. Although this development would meet required safety standards and fire codes at the time of individual facility construction, wildland fire hazards would continue to threaten the LBNL site. Although this impact is adequately addressed in the 2006 LRDP EIR and was found to be less than significant, the project-specific impact will be discussed in the Helios project EIR.

6.8 Hydrology and Water Quality

6.8.1 Background

Section IV.G of the 2006 LRDP EIR addresses the hydrology and water quality effects of Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.G of the 2006 LRDP EIR.

LBNL

Surface Water Hydrology

The Lab is located within the Blackberry and Strawberry Creek watersheds in the East Bay Hills, with the majority of the Lab site in the Strawberry Creek Watershed. This watershed is about 2,066 acres, of which about 202 acres or 10 percent are within the Lab site. The northwestern portion of the Lab site drains to the North Fork of Strawberry Creek whereas the majority of the Lab site drains to the South Fork. A number of smaller drainages discharge into the South Fork, including Ravine Creek, Chicken Creek, No Name Creek, and Botanical Garden Creek. Runoff from the Lab site that drains into the South Fork of Strawberry Creek is routed into a mid-canyon retention basin from where it is released downstream at flow rates consistent with the design parameters of the storm drainage systems of UC Berkeley and the City of Berkeley. Runoff from the Lab site that drains into the North Fork exits the Lab site at the bottom of Blackberry Canyon from where it flows through a series of check dams and settlement basins before entering the City's storm water system.

Groundwater Resources

Groundwater at LBNL occurs at depths ranging from zero feet to approximately 100 feet below ground surface. Groundwater flow patterns generally reflect the site topography with groundwater flowing to the south for the vast majority of the site. Groundwater at the site is not used for potable or irrigation uses.

Flooding

The Lab site is not located within a 100-year flood plain as determined by the Federal Emergency Management Agency flood hazard mapping.

Surface Water and Groundwater Quality

LBNL has had a storm water management program in place since 1992. This program is designed to control pollution of surface waters. Groundwater in some portions of the Lab site has been affected by accidental releases of hazardous and radioactive materials. LBNL is implementing a remediation and monitoring program to address the groundwater contamination.

Project Site

The proposed Helios Project site is located in the Chicken Creek subwatershed of the South Fork of Strawberry Creek. All portions of the project site currently are pervious.

6.8.2 2006 LRDP EIR Analysis

Impacts on hydrology and water quality from Lab growth under the 2006 LRDP are evaluated in Section IV.G of the 2006 LRDP EIR and are incorporated herein by reference. The LRDP EIR analysis concludes that all hydrology and water quality impacts of Lab growth under the 2006 LRDP would be less than significant. No mitigation measures related to hydrology and water quality impacts are identified in the 2006 LRDP EIR. The proposed project is within the scope of analysis of the 2006 LRDP EIR.

6.8.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
HYDROLOGY AND WATER QUALITY- Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, which would result in substantial erosion or siltation on- or off-site?	☒	☐	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?	☒	☐	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☒	☐	☐	☐

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
f) Otherwise substantially degrade water quality?	☒	☐	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

DISCUSSION:

a.,c.-f. Potentially Significant Impact. Water quality is regulated by both state and federal agencies under the authority of the Clean Water Act. Projects that have the potential to degrade water quality are subject to the regulations of those agencies. Operational activities may involve common urban pollutants such as surface litter, oil, gasoline, grease, paint, fertilizers, pesticides, and herbicides. Construction activities involving soil disturbances such as excavation, demolition, stockpiling, and grading activities could result in increased erosion and sedimentation to surface waters, and could produce contaminated storm water runoff, a major contributor to the degradation of water quality. These activities could result in the discharge of pollutants into surface waters resources that would degrade water quality.

As discussed in LRDP Impacts HYDRO-1, HYDRO-2 and HYDRO-3, stormwater runoff from both LBNL and the UC Berkeley campus enters the City of Berkeley storm drain system at the western edge of the UC Berkeley campus, at Oxford Street. The 2006 LRDP EIR determined that the impacts of Lab growth related to runoff would be less than significant. The impervious surfaces associated with the proposed project would be located within the Chicken Creek sub-watershed of Strawberry Creek. Although the impact of potential increased runoff is adequately addressed in the 2006 LRDP EIR, this impact will be further discussed in the Helios project EIR for effects on Strawberry Creek.

The project site is approximately 3 acres. Under the California State Pollutant Discharge Elimination System (NPDES) permit for construction sites (sites one acre or more in size), which is administered by the San Francisco Bay RWQCB, a Stormwater Pollution Prevention Program (SWPPP) must be developed and implemented during construction for minimizing sedimentation and contamination of storm water runoff generated by the project. The SWPPP may include:

- Construction Storm Water Management Controls: these practices minimize the contact of construction materials and equipment with storm water. The SWPPP should include specific requirements that earth-moving equipment not be operated within an active creek

channel. Operation of equipment near creeks should be strictly limited. Both an on-site drainage system connecting to the City's storm water system and on-site source control measures designed to allow filtered storm water to percolate into the ground and to filter storm water prior to leaving the site should be installed.

- Erosion and Sediment Controls: BMPs designed to reduce erosion of exposed soil may include, but are not limited to, soil stabilization controls, watering for dust control, perimeter silt fences, placement of hay bales and sediment basins.
- Post-construction Storm Water Management: these measures prevent storm water pollution associated with post-construction activities at the developed site. Controls may include oil/water separators for the parking lots and contaminant control measures from the laboratory areas. The project occupants would be responsible for long-term maintenance of post-construction storm water controls and monitoring.

Although the 2006 LRDP EIR concluded that impacts associated with water quality and drainage from development under the 2006 LRDP would be less than significant, a project-specific discussion will be included in the Helios project EIR.

b. **Less than Significant Impact.** Water used at LBNL is supplied from the East Bay Municipal Utility District's Shasta Reservoir and Berkeley View Reservoir systems and groundwater at the site is not used by the Lab. The project would not require any groundwater withdrawal. Recharge of the groundwater table would not be affected by implementation of the proposed project because the project would infiltrate storm water to the maximum extent practicable and ensure that storm water flows upon project implementation approximate pre-project storm water flows as discussed in the 2006 LRDP Final EIR. Furthermore, the groundwater in the project area is not used for public water supply. Therefore, a less than significant impact related to groundwater recharge would occur and no further analysis is required.

g.-i. **No Impact.** The project site is not located within the Federal Emergency Management Agency's (FEMA) Flood Zone A (100-year flood zone). The surrounding area is mostly developed and is located approximately 750 feet above sea level, and therefore, existing structures are outside the flood plain with or without the project. The project would not involve the construction of residential structures. Therefore, there would be no impact and no further discussion is required.

j. **No Impact.** Active faults within the San Francisco Bay Area have largely horizontal movement and are not expected to generate significant water waves in the San Francisco Bay. Given the elevation and distance of the project site from the bay's edge, the potential for flooding from a seiche would be minimal. The LBNL location on the eastern hills of the San Francisco Bay Area effectively shields the site from tsunamis. Moreover, given the topography of the project site, there would be minimal impacts from mudflows. Therefore, implementation of the project would result in no impact related to the risk of inundation from seiche, tsunami, or mudflow and no further discussion is required.

6.9 Land Use and Planning

6.9.1 Background

Section IV.H of the 2006 LRDP EIR addresses the effects of Lab growth under the 2006 LRDP on land use and planning and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following summarizes information presented in the 'Setting' subsection of Section IV.H of the 2006 LRDP EIR.

LBNL

The LBNL site covers approximately 200 acres in the eastern hills of Berkeley and Oakland. The site is largely buffered by undeveloped land owned by the University of California, although the northwest corner of the Lab generally abuts residential neighborhoods in the City of Berkeley.

Access to the Lab's hill site is limited to three controlled-access vehicular gates on Cyclotron Road (the main Blackberry Canyon Gate) and Centennial Drive (the Strawberry Canyon and Grizzly Peak gates), all of which are staffed by an on-site security firm contracted by LBNL. Visitors primarily use the Blackberry Canyon Gate. The Grizzly Peak Gate is an exit-only gate after the morning commute hours.

LBNL is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned or controlled by The Regents of the University of California. As such, LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. However, LBNL seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The western part of the LBNL site is within the Berkeley city limits, and the eastern part is within the Oakland city limits.

Project Site

The Helios project site is currently undeveloped. The Helios building would be located on a previously graded portion of the hillside located in the southeastern portion of LBNL. The parking lot would also be located on vacant, previously graded land. To provide access to the project, the project includes improvements to an existing 10-foot wide access road to Centennial Drive. This access road is adjacent to existing buildings and dense hillside vegetation. The access road would extend beyond the property line for LBNL and would be constructed on LBNL and UC Berkeley lands. The 2006 LRDP designates the project site as Research and Academic.

6.9.2 2006 LRDP EIR Analysis

Impacts of Lab growth under the 2006 LRDP through 2025 on land use and planning are evaluated in Section IV.H of the 2006 LRDP EIR and incorporated herein by reference. The LRDP EIR analysis concluded that all land use and planning impacts of Lab growth under the 2006 LRDP would be less than significant. The proposed project is within the scope of analysis of the 2006 LRDP EIR.

6.9.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

DISCUSSION:

a., b. **No Impact.** The project site is located in the southeastern area of the LBNL site. The applicable land use plan is the 2006 LRDP. As described above, the 2006 LRDP designates this area of the Lab as Research and Academic. The proposed Helios project is consistent with this land use designation. The new building space included in the proposed project is within the building space included in the 2006 LRDP program for these uses. The proposed use would not conflict with adjacent uses, which include various research facilities and parking. The project would not disrupt an existing community, or conflict with an applicable land use plan or with adjacent existing or planned uses of adjacent sites. Therefore, no impacts would occur and no further analysis is required.

a. **No Impact.** The project site is not within the purview of any habitat conservation plan or natural community conservation plan, nor would the proposed activity or development affect any area so designated, directly or indirectly. Therefore, no project impact would occur and no further analysis is required.

6.10 Mineral Resources

6.10.1 Background

The Initial Study, prepared as part of the 2006 LRDP EIR scoping process, concluded that development on Lab site would not impede the extraction or result in the loss of availability of mineral resources. According to the State of California Department of Mines and Geology, Mineral Resource Zones and Resource Sectors map, the Lab site is located in an area designated as MRZ-1. This designation refers to an area "where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence." Therefore, development on LBNL in accordance with the 2006 LRDP would not impede extraction or result in the loss of availability of mineral resources.

6.10.2 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
MINERAL RESOURCES - Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

DISCUSSION:

a.-b. **No Impact.** According to the State of California Department of Mines and Geology, Mineral Resource Zones and Resource Sectors map, the project site is located in an area designated as MRZ-1. This designation refers to an area "where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence." Therefore, implementation of the project would not impact mineral resources and no further analysis is required.

6.11 Noise

6.11.1 Background

Section IV.I of the 2006 LRDP EIR addresses the noise effects of Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.I of the 2006 LRDP EIR that is relevant to the proposed project.

Characterization of Noise

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Technically, sound is described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB), and the decibel scale adjusted for A-weighting (dBA) is a special frequency-dependent rating scale that relates to the frequency sensitivity of the human ear.

Community noise usually consists of a base of steady "ambient" noise that is the sum of many distant and indistinguishable noise sources, as well as more distinct sounds from individual local sources. A number of noise descriptors are used to analyze the effects of community noise on people, including the following:

- Leq, the equivalent sound level, which is used to describe noise over a specified period of time, typically one hour.
- DNL, the energy average of the A-weighted sound levels occurring during a 24 hour period, with a 10 dBA "penalty" added to noise occurring during the hours of 10:00 PM to 7:00 AM to account for greater nocturnal noise sensitivity.
- CNEL, the Community Noise Equivalent Level, which is a 24-hour-average Leq with a "penalty" of 5 dB added to evening noise occurring between 7:00 PM and 10:00 PM, and a "penalty" of 10 dB added to nighttime noise occurring between 10:00 PM and 7:00 AM.

LBNL

Noise Sources

Within the boundaries of LBNL, the ambient noise levels are generated by vehicular traffic on the road network, heating, ventilation and air conditioning equipment associated with buildings and other stationary equipment such as pumps, cooling towers, generators, and machine shop equipment. On-going construction projects also raise noise levels in the vicinity of the construction sites.

Sensitive Receptors

Sensitive receptors are noise-sensitive locations, where noise from a project's construction or operations could be experienced and could detract from or interfere with normal activities. Some land uses are considered more sensitive to ambient noise levels than others, due to the amount of exposure and the types of activities involved. Typically sensitive receptors include residences, schools, medical facilities, parks, and outdoor recreation areas. LBNL does not immediately border residential areas, except along its western and northern boundary near Cyclotron Road.

Project Site

The primary existing noise sources in the vicinity of the Helios project site are vehicular traffic on Lawrence Road and stationary sources associated with the nearby buildings. Secondary, intermittent sources of noise include distant aircraft noise and sounds from parking lots. There are no noise-sensitive receptors in the vicinity of the project site. The nearest residential receptors are homes in the Panoramic Hill neighborhood, which are more than 1,000 feet from the site.

6.11.2 2006 LRDP EIR Analysis

Impacts of Lab growth under the 2006 LRDP through 2025 related to noise are evaluated in Section IV.I of the 2006 LRDP EIR and that analysis is incorporated herein by reference. The 2006 LRDP EIR concluded that all noise impacts except two would be either less than significant or less than significant following implementation of the proposed mitigation measures. The 2006 LRDP EIR concluded that LRDP Impact NOISE-1 related to construction noise would be significant and unavoidable even after mitigation and LRDP Impact NOISE-5 related to cumulative construction noise would also be significant and unavoidable after mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.11.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
NOISE - Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☒	☐	☐	☐
b) Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?	☒	☐	☐	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

DISCUSSION:

a., c. **Potentially Significant Impact.** The 2006 LRDP EIR evaluated the noise impact related to Lab growth-related traffic and other operational sources and determined that the impact would be less than significant. Increases in traffic, mechanical equipment associated with new building, and increases in LBNL hillsite population due to the Helios project could result in potential long-term increases in noise levels. Although this impact is adequately addressed in the 2006 LRDP EIR and determined to be less than significant, a project-specific discussion will be included in the Helios project EIR.

b. **Potentially Significant Impact.** Because construction at LBNL generally does not include pile driving, LBNL activities do not generate excessive groundborne vibration or groundborne noise levels, particularly to off-site receptors. Although this impact is adequately addressed in the 2006 LRDP EIR and determined to be less than significant, a project-specific discussion will be included in the Helios project EIR.

d. **Potentially Significant Impact.** The 2006 LRDP EIR evaluated the potential increases in ambient noise levels that could result from construction activities and concluded that despite mitigation, the impact would be significant and unavoidable at some project locations that are close to sensitive receptors. Construction of the project could increase ambient noise levels in the project vicinity. Although this significant and unavoidable temporary increase in ambient noise levels has been adequately addressed in the LRDP EIR, a project-specific discussion will be included in the EIR.

e. **No Impact.** The project site is not located within the boundaries of any airport land use plan and is more than 2 miles from the nearest public airport. Therefore, implementation of the proposed project would not be affected by operation of a public airport and no further discussion is required.

f. **No Impact.** The project site is not located within the vicinity of a private airstrip. Therefore, implementation of the project would neither impact nor be affected by a private airstrip. No further evaluation is required.

6.12 Population and Housing

6.12.1 Background

LBNL Population, Housing and Residence Patterns

Section IV.J of the 2006 LRDP EIR addresses the population and housing effects of Lab growth under the 2006 LRDP through 2025, and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information and is based on analysis presented in the 'Setting' subsection of Section IV.J of the 2006 LRDP EIR.

In 2003, there were 3,800 people employed by the Lab. Most of these employees (56 percent) were full-time employees in scientific and technical positions. Administrative support positions accounted for 16 percent of Lab employment. Faculty (seven percent of the total), and postdoctoral researchers (six percent of the total), as well as undergraduate and graduate students (combined representing 15 percent of the total) were also counted among the Lab's employees.

In 2003, over the course of the year, a total of about 2,500 people used Lab facilities as guests. Guests include industry and government researchers working at the Lab for short-term assignments, scientists visiting from other academic institutions, or people from other institutions such as UC Davis who use Lab facilities regularly over a period of weeks or months. On an average day, 40 percent of total annual guests use Lab facilities. In 2003, this represented about 1,000 people on any given day. The Lab estimates an adjusted total daily population of 4,375 people for 2003, counting both employees and guests; of the total, 3,650 adjusted daily population (ADP) are on the Laboratory's main site on any given day.[2]

Lab employees and their dependents represented 2.0 percent of the Berkeley and Albany population in 2003. In all other residential locations, Lab employees and their dependents accounted for less than one percent of the total population. Lab employees and their dependents represented 0.3 percent of the total population of Emeryville, Oakland and Piedmont; 0.6 percent of the total population of El Cerrito, Richmond, and San Pablo; and 0.7 percent of the total population of Lafayette, Moraga, and Orinda. For the Bay Area region as a whole, Lab employees and the other members of their households represented 0.1 percent of total regional population in 2003.

Regional Population and Housing

There were 6.8 million people living in the nine-county Bay Area region in 2000. The region's population grew at a compound rate of 1.2 percent per year from 1990 to 2000. The Bay Area also produced substantial increases in employment opportunities in the 1990s. The number of jobs increased at a compound rate of 1.6 percent per year, growing to a total of 3.8 million jobs in the nine-county region in 2000.

Housing production has not kept pace with demand associated with employment growth, in-migration, and household formation. Between 1990 and 2000, about 187,000 housing units were added in the region (an eight-percent increase). During the same period, the number of employed residents increased by 456,000 (14 percent) and the number of jobs increased by 548,000 (17 percent). Housing price increases

2 The LBNL estimate of adjusted daily population (ADP) is defined to include FTE employment plus 40 percent of total annual guests.

reflect this imbalance between supply and demand. In April 2003, market prices for single-family homes in the Bay Area were about double the price levels observed in 1990. In April 2003, the average single-family home price in the Bay Area was $580,000. New home prices in the Bay Area are 50 to 70 percent higher than new home prices in neighboring San Joaquin and Stanislaus counties, and prices for existing homes in the Bay Area are more than double those in the neighboring counties.

Residential population and employed population growth in the Bay Area have been accommodated through increases in the number of people and workers living in both existing and new units. There has also been a substantial increase in the number of people working in the Bay Area but living in surrounding counties where new housing is more plentiful and more affordable.

Projections prepared by the ABAG in June 2003 reflecting a "smart growth forecast" for the Bay Area show regional population growth of almost 1.7 million and an increase of about 600,000 households for the 2001–2025 period. For the region as a whole, the projection is for growth of 25 percent over levels in 2000. In a departure from previous trend-based forecasts, this population and housing scenario reflects a "smart growth" vision: emphasizing infill development to revitalize central cities, support and enhance public transit, and preserve open space and agricultural land. The smart growth scenario assumes that local policies and regulations that currently limit this type of development are changed and that there is significant public investment on a regional and local level in infrastructure and in housing to achieve higher levels of housing production, and particularly high density housing near transit. The "smart growth" scenario illustrates a development pattern that, over the long term, assumes central Bay Area locations such as San Francisco, Berkeley, Oakland, Emeryville, Alameda, Fremont, Union City, Albany, El Cerrito, and Richmond absorb more housing production and population growth than would otherwise be the case. Regionally and locally, the scenario has implicit benefits in an improved balance of jobs and housing, less in-commuting, and more efficient development patterns that preserve open space and agricultural land.

Population and household growth for Berkeley and Albany represent about one percent of the total population and household growth forecast for the Bay Area region. Population growth is expected to continue in the City of Berkeley, building on the trends of the 1990s. The "smart growth forecast" shows an increase of over 13,000 people in the City of Berkeley between 2000 and 2025 (a 13 percent increase over 2000 levels) and an increase of almost 5,000 households in the city (an 11 percent increase over that same period). Using the adjusted 2000 population count for the City of Berkeley as a base, the total population living in the city could reach 119,700 by 2025. In Albany, population is forecast to increase by 14 percent to a total of 18,700 people in 2025. The forecast shows an additional 850 households in Albany between 2000 and 2025, an increase of 12 percent over the period.

The numerical and percentage increases in population and housing are expected to be greater in other parts of the Bay Area that house substantial numbers of Lab employees. The expected increases in population and households are around 20 percent or more in Oakland, Emeryville, and Piedmont; in El Cerrito, Richmond, and San Pablo; and in central Contra Costa County communities.

The 2006 LRDP would increase the total ADP from 4,375 in 2003 to 5,375 in 2025, an increase of 1,000 people or 23 percent.

Proposed Project

The proposed project would provide laboratory and office space for up to 500 employees. Of these employees, approximately 368 new employees would be added through the Helios research, EBI laboratory and proprietary researchers. It is anticipated that approximately 132 employees would relocated to the Helios building from other areas within LBNL or UC Berkeley. Under the 2006 LRDP, each new LBNL employee is assumed to require one housing unit in the Bay Area.

6.12.2 2006 LRDP EIR Analysis

Impacts related to population and housing from Lab growth under the 2006 LRDP through 2025 are evaluated in Section IV.J of the 2006 LRDP EIR. The 2006 LRDP EIR concluded that all impacts related to population and housing impacts of Lab growth under the 2006 LRDP would be less than significant. The proposed project is within the scope of analysis of the 2006 LRDP EIR.

6.12.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
POPULATION & HOUSING - Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

DISCUSSION:

a. **Less than Significant Impact.** The proposed project does not include residential uses, and would not require extension of roads or other infrastructure that could indirectly induce substantial population growth. It would generate incidental, short-term construction employment that would create an undetermined number of new jobs. Operation of the project would involve up to 500 people (employees, visitors and customers). Of the projected Helios population, it is estimated that 132 employees would come from existing laboratories and offices within LBNL or UC Berkeley. The remaining 368 new employees that would be generated by the proposed project are within the anticipated 2006 LRDP growth. The proposed project would represent approximately 40 percent of the 1,000 new employees that would be added to the Lab site by buildout of the 2006 LRDP. The environmental impacts

associated with the growth in the Lab's ADP were adequately addressed in the 2006 LRDP EIR. No conditions have changed and no new information has become available since the certification of the 2006 LRDP EIR that would alter this previous analysis. Therefore, no further analysis of this impact is required.

Cumulative Impacts

LRDP Impact POP-2 evaluated the cumulative impact of 2006 LRDP growth in conjunction with other regional growth on population and housing. As noted in the Setting, LBNL is one of the largest employers in Berkeley, and by far the greatest number of Lab employees live in Berkeley or the immediate vicinity. Accordingly, growth in Berkeley (including at UC Berkeley) is the focus of the cumulative analysis in the 2006 LRDP EIR.

In addition to the population growth associated with the 2006 LBNL LRDP, other future growth would contribute to existing population and housing totals. This future growth could be accommodated through both new development and through changes in the occupancy and use of existing housing and other building space.

As part of the environmental review for its General Plan Update in 2001, the City of Berkeley prepared estimates for 2000 and projections of growth through 2020 in the city under the new General Plan policies. City staff projected an increase of about 3,200 households in the city between 2000 and 2020 and a total population of about 116,000 in 2020 – about the same number of people that lived in Berkeley in 1970.

The UC Berkeley 2020 LRDP could result in an increase of 2,870 faculty and staff working in the Campus Park and adjacent blocks and an increase in 1,650 students. In addition, an important objective of the UC Berkeley 2020 LRDP is increasing the housing supply near campus for students, faculty, and staff. Under the UC Berkeley 2020 LRDP, there could be an additional 2,600 beds of housing added within one mile of the center of campus. It is likely that most of this housing would be developed in the city of Berkeley.

Many students, faculty, and staff prefer to live in Berkeley, close to the campus. Therefore, the employment and enrollment growth associated with the two LRDPs, in conjunction with other projected population growth, would represent substantial cumulative population growth and a concentration of population in the City of Berkeley. The employee population growth associated with the proposed 2006 LBNL LRDP would contribute to this cumulative impact; however, increases in population growth associated with the implementation of the 2006 LRDP would represent about two percent of the total number of people projected to be living in the Berkeley and Albany in 2025, and less than one percent of total projected population in 2025 in all other places of residence. Housing demand associated with implementation of the 2006 LRDP could account for less than one percent of the total increase in households projected for most communities where LBNL employees live. These increases under the 2006 LRDP represent a less-than-significant impact under existing conditions, and therefore would not be considered a cumulatively considerable contribution to potential population and housing impacts.

The university-related housing production anticipated in the UC Berkeley 2020 LRDP could be part of the City of Berkeley General Plan scenario of increased housing supply. At the same time, more housing production would lead to greater concentration of population in the city. As noted above, the City of Berkeley General Plan EIR found that such a concentration of population in Berkeley would result in a net benefit both to the city and to the region as a whole.

In light of the above, lab growth under the 2006 LRDP would not contribute to cumulative adverse effects with regard to population or housing. Because the proposed project is within the 2006 LRDP scope of development, the proposed project would also not contribute to cumulative adverse effects related to population and housing.

b.-c. **No Impact.** The LBNL site does not include housing or long-term residential uses, and no housing would be displaced with implementation of the proposed project. No individuals would be displaced as a result of the project and no replacement housing would be required. Therefore, no further analysis is required.

6.13 Public Services

6.13.1 Background

Section IV.K of the 2006 LRDP EIR addresses the effects on public services from LBNL growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.K of the 2006 LRDP EIR.

In accordance with the *CEQA Guidelines*, this public services analysis evaluates the environmental effects associated with any physical changes required to meet increases in demand for public services, including police, fire protection, schools, and parks. Project-level public-services impacts are addressed by evaluating the effects of LBNL employee growth on public services that directly serve the project site population.

Fire Protection

The Alameda County Fire Department has a contract with LBNL to provide firefighting services and typically assists the Lab fire station with structural fires. The Lab also has a contract with the Alameda County Fire Department that provides LBNL an "around-the-clock" engine company staffed by four Hazardous Materials Emergency Response (HAZMAT) certified firefighters. LBNL and the City of Berkeley have worked collaboratively and developed an Automatic Aid Agreement, under which the Lab's on-site fire station is the first responder for a portion of north Berkeley, including portions of the UC campus. The Berkeley Fire Department provides paramedic transport for LBNL; therefore, if a patient in a medical emergency requires transport to a hospital, a City of Berkeley ambulance responds at the Lab. The City of Oakland Fire Department served the far eastern and southeastern extent of LBNL. The 2006 LRDP EIR also discusses hazardous materials emergency response and the emergency program. HAZMAT automatic aid is available through the Berkeley Fire Department or the Alameda County Fire Department. The Lab's master Emergency Program Plan establishes policies, procedures and an organizational structure for responding to and recovering from a major disaster at LBNL. In addition, the 2006 LRDP EIR describes the Berkeley Lab's Vegetation Management Plan as a prevention program for wildland fires.

Law Enforcement

Police services at LBNL are provided through a contract with the UC Berkeley Police Department (UCPD), as well as with a private security provider responsible for outside security needs including Laboratory access, property protection, and traffic control. The UCPD handles all patrol, investigation, and related law enforcement duties for UC Berkeley, LBNL, and other University-owned properties. UCPD operates 24 hours a day, seven days a week, coordinating closely with the City of Berkeley Police Department. UCPD and the Oakland Police Department are members of the California Law Enforcement Master Mutual Aid Plan; all law enforcement agencies in the state belong to this plan to provide each other information and resources when needed. Additionally, the Lab has an annual renewable contract with UCPD that provides, when requested, law enforcement emergency response, limited patrols, criminal investigations, and VIP protection. UCPD and the Berkeley Police Department have an agreement regarding jurisdiction over off-site locations occupied by UC staff and Lab staff; this agreement is reviewed and updated annually. The Lab does not have an agreement with Oakland Police Department.

LBNL is protected by a perimeter fence that provides access through vehicle entrance points, hardware lock-and-key sets at critical doors, and by an electronic system pre-coded to permit entry only to authorized card holders. Vehicular access onto the LBNL site is controlled by security personnel at the three vehicle entrance gates who visually inspect entering vehicles.

Schools

The Berkeley Unified School District (BUSD) and Oakland Unified School District (OUSD) provide public elementary and secondary school services to dependents of LBNL personnel who live in these two communities.

Parks and Recreation

The East Bay Regional Park District (EBRPD) manages over 95,000 acres within Alameda and Contra Costa counties, including 65 regional parks, recreational areas, wilderness, shorelines, preserves, and land bank areas. The EBRPD regional park properties within the vicinity of the LBNL site include Tilden Park and the Claremont Canyon Preserve.

UC Berkeley manages parks and athletic and recreational facilities that serve the University and the wider community. The University also owns the 2.3-acre People's Park located south of the UC Berkeley campus. Athletic and recreational facilities are located within the central campus and also within the Strawberry Canyon Recreation Area. Additional resources include the Ecological Study Area.

The City of Berkeley's Parks, Recreation and Waterfront Department manages the city's parks and open space. The City has 243 acres of City-owned and/or maintained parks and open space throughout Berkeley, excluding the 99-acre Aquatic Park. There are 52 parks providing traditional activities such as athletic fields, swimming pools, and tennis and basketball courts, as well as numerous tot and school-age play areas, community gardens, rock climbing, and a variety of water sports at the Berkeley Marina. The City of Berkeley maintains the parks-to-population ratio of 2.0 acres of parkland per 1,000 persons that was established in the 1977 City of Berkeley Master Plan (City of Berkeley, 2002).

The City of Oakland's Office of Parks, Recreation and Cultural Affairs manages the city's parks and recreation centers. According to the Open Space, Conservation and Recreation (OSCAR) Element of the Oakland General Plan, an estimated 3,073 acres of total parklands are available within Oakland's city limits, providing about 8.26 acres of parkland per 1,000 residents; local-serving parks provide an estimated 1.33 acres per 1,000 residents.

Project Site

The proposed project would accommodate a population of approximately 500 permanent employees, and involve construction of about 160,000 gsf of new building space. The LBNL personnel and the new building space developed under this project would be served by public services agencies in the Cities of Berkeley and Oakland, Alameda County, and the Lab in the manner discussed above.

6.13.2 2006 LRDP EIR Analysis

Impacts of Lab development under the 2006 LRDP through 2025 on public services are evaluated in Section IV.K of the 2006 LRDP EIR. Because implementation of the 2006 LRDP would not result in any significant impacts to public services and recreation, the 2006 LRDP EIR did not identify any mitigation

measures for impacts to public services and recreation. The proposed project is within the scope of analysis of the 2006 LRDP EIR.

6.13.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i) Fire protection?	☐	☐	☒	☐
ii) Police protection?	☐	☐	☒	☐
iii) Schools?	☐	☐	☒	☐
iv) Parks?	☐	☐	☒	☐
v) Other governmental services?	☐	☐	☐	☒

DISCUSSION:

a.i. **Less than Significant Impact**. Construction of the new building and additional employees and students associated with the proposed project would increase the potential need for emergency fire services. The 2006 LRDP EIR analyzed impacts of the LBNL development on the Alameda County Fire Department's Fire Station 19, which currently serves the LBNL site. The 2006 LRDP EIR concluded that based on current and expected demand for fire protection services and discussion with Alameda County Fire Department, implementation of the 2006 LRDP would not result in the need for new facilities, staff or equipment to provide adequate fire protection (LRDP Impact PUB-1). The Alameda County Fire Department expects that additional staff and buildings projected under the 2006 LRDP at LBNL would result in an additional three to five calls per month, which could be accommodated without additional staff or facilities. Accordingly, the 2006 LRDP EIR concluded that the impacts of the 2006 LRDP, including the growth and development included in the proposed project, would be less than significant and no further mitigation is required. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. The development proposed by the project is well within the levels of development and growth analyzed in

the 2006 LRDP EIR. Therefore, impacts of the proposed project in relation to fire protection services would be less than significant and no further analysis is required.

Cumulative Impacts

Cumulative conditions related to fire and police protection services are discussed under LRDP Impact PUB-5 in the 2006 LRDP EIR. Implementation of the 2006 LRDP would contribute to an increase in demand for fire protection services and police services. However, the 2006 LRDP EIR concluded that this increased demand would not result in the need for new or physically altered facilities, the construction of which could cause significant environmental impacts. While foreseeable development may cause call volume for fire services to increase slightly, such incremental increases in demand for fire protection services can be accommodated without additional staffing or facilities. The increase in population proposed by the project is well within the levels of growth analyzed in the 2006 LRDP EIR and the demand for police and fire services attributable to the proposed project is within the scope of the 2006 LRDP analysis.

Reasonably foreseeable development in the East Bay could result in the increased need for new or altered fire protection or police facilities in the region. The City of Berkeley General Plan indicates the need for additional fire protection facilities and the City of Oakland General Plan indicates the need for expanded facilities or the seismic retrofit of existing facilities. However, the 2006 LRDP EIR concludes that implementation of the 2006 LRDP would not result in the need for new facilities, staff, or equipment to provide adequate fire protection or police services. Accordingly, it concludes that the LRDP's contribution to cumulative demand would not be cumulatively considerable. Furthermore, planned residential development in local jurisdictions where Berkeley Lab employees might live, such as the cities of Berkeley or Oakland, would be subject to the local agency's zoning ordinance and general plan policies, which would require that environmental impacts associated with new residential development be mitigated to the maximum extent feasible. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis and no further analysis is required.

a.ii. **Less than Significant Impact**. Construction of new building space and the additional staff associated with the proposed project would increase the potential need for police protection services. Police services are provided through the UCPD and a private on-site security firm on a contract basis. The private security firm is responsible for on-site security needs including access to the LBNL site, property protection, and traffic control, and can respond to any road accessible area of LBNL in less than five minutes. Under the existing contract, UCPD responds to LBNL as needed, and response times for UCPD are also less than five minutes (LRDP Impact PUB-2). According to the 2006 LRDP EIR, the increase in on-site population and building space that would result from implementation of the 2006 LRDP would incrementally increase calls for police services. Based on the historic average of calls (approximately 10 calls per year), buildout of the 2006 LRDP could increase the number of calls for police services by about five additional calls per year. In addition, there would be an increased demand for on-site security, which would be addressed in the contract for services between the LBNL and the private security provided, to ensure adequate police protection for the on-site population. The 2006 LRDP EIR concluded that this incremental increase in demand for police services is not anticipated to result in the need for new facilities, staff or equipment to provide adequate police services. Accordingly, the 2006 LRDP EIR concluded that impacts of the 2006 LRDP, including the growth and development included in the proposed project, would be less than significant and no mitigation is required. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that

would alter this previous analysis. The development proposed by the project is well within the levels of development and growth analyzed in the 2006 LRDP EIR. Therefore, impacts of the proposed project in relation to police protection services would be less than significant and no further analysis is required.

Cumulative Impacts

See discussion under Item a.i, above.

a.iii. **Less than Significant Impact**. Project-related increases in personnel could draw more families with school-aged children to the LBNL commute area. The proposed project would not develop residential uses and therefore would not directly generate new student enrollment in the Berkeley Unified School District (BUSD) or Oakland Unified School District (OUSD) (or other school districts). However, it is possible that project-related households would relocate to the cities of Berkeley and Oakland as a result of new employment generated by implementation of the proposed project. School-aged children in these households would attend BUSD or OUSD schools.

Using student generation rates of 0.7 student per household from the State Department of Education, the 2006 LRDP EIR estimated that implementation of the 2006 LRDP would generate approximately 175 elementary or middle school children and 70 high-school students in Berkeley. This represents less than two percent of current enrollment. Based on the existing capacity in the BUSD schools, the elementary, middle, and high schools could accommodate the 245 new students that could indirectly result from implementation of the 2006 LRDP. In Oakland, the 2006 LRDP could generate up to 70 elementary or middle school children and 28 high school students. This represents less than one quarter of a percent of the existing student enrollment in Oakland. According to the 2006 LRDP EIR, these new students introduced to the OUSD could be accommodated in existing school facilities and would not require the construction of new school sites (LRDP Impact PUB-3). Furthermore, the 2006 LRDP EIR concluded that the indirect contribution to student enrollment due to implementation of the 2006 LRDP would occur incrementally over a 20-year planning horizon, and would not, by itself, induce a substantial or immediate population increase or result in a substantial increase in the demand for housing. Accordingly, this would not result in the need for new or physically altered public school facilities. The 2006 LRDP would therefore have a less than significant impact and no mitigation is required. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. The growth proposed by the project is well within the levels of growth analyzed in the 2006 LRDP EIR and the demand for school services attributable to the proposed project is well within the scope of the 2006 LRDP analysis. Therefore, impacts of the proposed project in relation to public schools would be less than significant and no further analysis is required.

Cumulative Impacts

According to the 2006 LRDP EIR, implementation of the 2006 LRDP under cumulative conditions would not result in the need for new or physically altered public school facilities (LRDP Impact PUB-6). As discussed under LRDP Impact PUB-3 of the 2006 LRDP EIR, the 2006 LRDP would include no housing, and therefore the effect of implementing the LRDP would be indirect; that is, any increased demand for school facilities would derive from residential development to accommodate increased daily population at the Lab. Because the 2006 LRDP would result in no direct impact on school facilities, and because the indirect effect would be minimal, implementation of the 2006 LRDP would not result in a considerable contribution to any cumulative increase in the demand for school facilities. The increase in population proposed by the project is well within the levels of growth analyzed in the 2006 LRDP EIR and the

demand for public school services attributable to the proposed project would be within the scope of the 2006 LRDP analysis.

Compared to existing student enrollment, the 2006 LRDP would increase enrollment by less than three percent in the BUSD and less than one quarter of a percent in the OUSD. Under cumulative conditions, these percentages would decrease since both the Berkeley General Plan and the Oakland General Plan provide for future residential and employment growth. Therefore, the proposed project would not result in a considerable contribution to the demand for school facilities that would result in the need for new or physically altered facilities under cumulative conditions.

Furthermore, planned residential development in local jurisdictions where new Berkeley Lab employees might live, such as the cities of Berkeley or Oakland, would be subject to the local agency's zoning ordinance and general plan policies. Planned development may also be required to pay school impact fees that, under CEQA, are deemed as full and complete mitigation for effects on schools. Therefore, the 2006 LRDP's cumulative effect on public school facilities would not be considerable. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. No further analysis is required.

a.iv. **Less than Significant Impact**. Project-related increases in personnel would draw more residences into the area and would thus increase demand for parks and recreational facilities. The 2006 LRDP EIR analyzed potential impacts of Lab growth on parks and recreational facilities based on current residential trends for LBNL employees in Berkeley and Oakland. Assuming the current residential trends for LBNL employees continue, approximately 35 percent (350) of the new LBNL employees generated by the 2006 LRDP would reside in Berkeley, resulting in an additional demand for 0.7 acre of parkland. Assuming that approximately 14 percent (140) of the new LBNL employees generated by the 2006 LRDP would be Oakland residents, implementation of the 2006 LRDP would result in a demand for an additional 1.4 acres of parkland and an increase of 0.6 acre of local-serving parkland. The additional demand for parks and recreational facilities would be relatively small, compared to Berkeley's 243 acres of existing parkland and Oakland's 3,703 acres of parkland.

Furthermore, implementation of the 2006 LRDP would not directly result in housing development, and thus the effect of the 2006 LRDP on parks and recreation would be indirect, resulting from an increase in residential population related to an increase in employees at LBNL. Construction of new housing is anticipated in Berkeley, Oakland, and elsewhere in the next 20 years, based on current projections by the Association of Bay Area Governments, which are relied upon in the preparation of city and county general plans. Under the City of Berkeley and the City of Oakland planning process, planned residential uses in each city would be subject to the City's zoning ordinance and general plan policies. While significant environmental impacts from the development of parkland in urban areas are generally not anticipated, the environmental review processes of the cities of Berkeley and Oakland, and other jurisdictions, would ensure that environmental impacts associated with the development of residential projects and their demand for recreational facilities, as well as the development of recreational facilities themselves, are mitigated to the maximum extent feasible. It would be speculative to assume that there would be significant and unavoidable impacts from the development of parks or recreation facilities in the region. In summary, the 2006 LRDP EIR concluded that effects on parks and recreation resources from the 2006 LRDP would be less than significant and no mitigation is required (LRDP Impact PUB-4). No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. The growth proposed by the project is well within the levels of growth analyzed in the 2006 LRDP EIR and the demand for park and recreational services

attributable to the proposed project would be within the scope of the 2006 LRDP analysis. Therefore, impacts of the proposed project in relation to parks and recreation would be less than significant and no further analysis is required.

Cumulative Impacts

Implementation of the 2006 LRDP would not substantially affect the provision of parks and recreation facilities under cumulative conditions (LRDP Impact PUB-7). The increase in population proposed by the project is well within the levels of growth analyzed in the 2006 LRDP EIR and the demand for parks and recreation services attributable to the proposed project would be within the scope of the 2006 LRDP analysis. Implementation of the 2006 LRDP along with cumulative development could result in an increased demand for parks and recreation facilities in Berkeley and Oakland. The 2006 LRDP does not include any housing component, and therefore the effect of implementing the 2006 LRDP would be indirect; that is, any increased demand for park and recreation facilities would derive from new residential development to accommodate increased daily population at the Lab. As noted under LRDP Impact PUB-4 in the 2006 LRDP EIR, planned residential uses in each city (as well as in other local jurisdictions where the Lab employees might reside) would be subject to the local agency's zoning ordinance and general plan policies, which would require that environmental impacts associated with the development of parks and recreation facilities are mitigated to the maximum extent feasible. Because the 2006 LRDP would result in no direct impact on park and recreation facilities, and because any indirect effect would be minimal, implementation of the 2006 LRDP would not result in a considerable contribution to any cumulative increase in the demand for park and recreation facilities. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. No further analysis is required.

a.v. **No Impact.** No other governmental services would be affected by the proposed project and no further analysis is required.

6.14 Recreation

6.14.1 Background

Section IV.K (Public Services and Recreation) of the 2006 LRDP EIR addresses the demand for recreational facilities and the potential for substantial deterioration of recreational facilities as a result of development under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. Background conditions for recreation are discussed under Section 6.13.1 above. .

6.14.2 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
RECREATION - Would the project:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☒	☐

DISCUSSION:

a. **Less than Significant Impact.** Impacts associated with the increase in demand for parks and recreational facilities in the region as a result of project-related growth in LBNL employees are discussed in the response to 13a, "Parks" above. Because indirect population increase associated with the proposed project is relatively small, increased demand for recreational facilities that could cause physical deterioration of recreational facilities is not expected to occur as a result of the proposed project. This impact is considered less than significant and no further analysis of this impact is required.

b. **Less than Significant Impact**. The project would not include recreational facilities. Since the project's impacts on existing recreational facilities would be less than significant (see response to 13a, "Parks above), the need for new or expanded recreational facilities is not expected to be a result, either direct or indirect, of the proposed project. Therefore, this impact would be less than significant and no further analysis of this impact is required.

6.15 Transportation/Traffic

6.15.1 Background

Section IV.L of the 2006 LRDP EIR addresses the transportation, circulation, and parking effects of Lab growth under the 2006 LRDP through 2025 and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The following discussion summarizes information presented in the 'Setting' subsection of Section IV.L of the 2006 LRDP EIR, which provides a basis for the analysis of the environmental effects of the proposed project.

Regional and Lab Roadway Network

LBNL is located close to three regional highways: Interstate 80/580 about 3 miles to the west and State Routes (SR) 24 and 13 about 2 miles to the south. Access to I-80/580 is via arterial roads in the City of Berkeley and Oakland, including University Avenue, Ashby Avenue, Hearst Avenue, Gayley Road, and College Avenue. Access to SR 24 and 13 is via Tunnel Road.

The Lab is served by three roadway entrances: (1) the Blackberry Canyon Gate which is the main entrance to the Lab and is on Cyclotron Road, north of the intersection of Hearst Avenue and Gayley Road in the southwestern portion of the Lab; (2) Strawberry Canyon Gate which is located at the eastern end of the Lab and is also accessed via Centennial Drive; and (3) Grizzly Peak Gate located along the northern boundary of the Lab and accessed via Centennial Drive. Internal circulation on the Lab site is provided by an east-west roadway system that generally follows the site contours.

Roadway Levels of Service

Level of service (LOS) is a general measure of traffic operating conditions, whereby a letter grade from A (the best) to F (the worst) is assigned to roadway intersections. These grades represent the comfort and convenience associated with driving from the driver's perspective. To assess the worst-case traffic conditions, LOS is measured during morning (generally 7 AM to 9 AM) and afternoon (generally 4 PM to 6 PM) peak commute times. The LOS standard for City intersections is LOS D. Of the 20 city intersections evaluated in the 2006 LRDP EIR, only one intersection (Bancroft Way at Gayley Road/Piedmont Avenue currently operates at an unacceptable level of service. The 2006 LRDP EIR found that by 2025, even without traffic added by Lab growth, three additional intersections would operate at unacceptable levels of service.

Parking

There are a total of 2,175 off-street and on-street parking spaces at the Lab. Because access to the Lab is controlled, parking facilities are not open to the general public. The Lab implements a permit parking program. The Lab discourages the use of single occupant vehicles for access to the site as part of its Transportation Demand Management (TDM) program.

Bicycle and Pedestrian Network

Due to the site's hilly terrain, about 10 percent of the Lab employees use bicycles for their commutes. Pedestrian and bicycle facilities within the Lab site are discontinuous. These facilities are used to move between nearby building clusters; for longer trips, LBNL employees use shuttles or personal vehicles.

Transit

The Lab is served by LBNL shuttles that run between the Lab and the Center Street/Shattuck BART station on 10 minute headways on weekdays and an express shuttle that operates on an hourly schedule during commute hours between the Lab and the Rockridge BART station. The Lab shuttle stops have been coordinated with AC Transit bus lines serving downtown Berkeley.

Project Site

The Helios project site is located south of the Molecular Foundry Building and is currently not served by any existing roadways. The nearest LBNL street is Lawrence Road to the north of the Molecular Foundry Building and a service road to the south of the Foundry Building. A 10-foot paved road currently extends from near Centennial Drive and Building 73 to about 700 feet of the Helios project site. A second 8 to 10 foot service road with five switchback turns also provides a connection between the site and Centennial Drive. Both these roads are not used for general access.

6.15.2 2006 LRDP EIR Analysis

Impacts on traffic, circulation, and parking from Lab growth under the 2006 LRDP through 2025 are evaluated in Section IV.L of the 2006 LRDP EIR. The 2006 LRDP EIR analysis concluded under LRDP Impact TRANS-1 that the addition of LRDP-related traffic would degrade the levels of service at three study intersections. Fair share funding of traffic improvements pursuant to LRDP Mitigation Measures TRANS-1a, 1b, 1c and 2d would reduce the impact to a less-than-significant level if a plan were currently in place for those traffic improvements. At this time, no plan is in place for the installation of those traffic improvements, although these measures would remain binding mitigation commitments. Accordingly, although mitigation may be accomplished in the future and the mitigation commitment remains binding, at this time these impacts cannot be determined to be mitigated to a less than significant level. The Regents found this remaining significant impact to be acceptable because the benefits of the project outweigh this and the other unavoidable environmental impacts of the project. The 2006 LRDP EIR also concluded that a significant and unavoidable cumulative traffic impact (LRDP Impact TRANS-8) would occur at certain study intersections. LRDP Mitigation Measure TRANS-8 would be implemented for this impact, but as identified above, there would be a significant unavoidable impact. These impacts were adequately analyzed in the 2006 LRDP EIR and were fully addressed in the Findings and Statement of Overriding Considerations adopted by The Regents in connection with its approval of the 2006 LRDP. All other traffic impacts were determined to be less than significant. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis.

The proposed project is within the scope of development analyzed in the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.15.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
TRANSPORTATION/TRAFFIC - Would the project:				
a) Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☒	☐	☐	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☒	☐	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☒	☐	☐	☐
e) Result in inadequate emergency access?	☒	☐	☐	☐
f) Result in inadequate parking capacity?	☒	☐	☐	☐
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☒	☐	☐	☐

DISCUSSION:

a.-b. **Potentially Significant Impact.** The 2006 LRDP EIR found that with full development under the 2006 LRDP, by 2025, daily traffic on study area roadways due to new employees and visitors to the Lab site would increase and result in significant level of service impacts at three study area intersections (LRDP Impact TRANS-1). Mitigation measures were developed to improve levels of service at these intersections, but for reasons presented above, the impact would not be reduced to a less than significant level. The proposed project is within the development evaluated in the 2006 LRDP EIR, and the project would contribute to this significant and unavoidable impact. The impact is adequately addressed in the 2006 LRDP EIR and is fully addressed by the Findings and Statement of Overriding Considerations

adopted by The Regents in conjunction with the adoption of the 2006 LRDP. No conditions have changed since the certification of the 2006 LRDP EIR that would change the results of this 2025 LRDP level analysis and no further analysis is required.

The proposed project would be operational by 2010, and an evaluation of the effect from the addition of project traffic on existing or near-term conditions will be included in the Helios project EIR. This impact could potentially be significant, and will be discussed in the Helios project EIR.

c. **No Impact.** The project would not affect the air traffic patterns at any of the regional airports. The project does not include activities or structures that could hinder aviation activity. Therefore, implementation of the project would result in no impact from the safety risks associated with air traffic patterns.

d. **Potentially Significant Impact.** The project would change on-site circulation and site access from existing conditions. Although impacts associated with transportation have been adequately addressed in the 2006 LRDP EIR, project-specific impacts will be discussed in the Helios project EIR.

e.,g. **Potentially Significant Impact.** The project would alter off-site circulation, and consequently emergency access may be affected. There are numerous policies in the 2006 LRDP related to alternative transportation. A detailed analysis of consistency with policies related to alternative forms of transportation will be included in the EIR. Although impacts associated with alternative transportation and emergency access have been adequately addressed in the 2006 LRDP EIR, project-specific impacts will be discussed in the Helios project EIR.

f. **Potentially Significant Impact.** LRDP Impact TRANS-4 discusses the increase in need for parking spaces and the provision for parking under the 2006 LRDP. The total number of proposed parking spaces is 50, which may be inadequate on-site parking based on the proposed use of the site. Although impacts associated with parking have been adequately addressed in the 2006 LRDP EIR, project-specific impacts will be further discussed in the Helios project EIR.

6.16 Utilities and Service Systems

6.16.1 Background

Section IV.M of the 2006 LRDP EIR addresses the effects of Lab growth under the 2006 LRDP on utility systems that serve the Lab site and is incorporated by reference in this Initial Study for this project pursuant to *CEQA Guidelines* Section 15150. The Lab is served by the following utility and service systems:

Potable and Fire Protection Water: East Bay Municipal Utility District (EBMUD) provides high pressure water to the Lab via two points of connection – a 12-inch meter on Campus Drive in the Shasta Pressure Zone of the district and a 6-inch meter on Summit Road from the Berkeley View Pressure Zone. On the site, water is distributed by an extensive water distribution system which provides water not only to the buildings but also for use in cooling towers, for irrigation, and for other uses. The Lab also maintains three 200,000-gallon water storage tanks on-site for emergency water supply. In 2003, the total annual water consumption at the Lab was approximately 41.6 million gallons. Even though the total building space at the Lab has increased, water usage has declined substantially since 1990 because of water conservation measures that the Lab has implemented in the past few years.

Wastewater: Wastewater generated at the Lab is collected in a gravity-flow system that eventually discharges into the City of Berkeley's sanitary sewer system through a monitoring station located at Hearst Avenue and a second monitoring station located in Centennial Drive. The volume and quality of effluent at both monitoring stations is monitored and evaluated for compliance with EBMUD discharge requirements. From these monitoring stations, the discharge continues down into the City's sewer system to be transported to EBMUD's north interceptor sewer and then to the wastewater treatment facility in Oakland. Sanitary sewer sub-basin 17-503 which receives flows from the sewer main in Centennial Drive (and other areas of Berkeley and Oakland) is constrained around Dwight Avenue during peak wet weather conditions.

Storm Drainage: The LBNL storm drain system is a gravity-fed system of open and culverted drainages that generally run east west. The combined flows are then conveyed through the developed portions of the site to eventually discharge via outfalls into the open channels of the Strawberry Creek watershed.

Solid Waste: Non-hazardous solid waste is collected and transported off-site by a commercial waste contractor. The Lab implements an extensive program focused on waste minimization and recycling.

Electricity: The Lab purchases electricity from the Western Area Power Administration. Electricity is delivered to the Lab's Grizzly Peak Substation via the PG&E transmission system. The total electrical power consumption in 2003 at LBNL was 74,500 megawatt hours. The Lab also has a number of stationary and portable emergency power generators that are powered by diesel, gasoline or natural gas.

Natural Gas: Natural gas is used at the Lab for heating all buildings, to operate certain equipment and also in some experimental uses. Natural gas is delivered to the site by the PG&E system via a 6-inch line. The point of delivery is located above Cyclotron Road and below Building 88. Natural gas is distributed from this point of delivery to all buildings at the Lab. Two buildings (Buildings 73 and 73A) in the eastern portion of the Lab are served by another PG&E line located along Centennial Drive.

Other On-Site Utilities: The Lab also owns and operates other specialized utility systems that are needed for the research and specific equipment used on site. These include a Lab-wide compressed air system, a Lab-wide low conductivity water system, a closed loop cooling water system, building-specific purified water systems, and building-specific de-ionized water systems.

Project Site

The Helios project would require water for human consumption, deionized water use, and cooling towers. The project would also produce wastewater from sanitary sources, laboratories, and cooling towers. All of the utilities that would be needed for the proposed project are available in the vicinity of the project site. The Helios project would connect to existing utilities that run along Lawrence Road, north of the project site.

6.16.2 2006 LRDP EIR Analysis

Impacts of Lab growth under the 2006 LRDP through 2025 on utilities and service systems are evaluated in Section IV.M of the 2006 LRDP EIR. The EIR analysis concluded that implementation of the 2006 LRDP would result in impacts on utilities that would either be less than significant or reduced to a less than significant level with the proposed mitigation measures.

The proposed project is within the scope of development analyzed in the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP EIR have been incorporated into the proposed project planning and design and will be implemented during project operations consistent with LRDP or project-specific mitigation monitoring requirements.

6.16.3 Environmental Checklist and Discussion

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
UTILITIES AND SERVICE SYSTEMS - Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☒	☐	☐	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new and expanded entitlements needed?	☐	☐	☒	☐
e) Result in the need for increased chilled water or steam generation capacity or major distribution improvements?	☒	☐	☐	☐
f) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☒	☐	☐	☐
g) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
h) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐
i) Require or result in the construction or expansion of electrical, or natural gas which would cause significant environmental impacts.	☒	☐	☐	☐
j) Require or result in the construction or expansion of telecommunication facilities, which would cause significant environmental impacts.	☐	☐	☐	☒

DISCUSSION:

a.,b.,f. **Potentially Significant Impact.** As discussed in the 2006 LRDP EIR, LBNL currently contributes to sanitary sewer flows to sub-basin 17-503 that exceed capacity during the wet season (LRDP Impact UTILS-2). Mitigation measures identified for this impact include directing wastewater flows to non-constrained sanitary sewer lines (LRDP Mitigation Measure UTILS-2). Although the impact associated with wastewater has been adequately addressed in the 2006 LRDP EIR, the project-specific impact will be discussed in the Helios project EIR.

c. **Potentially Significant Impact.** According to the 2006 LRDP EIR, existing LBNL storm water drainage facilities have adequate capacity to serve existing and future development in the area. Development of the project would increase the amount of impervious surfaces on the project site. However, the project would include design features to maintain storm water runoff at existing levels. Although the impact is

anticipated to be less than significant and was adequately addressed in the 2006 LRDP EIR, a project-specific discussion will be included in the Helios project EIR.

d. **Less than Significant Impact**. Construction of the new building and additional staff and students associated with the proposed project would increase the potential demand for water. The 2006 LRDP EIR concluded that implementation of the 2006 LRDP would generate an estimated water demand of approximately 56.5 million gallons per year (see LRDP Impact UTILS-1). This represents an increase of about 36 percent, or 14.9 million gallons from existing conditions. Of this total increase, the annual demand for water by employees would increase by approximately 27 percent and the demand for process water would increase by about 45 percent for the LBNL.

Pursuant to Sections 10910-10915 (SB 610) of the California Water Code, LBNL submitted a request to EBMUD to prepare a water supply assessment (WSA) for the 2006 LRDP project. EBMUD submitted a WSA to LBNL in a letter dated November 23, 2004. On February 23, 2006 EBMUD confirmed that the 2006 LRDP's estimated water demand is accounted for in EBMUD's water demand projections, as published in the 2000 Urban Water Management Plan. The 2006 LRDP would not change EBMUD's 2020 water demand projection, nor would it result in a new significant increase in water use beyond what EBMUD has projected for the region. Therefore, the 2006 LRDP would not result in the need for new or expanded water entitlements.

New buildings constructed under the 2006 LRDP, including the proposed project, would install water conservation devices such as low-flow plumbing fixtures and water-saving appliances; other devices and new technology (e.g., drip irrigation, re-circulating cooling systems, etc.) would be employed where practicable to further water conservation. Additionally, landscaping introduced to the project site as a result of the 2006 LRDP would include drought-tolerant plant materials with a long-term goal to wean the majority of the plant materials off the irrigation system and allow them to naturalize. The 2006 LRDP also includes various system upgrades intended to improve reliability and reduce water loss due to outdated, deteriorating pipelines. Improvements include the replacement of selected existing water distribution lines.

The on-site water delivery system at LBNL and connection to off-site pipes are sized for firefighting, which requires roughly 20 times larger capacity than the infrastructure necessary for water delivery for daily use. Thus, existing infrastructure is adequate for future development and redevelopment under the 2006 LRDP. Based on the discussion above, the 2006 LRDP EIR concluded that implementation of the 2006 LRDP would generate a less-than-significant impact with respect to demand for water services and would not result in the need for new or upgraded water treatment facilities. The proposed project is within the levels of development analyzed in the 2006 LRDP EIR. Therefore, impacts of the proposed project on water facilities would be less than significant. No conditions have changed and no new information has become available since the certification of the 2006 LRDP EIR that would alter this previous analysis. Therefore, no further analysis of this impact is required.

Cumulative Impacts

The 2006 LRDP EIR analyzed the cumulative impact on utilities under LRDP Impact UTILS-6. According to that analysis, other foreseeable development in the City of Berkeley and in the LBNL area surrounding the Lab site would contribute to cumulative increases in utility and energy demand; however, new development would occur within a largely built-out urban area where utilities and service systems generally are provided. Additionally, these increases in demand attributed to other development would be addressed on a site-by-site basis by the service providers prior to approval of new development, and through CEQA review of each development project. The incremental increase in demand for utilities for

storm water delivery systems, water supply, and solid waste associated with the 2006 LRDP would not be expected to represent a substantial increase in demand for utility and service systems, and existing utility delivery systems would be expected to handle growth anticipated under the 2006 LRDP. Therefore, the effect of 2006 LRDP development in combination with other foreseeable development would not be significant, nor would the LRDP development's contribution to any cumulative effects be cumulatively considerable. Because the proposed project is within the 2006 LRDP scope of development, the proposed project contribution to any cumulative impacts would also not be considerable.

e., i. **Potentially Significant Impact.** The proposed project would not create a substantial demand for energy. The delivery of additional electricity and natural gas to LBNL could be accommodated by existing infrastructure (LRDP Impact UTILS-5). Development under the 2006 LRDP would require specific utility connections for new buildings that would occur in existing developed areas, and would be incorporated with the construction or rehabilitation of new structures. No new structures would be developed solely for the purpose of supplying new electricity or natural gas to LBNL. The proposed project could result in the need for increased chilled water or steam generation associated with laboratory components. The project proposes to construct cooling towers for purposes of chilled water generation. Although this impact is adequately addressed in the 2006 LRDP EIR and determined to be less than significant, a project-specific discussion will be included in the Helios project EIR. The project EIR will discuss impacts related to global climate change.

g.-h. **Less Than Significant Impact.** The 2006 LRDP would result in an increased waste stream due to an increase in operations (additional personnel and building square feet). The increase in ADP with implementation of the 2006 LRDP would take place at the hill site. The increase translates into an average annual growth rate of approximately 1.1 percent. This would result in an increase in disposed waste from the existing estimate of about 413 tons per year to about 520 tons per year at buildout of the LRDP. The amount of recycled waste generated at LBNL would also increase from the existing annual estimate of 1,592 tons to 2,006 tons. The proportion of recycled waste to disposed waste under buildout of the 2006 LRDP would remain at the existing ratio of roughly 4:1.

Currently, disposed waste from LBNL is transported to the Altamont Landfill. The Altamont Landfill has a permitted maximum daily disposal of 11,150 tons per day. Under existing conditions, LBNL disposed waste accounts for about 0.01 percent of the daily permitted disposal. Under the 2006 LRDP, the projected disposed waste would increase but would remain at roughly 0.01 percent of the daily permitted disposal. The Altamont Landfill has recently updated its conditional use permit, which allows for an additional capacity of approximately 40 million tons of disposal over the next 19 to 38 years (CIWMB 2007). Therefore, development at LBNL attributed to the 2006 LRDP would not cause any landfill to exceed its permitted capacity and would result in a less-than-significant impact. The proposed project is within the levels of development analyzed in the 2006 LRDP EIR. Therefore, impacts of the proposed project on solid waste facilities would be less than significant. No conditions have changed and no new information has become available since the certification of the 2006 LRDP EIR that would alter this previous analysis. Therefore, no further analysis of this impact is required.

Cumulative Impacts

See discussion under Item **d** above.

j. **No impact**. The proposed project would not affect telecommunication facilities and no impact would occur. No further analysis is required.

	Potentially Significant Impact	Less than Significant with Project Mitigation	Less than Significant Impact	No Impact
MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or pre-history?	☒	☐	☐	
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☒	☐	☐	
c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	

DISCUSSION:

a. **Potentially Significant Impact.** Implementation of the proposed project has the potential to impact the environment. As noted in the checklist responses, the Helios project EIR will analyze and determine whether the project would substantially degrade the quality of the environment, with respect to biological resources.

b. **Potentially Significant Impact.** The proposed project has the potential to contribute to cumulative impacts associated with the near-term traffic. All other cumulative impacts are adequately addressed in the 2006 LRDP EIR and further evaluation of cumulative impacts is not required.

c. **Potentially Significant Impact.** As discussed in this Initial Study, the project has the potential to directly or indirectly impact human beings via impacts on aesthetics and traffic. These are considered potentially significant impacts and will be discussed in the Helios project EIR.

7. SOURCES OF INFORMATION USED IN PREPARING INITIAL STUDY

1. California Integrated Waste Management Board, Solid Waste Information System, Accessed June 29, 2007.
2. Lawrence Berkeley National Laboratory, Long Range Development Plan Final Environmental Impact Report, SCH No. 200102046, July 2007.
3. Helios Energy Research Facility, Detailed Project Program, dated June 2007. Prepared for Lawrence Berkeley National Laboratory and UC Berkeley by Smithgroup.

8. REPORT PREPARERS

Lawrence Berkeley National Laboratory

Jeff Philliber, LBNL Environmental Planning Group Coordinator

Impact Sciences

Shabnam Barati, Project Manager
Shauna Stringham, Deputy Project Manager
Thomas Brauer, Graphics Coordinator
Lisa Cuoco, Publications Coordinator

2006 LBNL LRDP EIR Mitigation Measures

2006 LBNL LRDP EIR MITIGATION MEASURES

LRDP 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 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 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.

LRDP AQ-1a: The BAAQMD's approach to dust abatement calls for "basic" control measures that should be implemented at all construction sites, "enhanced" control measures that should be implemented at construction sites greater than four acres in area, and "optional" control measures that should be implemented on a case-by-case basis at construction sites that are large in area or are located near sensitive receptors, or that, for any other reason, may warrant additional emissions reductions (BAAQMD, 1999).

During construction of individual projects proposed under the LRDP, LBNL shall require construction contractors to implement the appropriate level of mitigation (as detailed below), based on the size of the construction area, to maintain project construction-related impacts at acceptable levels; this would reduce the potential impact to a less-than-significant level.

Elements of the "basic" dust control program for project components that disturb less than one acre shall include the following at a minimum:

- Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible.

- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer).

- Pave, apply water three times daily (or as sufficient to prevent dust from leaving the site), or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.

- Sweep daily or as appropriate (with water sweepers using reclaimed water if possible) all paved access roads, parking areas and staging areas at construction sites.

- Sweep streets daily or as appropriate (with water sweepers using reclaimed water if possible) if visible soil material is carried onto adjacent public streets.

Elements of the "enhanced" dust abatement program for project components that disturb four or more acres shall include all of the "basic" measures in addition to the following measures:

- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).

- Enclose, cover, water twice daily (or as sufficient to prevent dust from leaving the site), or apply (non-toxic) soil stabilizers to exposed stockpiles (dirt, sand, etc.).

- Limit traffic speeds on unpaved roads to 15 miles per hour.

- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.

- Replant vegetation in disturbed areas as quickly as possible.

Elements of the "optional" control measures are strongly encouraged at construction sites that are large in area or located near sensitive receptors, or that for any other reason may warrant additional emissions reductions:

- Install wheel washers for all exiting trucks, or wash off tires or tracks of all trucks and equipment leaving the site.

- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.

- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 miles per hour.

- Limit the area subject to excavation, grading, and other construction activity at any one time.

- Pave all roadways, driveways, sidewalks, etc. as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.

- Designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of dust off-site. Their duties shall include holidays and weekend

periods when work may not be in progress. The names and telephone numbers of such persons shall be provided to the BAAQMD prior to the start of construction.

LRDP AQ-1b: To mitigate equipment exhaust emissions, LBNL shall require its construction contractors to comply with the following measures:

- Construction equipment shall be properly tuned and maintained in accordance with manufacturers' specifications.
- Best management construction practices shall be used to avoid unnecessary emissions (e.g., trucks 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 the California Air Resources Board.
- Incorporate use of low-NOx 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 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-one-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 one million. The 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.

Because most of the cancer risk from TACs is due to diesel particulate, measures to reduce the risk (beyond regulations already in place that will substantially reduce diesel particulate emissions in the next 20 years) would include those measures that could reduce vehicular travel to and from Berkeley Lab. Implementation of Mitigation Measure TRANS-1c, development and implementation of a new Transportation Demand Management Program (see Section IV.L, Transportation/Traffic), would result in a concomitant increase in vehicular emissions, including those of TACs. However, even with implementation of this measure, Berkeley Lab, as a major employer and thus a substantial source of vehicular traffic, would likely continue to contribute to Bay Area-wide emissions of TACs for the foreseeable future.

LRDP 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 Corps 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-1 and S-9 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 Corps 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 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 Corps-verified wetlands delineation identified in Mitigation Measure BIO-2.a. During the permit application process for specific development project(s) with identified impacts on jurisdictional drainages or wetlands, LBNL would consult with the Corps, 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 Corps); purchase of credits in an authorized mitigation bank acceptable to the Corps 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 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 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 IV.C 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 nesting 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 shall be implemented.

LRDP 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;

    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 shall be implemented.

LRDP 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 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.

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 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 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 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 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 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 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 (see Table IV.C 1, p. IV.C-10), 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 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.

LRDP CUL-1: Mitigation for the demolition or substantial physical alteration of Buildings 71 and 88, and other historical buildings and structures at LBNL found to be significant historical resources at the completion of the ongoing surveys and research, shall include the development of a Memorandum of Agreement (MOA) among the Department of Energy, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation. Full implementation of the MOA's stipulations shall also be required as part of this mitigation measure.

LRDP 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 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.

LRDP 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.

LRDP 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 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.

Earthquakes and groundshaking in the Bay Area are unavoidable and may occur at some time during the period covered by the LRDP. Although some structural damage is typically not avoidable, building codes and local construction requirements have been established to protect against building collapse and to minimize injury during a seismic event. Considering that the future individual buildings would be constructed in conformance with the California Building Code, LBNL requirements, federal regulations and guidelines, and Mitigation Measure GEO-2, the risks of injury and structural damage from groundshaking and earthquake-induced landsliding would be reduced and the impacts, therefore, would be considered less than significant.

Furthermore, as described in the Project Description, some of the buildings constructed pursuant to the LRDP would be occupied by staff relocated from other, older LBNL facilities, some of which were constructed in accordance with less stringent building code requirements than those that would apply to future construction. As of 2003, 14 percent of LBNL buildings were over 60 years old. Many of these buildings were constructed as temporary structures that were never replaced. The LRDP specifically proposes the demolition of some30 outdated buildings that together include approximately 250,000 square feet. In this regard, implementation of the LRDP would result in a beneficial seismic safety impact.

LRDP 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 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.

Compliance with California Building Code standards and compliance with Mitigation Measures GEO-2, GEO-3a, and GEO-3b would reduce potential impacts associated with expansive soils and soil erosion to a less-than-significant level.

None required for cumulative impacts, although Mitigation Measures GEO-1, GEO 2, GEO-3a, and GEO-3b would be implemented, as identified above.

LRDP 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.

An EH&S assessment of LBNL activities is performed annually, and these results are reported annually in the LBNL Self-Assessment Report.

In addition, LBNL prepares an annual Site Environmental Report that describes the environmental activities noted above. Implementation of this measure would ensure that the information in the LBNL Self-Assessment and Site Environmental Reports continues to be collected, reviewed, and provided.

LRDP 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.

LBNL is required by DOE Order 435.1 to verify that the receiving facility has all appropriate licenses and that the waste meets all waste acceptance criteria of the receiving facility.

LRDP 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.

Shipping procedures at LBNL require all transporters of hazardous, radioactive, and mixed waste to provide evidence that they are appropriately licensed.

LRDP 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.

Each LBNL Division is required to identify and implement new waste minimization activities each year. The waste minimization program at LBNL reduced hazardous waste by 72% during the period 1993-2004

LRDP 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.
- 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 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.

LRDP NOISE-1a: To reduce daytime noise impacts due to construction/demolition, LBNL shall require construction/demolition contractors to implement noise reduction measures appropriate for the project being undertaken. Measures that might be implemented could include, but not be limited to, the following:

- Construction/demolition activities would be limited to a schedule that minimizes disruption to uses surrounding the project site as much as possible. Such activities would be limited to the hours designated in the Berkeley and/or Oakland noise ordinance(s), as applicable to the location of the project. This would eliminate or substantially reduce noise impacts during the more noise-sensitive nighttime hours and on days when construction noise might be more disturbing.
- To the maximum extent feasible, equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).
- Stationary noise sources shall be located as far from adjacent receptors as possible.
- At locations where noise may affect neighboring residential uses, LBNL will develop a comprehensive construction noise control specification to implement construction/demolition noise controls, such as noise attenuation barriers, siting of construction laydown and vehicle staging areas, and community outreach, as appropriate to specific projects. The specification will include such information as general provisions, definitions, submittal requirements, construction limitations, requirements for noise and vibration monitoring and control plans, noise control materials and methods. This document will be modified as appropriate for a particular construction project and included within the construction specification.

LRDP NOISE-1b: For each subsequent project pursuant to the LRDP that would involve construction and/or demolition activities, LBNL shall engage a qualified noise consultant to determine whether, based on the location of the site and the activities proposed, construction/demolition noise levels could approach the property-line receiving noise standards of the cities of Berkeley or Oakland (as applicable). If the consultant determines that the standards would not be exceeded, no further mitigation is required. If the standards would be reached or exceeded absent further mitigation, one or more of the following additional measures would be required, as determined necessary by the noise consultant:

- Stationary noise sources shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

- Noise from idling trucks shall be kept to a minimum. No trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area.

- If determined necessary by the noise consultant, a set of site-specific noise attenuation measures shall be developed before construction begins; possible measures might include erection of temporary noise barriers around the construction site, use of noise control blankets on structures being erected to reduce noise emission from the site, evaluation of the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings, and monitoring the effectiveness of noise attenuation measures by taking noise measurements.

- If determined necessary by the noise consultant, at least two weeks prior to the start of excavation, LBNL or its contractor shall provide written notification to all neighbors within 500 feet of the construction site. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of party responsible for construction). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the LBNL boundaries.

LRDP NOISE-4: Mechanical equipment shall be selected and building designs prepared for all future development projects pursuant to the 2006 LRDP so that noise levels from future building and other facility operations would not exceed the Noise Ordinance limits of the cities of Berkeley or Oakland for commercial areas or residential zones as measured on any commercial or residential property in the area surrounding the future LRDP project. Controls that would typically be incorporated to attain adequate noise reduction would include selection of quiet equipment, sound attenuators on fans, sound attenuator

packages for cooling towers and emergency generators, acoustical screen walls, and equipment enclosures.

Implementation of Mitigation Measures NOISE-1a and NOISE-1b would reduce the cumulative impact of construction noise to the maximum extent feasible. However, for purposes of a conservative analysis, the cumulative effect of construction noise is considered significant and unavoidable.

LRDP TRANS-1a: LBNL shall work with UC Berkeley and the City of Berkeley to design and install a signal at the Gayley Road/Stadium Rim Way intersection, when a signal warrant analysis shows that the signal is needed. The intersection would meet one hour signal warrants for peak-hour volume and peak hour delay under 2025 conditions with implementation of the LBNL 2006 LRDP. LBNL shall contribute funding on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for a periodic (annual or biennial) signal warrant check to allow the City to determine when a signal is warranted, and for installation of the signal. Should the City determine that alternative mitigation strategies may reduce or avoid the significant impact, the Lab shall work with the City and UC Berkeley to identify and implement such alternative feasible measure(s). See also Mitigation Measure TRANS-1c, development and implementation of a new Transportation Demand Management Program.

With the implementation of this mitigation measure, the intersection of Gayley Road/Stadium Rim Way would operate at an acceptable level of service (LOS B or better under traffic signal control) during both the a.m. and p.m. peak hours. Because LBNL could not implement this measure on its own, but would need the cooperation of UC Berkeley and/or the City of Berkeley, this impact would be considered significant and unavoidable.

This mitigation measure is proposed to be adopted as part of the LRDP and will be monitored through the LRDP mitigation monitoring and reporting program. It will thus continue to be a binding mitigation commitment of LBNL. Under CEQA case law, however, when the lead agency contributes fair share funding to a mitigation measure that will be carried out by another entity, there must be some evidence of a reasonable plan in place in order for the lead agency to conclude that the adopted mitigation will reduce the impact to a less than significant level (City of Marina v. Board of Trustees of the California State University (2006) 39 Cal.4th 341). LBNL has discussed this with the City, and based on that consultation, LBNL understands there have been some discussions of improvements at Gayley Road/Stadium Rim Way. Also, the University has retained a consultant to perform studies related to these improvements, but there is not yet a plan in place for the improvements. As such, it cannot be determined at this time that this impact will be mitigated to a less than significant level. Accordingly, this impact would still be considered significant and unavoidable, but LBNL would contribute to fair share

funding which, if a reasonable plan is implemented, would mitigate these impacts to a less than significant level.

LRDP TRANS-1b: LBNL shall work with the City of Berkeley to design and install a signal at the Durant Avenue/Piedmont Avenue intersection, when a signal warrant analysis shows that the signal is needed. LBNL shall contribute funding, on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for a periodic (annual or biennial) signal warrant check to allow the City to determine when a signal is warranted, and for installation of the signal. Should the City determine that alternative mitigation strategies may reduce or avoid the significant impact, the Lab shall work with the City and UC Berkeley to identify and implement such alternative feasible measure(s). See also Mitigation Measure TRANS-1c, development and implementation of a new Transportation Demand Management Program.

With the implementation of this mitigation measure, the Durant Avenue/Piedmont Avenue intersection would operate at an acceptable level of service (LOS B or better under traffic signal control) during both the a.m. and p.m. peak hours. Because LBNL could not implement this measure on its own, but would need the cooperation of the City of Berkeley, this impact would be considered significant and unavoidable.

This mitigation measure is proposed to be adopted as part of the LRDP and will be monitored through the LRDP mitigation monitoring and reporting program. It will thus continue to be a binding mitigation commitment of LBNL. Under CEQA case law, however, when the lead agency contributes fair share funding to a mitigation measure that will be carried out by another entity, there must be some evidence of a reasonable plan in place in order for the lead agency to conclude that the adopted mitigation will reduce the impact to a less than significant level (City of Marina v. Board of Trustees of the California State University (2006) 39 Cal.4th 341). LBNL has discussed this with the City, and based on that consultation, LBNL understands there have been some discussions of improvements at Gayley Road/Stadium Rim Way. Also, the University has retained a consultant to perform studies related to these improvements, but there is not yet a plan in place for the improvements. As such, it cannot be determined at this time that this impact will be mitigated to a less than significant level. Accordingly, this impact would still be considered significant and unavoidable, but LBNL would contribute to fair share funding which, if a reasonable plan is implemented, would mitigate these impacts to a less than significant level.

LRDP TRANS-1c: LBNL shall fund and conduct a study to evaluate whether there may be feasible mitigation (with design standards acceptable to the City) at the intersection of Hearst Avenue at Gayley Road/La Loma Avenue. This intersection is currently signalized, and physical geometric limitations

constrain improvements within its current right-of-way. All four corners of this intersection are occupied by existing UC Berkeley facilities, including Foothill Student Housing, Cory Hall, and outdoor tennis courts, as well as the Founders' Rock. The LOS analyses herein used conservative assumptions so as to not underestimate potential project impacts. For example, even though the approach widths at this intersection allow drivers to maneuver past other vehicles as they near the intersection, the absence of pavement striping to delineate separate lanes dictated that the analysis conservatively assume all vehicle movements on each approach are made on a single lane. Similarly, without the certainty that standard lane widths (and adequate storage lengths) could be provided, possible improvement measures were not relied on to judge that significant impacts would be mitigated to less-than-significant levels. Judging the success of possible mitigation measures with a conservative standard is reasonable, but in consultation with City of Berkeley staff, the Lab will conduct a further study to re evaluate whether there may be feasible mitigation (with design standards acceptable to the City) at this intersection. That additional study will be conducted by the Lab as part of the TDM program set forth below as Mitigation Measure TRANS-1d. If such mitigation is determined by Berkeley Lab to be feasible, then Berkeley Lab shall contribute funding on a fair share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for the installation of the improvements.

This mitigation measure will be monitored through the LRDP mitigation monitoring and reporting program. It will thus continue to be a binding mitigation commitment of LBNL. Under CEQA case law, however, when the lead agency contributes fair share funding to a mitigation measure that will be carried out by another entity, there must be some evidence of a reasonable plan in place in order for the lead agency to conclude that the adopted mitigation will reduce the impact to a less than significant level (City of Marina v. Board of Trustees of the California State University (2006) 39 Cal.4th 341). LBNL will reevaluate its conclusion that there is not feasible mitigation for this intersection, and will retain and fund a consultant to perform that reevaluation. However, given that LBNL has evaluated all of the potential mitigation that has been suggested and concluded that mitigation is not feasible, and given the absence of a City plan for such improvements, it cannot be determined at this time that this impact will be mitigated to a less than significant level. Accordingly, this impact would still be considered significant and unavoidable, but LBNL shall fund the study pursuant to the TDM program, and would contribute to fair share funding which, if feasible mitigation is identified and a plan to proceed with that mitigation is implemented, would mitigate this impact to a less than significant level.

LRDP TRANS-1d: LBNL shall develop and implement a new Transportation Demand Management (TDM) Program to replace its existing TDM program. This enhanced TDM Program has been drafted in consultation with the City of Berkeley, and is proposed to be adopted by the Lab following The Regents' consideration of the 2006 LRDP. The new draft proposed TDM Program is attached to this EIR as

Appendix G. The proposed TDM Program includes several implementation phases tied to the addition of parking to LBNL. The final provisions of the TDM Program may be revised as it is finally adopted but will include a TDM coordinator and transportation committee, an annual inventory of parking spaces and a gate count, a study of more aggressive TDM measures, investigation of a possible parking fee, investigation of sharing services with UC Berkeley and an alternative fuels program. The TDM program shall also include funding of a study to reevaluate the feasibility of mitigation at the Hearst and Gayley/LaLoma intersection. The new draft proposed TDM Program also includes a requirement that LBNL conduct an additional traffic study to reevaluate traffic impacts on the earliest to occur of 10 years following the certification of this EIR or the time at which the Lab formally proposes a project that will bring total development of parking spaces pursuant to the 2006 LRDP to or above 375 additional parking spaces.

LRDP TRANS-3: LBNL shall develop and maintain a transportation plan designed to ensure that the current balance of transportation modes is maintained. This plan shall include 1) maintaining the same (or lesser) ratio of parking permits and parking spaces to average daily population (ADP), and 2) ensuring that levels of shuttle bus service and provision of bike racks on shuttle buses are sufficient to accommodate projected demand.

LRDP TRANS-8: LBNL shall implement Mitigation Measure TRANS 1a (work with UC Berkeley and the City of Berkeley to design and install a signal at the Gayley Road/Stadium Rim Way intersection; LBNL would contribute funding on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, to install the signal) and Mitigation Measure TRANS 1b (work with the City of Berkeley to design and install a signal at the Durant Avenue/Piedmont Avenue intersection, when a signal warrant analysis shows that the signal is needed; LBNL would contribute funding on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, to install the signal and for monitoring to determine when a signal is warranted).

With the implementation of these mitigation measure, the intersections of Gayley Road/Stadium Rim Way and Durant Avenue/Piedmont Avenue would operate at LOS B or better during both the a.m. and p.m. peak hours.

As explained earlier, the intersection of Hearst Avenue at Gayley Road/La Loma Avenue is currently signalized, and physical geometric limitations constrain improvements within its current right-of-way. Without the certainty that standard lane widths (and adequate storage lengths) could be provided, possible improvement measures were not relied on to judge that significant impacts would be mitigated to less-than-significant levels. Judging the success of possible mitigation measures with a conservative standard is reasonable, but in consultation with City of Berkeley staff, the Lab shall fund and conduct a

study to evaluate whether there may be feasible mitigation (with design standards acceptable to the City) at this intersection. That additional study will be conducted by the Lab as part of the TDM program set forth below as Mitigation Measure TRANS-1d. If such mitigation is determined by Berkeley Lab to be feasible, then Berkeley Lab shall contribute funding on a fair share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for the installation of the improvements. Analyses indicate that little can be done to mitigate future LOS conditions without acquiring additional right-of-way or prohibiting certain turning movements, such as minor left-turn movements. Therefore, no mitigation is available for cumulative impacts on this intersection.

LRDP UTILS-2: LBNL shall implement programs to ensure that additional wastewater flows from the Lab are directed into unconstrained sub-basins, as necessary and appropriate. LBNL shall continue to direct the Lab's existing western effluent flows into sub-basin 17-013. In addition, new flows at the Lab shall be directed into either sub-basin 17-013, sub-basin 17-304, unconstrained portions of sub-basin 17-503, or another sub-basin that has adequate capacity. Final design and implementation of these improvements shall be negotiated between the appropriate parties and shall undergo appropriate environmental review and approval. LBNL shall closely coordinate the planning, approval, and implementation of this mitigation with the City of Berkeley and the UC Berkeley, as appropriate.

LRDP UTILS-4: LBNL shall develop a plan for maximizing diversion of construction and demolition materials associated with the construction of the proposed project from landfill disposal.

APPENDIX 4.2

Air Quality

URBEMIS2007 Operational Emissions

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Urbemis 2007 Version 9.2.2

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\glu\My Documents\aqLBNL\Helios\Helios Operational Emissions.urb9

Project Name: LBNL Helios Project

Project Location: Alameda County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (lbs/day, unmitigated)	1.14	1.09	2.45	0.00	0.01	1,282.81
TOTALS (lbs/day, mitigated)	1.12	0.87	2.27	0.00	0.01	1,026.81
Percent Reduction	1.75	20.18	7.35	0.00	0.00	19.96

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (lbs/day, unmitigated)	4.48	4.10	38.77	0.03	5.67	3,256.50

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (lbs/day, unmitigated)	5.62	5.19	41.22	0.03	5.68	4,539.31

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	CO2
Natural Gas	0.08	1.07	0.90	0.00	0.00	1,280.00
Hearth - No Summer Emissions						
Landscape	0.12	0.02	1.55	0.00	0.01	2.81
Consumer Products	0.00					
Architectural Coatings	0.94					
TOTALS (lbs/day, unmitigated)	1.14	1.09	2.45	0.00	0.01	1,282.81

Area Source Mitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Mitigated

Source	ROG	NOx	CO	SO2	PM10	CO2
Natural Gas	0.06	0.85	0.72	0.00	0.00	1,024.00
Hearth - No Summer Emissions						
Landscape	0.12	0.02	1.55	0.00	0.01	2.81
Consumer Products	0.00					
Architectural Coatings	0.94					
TOTALS (lbs/day, mitigated)	1.12	0.87	2.27	0.00	0.01	1,026.81

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	CO2
R & D Laboratory	4.48	4.10	38.77	0.03	5.67	3,256.50
TOTALS (lbs/day, unmitigated)	4.48	4.10	38.77	0.03	5.67	3,256.50

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2010 Temperature (F): 85 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

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Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
R & D Laboratory		2.21	1000 sq ft	160.00	353.60	3,283.18
					353.60	3,283.18

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	54.4	1.3	98.3	0.4
Light Truck < 3750 lbs	12.4	2.4	95.2	2.4
Light Truck 3751-5750 lbs	19.7	0.5	99.5	0.0
Med Truck 5751-8500 lbs	6.3	0.0	98.4	1.6
Lite-Heavy Truck 8501-10,000 lbs	0.8	0.0	75.0	25.0
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	50.0	50.0
Med-Heavy Truck 14,001-33,000 lbs	1.3	0.0	15.4	84.6
Heavy-Heavy Truck 33,001-60,000 lbs	0.8	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.9	69.0	31.0	0.0
School Bus	0.0	0.0	0.0	0.0
Motor Home	0.6	0.0	83.3	16.7

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
R & D Laboratory				90.0	5.0	5.0

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Urbemis 2007 Version 9.2.2

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\glu\My Documents\aqLBNL\Helios\Helios Operational Emissions.urb9

Project Name: LBNL Helios Project

Project Location: Alameda County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (lbs/day, unmitigated)	1.02	1.07	0.90	0.00	0.00	1,280.00
TOTALS (lbs/day, mitigated)	1.00	0.85	0.72	0.00	0.00	1,024.00
Percent Reduction	1.96	20.56	20.00	0.00	0.00	20.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (lbs/day, unmitigated)	3.34	6.00	40.35	0.03	5.67	2,832.31

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (lbs/day, unmitigated)	4.36	7.07	41.25	0.03	5.67	4,112.31

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	CO2
Natural Gas	0.08	1.07	0.90	0.00	0.00	1,280.00
Hearth	0.00	0.00	0.00	0.00	0.00	0.00
Landscaping - No Winter Emissions						
Consumer Products	0.00					
Architectural Coatings	0.94					
TOTALS (lbs/day, unmitigated)	1.02	1.07	0.90	0.00	0.00	1,280.00

Area Source Mitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Mitigated

Source	ROG	NOx	CO	SO2	PM10	CO2
Natural Gas	0.06	0.85	0.72	0.00	0.00	1,024.00
Hearth	0.00	0.00	0.00	0.00	0.00	0.00
Landscaping - No Winter Emissions						
Consumer Products	0.00					
Architectural Coatings	0.94					
TOTALS (lbs/day, mitigated)	1.00	0.85	0.72	0.00	0.00	1,024.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	CO2
R & D Laboratory	3.34	6.00	40.35	0.03	5.67	2,832.31
TOTALS (lbs/day, unmitigated)	3.34	6.00	40.35	0.03	5.67	2,832.31

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2010 Temperature (F): 40 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

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Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
R & D Laboratory		2.21	1000 sq ft	160.00	353.60	3,283.18
					353.60	3,283.18

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	54.4	1.3	98.3	0.4
Light Truck < 3750 lbs	12.4	2.4	95.2	2.4
Light Truck 3751-5750 lbs	19.7	0.5	99.5	0.0
Med Truck 5751-8500 lbs	6.3	0.0	98.4	1.6
Lite-Heavy Truck 8501-10,000 lbs	0.8	0.0	75.0	25.0
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	50.0	50.0
Med-Heavy Truck 14,001-33,000 lbs	1.3	0.0	15.4	84.6
Heavy-Heavy Truck 33,001-60,000 lbs	0.8	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.9	69.0	31.0	0.0
School Bus	0.0	0.0	0.0	0.0
Motor Home	0.6	0.0	83.3	16.7

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
R & D Laboratory				90.0	5.0	5.0

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Urbemis 2007 Version 9.2.2

Combined Annual Emissions Reports (Tons/Year)

File Name: C:\Documents and Settings\glu\My Documents\aqLBNL\Helios\Helios Operational Emissions.urb9

Project Name: LBNL Helios Project

Project Location: Alameda County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (tons/year, unmitigated)	0.19	0.19	0.30	0.00	0.00	233.85
TOTALS (tons/year, mitigated)	0.19	0.16	0.27	0.00	0.00	187.13
Percent Reduction	0.00	15.79	10.00	0.00	0.00	19.98

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (tons/year, unmitigated)	0.75	0.86	7.17	0.01	1.03	568.51

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	CO2
TOTALS (tons/year, unmitigated)	0.94	1.05	7.47	0.01	1.03	802.36

Both Area and Operational Mitigation must be turned on to get a combined mitigated total.

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	CO2
Natural Gas	0.01	0.19	0.16	0.00	0.00	233.60
Hearth	0.00	0.00	0.00	0.00	0.00	0.00
Landscape	0.01	0.00	0.14	0.00	0.00	0.25
Consumer Products	0.00					
Architectural Coatings	0.17					
TOTALS (tons/year, unmitigated)	0.19	0.19	0.30	0.00	0.00	233.85

Area Source Mitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Mitigated

Source	ROG	NOx	CO	SO2	PM10	CO2
Natural Gas	0.01	0.16	0.13	0.00	0.00	186.88
Hearth	0.00	0.00	0.00	0.00	0.00	0.00
Landscape	0.01	0.00	0.14	0.00	0.00	0.25
Consumer Products	0.00					
Architectural Coatings	0.17					
TOTALS (tons/year, mitigated)	0.19	0.16	0.27	0.00	0.00	187.13

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	CO2
R & D Laboratory	0.75	0.86	7.17	0.01	1.03	568.51
TOTALS (tons/year, unmitigated)	0.75	0.86	7.17	0.01	1.03	568.51

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2010 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

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Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
R & D Laboratory		2.21	1000 sq ft	160.00	353.60	3,283.18
					353.60	3,283.18

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	54.4	1.3	98.3	0.4
Light Truck < 3750 lbs	12.4	2.4	95.2	2.4
Light Truck 3751-5750 lbs	19.7	0.5	99.5	0.0
Med Truck 5751-8500 lbs	6.3	0.0	98.4	1.6
Lite-Heavy Truck 8501-10,000 lbs	0.8	0.0	75.0	25.0
Lite-Heavy Truck 10,001-14,000 lbs	0.6	0.0	50.0	50.0
Med-Heavy Truck 14,001-33,000 lbs	1.3	0.0	15.4	84.6
Heavy-Heavy Truck 33,001-60,000 lbs	0.8	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.9	69.0	31.0	0.0
School Bus	0.0	0.0	0.0	0.0
Motor Home	0.6	0.0	83.3	16.7

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	9.5	7.4	7.4
Rural Trip Length (miles)	16.8	7.1	7.9	14.7	6.6	6.6
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
R & D Laboratory				90.0	5.0	5.0

Stationary Source and Greenhouse Gas Emissions

LBNL Helios Stationary Emissions

Criteria Pollutants

	lbs/day				
Source	**ROG**	**NOx**	**CO**	**SOx**	**PM10**
Emergency Generator	2.33	11.21	6.07	0.01	0.02
Boilers	0.90	5.88	13.71	0.10	1.24
Cooling Towers	—	—	—	—	3.77
Total Stationary Source Emissions	3.23	17.08	19.78	0.11	5.04

Greenhouse Gases

Source	**metric tons/yr CO_2E**
Emergency Generator	27.6
Boilers	3,249
Cooling Towers	—
Total	**3,277**

LBNL Helios Project
Emergency Generator

Emergency Generator #1

Rating:	750	KW
	1059	HP
Operating Hours	1.0	hr/day
	50	hr/yr

	ROG	NOx	CO	SOx	PM10	CO_2
gm/HP-hr	1.0	4.8	2.6	0.005	0.01	521.64
lb/hr	2.33	11.21	6.07	0.01	0.02	1,217.85
lb/day	2.33	11.21	6.07	0.01	0.02	1,217.85
lb/yr	116.73	560.32	303.51	0.58	1.17	60,892.50
metric tons/yr						27.62

Notes:

1. Emission factors (except SOx) based on EPA/CARB emission standards for 2010 MY generators > 750 HP and $\leq$ 1200 HP.
2. Emission Factor for SOx is based on 15 ppm (0.0015%) S and fuel usage of 0.4 lb/HP-hr.
3. Emission factor for CO_2 is based AP-42, Chapter 3.3, Table 3.3.-1.

LBNL Helios Project
Boilers

Boiler #1
Rating: 1.7 MMBtu/hr

	ROG	NOx	CO	SOx	PM10	Greenhouse Gases CO_2	CH_4	N_2O	CO_2E
ppm @ 3% O_2		30							
lb/MMBtu	0.0055	0.036	0.084	0.0006	0.0076	120	0.0023	0.00064	
lb/day	0.22	1.47	3.43	0.02	0.31	4,896.00	0.09	0.03	4,906.07
lb/yr	81.91	536.11	1,250.93	8.94	113.18	1,787,040.00	34.25	9.53	1,790,713.86

Concentration limit for NOx: Lochinvar Manufacturer Specifications
Emission Factors for VOC, CO, CO_2, PM10, and SOx: AP-42, Chapter 1.4

Boiler #2
Rating: 1.7 MMBtu/hr

	ROG	NOx	CO	SOx	PM10	Greenhouse Gases CO_2	CH_4	N_2O	CO_2E
ppm @ 3% O_2		30							
lb/MMBtu	0.0055	0.036	0.084	0.0006	0.0076	120	0.0023	0.00064	
lb/day	0.22	1.47	3.43	0.02	0.31	4,896.00	0.09	0.03	4,906.07
lb/yr	81.91	536.11	1,250.93	8.94	113.18	1,787,040.00	34.25	9.53	1,790,713.86

Concentration limit for NOx: Lochinvar Manufacturer Specifications
Emission Factors for VOC, CO, CO_2, PM10, and SOx: AP-42, Chapter 1.4

Boiler #3
Rating: 1.7 MMBtu/hr

	ROG	NOx	CO	SOx	PM10	Greenhouse Gases CO_2	CH_4	N_2O	CO_2E
ppm @ 3% O_2		30							
lb/MMBtu	0.0055	0.036	0.084	0.0006	0.0076	120	0.0023	0.00064	
lb/day	0.22	1.47	3.43	0.02	0.31	4,896.00	0.09	0.03	4,906.07
lb/yr	81.91	536.11	1,250.93	8.94	113.18	1,787,040.00	34.25	9.53	1,790,713.86

Concentration limit for NOx: Lochinvar Manufacturer Specifications
Emission Factors for VOC, CO, CO_2, PM10, and SOx: AP-42, Chapter 1.4

Boiler #4
Rating: 1.7 MMBtu/hr

	ROG	NOx	CO	SOx	PM10	Greenhouse Gases CO_2	CH_4	N_2O	CO_2E
ppm @ 3% O_2		30							
lb/MMBtu	0.0055	0.036	0.084	0.0006	0.0076	120	0.0023	0.00064	
lb/day	0.22	1.47	3.43	0.02	0.31	4,896.00	0.09	0.03	4,906.07
lb/yr	81.91	536.11	1,250.93	8.94	113.18	1,787,040.00	34.25	9.53	1,790,713.86

Concentration limit for NOx: Lochinvar Manufacturer Specifications
Emission Factors for VOC, CO, CO_2, PM10, and SOx: AP-42, Chapter 1.4

	ROG	NOx	CO	SOx	PM10	Greenhouse Gases CO_2	CH_4	N_2O	CO_2E
Boiler Totals									
lb/day	0.90	5.88	13.71	0.10	1.24	19,584.00	0.38	0.10	19,624.26
ton/yr	0.16	1.07	2.50	0.02	0.23	3,574.08	0.07	0.02	3,581.43
metric tons/yr									3,249.02

LBNL Helios Project
Cooling Towers
Daily Emissions

High Flow Rate	1465	Gallons per Minute
Maximum Drift	0.005%	Percent
Water Density	8.34	Pounds per gallon
	8	Cooling Towers
	24	hr/day

	PM10
TDS ppm	536
lb/hr	0.16
lb/day	3.77

Note:
1. Total dissolved solids (TDS) is based on a maximum electrical conductivity of 800 micromhos per centimeter, which is a TDS of approximately 536 ppm.

LBNL Helios Project
Cooling Towers
Annual Emissions

High Flow Rate	735	Gallons per M
Maximum Drift	0.005%	Percent
Water Density	8.34	Pounds per ga
	8	Cooling Towe
	24	hr/day
	90	day/yr

	PM10
TDS ppm	536
lb/hr	0.16
lb/yr	170.33

Note:
1. Total dissolved solids (TDS) is based on a maxir conductivity of 800 micromhos per centimeter, w approximately 536 ppm.
2. Cooling towers are assumed to operate up to 90

Helios Facility
Greenhouse Gas Emissions from Motor Vehicles

Source	Annual CO_2 Emissions (tons/yr)[1]	Annual CO_2E Emissions (metric tons/yr)[2,3]
Proposed Land Uses	568.5	542.9

1. Estimated emissions from URBEMIS2007
2. CO_2 emissions are assumed to be 95% of GHG emissions on a CO_2 equivalent basis. (U.S. EPA, "Emission Facts - Greenhouse Gas Emissions from a Typical Passenger Vehicle", Office of Transportation and Air Quality, EPA420-F-05-004, February 2005)
3. 1 metric ton = 1.102 tons

Helios Facility
Greenhouse Gas Emissions from Area Sources

GHG	Emission Factor ($lb/10^6$ scf)[1]	GWP	% CO_2E
CO_2	120,000	1	99.4%
N_2O	2.2	310	0.6%
CH_4	2.3	21	0.0%
CO_2E	120,730		

	Annual CO_2 (tons/yr)[2]	Annual CO_2E (metric tons/yr)[3]
Proposed Land Uses	187.1	170.8

1. U.S. EPA. AP-42 Chapter 1.4 Natural Gas Combustion. July 1998.
2. Estimated emissions from URBEMIS2007
3. 1 metric ton = 1.102 tons

CRT CO Hotspots Analysis

BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

Project Title:	LBNL Helios Project
Intersection:	Centennial Dr and Grizzly Pk Blvd
Analysis Condition:	Cumulative with Project
Nearest Air Monitoring Station measuring CO:	822 Alice Street Oakland, CA 94607
Background 1-hour CO Concentration (ppm):	6.8
Background 8-hour CO Concentration (ppm):	4.2
Persistence Factor:	0.7
Analysis Year:	2025

		Roadway Type	No. of Lanes	Approach/Departure Speed A.M.	Approach/Departure Speed P.M.
North-South Roadway:	Centennial Drive	AT GRADE	2	5	5
East-West Roadway:	Grizzly Peak Boulevard	AT GRADE	2	5	5

EMFAC2007 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: San Francisco Bay Ar County: All

Assumes lowest mean wintertime temperature of 40 degrees F and 30% humidity.

	Average Speed (miles per hour)									
Year	5	8	11	14	17	20	23	26	29	32
2007	10.404	9.093	8.058	7.231	6.563	6.024	5.588	5.23	4.936	4.7
2008	9.453	8.28	7.351	6.607	6.005	5.518	5.124	4.799	4.532	4.316
2009	8.51	7.471	6.646	5.984	5.448	5.012	4.66	4.367	4.126	3.929
2010	7.609	6.699	5.976	5.392	4.918	4.532	4.219	3.958	3.741	3.564
2011	6.831	6.032	5.393	4.877	4.456	4.113	3.833	3.599	3.404	3.243
2012	6.141	5.437	4.874	4.416	4.042	3.737	3.487	3.277	3.101	2.955
2013	5.528	4.909	4.411	4.005	3.673	3.4	3.177	2.988	2.83	2.697
2014	4.98	4.435	3.995	3.635	3.339	3.097	2.897	2.728	2.584	2.464
2015	4.502	4.021	3.63	3.311	3.047	2.829	2.65	2.497	2.368	2.258
2020	2.909	2.632	2.402	2.21	2.05	1.917	1.805	1.708	1.624	1.552
2025	2.144	1.95	1.789	1.653	1.539	1.444	1.364	1.294	1.233	1.181
2030	1.756	1.601	1.472	1.363	1.271	1.195	1.131	1.075	1.027	0.985

PEAK HOUR TURNING VOLUMES

A.M. Peak

	N				
		4	52	25	
W		<	v	>	E
6	^			^	16
187	>			<	101
161	v			v	236
		<	^	>	
		65	13	29	
	S				

P.M. Peak

	N				
		9	33	37	
W		<	v	>	E
3	^			^	28
201	>			<	136
74	v			v	42
		<	^	>	
		202	72	367	
	S				

Representative Traffic Volumes (Vehicles per Hour)

N-S Road	556	N-S Road	790
E-W Road	594	E-W Road	811
Primary Road =	E-W Road	Primary Road =	E-W Road

ROADWAY CO CONTRIBUTIONS

Roadway	Reference CO Concentrations 0 Feet	25 Feet	50 Feet		Traffic Volume		Emission Factor		
A.M. Peak Hour									
N-S Road	3.7	2.7	2.2	*	556	*	2.14	÷	100,000
E-W Road	14.0	7.6	5.7	*	594	*	2.14	÷	100,000
P.M. Peak Hour									
N-S Road	3.7	2.7	2.2	*	790	*	2.14	÷	100,000
E-W Road	14.0	7.6	5.7	*	811	*	2.14	÷	100,000

TOTAL CO CONCENTRATIONS (ppm)

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
0 Feet from Roadway Edge	7.0	7.1	4.4
25 Feet from Roadway Edge	6.9	6.9	4.3
50 Feet from Roadway Edge	6.8	6.9	4.3

BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

Project Title:	LBNL Helios Project
Intersection:	Gayley Ave-La Loma Ave and Hearst Ave
Analysis Condition:	Cumulative with Project
Nearest Air Monitoring Station measuring CO:	822 Alice Street Oakland, CA 94607
Background 1-hour CO Concentration (ppm):	6.8
Background 8-hour CO Concentration (ppm):	4.2
Persistence Factor:	0.7
Analysis Year:	2025

		Roadway Type	No. of Lanes	Approach/Departure Speed A.M.	Approach/Departure Speed P.M.
North-South Roadway:	Gayley Avenue/La Loma Avenue	AT GRADE	2	5	5
East-West Roadway:	Hearst Avenue	AT GRADE	2	5	5

EMFAC2002 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: San Francisco Bay Ar County: All

Assumes lowest mean wintertime temperature of 40 degrees F and 30% humidity.

	Average Speed (miles per hour)									
Year	5	8	11	14	17	20	23	26	29	32
2007	10.404	9.093	8.058	7.231	6.563	6.024	5.588	5.23	4.936	4.7
2008	9.453	8.28	7.351	6.607	6.005	5.518	5.124	4.799	4.532	4.316
2009	8.51	7.471	6.646	5.984	5.448	5.012	4.66	4.367	4.126	3.929
2010	7.609	6.699	5.976	5.392	4.918	4.532	4.219	3.958	3.741	3.564
2011	6.831	6.032	5.393	4.877	4.456	4.113	3.833	3.599	3.404	3.243
2012	6.141	5.437	4.874	4.416	4.042	3.737	3.487	3.277	3.101	2.955
2013	5.528	4.909	4.411	4.005	3.673	3.4	3.177	2.988	2.83	2.697
2014	4.98	4.435	3.995	3.635	3.339	3.097	2.897	2.728	2.584	2.464
2015	4.502	4.021	3.63	3.311	3.047	2.829	2.65	2.497	2.368	2.258
2020	2.909	2.632	2.402	2.21	2.05	1.917	1.805	1.708	1.624	1.552
2025	2.144	1.95	1.789	1.653	1.539	1.444	1.364	1.294	1.233	1.181
2030	1.756	1.601	1.472	1.363	1.271	1.195	1.131	1.075	1.027	0.985

PEAK HOUR TURNING VOLUMES

A.M. Peak

N				
	21	446	12	
W	<	v	>	E
28 ^			^	5
292 >			<	67
344 v			v	45
	<	^	>	
	385	227	159	
S				

P.M. Peak

N				
	71	215	4	
W	<	v	>	E
50 ^			^	51
93 >			<	329
376 v			v	91
	<	^	>	
	463	352	39	
S				

Representative Traffic Volumes (Vehicles per Hour)

N-S Road	1,606	N-S Road	1,536
E-W Road	1,137	E-W Road	1,382
Primary Road =	N-S Road	Primary Road =	N-S Road

ROADWAY CO CONTRIBUTIONS

Roadway	Reference CO Concentrations 0 Feet	25 Feet	50 Feet		Traffic Volume		Emission Factor		
A.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,606	*	2.14	÷	100,000
E-W Road	3.7	2.7	2.2	*	1,137	*	2.14	÷	100,000
P.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,536	*	2.14	÷	100,000
E-W Road	3.7	2.7	2.2	*	1,382	*	2.14	÷	100,000

TOTAL CO CONCENTRATIONS (ppm)

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
0 Feet from Roadway Edge	7.3	7.3	4.6
25 Feet from Roadway Edge	7.1	7.1	4.4
50 Feet from Roadway Edge	7.0	7.0	4.4

BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

Project Title:	LBNL Helios Project
Intersection:	Gayley Ave and Stadium Rim Wy
Analysis Condition:	Cumulative with Project
Nearest Air Monitoring Station measuring CO:	822 Alice Street Oakland, CA 94607
Background 1-hour CO Concentration (ppm):	6.8
Background 8-hour CO Concentration (ppm):	4.2
Persistence Factor:	0.7
Analysis Year:	2025

		Roadway Type	No. of Lanes	Approach/Departure Speed A.M.	Approach/Departure Speed P.M.
North-South Roadway:	Gayley Avenue	AT GRADE	2	5	5
East-West Roadway:	Stadium Rim Way	AT GRADE	2	5	5

EMFAC2002 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: San Francisco Bay Ar County: All

Assumes lowest mean wintertime temperature of 40 degrees F and 30% humidity.

	Average Speed (miles per hour)									
Year	5	8	11	14	17	20	23	26	29	32
2007	10.404	9.093	8.058	7.231	6.563	6.024	5.588	5.23	4.936	4.7
2008	9.453	8.28	7.351	6.607	6.005	5.518	5.124	4.799	4.532	4.316
2009	8.51	7.471	6.646	5.984	5.448	5.012	4.66	4.367	4.126	3.929
2010	7.609	6.699	5.976	5.392	4.918	4.532	4.219	3.958	3.741	3.564
2011	6.831	6.032	5.393	4.877	4.456	4.113	3.833	3.599	3.404	3.243
2012	6.141	5.437	4.874	4.416	4.042	3.737	3.487	3.277	3.101	2.955
2013	5.528	4.909	4.411	4.005	3.673	3.4	3.177	2.988	2.83	2.697
2014	4.98	4.435	3.995	3.635	3.339	3.097	2.897	2.728	2.584	2.464
2015	4.502	4.021	3.63	3.311	3.047	2.829	2.65	2.497	2.368	2.258
2020	2.909	2.632	2.402	2.21	2.05	1.917	1.805	1.708	1.624	1.552
2025	2.144	1.95	1.789	1.653	1.539	1.444	1.364	1.294	1.233	1.181
2030	1.756	1.601	1.472	1.363	1.271	1.195	1.131	1.075	1.027	0.985

PEAK HOUR TURNING VOLUMES

A.M. Peak

	N				
		0	591	241	
W		<	v	>	E
12	^			^	155
5	>			<	1
14	v			v	63
		<	^	>	
		0	505	285	
	S				

P.M. Peak

	N				
		0	536	171	
W		<	v	>	E
20	^			^	361
7	>			<	0
15	v			v	212
		<	^	>	
		0	464	78	
	S				

Representative Traffic Volumes (Vehicles per Hour)

N-S Road	1,504	N-S Road	1,552
E-W Road	750	E-W Road	829
Primary Road =	N-S Road	Primary Road =	N-S Road

ROADWAY CO CONTRIBUTIONS

Roadway	Reference CO Concentrations 0 Feet	25 Feet	50 Feet		Traffic Volume		Emission Factor		
A.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,504	*	2.14	÷	100,000
E-W Road	3.7	2.7	2.2	*	750	*	2.14	÷	100,000
P.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,552	*	2.14	÷	100,000
E-W Road	3.7	2.7	2.2	*	829	*	2.14	÷	100,000

TOTAL CO CONCENTRATIONS (ppm)

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
0 Feet from Roadway Edge	7.3	7.3	4.6
25 Feet from Roadway Edge	7.0	7.1	4.4
50 Feet from Roadway Edge	7.0	7.0	4.4

BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

Project Title:	LBNL Helios Project
Intersection:	Piedmont Ave and Bancroft Wy
Analysis Condition:	Cumulative with Project
Nearest Air Monitoring Station measuring CO:	822 Alice Street Oakland, CA 94607
Background 1-hour CO Concentration (ppm):	6.8
Background 8-hour CO Concentration (ppm):	4.2
Persistence Factor:	0.7
Analysis Year:	2025

		Roadway Type	No. of Lanes	Approach/Departure Speed A.M.	Approach/Departure Speed P.M.
North-South Roadway:	Piedmont Avenue	AT GRADE	2	5	5
East-West Roadway:	Bancroft Way	AT GRADE	0	5	5

EMFAC2007 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: San Francisco Bay Ar County: All

Assumes lowest mean wintertime temperature of 40 degrees F and 30% humidity.

	Average Speed (miles per hour)									
Year	5	8	11	14	17	20	23	26	29	32
2007	10.404	9.093	8.058	7.231	6.563	6.024	5.588	5.23	4.936	4.7
2008	9.453	8.28	7.351	6.607	6.005	5.518	5.124	4.799	4.532	4.316
2009	8.51	7.471	6.646	5.984	5.448	5.012	4.66	4.367	4.126	3.929
2010	7.609	6.699	5.976	5.392	4.918	4.532	4.219	3.958	3.741	3.564
2011	6.831	6.032	5.393	4.877	4.456	4.113	3.833	3.599	3.404	3.243
2012	6.141	5.437	4.874	4.416	4.042	3.737	3.487	3.277	3.101	2.955
2013	5.528	4.909	4.411	4.005	3.673	3.4	3.177	2.988	2.83	2.697
2014	4.98	4.435	3.995	3.635	3.339	3.097	2.897	2.728	2.584	2.464
2015	4.502	4.021	3.63	3.311	3.047	2.829	2.65	2.497	2.368	2.258
2020	2.909	2.632	2.402	2.21	2.05	1.917	1.805	1.708	1.624	1.552
2025	2.144	1.95	1.789	1.653	1.539	1.444	1.364	1.294	1.233	1.181
2030	1.756	1.601	1.472	1.363	1.271	1.195	1.131	1.075	1.027	0.985

PEAK HOUR TURNING VOLUMES

A.M. Peak

	N				
		219	426	0	
W		<	v	>	E
0	^			^	0
0	>			<	0
0	v			v	0
		<	^	>	
		246	819	0	
	S				

P.M. Peak

	N				
		225	439	0	
W		<	v	>	E
0	^			^	0
0	>			<	0
0	v			v	0
		<	^	>	
		175	615	0	
	S				

Representative Traffic Volumes (Vehicles per Hour)

N-S Road	1,491	N-S Road	1,279
E-W Road	465	E-W Road	400
Primary Road =	N-S Road	Primary Road =	N-S Road

ROADWAY CO CONTRIBUTIONS

Roadway	Reference CO Concentrations 0 Feet	25 Feet	50 Feet		Traffic Volume		Emission Factor		
A.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,491	*	2.14	÷	100,000
E-W Road	0.0	0.0	0.0	*	465	*	2.14	÷	100,000
P.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,279	*	2.14	÷	100,000
E-W Road	0.0	0.0	0.0	*	400	*	2.14	÷	100,000

TOTAL CO CONCENTRATIONS (ppm)

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
0 Feet from Roadway Edge	7.2	7.1	4.5
25 Feet from Roadway Edge	7.0	7.0	4.4
50 Feet from Roadway Edge	6.9	6.9	4.3

BAY AREA AQMD SIMPLIFIED CALINE4 ANALYSIS; UPDATED WITH EMFAC2007

Project Title:	LBNL Helios Project
Intersection:	Piedmont Ave and Durant Avenue
Analysis Condition:	Cumulative with Project
Nearest Air Monitoring Station measuring CO:	822 Alice Street Oakland, CA 94607
Background 1-hour CO Concentration (ppm):	6.8
Background 8-hour CO Concentration (ppm):	4.2
Persistence Factor:	0.7
Analysis Year:	2025

		Roadway Type	No. of Lanes	Approach/Departure Speed A.M.	Approach/Departure Speed P.M.
North-South Roadway:	Piedmont Avenue	AT GRADE	2	5	5
East-West Roadway:	Durant Avenue	AT GRADE	0	5	5

EMFAC2007 COMPOSITE EMISSION FACTORS FOR CO

Air Basin: San Francisco Bay Ar County: All

Assumes lowest mean wintertime temperature of 40 degrees F and 30% humidity.

	Average Speed (miles per hour)									
Year	5	8	11	14	17	20	23	26	29	32
2007	10.404	9.093	8.058	7.231	6.563	6.024	5.588	5.23	4.936	4.7
2008	9.453	8.28	7.351	6.607	6.005	5.518	5.124	4.799	4.532	4.316
2009	8.51	7.471	6.646	5.984	5.448	5.012	4.66	4.367	4.126	3.929
2010	7.609	6.699	5.976	5.392	4.918	4.532	4.219	3.958	3.741	3.564
2011	6.831	6.032	5.393	4.877	4.456	4.113	3.833	3.599	3.404	3.243
2012	6.141	5.437	4.874	4.416	4.042	3.737	3.487	3.277	3.101	2.955
2013	5.528	4.909	4.411	4.005	3.673	3.4	3.177	2.988	2.83	2.697
2014	4.98	4.435	3.995	3.635	3.339	3.097	2.897	2.728	2.584	2.464
2015	4.502	4.021	3.63	3.311	3.047	2.829	2.65	2.497	2.368	2.258
2020	2.909	2.632	2.402	2.21	2.05	1.917	1.805	1.708	1.624	1.552
2025	2.144	1.95	1.789	1.653	1.539	1.444	1.364	1.294	1.233	1.181
2030	1.756	1.601	1.472	1.363	1.271	1.195	1.131	1.075	1.027	0.985

PEAK HOUR TURNING VOLUMES

A.M. Peak

	N				
		0	436	0	
W		<	v	>	E
321	^			^	0
0	>			<	0
161	v			v	0
		<	^	>	
		0	707	0	
	S				

P.M. Peak

	N				
		0	521	0	
W		<	v	>	E
253	^			^	0
0	>			<	0
320	v			v	0
		<	^	>	
		0	534	0	
	S				

Representative Traffic Volumes (Vehicles per Hour)

N-S Road	1,464	N-S Road	1,375
E-W Road	482	E-W Road	573
Primary Road =	N-S Road	Primary Road =	N-S Road

ROADWAY CO CONTRIBUTIONS

Roadway	Reference CO Concentrations 0 Feet	25 Feet	50 Feet		Traffic Volume		Emission Factor		
A.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,464	*	2.14	÷	100,000
E-W Road	0.0	0.0	0.0	*	482	*	2.14	÷	100,000
P.M. Peak Hour									
N-S Road	14.0	7.6	5.7	*	1,375	*	2.14	÷	100,000
E-W Road	0.0	0.0	0.0	*	573	*	2.14	÷	100,000

TOTAL CO CONCENTRATIONS (ppm)

	A.M. Peak Hour	P.M. Peak Hour	8-Hour
0 Feet from Roadway Edge	7.2	7.2	4.5
25 Feet from Roadway Edge	7.0	7.0	4.4
50 Feet from Roadway Edge	6.9	6.9	4.3

APPENDIX 4.3

Biological Resources

Local Plans and Policies

Local Plans and Policies

LBNL is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned or controlled by The Regents of the University of California. As such LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. Therefore, local plans and policies of the cities of Berkeley and Oakland related to biological resources are not directly relevant to the lab projects and activities. This section summarizes relevant polices contained in both the Berkeley and Oakland General Plans, as well as other City of Berkeley and City of Oakland documents relevant to biological resources at LBNL.

Berkeley General Plan

City of Berkeley General Plan policies pertaining to natural resources that are relevant to implementation of the LBNL LRDP include the following:

> Policy EM-28 Creeks and Watershed Management: Whenever feasible, daylight creeks by removing culverts, underground pipes, and obstructions to fish and animal migrations.
>
> Policy EM-28 Natural Habitat: Restore and protect valuable, significant, or unique natural habitat areas.
>
> Policy EM-30 Native Plants: Use native tree and plant species to enhance ecological richness.
>
> Policy EM-31 Landscaping: Encourage drought-resistant, rodent-resistant, and fire resistant plants to reduce water use, prevent soil erosion, improve habitat, reduce fire danger, and minimize degradation of natural resources.
>
> Policy EM-32 Inter-jurisdictional Coordination: Encourage efforts by neighboring jurisdictions and agencies, such as the East Bay Regional Parks District, University of California, Berkeley, and the Lawrence Berkeley National Laboratory, to restore historic coastal grasslands in the hill area to provide natural habitat and reduce fire danger in the area.

City of Berkeley Coast Live Oak Removal Ordinance

The Berkeley City Council adopted ordinances declaring a moratorium on the removal of coast live oak trees within the city (Ordinance No. 6321-N.S., as amended by Ordinance No. 6462-N.S and Ordinance No. 6550-N.S.). These ordinances prohibit the removal of any single-stem coast live oak with a circumference of 18 inches or greater, as measured at a distance of 4 feet above ground level, and the

removal of any multi-stemmed coast live oak with an aggregate circumference of 26 inches or greater. Exceptions may be made if the tree poses a danger to people and/or property and the only reasonable solution is tree removal.

City of Berkeley Creek Ordinance

Title 17, Chapter 17.08 of the Berkeley Municipal Code, Preservation and Restoration of Natural Watercourses, establishes policies on the issuance of permits for culverting open creeks, the rehabilitation and restoration of open waterways, and the management of watersheds. The ordinance defines a creek as a "…naturally occurring swale or depression, which carries water either seasonally or year-round, and which appears as an aboveground creek on the Geological Survey Map and in the 1975 Berkeley creeks map prepared by the planning department to show the approximate undergrounding of the watercourse." The ordinance prohibits the filling, obliteration, obstruction, and interference with any natural watercourse in Berkeley, as well as the construction of structures within 30 feet of the centerline of a creek without a permit. The ordinance also prohibits the culverting or riprapping of a creek without a permit issued by the city engineer. No permit will be issued without the submittal of plans, and any work carried out under the permit must be supervised by the city engineer or his designee. A permit will not be granted if less destructive solutions are feasible. Such alternatives include clearing of debris within the creek channel; restoration of the creek to re-establish natural stream morphology, geometry, or channel roughness; removal of structures when feasible; and bank stabilization using bioengineering techniques.

Oakland General Plan

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

> Policy CO-6.1: Protect Oakland's remaining natural creek segments by retaining creek vegetation, maintaining creek setbacks, and controlling bank erosion. Design future flood control projects to preserve the natural character of creeks and incorporate provisions for creeks or divert them into concrete channels.
>
> Policy CO-7.1: Protect native plant communities, especially oak woodlands, redwood forests, native perennial grasslands, and riparian woodlands, from the potential adverse impacts of development. Manage development in a way which prevents or mitigates adverse impacts to these communities.

Policy CO-7.3: Make every effort to maintain the wooded or forested character of tree-covered lots when development occurs on such lots.

Policy CO-7.4: Discourage the removal of large trees on already developed sites unless removal is required for biological, public safety, or public works reasons.

Policy CO-8.1: Work with federal, state, and regional agencies on an ongoing basis to determine mitigation measures for development which could potentially impact wetlands. Strongly discourage development with unmitigatable adverse impacts.

Policy CO-9.1: Protect rare, endangered, and threatened species by conserving and enhancing their habitat and requiring mitigation of potential adverse impacts when development occurs within habitat areas.

Policy CO-11.1: Protect wildlife from the hazards of urbanization, including loss of habitat and predation by domestic animals.

Policy CO-11.2: Protect and enhance migratory corridors for wildlife. Where such corridors are privately owned, require new development to retain native habitat or take other measures which help sustain local wildlife population and migratory patterns.

The following policy is from the Land Use and Transportation Element:

Policy W3.3: Native plant communities, wildlife habitats, and sensitive habitats should be protected and enhanced.

City of Oakland Tree Ordinance

Title 12, Chapter 12.36 of the Oakland Municipal Code provides protection to coast live oaks measuring 4 inches in diameter (12 inches in circumference) and to any other tree measuring 9 inches in diameter (28 inches in circumference), when measured at a height of 4 feet above grade. Protected trees may not be removed without a tree removal permit. Permits may be issued with conditions of approval that include, but are not limited to, the protection of any other protected trees in the vicinity of the tree(s) to be removed and replacement plantings. Replacement plantings are not required for the removal of non-native species when trees are removed for the benefit of remaining trees or when there is insufficient space for a mature tree of the species being considered. Replacement trees must be trees appropriate to the area: coast live oak, coast redwood, madrone, California buckeye, or California bay.

City of Oakland Creek Ordinance

Title 13, Chapter 13.16, City of Oakland Creek Protection, Storm Water Management, and Discharge Control Ordinance, provides a high level of protection for creeks within Oakland's city limits. The ordinance defines a creek as "a watercourse that is a naturally occurring swale or depression, or engineered channel that carries fresh or estuarine water either seasonally or year round." In addition, under the ordinance definition, a creek channel must be hydrologically connected to a waterway above or below a project site, and the channel must exhibit a defined bed and bank. A creek protection permit is required whenever work is to be undertaken on a creekside property. The ordinance prohibits, among other things, the discharge of concentrated stormwater or other modification of the natural flow of water in a watercourse, development within a watercourse or within 20 feet from the top of the bank, and the deposition or removal of any material within a watercourse without a permit. Depending on the type of activity being permitted, conditions of approval may include the submittal of a creek protection plan and/or a hydrology report, revegetation with native plant species, the use of soil bioengineering techniques for bank stabilization and erosion control, and implementation of stormwater quality protection measures. The following activities, among others, are typically not permitted:

- Removal of riparian vegetation
- Culverting or undergrounding of a creek
- Moving the location of a creek
- Structures spanning a creek
- Riprap, rock gabions, or concrete within the bed or on the creek banks

The City of Oakland Creek Protection Ordinance was adopted in 1997. The ordinance is currently undergoing a clarification and revision process, and new guidelines for implementation are being developed.

Plant Species Identified on the Project Site

Plant species observed during June 28, 2007 special-status plant surveys of Lawrence Berkeley Lab Helios Site. Asterisk (*) indicates non-native species. Survey conducted by Vollmar Consulting, Berkeley CA.

Scientific Name[1]	Common Name	Helios
**Anthemis cotula*	Mayweed	X
Artemesia douglasiana	Mugwort	
**Avena fatua*	Wild oats	X
Baccharis pilularis	Coyote brush	X
**Brassica* sp.	Mustard	X
**Bromus hordeaceus*	Soft chess	X
Bromus carinatus	California brome	X
**Bromus diandrus*	Rip-gut	X
**Briza maxima*	Rattlesnake grass	X
**Carduus pycnocephalus*	Italian thistle	X
Chlorogalum p. var. *pomeridianum*	Big soaproot	
**Cirsium vulgare*	Bull thistle	X
**Conium maculatum*	Poison hemlock	X
**Cynara cardunculus*	Artichoke thistle	
**Cynodon dactylon*	Bermuda grass	X
Cyperus eragrostis	Umbrella nutsedge	X
**Dactylis glomerata*	Orchardgrass	X
Elymus glaucus ssp. *glaucus*	Blue wildrye	X
**Erodium moschatum*	Filaree	
Eschscholtzia californica	California poppy	
**Eucalyptus* sp.	Eucalyptus	X
**Genista monspessulana*	French broom	X
Gnaphalium sp.	Cudweed	X
**Hordeum murinum*	Foxtail barley	X
**Lathyrus latifolius*	Perennial sweetpea	
**Lotus corniculatus*	Bird's-foot trefoil	X
Marah fabaceus	California man-root	
Nassella pulchra	Purple needlegrass	X
Nasturtium officianale	Water cress	X
**Picris echioides*	Bristly ox-tongue	X
Pinus sp.	Pine (planted)	
**Phalaris aquatica*	Harding grass	X
**Plantago lanceolata*	English plantain	
Poa secunda	One-sided bluegrass	X
**Polypogon monspeliensis*	Rabbit's-foot grass	X
Quercus agrifolia	Coast live oak	X
Rubus ursinus	California blackberry	
**Rumex conglomeratus*	Clustered dock	X
Salix lasiolepis	Arroyo willow	X
**Sonchus oleraceus*	Sow thistle	
Stachys ajugoides var. *rigida*	Hedge nettle	
Symphoricarpos sp.	Snowberry	
**Torilis arvensis*	Hedge-parsley	
Toxicodendron diversilobum	Poison oak	X
Typha latifolia	Broad-leaved cattail	X
Umbellularia californica	Bay laurel	X
**Vicia sativa*	Spring vetch	
**Vicia villosa*	Hairy vetch	
Vulpia bromoides	Brome-like vulpia	X

APPENDIX 4.12

Traffic and Circulation

Trip Generation for Helios and CRT EIRs

FEHR & PEERS
TRANSPORTATION CONSULTANTS

MEMORANDUM

Date: September 17, 2007

To: Shabnam Barati, Impact Sciences

From: Sam Tabibnia

Subject: ***Trip Generation for Helios and CRT EIRS***

WC07-2465

This memorandum presents the methodology and assumptions used in estimating trip generation for the EIRs for the proposed Helios and Computational Research and Theory (CRT) Buildings at the Lawrence Berkeley National Lab (LBNL). Both projects are part of the recently approved LBNL Long Range Development Plan (LRDP). The methodology and assumptions presented in this memorandum are consistent with the methodology and analysis used in the LBNL LRDP EIR.

LRDP EIR

The transportation/traffic analysis completed for the LRDP EIR assumed that the daily and peak hour traffic generated by LBNL is directly proportional to the Adjusted Daily Population (ADP) of the LBNL main hill site. Traffic counts collected at the three LBNL gates and ADP in 2003 were used to establish the baseline for the EIR analysis. The traffic analysis was based on a 29 percent growth in ADP from 4,000 in 2003 to 5,150 in 2025.[1] Table 1 summarizes the existing and LRDP vehicle trip generation as presented in the LRDP EIR.

The LRDP EIR assumed that parking supply at the main hill site would also increase by 29 percent. Vehicle trip generation is expected to be directly proportional to overall parking supply because the main hill site is somewhat isolated, parking supply in the vicinity of the site is limited, and parking demand at the site can be controlled by the number of parking permits issued by LBNL.

TABLE 1
LBNL POPULATION AND VEHICLE TRIP GENERATION

	Adjusted Daily Population	***Trip Generation***						
		Daily	***AM Peak Hour***			***PM Peak Hour***		
			In	***Out***	***Total***	***In***	***Out***	***Total***
Existing (2003)	4,000	5,700	540	70	610	75	585	660
LRDP	1,150	1,600	150	20	170	20	160	180

Source: Data presented in section IV.L of the LBNL LRDP EIR.

[1] The LRDP program has been reduced to 25 percent growth from 4,000 ADP in 2003 to 5,000 ADP in 2025. However, the traffic analysis in the LRDP EIR was completed for a 29 percent growth and is more conservative.

FEHR & PEERS
TRANSPORTATION CONSULTANTS

EXISTING CONDITIONS

Fehr & Peers conducted a parking study at the LBNL main hill site in September 2007. Based on the current parking inventory, the LBNL main hill site currently provides about 2,160 parking spaces. The parking supply is slightly lower than the parking supply reported in 2003 and used in the LRDP EIR due to construction staging at several parking facilities.

Since these parking spaces are scattered through many parking lots, the last few spaces can be difficult to locate. Thus, the practical capacity of the entire site is considered to be 90 percent. Based on parking occupancy counts in September 2007, the peak parking occupancy at the Lab was 81 percent, which occurred in mid-afternoon. In general, most parking lots were occupied at or near their capacities. However, several more remote lots have more unoccupied spaces available. Considering the practical capacity of the site, about 190 parking spaces are currently available.

PROPOSED PROJECTS

The proposed Helios project is estimated to increase the LBNL population by 500 ADP and the proposed CRT project is estimated to increase the LBNL population by 303 ADP. Although some of these employees are currently at other LBNL buildings and would relocate to the new buildings, this analysis assumes that the 803 ADP at these two buildings would be new to the main hill site to account for potential back-fill of existing spaces and present a conservative analysis. A 50-space parking lot would be constructed as part of the Helios Project. However, the CRT project would not include any additional parking supply.

Table 2 presents the estimated vehicle trip generation for these projects assuming that they would have the same trip generation rates per ADP as the existing site. This also assumes that vehicle trip generation would not be constrained by parking supply (i.e., adequate parking supply would be available to meet expected demand.) The Helios and CRT projects combined would represent about 70 percent of the population increase expected under the LBNL LRDP. As shown in Table 2, if parking supply is not accounted for, the two projects combined would represent about 70 percent of the LRDP vehicle trip generation as presented in the LRDP EIR.

TABLE 2
PROJECT VEHICLE TRIP GENERATION
UNCONSTRAINED PARKING

	Adjusted Daily Population	***Trip Generation***						
		Daily	***AM Peak Hour***			***PM Peak Hour***		
			In	***Out***	***Total***	***In***	***Out***	***Total***
Helios	500	696	65	9	74	9	70	78
CRT	303	422	40	5	45	5	42	47
Total New	***803***	***1,117***	***105***	***14***	***119***	***14***	***112***	***126***
LRDP	1,150	1,600	150	20	170	20	160	180
Percent of LRDP	70%	70%	70%	70%	70%	70%	70%	70%

Source: Fehr & Peers, 2007 and data presented in section IV.L of the LBNL LRDP EIR.

As shown in Table 3, the total main hill site parking supply would need to be increased by about 461 spaces to maintain the same parking supply to ADP ratio as existing conditions and the LRDP analysis. However, the Helios and CRT projects combined would increase overall parking supply by about 50 spaces. There are also currently 190 spaces available at the main hill site. Thus, about 240 parking spaces would be available for the Helios and CRT projects before parking demand would exceed the total parking supply at the main hill site. Since only 52 percent of the parking demand generated by the Helios and CRT projects can be met, it is estimated that the limited parking supply would also constrain the project vehicle trip generation presented in Table 2 by 52 percent.

TABLE 3
LBNL POPULATION AND PARKING SUPPLY

	Adjusted Daily Population	***Parking Supply***
Existing Conditions (2007)	4,000	2,160 [1]
LRDP	1,150	660 [2]
ADP and Parking Supply to Meet Helios and CRT Combined Demand	803	461 [2]
Parking Supply Available to meet Helios and CRT Parking Demand		240 [3]
Percent Parking Demand for Helios and CRT that can be Satisfied		52%

1. Parking supply based on data collected in September 2007.
2. Based on 1.7 ADP per parking spaces as documented in the LRDP EIR.
3. Includes 190 parking spaces currently available and 50 parking spaces at the new Helios lot.

Source: Fehr & Peers, 2007.

Table 4 presents the project vehicle trip generation constrained by the limited on-site parking supply. The trip generation for the two projects combined would represent about 36 percent of the total vehicle trip generation estimated in the LRDP EIR.

TABLE 4
PROJECT VEHICLE TRIP GENERATION
CONSTRAINED PARKING

	Adjusted Daily Population	***Trip Generation***						
		Daily	***AM Peak Hour***			***PM Peak Hour***		
			In	***Out***	***Total***	***In***	***Out***	***Total***
Helios	500	353	34	4	38	5	36	41
CRT	303	214	21	3	24	3	22	25
Total New	***803***	***567***	***55***	***7***	***62***	***8***	***58***	***66***
LRDP	1,150	1,600	150	20	170	20	160	180
Percent of LRDP	70%	36%	36%	36%	36%	36%	36%	36%

Source: Fehr & Peers, 2007.

FEHR & PEERS
TRANSPORTATION CONSULTANTS

Based on data collected in 2000 and presented in the LRDP EIR, about 52 percent of LBNL employees drive alone to work, and 48 percent use other modes including the LBNL shuttle, other transit, and bicycles. Based on this mode split data, Table 5 presents the estimated total person-trips generated by the main hill site under existing conditions, LRDP buildout, and Helios and CRT projects. Each person is estimated to generate about 2.7 daily trips, 0.28 AM peak hour trips, and 0.29 PM peak hour trips. As vehicle trip generation deceases due to limited parking, more employees and visitors would shift to other modes.

TABLE 5
PERSON TRIP GENERATION

	Adjusted Daily Population	***Trip Generation***						
		Daily	***AM Peak Hour***			***PM Peak Hour***		
			In	***Out***	***Total***	***In***	***Out***	***Total***
Existing (2003)	4,000	10,960	1,038	135	1,173	144	1,125	1,269
LRDP	1,150	3,080	288	38	327	38	308	346
Helios	500	1,340	130	20	150	20	130	150
CRT	303	810	80	10	90	10	80	90
Total New	***803***	***2,150***	***210***	***30***	***240***	***30***	***210***	***240***

Source: Fehr & Peers, 2007 and LBNL LRDP EIR.

CONCLUSIONS

We intend to use the vehicle trip generation presented in Table 4 for the traffic analysis for the Helios and CRT project EIRs. These estimates are based on the following assumptions:

- Parking supply and demand at the main hill site has would not be changed by any of the LBNL projects that are under construction or planned to be completed prior to the Helios and CRT projects.
- The proportion of parking permits to parking supply issued by LBNL for the main hill site would remain similar to the current ratio.
- The LBNL parking supply would not be increased above the 50-space Helios Lot. Stacked or attendant parking would not be implemented to meet typical weekday parking demand.
- The LBNL Transportation Demand Management (TDM) program would be expanded to discourage the use of single-occupant vehicles and meet the additional demand by employees and visitors who cannot drive to the site. This would include expansion of the existing shuttle service.

Please contact us with questions or comments.

Traffic Calculations

Helios Energy
Research Facility

Technical Appendix
Intersection LOS Calculations

FEHR & PEERS
TRANSPORTATION CONSULTANTS

LBNL Helios Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 65 Critical Vol./Cap.(X): 0.924
Loss Time (sec): 8 (Y+R=4.0 sec) Average Delay (sec/veh): 22.4
Optimal Cycle: 91 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	17	17	17	17	17	17				
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	1	0	0 1
Volume Module: >> Count Date: 6 Nov 2002 << 7:00-9:00 AM																
Base Vol:	274	212	95	12	274	21	28	161	304	21	33	5				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	274	212	95	12	274	21	28	161	304	21	33	5				
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	274	212	95	12	274	21	28	161	304	21	33	5				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
PHF Volume:	298	230	103	13	298	23	30	175	330	23	36	5				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	298	230	103	13	298	23	30	175	330	23	36	5				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	298	230	103	13	298	23	30	175	330	23	36	5				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.67	0.67	0.67	0.97	0.97	0.97	0.90	0.90	0.90	0.82	0.82	0.85				
Lanes:	0.48	0.36	0.16	0.04	0.89	0.07	0.06	0.32	0.62	0.39	0.61	1.00				
Final Sat.:	599	463	208	72	1640	126	97	559	1056	603	947	1615				
Capacity Analysis Module:																
Vol/Sat:	0.50	0.50	0.50	0.18	0.18	0.18	0.31	0.31	0.31	0.04	0.04	0.00				
Crit Moves:		****						****								
Green/Cycle:	0.55	0.55	0.55	0.55	0.55	0.55	0.40	0.40	0.40	0.40	0.40	0.40				
Volume/Cap:	0.90	0.90	0.90	0.33	0.33	0.33	0.78	0.78	0.78	0.09	0.09	0.01				
Delay/Veh:	29.5	29.5	29.5	8.8	8.8	8.8	23.9	23.9	23.9	11.2	11.2	10.5				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	29.5	29.5	29.5	8.8	8.8	8.8	23.9	23.9	23.9	11.2	11.2	10.5				
LOS by Move:	C	C	C	A	A	A	C	C	C	B	B	B				
HCM2kAvgQ:	16	16	16	4	4	4	11	11	11	1	1	0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 Critical Vol./Cap.(X): 0.911
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 26.2
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0				
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2000 << 7:00 AM - 9:00 AM																
Base Vol:	0	386	19	128	471	0	12	5	14	18	1	118				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	386	19	128	471	0	12	5	14	18	1	118				
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	386	19	128	471	0	12	5	14	18	1	118				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93				
PHF Volume:	0	415	20	138	506	0	13	5	15	19	1	127				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	415	20	138	506	0	13	5	15	19	1	127				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	415	20	138	506	0	13	5	15	19	1	127				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.95	0.05	0.21	0.79	0.00	0.39	0.16	0.45	0.13	0.01	0.86				
Final Sat.:	0	641	32	151	556	0	190	79	222	74	4	488				
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.65	0.65	0.91	0.91	xxxx	0.07	0.07	0.26	0.26	0.26					
Crit Moves:		****			****		****			****						
Delay/Veh:	0.0	16.8	16.8	36.9	36.9	0.0	10.0	10.0	10.0	10.8	10.8	10.8				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	16.8	16.8	36.9	36.9	0.0	10.0	10.0	10.0	10.8	10.8	10.8				
LOS by Move:	*	C	C	E	E	*	A	A	A	B	B	B				
ApproachDel:		16.8			36.9			10.0			10.8					
Delay Adj:		1.00			1.00			1.00			1.00					
ApprAdjDel:		16.8			36.9			10.0			10.8					
LOS by Appr:		C			E			A			B					
AllWayAvgQ:	1.6	1.6	1.6	5.7	5.7	5.7	0.1	0.1	0.1	0.3	0.3	0.3				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.930
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 28.2
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 13 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	131	553	0		0	344	123		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	131	553	0		0	344	123		0	0	0		0	0	0	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	131	553	0		0	344	123		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91	
PHF Volume:	144	608	0		0	378	135		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	144	608	0		0	378	135		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	144	608	0		0	378	135		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.19	0.81	0.00		0.00	0.74	0.26		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	155	654	0		0	587	210		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	0.93	0.93	xxxx		xxxx	0.64	0.64		xxxx	xxxx	xxxx		xxxx	xxxx	xxxx	
Crit Moves:		****				****										
Delay/Veh:	37.2	37.2	0.0		0.0	15.0	15.0		0.0	0.0	0.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	37.2	37.2	0.0		0.0	15.0	15.0		0.0	0.0	0.0		0.0	0.0	0.0	
LOS by Move:	E	E	*		*	C	C		*	*	*		*	*	*	
ApproachDel:	37.2					15.0			xxxxxx				xxxxxx			
Delay Adj:	1.00					1.00			xxxxx				xxxxx			
ApprAdjDel:	37.2					15.0			xxxxxx				xxxxxx			
LOS by Appr:	E					C			*				*			
AllWayAvgQ:	6.7	6.7	6.7		1.7	1.7	1.7		0.0	0.0	0.0		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.761
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 17.4
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	0	489	0		0	345	0		158	0	86		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	489	0		0	345	0		158	0	86		0	0	0	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	489	0		0	345	0		158	0	86		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	0	520	0		0	367	0		168	0	91		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	520	0		0	367	0		168	0	91		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	520	0		0	367	0		168	0	91		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	683	0		0	652	0		485	0	576		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.76	xxxx		xxxx	0.56	xxxx		0.35	xxxx	0.16		xxxx	xxxx	xxxx	
Crit Moves:		****				****			****							
Delay/Veh:	0.0	22.1	0.0		0.0	14.7	0.0		13.1	0.0	9.5		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	0.0	22.1	0.0		0.0	14.7	0.0		13.1	0.0	9.5		0.0	0.0	0.0	
LOS by Move:	*	C	*		*	B	*		B	*	A		*	*	*	
ApproachDel:		22.1				14.7				11.9			xxxxxx			
Delay Adj:		1.00				1.00				1.00			xxxxx			
ApprAdjDel:		22.1				14.7				11.9			xxxxxx			
LOS by Appr:		C				B				B			*			
AllWayAvgQ:	2.6	2.6	2.6		1.2	1.2	1.2		0.5	0.0	0.2		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.416
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 10.2
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module: >> Count Date: 4 Dec 2002 << 7:00-9:00 AM												
Base Vol:	31	13	13	25	52	4	6	165	143	169	90	16
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	31	13	13	25	52	4	6	165	143	169	90	16
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	31	13	13	25	52	4	6	165	143	169	90	16
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	33	14	14	27	55	4	6	176	152	180	96	17
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	33	14	14	27	55	4	6	176	152	180	96	17
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	33	14	14	27	55	4	6	176	152	180	96	17
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.54	0.23	0.23	0.31	0.64	0.05	0.02	0.53	0.45	0.61	0.33	0.06
Final Sat.:	327	137	137	187	389	30	15	422	365	454	242	43
Capacity Analysis Module:												
Vol/Sat:	0.10	0.10	0.10	0.14	0.14	0.14	0.42	0.42	0.42	0.40	0.40	0.40
Crit Moves:	****			****			****			****		
Delay/Veh:	8.9	8.9	8.9	9.2	9.2	9.2	10.3	10.3	10.3	10.7	10.7	10.7
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	8.9	8.9	8.9	9.2	9.2	9.2	10.3	10.3	10.3	10.7	10.7	10.7
LOS by Move:	A	A	A	A	A	A	B	B	B	B	B	B
ApproachDel:	8.9			9.2			10.3			10.7		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	8.9			9.2			10.3			10.7		
LOS by Appr:	A			A			B			B		
AllWayAvgQ:	0.1	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.7	0.6	0.6	0.6

Note: Queue reported is the number of cars per lane.

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LBNL Helios Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 70 Critical Vol./Cap.(X): 0.871
Loss Time (sec): 8 (Y+R=4.0 sec) Average Delay (sec/veh): 24.3
Optimal Cycle: 75 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	18	17	17	17	17	17	17	17	17	17
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	1	0	0 1
Volume Module: >> Count Date: 5 Dec 2002 << 4:00-6:00 PM																
Base Vol:	318	288	19	4	203	49	28	52	288	69	197	40				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	318	288	19	4	203	49	28	52	288	69	197	40				
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	318	288	19	4	203	49	28	52	288	69	197	40				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91				
PHF Volume:	349	316	21	4	223	54	31	57	316	76	216	44				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	349	316	21	4	223	54	31	57	316	76	216	44				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	349	316	21	4	223	54	31	57	316	76	216	44				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.69	0.69	0.69	0.97	0.97	0.97	0.86	0.86	0.86	0.82	0.82	0.85				
Lanes:	0.51	0.46	0.03	0.02	0.79	0.19	0.08	0.14	0.78	0.26	0.74	1.00				
Final Sat.:	667	604	40	29	1457	352	124	231	1277	403	1151	1615				
Capacity Analysis Module:																
Vol/Sat:	0.52	0.52	0.52	0.15	0.15	0.15	0.25	0.25	0.25	0.19	0.19	0.03				
Crit Moves:		****						****								
Green/Cycle:	0.54	0.54	0.54	0.54	0.54	0.54	0.46	0.46	0.46	0.46	0.46	0.46				
Volume/Cap:	0.97	0.97	0.97	0.28	0.28	0.28	0.54	0.54	0.54	0.41	0.41	0.06				
Delay/Veh:	42.8	42.8	42.8	9.5	9.5	9.5	13.9	13.9	13.9	12.1	12.1	8.8				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	42.8	42.8	42.8	9.5	9.5	9.5	13.9	13.9	13.9	12.1	12.1	8.8				
LOS by Move:	D	D	D	A	A	A	B	B	B	B	B	A				
HCM2kAvgQ:	21	21	21	3	3	3	5	5	5	4	4	0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 Critical Vol./Cap.(X): 0.986
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 34.7
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	359	19	135	459	0	20	7	15	47	0	232				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	359	19	135	459	0	20	7	15	47	0	232				
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	359	19	135	459	0	20	7	15	47	0	232				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95				
PHF Volume:	0	378	20	142	483	0	21	7	16	49	0	244				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	378	20	142	483	0	21	7	16	49	0	244				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	378	20	142	483	0	21	7	16	49	0	244				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.95	0.05	0.23	0.77	0.00	0.47	0.17	0.36	0.17	0.00	0.83				
Final Sat.:	0	566	30	144	490	0	210	73	157	95	0	471				
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.67	0.67	0.99	0.99	xxxx	0.10	0.10	0.10	0.52	xxxx	0.52				
Crit Moves:		****		****			****			****						
Delay/Veh:	0.0	19.4	19.4	55.3	55.3	0.0	11.0	11.0	11.0	15.2	0.0	15.2				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	19.4	19.4	55.3	55.3	0.0	11.0	11.0	11.0	15.2	0.0	15.2				
LOS by Move:	*	C	C	F	F	*	B	B	B	C	*	C				
ApproachDel:		19.4		55.3			11.0			15.2						
Delay Adj:		1.00		1.00			1.00			1.00						
ApprAdjDel:		19.4		55.3			11.0			15.2						
LOS by Appr:		C		F			B			C						
AllWayAvgQ:	1.7	1.7	1.7	8.2	8.2	8.2	0.1	0.1	0.1	0.9	0.9	0.9				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.825
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 20.9
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 14 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	152	439	0		0	357	159		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	152	439	0		0	357	159		0	0	0		0	0	0	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	152	439	0		0	357	159		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90	
PHF Volume:	169	488	0		0	397	177		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	169	488	0		0	397	177		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	169	488	0		0	397	177		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.26	0.74	0.00		0.00	0.69	0.31		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	205	592	0		0	567	252		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	0.82	0.82	xxxx	xxxx	0.70	0.70	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx				
Crit Moves:	****					****										
Delay/Veh:	24.6	24.6	0.0	0.0	16.7	16.7	0.0	0.0	0.0	0.0	0.0	0.0				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	24.6	24.6	0.0	0.0	16.7	16.7	0.0	0.0	0.0	0.0	0.0	0.0				
LOS by Move:	C	C	*	*	C	C	*	*	*	*	*	*				
ApproachDel:	24.6				16.7		xxxxxx			xxxxxx						
Delay Adj:	1.00				1.00		xxxxx			xxxxx						
ApprAdjDel:	24.6				16.7		xxxxxx			xxxxxx						
LOS by Appr:	C				C		*			*						
AllWayAvgQ:	3.8	3.8	3.8	2.1	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.714
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 17.6
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	398	0		0	427	0		179	0	197		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	398	0		0	427	0		179	0	197		0	0	0	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	398	0		0	427	0		179	0	197		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.95	0.95	0.95		0.95	0.95	0.95		0.95	0.95	0.95		0.95	0.95	0.95	
PHF Volume:	0	419	0		0	449	0		188	0	207		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	419	0		0	449	0		188	0	207		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	419	0		0	449	0		188	0	207		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	622	0		0	629	0		488	0	580		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.67	xxxx	xxxx	0.71	xxxx	0.39	xxxx	0.36	xxxx	xxxx	xxxx				
Crit Moves:		****			****		****									
Delay/Veh:	0.0	18.9	0.0	0.0	20.8	0.0	13.9	0.0	11.6	0.0	0.0	0.0				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	18.9	0.0	0.0	20.8	0.0	13.9	0.0	11.6	0.0	0.0	0.0				
LOS by Move:	*	C	*	*	C	*	B	*	B	*	*	*				
ApproachDel:	18.9				20.8			12.7			xxxxxx					
Delay Adj:	1.00				1.00			1.00			xxxxx					
ApprAdjDel:	18.9				20.8			12.7			xxxxxx					
LOS by Appr:	C				C			B			*					
AllWayAvgQ:	1.8	1.8	1.8	2.1	2.1	2.1	0.6	0.0	0.5	0.0	0.0	0.0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Existing Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.796
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 17.7
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module: >> Count Date: 4 Dec 2002 << 4:00-6:00 PM												
Base Vol:	162	65	250	33	30	8	3	159	45	22	111	25
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	162	65	250	33	30	8	3	159	45	22	111	25
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	162	65	250	33	30	8	3	159	45	22	111	25
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
PHF Volume:	191	76	294	39	35	9	4	187	53	26	131	29
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	191	76	294	39	35	9	4	187	53	26	131	29
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	191	76	294	39	35	9	4	187	53	26	131	29
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.34	0.14	0.52	0.47	0.42	0.11	0.01	0.77	0.22	0.14	0.70	0.16
Final Sat.:	239	96	370	248	226	60	8	445	126	77	389	88
Capacity Analysis Module:												
Vol/Sat:	0.80	0.80	0.80	0.16	0.16	0.16	0.42	0.42	0.42	0.34	0.34	0.34
Crit Moves:			****	****			****					****
Delay/Veh:	23.3	23.3	23.3	9.9	9.9	9.9	12.3	12.3	12.3	11.5	11.5	11.5
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	23.3	23.3	23.3	9.9	9.9	9.9	12.3	12.3	12.3	11.5	11.5	11.5
LOS by Move:	C	C	C	A	A	A	B	B	B	B	B	B
ApproachDel:	23.3			9.9			12.3			11.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	23.3			9.9			12.3			11.5		
LOS by Appr:	C			A			B			B		
AllWayAvgQ:	3.0	3.0	3.0	0.1	0.1	0.1	0.6	0.6	0.6	0.4	0.4	0.4

Note: Queue reported is the number of cars per lane.

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LBNL Helios Projects
Near Term No Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 65 | Critical Vol./Cap.(X): 0.997
Loss Time (sec): 8 (Y+R=4.0 sec) | Average Delay (sec/veh): 28.6
Optimal Cycle: 137 | Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	18	17	17	17	17	17	17	17	17	17
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	1	0	0 1
Volume Module: >> Count Date: 6 Nov 2002 << 7:00-9:00 AM																
Base Vol:	274	212	95	12	274	21	28	161	304	21	33	5				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	274	212	95	12	274	21	28	161	304	21	33	5				
Added Vol:	11	4	9	0	39	0	0	11	26	0	3	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	285	216	104	12	313	21	28	172	330	21	36	5				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
PHF Volume:	310	235	113	13	340	23	30	187	359	23	39	5				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	310	235	113	13	340	23	30	187	359	23	39	5				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	310	235	113	13	340	23	30	187	359	23	39	5				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.64	0.64	0.64	0.97	0.97	0.97	0.90	0.90	0.90	0.82	0.82	0.85				
Lanes:	0.47	0.36	0.17	0.03	0.91	0.06	0.05	0.32	0.63	0.37	0.63	1.00				
Final Sat.:	575	436	210	64	1668	112	91	557	1068	571	979	1615				
Capacity Analysis Module:																
Vol/Sat:	0.54	0.54	0.54	0.20	0.20	0.20	0.34	0.34	0.34	0.04	0.04	0.00				
Crit Moves:		****						****								
Green/Cycle:	0.55	0.55	0.55	0.55	0.55	0.55	0.40	0.40	0.40	0.40	0.40	0.40				
Volume/Cap:	0.97	0.97	0.97	0.37	0.37	0.37	0.84	0.84	0.84	0.10	0.10	0.01				
Delay/Veh:	42.4	42.4	42.4	9.2	9.2	9.2	27.5	27.5	27.5	11.2	11.2	10.5				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	42.4	42.4	42.4	9.2	9.2	9.2	27.5	27.5	27.5	11.2	11.2	10.5				
LOS by Move:	D	D	D	A	A	A	C	C	C	B	B	B				
HCM2kAvgQ:	19	19	19	4	4	4	13	13	13	1	1	0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Projects
Near Term No Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 | Critical Vol./Cap.(X): 1.108
Loss Time (sec): 0 (Y+R=4.0 sec) | Average Delay (sec/veh): 69.8
Optimal Cycle: 0 | Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2000 << 7:00 AM - 9:00 AM																
Base Vol:	0	386	19	128	471	0	12	5	14	18	1	118				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	386	19	128	471	0	12	5	14	18	1	118				
Added Vol:	0	16	230	67	-2	0	0	0	0	17	0	8				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	402	249	195	469	0	12	5	14	35	1	126				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93				
PHF Volume:	0	432	268	210	504	0	13	5	15	38	1	135				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	432	268	210	504	0	13	5	15	38	1	135				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	432	268	210	504	0	13	5	15	38	1	135				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.62	0.38	0.29	0.71	0.00	0.39	0.16	0.45	0.21	0.01	0.78				
Final Sat.:	0	420	260	189	455	0	183	76	213	118	3	423				
Capacity Analysis Module:																
Vol/Sat:	xxxx	1.03	1.03	1.11	1.11	xxxx	0.07	0.07	0.07	0.32	0.32	0.32				
Crit Moves:		****			****		****			****						
Delay/Veh:	0.0	65.2	65.2	91.0	91.0	0.0	10.9	10.9	10.9	12.6	12.6	12.6				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	65.2	65.2	91.0	91.0	0.0	10.9	10.9	10.9	12.6	12.6	12.6				
LOS by Move:	*	F	F	F	F	*	B	B	B	B	B	B				
ApproachDel:		65.2			91.0			10.9			12.6					
Delay Adj:		1.00			1.00			1.00			1.00					
ApprAdjDel:		65.2			91.0			10.9			12.6					
LOS by Appr:		F			F			B			B					
AllWayAvgQ:	10.7	10.7	10.7	14.8	14.8	14.8	0.1	0.1	0.1	0.5	0.5	0.5				

Note: Queue reported is the number of cars per lane.

LBNL Helios Projects
Near Term No Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 | Critical Vol./Cap.(X): 1.127
Loss Time (sec): 0 (Y+R=4.0 sec) | Average Delay (sec/veh): 63.5
Optimal Cycle: 0 | Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 13 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	131	553	0		0	344	123		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	131	553	0		0	344	123		0	0	0		0	0	0	
Added Vol:	0	139	0		0	36	3		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	131	692	0		0	380	126		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91	
PHF Volume:	144	760	0		0	418	138		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	144	760	0		0	418	138		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	144	760	0		0	418	138		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.16	0.84	0.00		0.00	0.75	0.25		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	128	675	0		0	595	197		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	1.13	1.13	xxxx		xxxx	0.70	0.70		xxxx	xxxx	xxxx		xxxx	xxxx	xxxx	
Crit Moves:		****				****										
Delay/Veh:	91.8	91.8	0.0		0.0	17.5	17.5		0.0	0.0	0.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	91.8	91.8	0.0		0.0	17.5	17.5		0.0	0.0	0.0		0.0	0.0	0.0	
LOS by Move:	F	F	*		*	C	C		*	*	*		*	*	*	
ApproachDel:	91.8					17.5			xxxxxx				xxxxxx			
Delay Adj:	1.00					1.00			xxxxx				xxxxx			
ApprAdjDel:	91.8					17.5			xxxxxx				xxxxxx			
LOS by Appr:	F					C			*				*			
AllWayAvgQ:	18.8	18.8	18.8		2.2	2.2	2.2		0.0	0.0	0.0		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Projects
Near Term No Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 | Critical Vol./Cap.(X): 0.889
Loss Time (sec): 0 (Y+R=4.0 sec) | Average Delay (sec/veh): 26.1
Optimal Cycle: 0 | Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	0	489	0		0	345	0		158	0	86		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	489	0		0	345	0		158	0	86		0	0	0	
Added Vol:	0	35	0		0	44	0		92	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	524	0		0	389	0		250	0	86		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	0	557	0		0	414	0		266	0	91		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	557	0		0	414	0		266	0	91		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	557	0		0	414	0		266	0	91		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	627	0		0	598	0		473	0	560		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.89	xxxx		xxxx	0.69	xxxx		0.56	xxxx	0.16		xxxx	xxxx	xxxx	
Crit Moves:		****				****			****							
Delay/Veh:	0.0	36.7	0.0		0.0	20.4	0.0		18.4	0.0	10.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	0.0	36.7	0.0		0.0	20.4	0.0		18.4	0.0	10.0		0.0	0.0	0.0	
LOS by Move:	*	E	*		*	C	*		C	*	B		*	*	*	
ApproachDel:		36.7				20.4				16.3			xxxxxx			
Delay Adj:		1.00				1.00				1.00			xxxxx			
ApprAdjDel:		36.7				20.4				16.3			xxxxxx			
LOS by Appr:		E				C				C			*			
AllWayAvgQ:	4.9	4.9	4.9		1.9	1.9	1.9		1.1	0.0	0.2		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Projects
Near Term No Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.418
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 10.3
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 4 Dec 2002 << 7:00-9:00 AM																
Base Vol:	31	13	13		25	52	4		6	165	143		169	90	16	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	31	13	13		25	52	4		6	165	143		169	90	16	
Added Vol:	0	0	1		0	0	0		0	0	0		11	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	31	13	14		25	52	4		6	165	143		180	90	16	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	33	14	15		27	55	4		6	176	152		191	96	17	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	33	14	15		27	55	4		6	176	152		191	96	17	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	33	14	15		27	55	4		6	176	152		191	96	17	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.54	0.22	0.24		0.31	0.64	0.05		0.02	0.53	0.45		0.63	0.31	0.06	
Final Sat.:	319	134	144		185	386	30		15	420	364		464	232	41	
Capacity Analysis Module:																
Vol/Sat:	0.10	0.10	0.10		0.14	0.14	0.14		0.42	0.42	0.42		0.41	0.41	0.41	
Crit Moves:		****				****				****				****		
Delay/Veh:	8.9	8.9	8.9		9.2	9.2	9.2		10.3	10.3	10.3		10.9	10.9	10.9	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	8.9	8.9	8.9		9.2	9.2	9.2		10.3	10.3	10.3		10.9	10.9	10.9	
LOS by Move:	A	A	A		A	A	A		B	B	B		B	B	B	
ApproachDel:	8.9				9.2				10.3				10.9			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	8.9				9.2				10.3				10.9			
LOS by Appr:	A				A				B				B			
AllWayAvgQ:	0.1	0.1	0.1		0.1	0.1	0.1		0.7	0.7	0.7		0.6	0.6	0.6	

Note: Queue reported is the number of cars per lane.

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LBNL Helios Project
Near Term No Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 70 | Critical Vol./Cap.(X): 0.942
Loss Time (sec): 8 (Y+R=4.0 sec) | Average Delay (sec/veh): 37.8
Optimal Cycle: 104 | Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	18	17	17	17	17	17	17	17	17	17
Lanes:	0	0	1!	0	0	0	1!	0	0	0	1!	0	0	1	0	0	1
Volume Module: >> Count Date: 5 Dec 2002 << 4:00-6:00 PM																
Base Vol:	318	288	19	4	203	49	28	52	288	69	197	40				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	318	288	19	4	203	49	28	52	288	69	197	40				
Added Vol:	28	35	1	0	12	0	0	2	3	3	18	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	346	323	20	4	215	49	28	54	291	72	215	40				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91				
PHF Volume:	380	355	22	4	236	54	31	59	320	79	236	44				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	380	355	22	4	236	54	31	59	320	79	236	44				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	380	355	22	4	236	54	31	59	320	79	236	44				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.68	0.68	0.68	0.97	0.97	0.97	0.86	0.86	0.86	0.82	0.82	0.85				
Lanes:	0.50	0.47	0.03	0.01	0.81	0.18	0.08	0.14	0.78	0.25	0.75	1.00				
Final Sat.:	652	609	38	27	1474	336	122	236	1272	391	1167	1615				
Capacity Analysis Module:																
Vol/Sat:	0.58	0.58	0.58	0.16	0.16	0.16	0.25	0.25	0.25	0.20	0.20	0.03				
Crit Moves:		****						****								
Green/Cycle:	0.54	0.54	0.54	0.54	0.54	0.54	0.46	0.46	0.46	0.46	0.46	0.46				
Volume/Cap:	1.08	1.08	1.08	0.30	0.30	0.30	0.55	0.55	0.55	0.44	0.44	0.06				
Delay/Veh:	73.8	73.8	73.8	9.6	9.6	9.6	14.1	14.1	14.1	12.5	12.5	8.8				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	73.8	73.8	73.8	9.6	9.6	9.6	14.1	14.1	14.1	12.5	12.5	8.8				
LOS by Move:	E	E	E	A	A	A	B	B	B	B	B	A				
HCM2kAvgQ:	29	29	29	4	4	4	6	6	6	4	4	0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term No Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 | Critical Vol./Cap.(X): 1.196
Loss Time (sec): 0 (Y+R=4.0 sec) | Average Delay (sec/veh): 73.3
Optimal Cycle: 0 | Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	0	1	0	0	1	0	0	0	0	0	0	1!	0	0	0	1!	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	359	19	135	459	0	20	7	15	47	0	232				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	359	19	135	459	0	20	7	15	47	0	232				
Added Vol:	0	-1	33	9	9	0	0	0	0	123	0	66				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	358	52	144	468	0	20	7	15	170	0	298				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95				
PHF Volume:	0	377	55	152	493	0	21	7	16	179	0	314				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	377	55	152	493	0	21	7	16	179	0	314				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	377	55	152	493	0	21	7	16	179	0	314				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.87	0.13	0.24	0.76	0.00	0.47	0.17	0.36	0.36	0.00	0.64				
Final Sat.:	0	458	67	127	412	0	190	67	143	199	0	348				
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.82	0.82	1.20	1.20	xxxx	0.11	0.11	0.11	0.90	xxxx	0.90				
Crit Moves:		****			****				****	****						
Delay/Veh:	0.0	32.9	32.9	128.1	128	0.0	12.3	12.3	12.3	42.5	0.0	42.5				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	32.9	32.9	128.1	128	0.0	12.3	12.3	12.3	42.5	0.0	42.5				
LOS by Move:	*	D	D	F	F	*	B	B	B	E	*	E				
ApproachDel:		32.9		128.1			12.3			42.5						
Delay Adj:		1.00		1.00			1.00			1.00						
ApprAdjDel:		32.9		128.1			12.3			42.5						
LOS by Appr:		D		F			B			E						
AllWayAvgQ:	3.4	3.4	3.4	17.7	17.7	17.7	0.1	0.1	0.1	5.0	5.0	5.0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term No Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 | Critical Vol./Cap.(X): 0.910
Loss Time (sec): 0 (Y+R=4.0 sec) | Average Delay (sec/veh): 28.0
Optimal Cycle: 0 | Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 14 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	152	439	0		0	357	159		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	152	439	0		0	357	159		0	0	0		0	0	0	
Added Vol:	-1	55	0		0	21	27		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	151	494	0		0	378	186		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90	
PHF Volume:	168	549	0		0	420	207		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	168	549	0		0	420	207		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	168	549	0		0	420	207		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.23	0.77	0.00		0.00	0.67	0.33		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	184	603	0		0	542	267		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	0.91	0.91	xxxx	xxxx	0.77	0.77	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx				
Crit Moves:	****					****										
Delay/Veh:	34.5	34.5	0.0	0.0	20.5	20.5	0.0	0.0	0.0	0.0	0.0	0.0				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	34.5	34.5	0.0	0.0	20.5	20.5	0.0	0.0	0.0	0.0	0.0	0.0				
LOS by Move:	D	D	*	*	C	C	*	*	*	*	*	*				
ApproachDel:	34.5				20.5		xxxxxx			xxxxxx						
Delay Adj:	1.00				1.00		xxxxx			xxxxx						
ApprAdjDel:	34.5				20.5		xxxxxx			xxxxxx						
LOS by Appr:	D				C		*			*						
AllWayAvgQ:	5.9	5.9	5.9	2.9	2.9	2.9	0.0	0.0	0.0	0.0	0.0	0.0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term No Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 | Critical Vol./Cap.(X): 0.768
Loss Time (sec): 0 (Y+R=4.0 sec) | Average Delay (sec/veh): 20.7
Optimal Cycle: 0 | Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	398	0		0	427	0		179	0	197		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	398	0		0	427	0		179	0	197		0	0	0	
Added Vol:	0	41	0		0	22	0		12	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	439	0		0	449	0		191	0	197		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.95	0.95	0.95		0.95	0.95	0.95		0.95	0.95	0.95		0.95	0.95	0.95	
PHF Volume:	0	462	0		0	473	0		201	0	207		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	462	0		0	473	0		201	0	207		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	462	0		0	473	0		201	0	207		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	613	0		0	615	0		477	0	565		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.75	xxxx	xxxx	0.77	xxxx	0.42	xxxx	0.37	xxxx	xxxx	xxxx				
Crit Moves:		****			****		****									
Delay/Veh:	0.0	23.5	0.0	0.0	24.4	0.0	14.8	0.0	12.0	0.0	0.0	0.0				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	23.5	0.0	0.0	24.4	0.0	14.8	0.0	12.0	0.0	0.0	0.0				
LOS by Move:	*	C	*	*	C	*	B	*	B	*	*	*				
ApproachDel:		23.5			24.4			13.4			xxxxxx					
Delay Adj:		1.00			1.00			1.00			xxxxx					
ApprAdjDel:		23.5			24.4			13.4			xxxxxx					
LOS by Appr:		C			C			B			*					
AllWayAvgQ:	2.5	2.5	2.5	2.7	2.7	2.7	0.6	0.0	0.5	0.0	0.0	0.0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term No Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.815
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 18.7
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 4 Dec 2002 << 4:00-6:00 PM																
Base Vol:	162	65	250		33	30	8		3	159	45		22	111	25	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	162	65	250		33	30	8		3	159	45		22	111	25	
Added Vol:	0	0	12		0	0	0		0	0	0		1	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	162	65	262		33	30	8		3	159	45		23	111	25	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.85	0.85	0.85		0.85	0.85	0.85		0.85	0.85	0.85		0.85	0.85	0.85	
PHF Volume:	191	76	308		39	35	9		4	187	53		27	131	29	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	191	76	308		39	35	9		4	187	53		27	131	29	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	191	76	308		39	35	9		4	187	53		27	131	29	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.33	0.13	0.54		0.47	0.42	0.11		0.01	0.77	0.22		0.14	0.70	0.16	
Final Sat.:	234	94	378		248	225	60		8	440	125		80	385	87	
Capacity Analysis Module:																
Vol/Sat:	0.82	0.82	0.82		0.16	0.16	0.16		0.42	0.42	0.42		0.34	0.34	0.34	
Crit Moves:		****				****				****				****		
Delay/Veh:	24.8	24.8	24.8		10.0	10.0	10.0		12.5	12.5	12.5		11.6	11.6	11.6	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	24.8	24.8	24.8		10.0	10.0	10.0		12.5	12.5	12.5		11.6	11.6	11.6	
LOS by Move:	C	C	C		A	A	A		B	B	B		B	B	B	
ApproachDel:	24.8				10.0				12.5				11.6			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	24.8				10.0				12.5				11.6			
LOS by Appr:	C				A				B				B			
AllWayAvgQ:	3.3	3.3	3.3		0.1	0.1	0.1		0.6	0.6	0.6		0.4	0.4	0.4	

Note: Queue reported is the number of cars per lane.

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LBNL Helios Project
Near Term with Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 65 Critical Vol./Cap.(X): 1.007
Loss Time (sec): 8 (Y+R=4.0 sec) Average Delay (sec/veh): 29.5
Optimal Cycle: 148 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	17	17	17	17	17	17				
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	1	0	0 1
Volume Module: >> Count Date: 6 Nov 2002 << 7:00-9:00 AM																
Base Vol:	274	212	95	12	274	21	28	161	304	21	33	5				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	274	212	95	12	274	21	28	161	304	21	33	5				
Added Vol:	13	4	9	0	39	0	0	11	36	0	3	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	287	216	104	12	313	21	28	172	340	21	36	5				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
PHF Volume:	312	235	113	13	340	23	30	187	370	23	39	5				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	312	235	113	13	340	23	30	187	370	23	39	5				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	312	235	113	13	340	23	30	187	370	23	39	5				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.64	0.64	0.64	0.97	0.97	0.97	0.90	0.90	0.90	0.81	0.81	0.85				
Lanes:	0.47	0.36	0.17	0.03	0.91	0.06	0.05	0.32	0.63	0.37	0.63	1.00				
Final Sat.:	577	434	209	64	1668	112	89	546	1079	570	977	1615				
Capacity Analysis Module:																
Vol/Sat:	0.54	0.54	0.54	0.20	0.20	0.20	0.34	0.34	0.34	0.04	0.04	0.00				
Crit Moves:		****						****								
Green/Cycle:	0.55	0.55	0.55	0.55	0.55	0.55	0.40	0.40	0.40	0.40	0.40	0.40				
Volume/Cap:	0.98	0.98	0.98	0.37	0.37	0.37	0.86	0.86	0.86	0.10	0.10	0.01				
Delay/Veh:	43.5	43.5	43.5	9.2	9.2	9.2	28.9	28.9	28.9	11.2	11.2	10.5				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	43.5	43.5	43.5	9.2	9.2	9.2	28.9	28.9	28.9	11.2	11.2	10.5				
LOS by Move:	D	D	D	A	A	A	C	C	C	B	B	B				
HCM2kAvgQ:	20	20	20	4	4	4	13	13	13	1	1	0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 Critical Vol./Cap.(X): 1.128
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 75.6
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0				
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2000 << 7:00 AM - 9:00 AM																
Base Vol:	0	386	19	128	471	0	12	5	14	18	1	118				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	386	19	128	471	0	12	5	14	18	1	118				
Added Vol:	0	16	243	77	-2	0	0	0	0	18	0	10				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	402	262	205	469	0	12	5	14	36	1	128				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93				
PHF Volume:	0	432	282	220	504	0	13	5	15	39	1	138				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	432	282	220	504	0	13	5	15	39	1	138				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	432	282	220	504	0	13	5	15	39	1	138				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.61	0.39	0.30	0.70	0.00	0.39	0.16	0.45	0.22	0.01	0.77				
Final Sat.:	0	411	268	195	447	0	183	76	213	119	3	422				
Capacity Analysis Module:																
Vol/Sat:	xxxx	1.05	1.05	1.13	1.13	xxxx	0.07	0.07	0.07	0.33	0.33	0.33				
Crit Moves:		****			****		****			****						
Delay/Veh:	0.0	71.5	71.5	98.0	98.0	0.0	10.9	10.9	10.9	12.7	12.7	12.7				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	71.5	71.5	98.0	98.0	0.0	10.9	10.9	10.9	12.7	12.7	12.7				
LOS by Move:	*	F	F	F	F	*	B	B	B	B	B	B				
ApproachDel:		71.5			98.0			10.9			12.7					
Delay Adj:		1.00			1.00			1.00			1.00					
ApprAdjDel:		71.5			98.0			10.9			12.7					
LOS by Appr:		F			F			B			B					
AllWayAvgQ:	11.9	11.9	11.9	16.0	16.0	16.0	0.1	0.1	0.1	0.5	0.5	0.5				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 1.144
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 67.5
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 13 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	131	553	0		0	344	123		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	131	553	0		0	344	123		0	0	0		0	0	0	
Added Vol:	0	151	0		0	36	5		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	131	704	0		0	380	128		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91	
PHF Volume:	144	774	0		0	418	141		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	144	774	0		0	418	141		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	144	774	0		0	418	141		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.16	0.84	0.00		0.00	0.75	0.25		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	126	676	0		0	593	200		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	1.14	1.14	xxxx		xxxx	0.70	0.70		xxxx	xxxx	xxxx		xxxx	xxxx	xxxx	
Crit Moves:		****				****										
Delay/Veh:	97.9	97.9	0.0		0.0	17.6	17.6		0.0	0.0	0.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	97.9	97.9	0.0		0.0	17.6	17.6		0.0	0.0	0.0		0.0	0.0	0.0	
LOS by Move:	F	F	*		*	C	C		*	*	*		*	*	*	
ApproachDel:		97.9				17.6			xxxxxx				xxxxxx			
Delay Adj:		1.00				1.00			xxxxx				xxxxx			
ApprAdjDel:		97.9				17.6			xxxxxx				xxxxxx			
LOS by Appr:		F				C			*				*			
AllWayAvgQ:	20.1	20.1	20.1		2.2	2.2	2.2		0.0	0.0	0.0		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.899
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 27.2
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	0	489	0		0	345	0		158	0	86		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	489	0		0	345	0		158	0	86		0	0	0	
Added Vol:	0	36	0		0	44	0		104	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	525	0		0	389	0		262	0	86		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	0	559	0		0	414	0		279	0	91		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	559	0		0	414	0		279	0	91		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	559	0		0	414	0		279	0	91		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	621	0		0	592	0		473	0	560		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.90	xxxx		xxxx	0.70	xxxx		0.59	xxxx	0.16		xxxx	xxxx	xxxx	
Crit Moves:		****				****			****							
Delay/Veh:	0.0	38.5	0.0		0.0	20.9	0.0		19.4	0.0	10.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	0.0	38.5	0.0		0.0	20.9	0.0		19.4	0.0	10.0		0.0	0.0	0.0	
LOS by Move:	*	E	*		*	C	*		C	*	B		*	*	*	
ApproachDel:		38.5				20.9			17.1				xxxxxx			
Delay Adj:		1.00				1.00			1.00				xxxxx			
ApprAdjDel:		38.5				20.9			17.1				xxxxxx			
LOS by Appr:		E				C			C				*			
AllWayAvgQ:	5.1	5.1	5.1		2.0	2.0	2.0		1.2	0.0	0.2		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.424
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 10.4
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 4 Dec 2002 << 7:00-9:00 AM																
Base Vol:	31	13	13	25	52	4	6	165	143	169	90	16				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	31	13	13	25	52	4	6	165	143	169	90	16				
Added Vol:	0	0	2	0	0	0	0	0	3	18	0	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	31	13	15	25	52	4	6	165	146	187	90	16				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94				
PHF Volume:	33	14	16	27	55	4	6	176	155	199	96	17				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	33	14	16	27	55	4	6	176	155	199	96	17				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	33	14	16	27	55	4	6	176	155	199	96	17				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.53	0.22	0.25	0.31	0.64	0.05	0.02	0.52	0.46	0.64	0.31	0.05				
Final Sat.:	313	131	151	184	383	29	15	414	367	469	226	40				
Capacity Analysis Module:																
Vol/Sat:	0.11	0.11	0.11	0.14	0.14	0.14	0.42	0.42	0.42	0.42	0.42	0.42				
Crit Moves:		****			****				****			****				
Delay/Veh:	9.0	9.0	9.0	9.3	9.3	9.3	10.4	10.4	10.4	11.1	11.1	11.1				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	9.0	9.0	9.0	9.3	9.3	9.3	10.4	10.4	10.4	11.1	11.1	11.1				
LOS by Move:	A	A	A	A	A	A	B	B	B	B	B	B				
ApproachDel:	9.0				9.3			10.4			11.1					
Delay Adj:	1.00				1.00			1.00			1.00					
ApprAdjDel:	9.0				9.3			10.4			11.1					
LOS by Appr:	A				A			B			B					
AllWayAvgQ:	0.1	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.7	0.7	0.7	0.7				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1131 Centenial Drvie/Helios Drvieway

Average Delay (sec/veh): 0.4 Worst Case Level Of Service: A[9.9]

Approach:	North Bound					South Bound					East Bound					West Bound				
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign					Stop Sign					Uncontrolled					Uncontrolled				
Rights:	Include					Include					Include					Include				
Lanes:	0	0	0	0	0	0	0	1!	0	0	0	1	0	0	0	0	0	0	1	0
Volume Module:																				
Base Vol:	0		0		0	0		0		0	0		254		0	0		185		0
Growth Adj:	1.00		1.00		1.00	1.00		1.00		1.00	1.00		1.00		1.00	1.00		1.00		1.00
Initial Bse:	0		0		0	0		0		0	0		254		0	0		185		0
Added Vol:	0		0		0	1		0		3	22		1		0	0		11		11
PasserByVol:	0		0		0	0		0		0	0		0		0	0		0		0
Initial Fut:	0		0		0	1		0		3	22		255		0	0		196		11
User Adj:	1.00		1.00		1.00	1.00		1.00		1.00	1.00		1.00		1.00	1.00		1.00		1.00
PHF Adj:	1.00		1.00		1.00	1.00		1.00		1.00	1.00		1.00		1.00	1.00		1.00		1.00
PHF Volume:	0		0		0	1		0		3	22		255		0	0		196		11
Reduct Vol:	0		0		0	0		0		0	0		0		0	0		0		0
FinalVolume:	0		0		0	1		0		3	22		255		0	0		196		11
Critical Gap Module:																				
Critical Gp:	xxxxx		xxxx		xxxxx	6.4		6.5		6.2	4.1		xxxx		xxxxx	xxxxx		xxxx		xxxxx
FollowUpTim:	xxxxx		xxxx		xxxxx	3.5		4.0		3.3	2.2		xxxx		xxxxx	xxxxx		xxxx		xxxxx
Capacity Module:																				
Cnflict Vol:	xxxx		xxxx		xxxxx	501		501		202	207		xxxx		xxxxx	xxxx		xxxx		xxxxx
Potent Cap.:	xxxx		xxxx		xxxxx	534		475		844	1376		xxxx		xxxxx	xxxx		xxxx		xxxxx
Move Cap.:	xxxx		xxxx		xxxxx	527		468		844	1376		xxxx		xxxxx	xxxx		xxxx		xxxxx
Volume/Cap:	xxxx		xxxx		xxxx	0.00		0.00		0.00	0.02		xxxx		xxxx	xxxx		xxxx		xxxx
Level Of Service Module:																				
2Way95thQ:	xxxx		xxxx		xxxxx	xxxx		xxxx		xxxxx	0.0		xxxx		xxxxx	xxxx		xxxx		xxxxx
Control Del:	xxxxx		xxxx		xxxxx	xxxxx		xxxx		xxxxx	7.7		xxxx		xxxxx	xxxxx		xxxx		xxxxx
LOS by Move:	*		*		*	*		*		*	A		*		*	*		*		*
Movement:	LT - LTR - RT					LT - LTR - RT					LT - LTR - RT					LT - LTR - RT				
Shared Cap.:	xxxx		xxxx		xxxxx	xxxx		734		xxxxx	xxxx		xxxx		xxxxx	xxxx		xxxx		xxxxx
SharedQueue:	xxxxx		xxxx		xxxxx	xxxxx		0.0		xxxxx	0.0		xxxx		xxxxx	xxxxx		xxxx		xxxxx
Shrd ConDel:	xxxxx		xxxx		xxxxx	xxxxx		9.9		xxxxx	7.7		xxxx		xxxxx	xxxxx		xxxx		xxxxx
Shared LOS:	*		*		*	*		A		*	A		*		*	*		*		*
ApproachDel:	xxxxxx					9.9					xxxxxx					xxxxxx				
ApproachLOS:	*					A					*					*				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 70 Critical Vol./Cap.(X): 0.956
Loss Time (sec): 8 (Y+R=4.0 sec) Average Delay (sec/veh): 41.0
Optimal Cycle: 112 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	18	17	17	17	17	17	17	17	17	17
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	1	0	0 1
Volume Module: >> Count Date: 5 Dec 2002 << 4:00-6:00 PM																
Base Vol:	318	288	19	4	203	49	28	52	288	69	197	40				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	318	288	19	4	203	49	28	52	288	69	197	40				
Added Vol:	38	35	1	0	12	0	0	2	5	3	18	0				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	356	323	20	4	215	49	28	54	293	72	215	40				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91				
PHF Volume:	391	355	22	4	236	54	31	59	322	79	236	44				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	391	355	22	4	236	54	31	59	322	79	236	44				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	391	355	22	4	236	54	31	59	322	79	236	44				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.68	0.68	0.68	0.97	0.97	0.97	0.86	0.86	0.86	0.82	0.82	0.85				
Lanes:	0.51	0.46	0.03	0.01	0.81	0.18	0.07	0.14	0.79	0.25	0.75	1.00				
Final Sat.:	658	597	37	27	1474	336	122	235	1274	390	1166	1615				
Capacity Analysis Module:																
Vol/Sat:	0.59	0.59	0.59	0.16	0.16	0.16	0.25	0.25	0.25	0.20	0.20	0.03				
Crit Moves:		****						****								
Green/Cycle:	0.54	0.54	0.54	0.54	0.54	0.54	0.46	0.46	0.46	0.46	0.46	0.46				
Volume/Cap:	1.10	1.10	1.10	0.30	0.30	0.30	0.55	0.55	0.55	0.44	0.44	0.06				
Delay/Veh:	81.0	81.0	81.0	9.6	9.6	9.6	14.1	14.1	14.1	12.5	12.5	8.8				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	81.0	81.0	81.0	9.6	9.6	9.6	14.1	14.1	14.1	12.5	12.5	8.8				
LOS by Move:	F	F	F	A	A	A	B	B	B	B	B	A				
HCM2kAvgQ:	30	30	30	4	4	4	6	6	6	4	4	0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 Critical Vol./Cap.(X): 1.222
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 80.4
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	359	19	135	459	0	20	7	15	47	0	232				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	359	19	135	459	0	20	7	15	47	0	232				
Added Vol:	0	-1	35	11	9	0	0	0	0	136	0	76				
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0				
Initial Fut:	0	358	54	146	468	0	20	7	15	183	0	308				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95				
PHF Volume:	0	377	57	154	493	0	21	7	16	193	0	324				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	377	57	154	493	0	21	7	16	193	0	324				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	377	57	154	493	0	21	7	16	193	0	324				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.87	0.13	0.24	0.76	0.00	0.47	0.17	0.36	0.37	0.00	0.63				
Final Sat.:	0	449	68	126	403	0	190	67	143	203	0	342				
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.84	0.84	1.22	1.22	xxxx	0.11	0.11	0.11	0.95	xxxx	0.95				
Crit Moves:			****		****				****	****						
Delay/Veh:	0.0	35.1	35.1	138.8	139	0.0	12.5	12.5	12.5	51.3	0.0	51.3				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	35.1	35.1	138.8	139	0.0	12.5	12.5	12.5	51.3	0.0	51.3				
LOS by Move:	*	E	E	F	F	*	B	B	B	F	*	F				
ApproachDel:	35.1			138.8			12.5			51.3						
Delay Adj:	1.00			1.00			1.00			1.00						
ApprAdjDel:	35.1			138.8			12.5			51.3						
LOS by Appr:	E			F			B			F						
AllWayAvgQ:	3.6	3.6	3.6	18.9	18.9	18.9	0.1	0.1	0.1	6.3	6.3	6.3				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.913
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 28.8
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 14 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	152	439	0		0	357	159		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	152	439	0		0	357	159		0	0	0		0	0	0	
Added Vol:	-1	56	0		0	22	39		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	151	495	0		0	379	198		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90	
PHF Volume:	168	550	0		0	421	220		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	168	550	0		0	421	220		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	168	550	0		0	421	220		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.23	0.77	0.00		0.00	0.66	0.34		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	184	602	0		0	532	278		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	0.91	0.91	xxxx		xxxx	0.79	0.79		xxxx	xxxx	xxxx		xxxx	xxxx	xxxx	
Crit Moves:		****				****										
Delay/Veh:	35.2	35.2	0.0		0.0	21.6	21.6		0.0	0.0	0.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	35.2	35.2	0.0		0.0	21.6	21.6		0.0	0.0	0.0		0.0	0.0	0.0	
LOS by Move:	E	E	*		*	C	C		*	*	*		*	*	*	
ApproachDel:	35.2					21.6			xxxxxx				xxxxxx			
Delay Adj:	1.00					1.00			xxxxx				xxxxx			
ApprAdjDel:	35.2					21.6			xxxxxx				xxxxxx			
LOS by Appr:	E					C			*				*			
AllWayAvgQ:	6.0	6.0	6.0		3.2	3.2	3.2		0.0	0.0	0.0		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.771
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 20.9
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	398	0		0	427	0		179	0	197		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	398	0		0	427	0		179	0	197		0	0	0	
Added Vol:	0	41	0		0	23	0		14	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	439	0		0	450	0		193	0	197		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.95	0.95	0.95		0.95	0.95	0.95		0.95	0.95	0.95		0.95	0.95	0.95	
PHF Volume:	0	462	0		0	474	0		203	0	207		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	462	0		0	474	0		203	0	207		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	462	0		0	474	0		203	0	207		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	612	0		0	615	0		477	0	565		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.75	xxxx		xxxx	0.77	xxxx		0.43	xxxx	0.37		xxxx	xxxx	xxxx	
Crit Moves:		****				****			****							
Delay/Veh:	0.0	23.6	0.0		0.0	24.6	0.0		14.9	0.0	12.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	0.0	23.6	0.0		0.0	24.6	0.0		14.9	0.0	12.0		0.0	0.0	0.0	
LOS by Move:	*	C	*		*	C	*		B	*	B		*	*	*	
ApproachDel:	23.6					24.6			13.5				xxxxxx			
Delay Adj:	1.00					1.00			1.00				xxxxx			
ApprAdjDel:	23.6					24.6			13.5				xxxxxx			
LOS by Appr:	C					C			B				*			
AllWayAvgQ:	2.5	2.5	2.5		2.7	2.7	2.7		0.7	0.0	0.5		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.834
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 19.7
Optimal Cycle: 0 Level Of Service: C

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 4 Dec 2002 << 4:00-6:00 PM																
Base Vol:	162	65	250		33	30	8		3	159	45		22	111	25	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	162	65	250		33	30	8		3	159	45		22	111	25	
Added Vol:	4	0	19		0	0	0		0	0	0		2	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	166	65	269		33	30	8		3	159	45		24	111	25	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.85	0.85	0.85		0.85	0.85	0.85		0.85	0.85	0.85		0.85	0.85	0.85	
PHF Volume:	195	76	316		39	35	9		4	187	53		28	131	29	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	195	76	316		39	35	9		4	187	53		28	131	29	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	195	76	316		39	35	9		4	187	53		28	131	29	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.33	0.13	0.54		0.47	0.42	0.11		0.01	0.77	0.22		0.15	0.69	0.16	
Final Sat.:	234	92	380		248	225	60		8	438	124		83	383	86	
Capacity Analysis Module:																
Vol/Sat:	0.83	0.83	0.83		0.16	0.16	0.43		0.43	0.43	0.43		0.34	0.34	0.34	
Crit Moves:			****		****					****				****		
Delay/Veh:	26.6	26.6	26.6		10.0	10.0	10.0		12.6	12.6	12.6		11.7	11.7	11.7	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	26.6	26.6	26.6		10.0	10.0	10.0		12.6	12.6	12.6		11.7	11.7	11.7	
LOS by Move:	D	D	D		B	B	B		B	B	B		B	B	B	
ApproachDel:	26.6				10.0				12.6				11.7			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	26.6				10.0				12.6				11.7			
LOS by Appr:	D				B				B				B			
AllWayAvgQ:	3.6	3.6	3.6		0.1	0.1	0.1		0.6	0.6	0.6		0.4	0.4	0.4	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Near Term with Project
PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1131 Centenial Drvie/Helios Drvieway

Average Delay (sec/veh): 0.7 Worst Case Level Of Service: B[10.6]

Approach:	North Bound					South Bound					East Bound					West Bound				
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign					Stop Sign					Uncontrolled					Uncontrolled				
Rights:	Include					Include					Include					Include				
Lanes:	0	0	0	0	0	0	0	1!	0	0	0	1	0	0	0	0	0	0	1	0
Volume Module:																				
Base Vol:	0		0		0	0		0		0	0		242		0	0		250		0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0		0		0	0		0		0	0		242		0	0		250		0
Added Vol:	0		0		0	11		0		24	3		12		0	0		1		1
PasserByVol:	0		0		0	0		0		0	0		0		0	0		0		0
Initial Fut:	0		0		0	11		0		24	3		254		0	0		251		1
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0		0		0	11		0		24	3		254		0	0		251		1
Reduct Vol:	0		0		0	0		0		0	0		0		0	0		0		0
FinalVolume:	0		0		0	11		0		24	3		254		0	0		251		1
Critical Gap Module:																				
Critical Gp:	xxxxx	xxxx	xxxxx			6.4	6.5			6.2	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
FollowUpTim:	xxxxx	xxxx	xxxxx			3.5	4.0			3.3	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
Capacity Module:																				
Cnflict Vol:	xxxx	xxxx	xxxxx			512	512			252	252	xxxx	xxxxx	xxxx	xxxx	xxxxx				
Potent Cap.:	xxxx	xxxx	xxxxx			526	469			792	1325	xxxx	xxxxx	xxxx	xxxx	xxxxx				
Move Cap.:	xxxx	xxxx	xxxxx			525	467			792	1325	xxxx	xxxxx	xxxx	xxxx	xxxxx				
Volume/Cap:	xxxx	xxxx	xxxx			0.02	0.00			0.03	0.00	xxxx	xxxx	xxxx	xxxx	xxxx				
Level Of Service Module:																				
2Way95thQ:	xxxx	xxxx	xxxxx			xxxx	xxxx	xxxxx			0.0	xxxx	xxxxx	xxxx	xxxx	xxxxx				
Control Del:	xxxxx	xxxx	xxxxx			xxxxx	xxxx	xxxxx			7.7	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
LOS by Move:	*	*	*			*	*	*			A	*	*	*	*	*				
Movement:	LT -	LTR -	RT			LT -	LTR -	RT			LT -	LTR -	RT		LT -	LTR -	RT			
Shared Cap.:	xxxx	xxxx	xxxxx			xxxx	683	xxxxx			xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx			
SharedQueue:	xxxxx	xxxx	xxxxx			xxxxx	0.2	xxxxx			0.0	xxxx	xxxxx		xxxxx	xxxx	xxxxx			
Shrd ConDel:	xxxxx	xxxx	xxxxx			xxxxx	10.6	xxxxx			7.7	xxxx	xxxxx		xxxxx	xxxx	xxxxx			
Shared LOS:	*	*	*			*	B	*			A	*	*		*	*	*			
ApproachDel:	xxxxxx					10.6					xxxxxx				xxxxxx					
ApproachLOS:	*					B					*				*					

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 Critical Vol./Cap.(X): 1.333
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 134.3
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	0	386	19	128	471	0	12	5	14	18	1	118				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	386	19	128	471	0	12	5	14	18	1	118				
Added Vol:	0	53	255	91	10	0	0	0	0	34	0	15				
Future:	0	66	11	22	110	0	0	0	0	11	0	22				
Initial Fut:	0	505	285	241	591	0	12	5	14	63	1	155				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	0	505	285	241	591	0	12	5	14	63	1	155				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	505	285	241	591	0	12	5	14	63	1	155				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	505	285	241	591	0	12	5	14	63	1	155				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.64	0.36	0.29	0.71	0.00	0.39	0.16	0.45	0.28	0.01	0.71				
Final Sat.:	0	419	236	181	443	0	177	74	207	155	2	383				
Capacity Analysis Module:																
Vol/Sat:	xxxx	1.21	1.21	1.33	1.33	xxxx	0.07	0.07	0.07	0.41	0.41	0.41				
Crit Moves:			****		****		****				****					
Delay/Veh:	0.0	126	125.9	178.5	179	0.0	11.1	11.1	11.1	14.0	14.0	14.0				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	126	125.9	178.5	179	0.0	11.1	11.1	11.1	14.0	14.0	14.0				
LOS by Move:	*	F	F	F	F	*	B	B	B	B	B	B				
ApproachDel:	125.9			178.5			11.1			14.0						
Delay Adj:	1.00			1.00			1.00			1.00						
ApprAdjDel:	125.9			178.5			11.1			14.0						
LOS by Appr:	F			F			B			B						
AllWayAvgQ:	21.4	21.4	21.4	29.4	29.4	29.4	0.1	0.1	0.1	0.7	0.7	0.7				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 1.356
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 123.1
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	1	0	0 0	0	0	0	1 0	0	0	0	0 0	0	0	0	0 0
Volume Module: >> Count Date: 13 Nov 2002 << 7:00 AM - 9:00 AM																
Base Vol:	131	553	0	0	344	123	0	0	0	0	0	0				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	131	553	0	0	344	123	0	0	0	0	0	0				
Added Vol:	104	200	0	0	38	30	0	0	0	0	0	0				
Future:	11	66	0	0	44	66	0	0	0	0	0	0				
Initial Fut:	246	819	0	0	426	219	0	0	0	0	0	0				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	246	819	0	0	426	219	0	0	0	0	0	0				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	246	819	0	0	426	219	0	0	0	0	0	0				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	246	819	0	0	426	219	0	0	0	0	0	0				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.23	0.77	0.00	0.00	0.66	0.34	0.00	0.00	0.00	0.00	0.00	0.00				
Final Sat.:	181	604	0	0	530	273	0	0	0	0	0	0				
Capacity Analysis Module:																
Vol/Sat:	1.36	1.36	xxxx	xxxx	0.80	0.80	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx				
Crit Moves:		****			****											
Delay/Veh:	183.6	184	0.0	0.0	23.1	23.1	0.0	0.0	0.0	0.0	0.0	0.0				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	183.6	184	0.0	0.0	23.1	23.1	0.0	0.0	0.0	0.0	0.0	0.0				
LOS by Move:	F	F	*	*	C	C	*	*	*	*	*	*				
ApproachDel:	183.6				23.1		xxxxxx			xxxxxx						
Delay Adj:	1.00				1.00		xxxxx			xxxxx						
ApprAdjDel:	183.6				23.1		xxxxxx			xxxxxx						
LOS by Appr:	F				C		*			*						
AllWayAvgQ:	38.4	38.4	38.4	3.5	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 1.201
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 68.8
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	1 0	0	0 0	1 0	0	1 0	0 0	1	0 0	0 0	0
Volume Module: >> Count Date: 20 Nov 2002 << 7:00 AM - 9:00 AM												
Base Vol:	0	489	0	0	345	0	158	0	86	0	0	0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0	489	0	0	345	0	158	0	86	0	0	0
Added Vol:	0	163	0	0	47	0	130	0	9	0	0	0
Future:	0	55	0	0	44	0	33	0	66	0	0	0
Initial Fut:	0	707	0	0	436	0	321	0	161	0	0	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0	707	0	0	436	0	321	0	161	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	707	0	0	436	0	321	0	161	0	0	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	0	707	0	0	436	0	321	0	161	0	0	0
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Final Sat.:	0	589	0	0	564	0	471	0	556	0	0	0
Capacity Analysis Module:												
Vol/Sat:	xxxx	1.20	xxxx	xxxx	0.77	xxxx	0.68	xxxx	0.29	xxxx	xxxx	xxxx
Crit Moves:		****			****		****					
Delay/Veh:	0.0	127	0.0	0.0	27.4	0.0	24.8	0.0	11.7	0.0	0.0	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	127	0.0	0.0	27.4	0.0	24.8	0.0	11.7	0.0	0.0	0.0
LOS by Move:	*	F	*	*	D	*	C	*	B	*	*	*
ApproachDel:	127.4			27.4			20.4			xxxxxx		
Delay Adj:	1.00			1.00			1.00			xxxxx		
ApprAdjDel:	127.4			27.4			20.4			xxxxxx		
LOS by Appr:	F			D			C			*		
AllWayAvgQ:	19.3	19.3	19.3	2.8	2.8	2.8	1.9	0.0	0.4	0.0	0.0	0.0

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.499
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 11.4
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module: >> Count Date: 4 Dec 2002 << 7:00-9:00 AM												
Base Vol:	31	13	13	25	52	4	6	165	143	169	90	16
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	31	13	13	25	52	4	6	165	143	169	90	16
Added Vol:	1	0	5	0	0	0	0	0	7	45	0	0
Future:	33	0	11	0	0	0	0	22	11	22	11	0
Initial Fut:	65	13	29	25	52	4	6	187	161	236	101	16
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	65	13	29	25	52	4	6	187	161	236	101	16
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	65	13	29	25	52	4	6	187	161	236	101	16
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	65	13	29	25	52	4	6	187	161	236	101	16
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.61	0.12	0.27	0.31	0.64	0.05	0.02	0.53	0.45	0.67	0.29	0.04
Final Sat.:	351	70	156	173	359	28	13	401	345	473	203	32
Capacity Analysis Module:												
Vol/Sat:	0.19	0.19	0.19	0.14	0.14	0.14	0.47	0.47	0.47	0.50	0.50	0.50
Crit Moves:			****		****				****		****	
Delay/Veh:	9.7	9.7	9.7	9.5	9.5	9.5	11.3	11.3	11.3	12.5	12.5	12.5
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	9.7	9.7	9.7	9.5	9.5	9.5	11.3	11.3	11.3	12.5	12.5	12.5
LOS by Move:	A	A	A	A	A	A	B	B	B	B	B	B
ApproachDel:	9.7			9.5			11.3			12.5		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.7			9.5			11.3			12.5		
LOS by Appr:	A			A			B			B		
AllWayAvgQ:	0.2	0.2	0.2	0.1	0.1	0.1	0.8	0.8	0.8	0.9	0.9	0.9

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1131 Centenial Drvie/Helios Drvieway

Average Delay (sec/veh): 0.3 Worst Case Level Of Service: B[10.5]

Approach:	North Bound					South Bound					East Bound					West Bound				
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign					Stop Sign					Uncontrolled					Uncontrolled				
Rights:	Include					Include					Include					Include				
Lanes:	0	0	0	0	0	0	0	1!	0	0	0	1	0	0	0	0	0	0	1	0
Volume Module:																				
Base Vol:	0	0	0	0	0	0	0	0	0	0	0	254	0	0	0	0	185	0		
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Initial Bse:	0	0	0	0	0	0	0	0	0	0	0	254	0	0	0	0	185	0		
Added Vol:	0	0	0	1	0	3	22	27	0	0	0	32	11							
Future:	0	0	0	0	0	0	0	44	0	0	0	33	0							
Initial Fut:	0	0	0	1	0	3	22	325	0	0	0	250	11							
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00							
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00							
PHF Volume:	0	0	0	1	0	3	22	325	0	0	0	250	11							
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0	0							
FinalVolume:	0	0	0	1	0	3	22	325	0	0	0	250	11							
Critical Gap Module:																				
Critical Gp:	xxxxx	xxxx	xxxxx	6.4	6.5	6.2	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx								
FollowUpTim:	xxxxx	xxxx	xxxxx	3.5	4.0	3.3	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx								
Capacity Module:																				
Cnflict Vol:	xxxx	xxxx	xxxxx	625	625	256	261	xxxx	xxxxx	xxxx	xxxx	xxxxx								
Potent Cap.:	xxxx	xxxx	xxxxx	452	404	788	1315	xxxx	xxxxx	xxxx	xxxx	xxxxx								
Move Cap.:	xxxx	xxxx	xxxxx	446	397	788	1315	xxxx	xxxxx	xxxx	xxxx	xxxxx								
Volume/Cap:	xxxx	xxxx	xxxx	0.00	0.00	0.00	0.02	xxxx	xxxx	xxxx	xxxx	xxxx								
Level Of Service Module:																				
2Way95thQ:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	0.1	xxxx	xxxxx	xxxx	xxxx	xxxxx								
Control Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.8	xxxx	xxxxx	xxxxx	xxxx	xxxxx								
LOS by Move:	*	*	*	*	*	*	A	*	*	*	*	*								
Movement:	LT - LTR - RT					LT - LTR - RT					LT - LTR - RT					LT - LTR - RT				
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	661	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx								
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	0.0	xxxxx	0.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx								
Shrd ConDel:	xxxxx	xxxx	xxxxx	xxxxx	10.5	xxxxx	7.8	xxxx	xxxxx	xxxxx	xxxx	xxxxx								
Shared LOS:	*	*	*	*	B	*	A	*	*	*	*	*								
ApproachDel:	xxxxxx				10.5		xxxxxx				xxxxxx									
ApproachLOS:	*				B		*				*									

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #1 Hearst Avenue / Gayley Road / LaLoma Avenue

Cycle (sec): 70 Critical Vol./Cap.(X): 1.184
Loss Time (sec): 8 (Y+R=4.0 sec) Average Delay (sec/veh): 85.2
Optimal Cycle: 180 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Permitted				Permitted				Permitted				Permitted			
Rights:	Include				Include				Include				Include			
Min. Green:	18	18	18	18	18	18	17	17	17	17	17	17				
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	1	0	0 1
Volume Module: >> Count Date: 5 Dec 2002 << 4:00-6:00 PM																
Base Vol:	318	288	19	4	203	49	28	52	288	69	197	40				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	318	288	19	4	203	49	28	52	288	69	197	40				
Added Vol:	46	31	9	0	12	0	0	8	22	11	66	0				
Future:	99	33	11	0	0	22	22	33	66	11	66	11				
Initial Fut:	463	352	39	4	215	71	50	93	376	91	329	51				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	463	352	39	4	215	71	50	93	376	91	329	51				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	463	352	39	4	215	71	50	93	376	91	329	51				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	463	352	39	4	215	71	50	93	376	91	329	51				
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Adjustment:	0.67	0.67	0.67	0.96	0.96	0.96	0.72	0.72	0.72	0.73	0.73	0.85				
Lanes:	0.54	0.41	0.05	0.01	0.75	0.24	0.10	0.18	0.72	0.22	0.78	1.00				
Final Sat.:	694	528	58	25	1351	446	131	244	985	299	1081	1615				
Capacity Analysis Module:																
Vol/Sat:	0.67	0.67	0.67	0.16	0.16	0.16	0.38	0.38	0.38	0.30	0.30	0.03				
Crit Moves:		****						****								
Green/Cycle:	0.56	0.56	0.56	0.56	0.56	0.56	0.33	0.33	0.33	0.33	0.33	0.33				
Volume/Cap:	1.19	1.19	1.19	0.28	0.28	0.28	1.16	1.16	1.16	0.92	0.92	0.10				
Delay/Veh:	114.9	115	114.9	8.8	8.8	8.8	115.7	116	115.7	48.4	48.4	16.0				
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	114.9	115	114.9	8.8	8.8	8.8	115.7	116	115.7	48.4	48.4	16.0				
LOS by Move:	F	F	F	A	A	A	F	F	F	D	D	B				
HCM2kAvgQ:	39	39	39	3	3	3	24	24	24	13	13	1				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #3 Stadium Rim Road / Gayley Road

Cycle (sec): 100 Critical Vol./Cap.(X): 1.401
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 131.7
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0				
Lanes:	0	0	0	1 0	0	1	0	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	359	19	135	459	0	20	7	15	47	0	232				
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Initial Bse:	0	359	19	135	459	0	20	7	15	47	0	232				
Added Vol:	0	6	48	14	22	0	0	0	0	154	0	96				
Future:	0	99	11	22	55	0	0	0	0	11	0	33				
Initial Fut:	0	464	78	171	536	0	20	7	15	212	0	361				
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
PHF Volume:	0	464	78	171	536	0	20	7	15	212	0	361				
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0				
Reduced Vol:	0	464	78	171	536	0	20	7	15	212	0	361				
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
FinalVolume:	0	464	78	171	536	0	20	7	15	212	0	361				
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lanes:	0.00	0.86	0.14	0.24	0.76	0.00	0.47	0.17	0.36	0.37	0.00	0.63				
Final Sat.:	0	440	74	122	382	0	190	67	143	196	0	334				
Capacity Analysis Module:																
Vol/Sat:	xxxx	1.05	1.05	1.40	1.40	xxxx	0.11	0.11	0.11	1.08	xxxx	1.08				
Crit Moves:		****			****		****					****				
Delay/Veh:	0.0	81.1	81.1	213.0	213	0.0	13.1	13.1	13.1	87.9	0.0	87.9				
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
AdjDel/Veh:	0.0	81.1	81.1	213.0	213	0.0	13.1	13.1	13.1	87.9	0.0	87.9				
LOS by Move:	*	F	F	F	F	*	B	B	B	F	*	F				
ApproachDel:		81.1			213.0			13.1			87.9					
Delay Adj:		1.00			1.00			1.00			1.00					
ApprAdjDel:		81.1			213.0			13.1			87.9					
LOS by Appr:		F			F			B			F					
AllWayAvgQ:	10.2	10.2	10.2	28.4	28.4	28.4	0.1	0.1	0.1	11.5	11.5	11.5				

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #6 Bancroft Way / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 1.009
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 41.6
Optimal Cycle: 0 Level Of Service: E

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Volume Module: >> Count Date: 13 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	152	439	0		0	357	159		0	0	0		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	152	439	0		0	357	159		0	0	0		0	0	0	
Added Vol:	12	77	0		0	38	55		0	0	0		0	0	0	
Future:	11	99	0		0	44	11		0	0	0		0	0	0	
Initial Fut:	175	615	0		0	439	225		0	0	0		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	175	615	0		0	439	225		0	0	0		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	175	615	0		0	439	225		0	0	0		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	175	615	0		0	439	225		0	0	0		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.22	0.78	0.00		0.00	0.66	0.34		0.00	0.00	0.00		0.00	0.00	0.00	
Final Sat.:	173	609	0		0	531	272		0	0	0		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	1.01	1.01	xxxx		xxxx	0.83	0.83		xxxx	xxxx	xxxx		xxxx	xxxx	xxxx	
Crit Moves:		****				****										
Delay/Veh:	55.5	55.5	0.0		0.0	25.1	25.1		0.0	0.0	0.0		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	55.5	55.5	0.0		0.0	25.1	25.1		0.0	0.0	0.0		0.0	0.0	0.0	
LOS by Move:	F	F	*		*	D	D		*	*	*		*	*	*	
ApproachDel:	55.5					25.1			xxxxxx				xxxxxx			
Delay Adj:	1.00					1.00			xxxxx				xxxxx			
ApprAdjDel:	55.5					25.1			xxxxxx				xxxxxx			
LOS by Appr:	F					D			*				*			
AllWayAvgQ:	10.4	10.4	10.4		3.9	3.9	3.9		0.0	0.0	0.0		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #7 Durant Avenue / Piedmont Avenue

Cycle (sec): 100 Critical Vol./Cap.(X): 0.945
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 37.5
Optimal Cycle: 0 Level Of Service: E

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 20 Nov 2002 << 4:00 - 6:00 PM																
Base Vol:	0	398	0		0	427	0		179	0	197		0	0	0	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	0	398	0		0	427	0		179	0	197		0	0	0	
Added Vol:	0	59	0		0	39	0		30	0	79		0	0	0	
Future:	0	77	0		0	55	0		44	0	44		0	0	0	
Initial Fut:	0	534	0		0	521	0		253	0	320		0	0	0	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Volume:	0	534	0		0	521	0		253	0	320		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	0	534	0		0	521	0		253	0	320		0	0	0	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	0	534	0		0	521	0		253	0	320		0	0	0	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.00	1.00	0.00		0.00	1.00	0.00		1.00	0.00	1.00		0.00	0.00	0.00	
Final Sat.:	0	565	0		0	563	0		460	0	541		0	0	0	
Capacity Analysis Module:																
Vol/Sat:	xxxx	0.94	xxxx		xxxx	0.93	xxxx		0.55	xxxx	0.59		xxxx	xxxx	xxxx	
Crit Moves:		****				****					****					
Delay/Veh:	0.0	49.7	0.0		0.0	46.0	0.0		19.0	0.0	17.7		0.0	0.0	0.0	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	0.0	49.7	0.0		0.0	46.0	0.0		19.0	0.0	17.7		0.0	0.0	0.0	
LOS by Move:	*	E	*		*	E	*		C	*	C		*	*	*	
ApproachDel:		49.7				46.0				18.3			xxxxxx			
Delay Adj:		1.00				1.00				1.00			xxxxx			
ApprAdjDel:		49.7				46.0				18.3			xxxxxx			
LOS by Appr:		E				E				C			*			
AllWayAvgQ:	6.3	6.3	6.3		5.7	5.7	5.7		1.1	0.0	1.3		0.0	0.0	0.0	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #10 Grizzly Peak Blvd / Centennial Drive

Cycle (sec): 100 Critical Vol./Cap.(X): 0.932
Loss Time (sec): 0 (Y+R=4.0 sec) Average Delay (sec/veh): 27.9
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 4 Dec 2002 << 4:00-6:00 PM																
Base Vol:	162	65	250		33	30	8		3	159	45		22	111	25	
Growth Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Initial Bse:	162	65	250		33	30	8		3	159	45		22	111	25	
Added Vol:	9	0	47		0	0	0		0	0	0		5	0	0	
Future:	11	0	33		0	0	0		0	22	22		11	11	0	
Initial Fut:	182	65	330		33	30	8		3	181	67		38	122	25	
User Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
PHF Adj:	0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90	
PHF Volume:	202	72	367		37	33	9		3	201	74		42	136	28	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	202	72	367		37	33	9		3	201	74		42	136	28	
PCE Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
MLF Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
FinalVolume:	202	72	367		37	33	9		3	201	74		42	136	28	
Saturation Flow Module:																
Adjustment:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Lanes:	0.32	0.11	0.57		0.47	0.42	0.11		0.01	0.72	0.27		0.21	0.66	0.13	
Final Sat.:	217	78	393		237	216	58		7	411	152		112	358	73	
Capacity Analysis Module:																
Vol/Sat:	0.93	0.93	0.93		0.15	0.15	0.15		0.49	0.49	0.49		0.38	0.38	0.38	
Crit Moves:	****				****					****				****		
Delay/Veh:	40.9	40.9	40.9		10.5	10.5	10.5		14.3	14.3	14.3		12.8	12.8	12.8	
Delay Adj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	40.9	40.9	40.9		10.5	10.5	10.5		14.3	14.3	14.3		12.8	12.8	12.8	
LOS by Move:	E	E	E		B	B	B		B	B	B		B	B	B	
ApproachDel:	40.9				10.5				14.3				12.8			
Delay Adj:	1.00				1.00				1.00				1.00			
ApprAdjDel:	40.9				10.5				14.3				12.8			
LOS by Appr:	E				B				B				B			
AllWayAvgQ:	6.2	6.2	6.2		0.1	0.1	0.1		0.8	0.8	0.8		0.5	0.5	0.5	

Note: Queue reported is the number of cars per lane.

LBNL Helios Project
Updated Year 2025 with LRDP Conditions
PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1131 Centenial Drvie/Helios Drvieway

Average Delay (sec/veh): 0.6 Worst Case Level Of Service: B[11.4]

Approach:	North Bound					South Bound					East Bound					West Bound				
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Stop Sign					Stop Sign					Uncontrolled					Uncontrolled				
Rights:	Include					Include					Include					Include				
Lanes:	0	0	0	0	0	0	0	1!	0	0	0	1	0	0	0	0	0	0	1	0
Volume Module:																				
Base Vol:	0		0		0	0		0		0	0		242		0	0		250		0
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	0		0		0	0		0		0	0		242		0	0		250		0
Added Vol:	0		0		0	11		0		24	3		29		0	0		39		1
Future:	0		0		0	0		0		0	0		44		0	0		33		0
Initial Fut:	0		0		0	11		0		24	3		315		0	0		322		1
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Volume:	0		0		0	11		0		24	3		315		0	0		322		1
Reduct Vol:	0		0		0	0		0		0	0		0		0	0		0		0
FinalVolume:	0		0		0	11		0		24	3		315		0	0		322		1
Critical Gap Module:																				
Critical Gp:	xxxxx	xxxx	xxxxx			6.4	6.5			6.2	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
FollowUpTim:	xxxxx	xxxx	xxxxx			3.5	4.0			3.3	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
Capacity Module:																				
Cnflict Vol:	xxxx	xxxx	xxxxx			644	644			323	323	xxxx	xxxxx		xxxx	xxxx	xxxxx			
Potent Cap.:	xxxx	xxxx	xxxxx			441	394			723	1248	xxxx	xxxxx		xxxx	xxxx	xxxxx			
Move Cap.:	xxxx	xxxx	xxxxx			440	393			723	1248	xxxx	xxxxx		xxxx	xxxx	xxxxx			
Volume/Cap:	xxxx	xxxx	xxxx			0.03	0.00			0.03	0.00	xxxx	xxxx		xxxx	xxxx	xxxx			
Level Of Service Module:																				
2Way95thQ:	xxxx	xxxx	xxxxx			xxxx	xxxx	xxxxx			0.0	xxxx	xxxxx		xxxx	xxxx	xxxxx			
Control Del:	xxxxx	xxxx	xxxxx			xxxxx	xxxx	xxxxx			7.9	xxxx	xxxxx		xxxxx	xxxx	xxxxx			
LOS by Move:	*		*			*		*			A		*		*		*			
Movement:	LT	-	LTR	-	RT	LT	-	LTR	-	RT	LT	-	LTR	-	RT	LT	-	LTR	-	RT
Shared Cap.:	xxxx	xxxx	xxxxx			xxxx		601	xxxxx		xxxx	xxxx	xxxxx			xxxx	xxxx	xxxxx		
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx				0.2	xxxxx		0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
Shrd ConDel:	xxxxx	xxxx	xxxxx	xxxxx				11.4	xxxxx		7.9	xxxx	xxxxx	xxxxx	xxxx	xxxxx				
Shared LOS:	*		*			*		B		*	A		*		*		*			
ApproachDel:	xxxxxx							11.4			xxxxxx					xxxxxx				
ApproachLOS:			*					B					*					*		

Note: Queue reported is the number of cars per lane.

APPENDIX 4.13

Energy Consumption and Cost Report

Produced: 1/10/2007

Energy Consumption and Cost Report

Site: 305 LAWRENCE BERKELEY LABORATORY Field Element: SC SCIENCE

Quarters: 1 - 4 Program Office: SC

	Consumption					Cost (x $1000)		
	2003		2006					
	Standard Units	BTU x 10 9 Units	Standard Units	BTU x 10 9 Units	% Change	2003	2006	% Change
BUILDINGS								
Electricity-MWH	0.000	0.000	0.000	0.000		0.000	0.000	
Green Credits-MWH	0.000	0.000	0.000	0.000		0.000	0.000	
Fuel Oil-(K Gal)	0.000	0.000	0.000	0.000		0.000	0.000	
Natural Gas-(MCF)	0.000	0.000	0.000	0.000		0.000	0.000	
LPG-(K Gal)	0.000	0.000	0.000	0.000		0.000	0.000	
Coal-Short Tons	0.000	0.000	0.000	0.000		0.000	0.000	
Steam-(Btu X 10 9)	0.000	0.000	0.000	0.000		0.000	0.000	
Other-(Btu X 10 9)	0.000	0.000	0.000	0.000		0.000	0.000	
Total:		0.000		0.000		0.000	0.000	
METERED PROCESS								
Electricity-MWH	13,261.631	45.249	20,452.128	69.783	54.22%	1,375.917	1,871.214	36.00%
Green Credits-MWH	0.000	0.000	0.000	0.000		0.000	0.000	
Fuel Oil-(K Gal)	0.000	0.000	0.000	0.000		0.000	0.000	
Natural Gas-(MCF)	0.000	0.000	0.000	0.000		0.000	0.000	
LPG-(K Gal)	0.000	0.000	0.000	0.000		0.000	0.000	
Coal-Short Tons	0.000	0.000	0.000	0.000		0.000	0.000	
Steam-(Btu X 10 9)	0.000	0.000	0.000	0.000		0.000	0.000	
Other-(Btu X 10 9)	0.000	0.000	0.000	0.000		0.000	0.000	
Total:		45.249		69.783	54.22%	1,375.917	1,871.214	36.00%
Square Footage (x1000):		42.888		284.207	562.67%			
Energy/1000 SqFt		1,055.050		245.536	-76.73%			
LAB/INDUSTRIAL								
Electricity-MWH	74,950.330	255.731	71,088.630	242.554	-5.15%	3,578.013	4,438.130	24.04%
Green Credits-MWH	0.000	0.000	0.000	0.000		0.000	0.000	
Fuel Oil-(K Gal)	0.000	0.000	0.000	0.000		0.000	0.000	
Natural Gas-(MCF)	154,077.000	158.853	150,984.000	155.665	-2.01%	923.129	1,317.430	42.71%
LPG-(K Gal)	0.000	0.000	0.000	0.000		0.000	0.000	
Coal-Short Tons	0.000	0.000	0.000	0.000		0.000	0.000	
Steam-(Btu X 10 9)	0.000	0.000	0.000	0.000		0.000	0.000	
Other-(Btu X 10 9)	0.000	0.000	0.000	0.000		0.000	0.000	
Total:		414.584		398.219	-3.95%	4,501.142	5,755.560	27.87%
Square Footage (x1000):		2,045.841		2,096.252	2.46%			
Energy/1000 SqFt		202.647		189.967	-6.26%			
Facilities Subtotal		459.833		468.002	1.78%	5,877.059	7,626.774	29.77%
Total (BTUs)		459.833		468.002	1.78%	5,877.059	7,626.774	29.77%